Transformations:
Ecology of Pyrmont peninsula
1788 - 2008

John Broadbent

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Sydney, 2010.

Executive summary

City Council's 'Sustainable Sydney 2030' initiative 'is a vision for the sustainable development of the City for the next 20 years and beyond'. It has a largely anthropocentric basis, that is 'viewing and interpreting everything in terms of human experience and values'(Macquarie Dictionary, 2005). The perspective taken here is that Council's initiative, vital though it is, should be underpinned by an ecocentric ethic to succeed. This latter was defined by Aldo Leopold in 1949, 60 years ago, as 'a philosophy that recognizes[sic] that the ecosphere, rather than any individual organism[notably humans] is the source and support of all life and as such advises a holistic and eco-centric approach to government, industry, and individual'(http://dictionary.babylon.com). Some relevant considerations are set out in Part 1: General Introduction.

In this report, Pyrmont peninsula - that is the communities of Pyrmont and Ultimo – is considered as a microcosm of the City of Sydney, indeed of urban areas globally. An extensive series of early views of the peninsula are presented to help the reader better visualise this place as it was early in European settlement (Part 2: Early views of Pyrmont peninsula).

The physical geography of Pyrmont peninsula has been transformed since European settlement, and Part 3: Physical geography of Pyrmont peninsula describes the geology, soils, topography, shoreline and drainage as they would most likely have appeared to the first Europeans to set foot there.

The above exercise was considered an essential preliminary to describing the ecology of the peninsula at European settlement(Part 4: Flora and Fauna of Pyrmont peninsula in 1788). This part also provides insights into some of the taxonomists who created an orderly view of plant and animal life around Port Jackson. Recognition is also given to the many observers, past and present, who have detailed the distribution and abundance of plant and animal species around Sydney. The outcome is an assessment that at least 675 plant species, perhaps 22 frog species and 45 reptile species, at least 220 bird species and 60 or more mammal species inhabited Pyrmont peninsula and adjoining waters at European settlement. This rich flora and fauna was related to the diverse habitats of the peninsula – from the typical sandstone country of its spine; the moister and taller forests at its base, towards today's Broadway; the extensive and diverse wetlands at the heads of Cockle and Blackwattle Bays; the varied shoreline communities; and the mangroves, limited saltmarsh, and seagrass beds offshore.

These natural lands were essentially destroyed during the century or so after European settlement by a series of transformative activities(Part 5: Transformations). The first, and likely the most ecologically injurious, was the clearing of native vegetation, which was completed during the 1840s. The peninsula and its relict ecology continued to be physically and biologically altered by a series of transformations which mostly started in the second half of the 19th century and continued into the 20th – agriculture, sandstone removal, urbanisation, industrialisation(and commercialisation), land reclamation, railway/wharf construction and, in the last 2-3 decades, urban consolidation.

Each of these transformations has been driven by economics with little or no regard for ecology. The result, not surprisingly, is a highly impoverished native flora and fauna on Pyrmont peninsula today(Part 6: Flora and fauna of Pyrmont peninsula in 2008). Fewer than 20 native plants remain, supplemented by almost 80 species re-introduced by landcarers. Some 45 native bird species have been observed in recent years, of which almost a third are considered vagrant or rare and almost half are uncommon. No frogs are believed to remain on the peninsula, although aquarium escapees are recorded from time to time. Seven reptile species have been observed in Pyrmont-Ultimo, the survival of over half of which is threatened. The Grey-headed Flying Fox and Common Brushtail Possum are the only native mammals known to occur on the peninsula today.

The ecological devastation of a peninsula near central Sydney has occurred in a little over two hundred years – mostly in the first century of European settlement. Of itself, this is nothing remarkable and is a predictable outcome of the urbanisation processes humans have practiced for some 7,000 years. Ecology has consistently been secondary to economy.

As we look towards a near-term future in which 60% of all humans will be urbanised by 2030, we must question the viability of our anthropocentric views of so many millennia. Perhaps we should rather adopt an ecocentric world view, and engage in 'the mother of all transformations' before it is too late – and collapse of global civilisation as we know it becomes unavoidable. Actions which will engage us with such a change process are suggested in Part 8: Proposals. These are starting points of a process which should be swift and systemic if it is to succeed; they will doubtless be greatly elaborated by the experience of implementation.

Acknowledgments

It is with much pleasure that I acknowledge the help of many individuals during this project:

* My profound thanks to the reader services librarians of the State Library of New South Wales, who patiently led me through the seemingly-endless complexities of the library catalogue. The wealth of information contained in this report is due largely to their helpful and ongoing commitment.

* I particularly acknowledge the help of Mark Hildebrand, whose encyclopaedic knowledge of the State Library collection and the multiplicity of ways to access it repeatedly expedited the location of relevant resources.

* Behind the reader services staff are the collectors, who must have walked many kilometres in search of requested materials, their retrieval skills ensuring the rapid supply of items. I should particularly mention librarian Joanne Searle, who has an extraordinary ability to retrieve items misplaced on the shelves!

* I greatly valued the help of Robert Woodley, of the Original Materials Branch of the State Library, in accessing the picture collections of the Mitchell Library. Robert's familiarity with Pyrmont peninsula helped locate items which may have otherwise escaped attention.

* I am particularly grateful to Kevin Leamon, Copyright & Permissions, State Library of New South Wales, for organising permission to publish the many images from that collection used in this report, and to the Library's photographers for their meticulous preparation of these images. The images are from four parts of the State Library, and are shown in the following figures:

  * *Dixson Galleries(DG)*: 2.12, 2.16, 2.18, 2.20, 5.4.7, 5.4.8, 5.7.1, 5.7.3, 5.7.12, 5.8.4, 5.8.14.

  * *Dixson Library(DL)*: 2.3, 2.17, 4.5.2, 4.6.3, 5.6.3, 5.6.4, 5.8.2, 5.9.1.

  * *Mitchell Library(ML):* 2.1, 2.2, 2.5, 2.6 2.8, 2.9, 2.11, 2.13, 2.14, 2.15, 2.19, 2.21, 2.22, 2.23, 3.3, 3.4, 3.7, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.2.7, 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.5.1, 4.5.9, 4.5.11, 4.5.12, 4.5.13, 4.5.14, 4.6.1, 4.6.2, 5.3.3, 5.4.1, 5.4.2, 5.4.3, 5.4.4, 5.4.5, 5.4.6, 5.5.2, 5.5.4, 5.5.5, 5.5.6, 5.5.7, 5.6.1, 5.6.2, 5.6.5, 5.6.6, 5.6.7, 5.7.2, 5.7.4, 5.7.5, 5.7.6, 5.7.7, 5.7.10, 5.7.11, 5.8.1, 5.8.3, 5.8.6, 5.8.11, 5.8.13, 5.9.2, 5.9.3, 5.9.4, 5.9.6, 5.9.7, 5.9.9, 5.9.10, 5.9.12, 5.9.13, 6.1.

  * *State Reference Library(SRL)*: 2.25, 5.3.1, 5.3.2, 5.5.1, 5.5.3, 5.7.8, 5.7.9, 5.7.13, 5.9.5, 5.9.11.

* I am also indebted to Elizabeth Ellis, former Assistant State Librarian, Collection Management Services and Mitchell Librarian and now Curator Emeritus, who interpreted a sketch supposedly from Ultimo House by Emily Manning in which key city landmarks seemed in reverse. It transpired that the sketch was from Kings Cross!

* I am most grateful to the National Library of Australia for permission to publish the images in Figures 2.7, 2.10 and 2.24.

* It is a great pleasure indeed to thank Margaret Ackland for permission to use her painting ‘Pyrmont Expressway, 1984’(ML 931) to illustrate the cover of this report. The painting reflects the raw anger of the Pyrmont-Ultimo communities at impositions from outside, so eloquently described by Fitzgerald & Golder(1994) - in this case the Western Distributor. That anger must have existed in many generations of Pyrmont-Ultimo residents as successive transformations wracked their neighbourhoods.

* The project committee, chaired by Charles Perry(Pyrmont Progress Inc.) with Elizabeth Elenius (Pyrmont-Ultimo Landcare) and Nik Midlam(City Council), kindly tolerated my incessant pleas for more time as the scope of this report seemed to expand ad infinitum. There was an end-point after all!

* My particular thanks go to Peter Gould, Daryl Prondoso and Jerry Chang who have done the hard yard in bringing together a grab-bag of inputs into a beautiful and stylish end-product. Their graphic work is of the highest order.

* Lastly, but of course by no means least, my heartfelt thanks go to my wife, Margaret, who has had to endure my preoccupation with this project for far too long. Now I can become a real pest around the house!

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Place names

The names of localities on and around Pyrmont peninsula have often changed over time. Aboriginal names are mostly unknown, but the following lists key name changes since European settlement. Unless the source is cited, information given was taken from contemporary maps.

* Blackwattle Bay has had various names, often concurrently. It was known as Blackwattle Swamp between at least 1806(Anon, 1806) and 1865, Black Wattle Swamp between at least 1825(Anon, 1825) and 1857/8, Blackwattle Bay at least from 1833(Colonial Secretary's Office, 1833), Black Wattle Bay(1836), Blackwattle Cove between at least 1840(Anon, 1840) and 1892(Anon, 1892), and Black Wattle Swamp Cove (1853/59).

* Darling Harbour: Various interpretations of the Cadigal name have been used – Tumbulong(Attenbrow, 2009), Tumbalong(Anon, nd) and Tuombalong(Anon, 1900). It was first known by the European settlers as Long Cove. However, the waterway later known as Iron Cove was also called Long Cove at least by 1803, by which time the original Long Cove had been re-named Cockle Bay(Anon, 1803), This name it retained until 1826 when it became Darling Harbour(Fitzgerald & Golder, 1994:15). Cockle Bay, of course, referred to 'the abundance of shell fish on the shores of this waterway'(Davies, 1984:70).

* Darling Island was first known as 'Cockle Island'. Maps between 1836 and 1884(Sands, 1884) refer to 'Darling Point'. The first map reference to Darling Island was on the Sydney Metropolitan Detail Series(1888).

* Elizabeth Macarthur Bay was known as Elizabeth Bay at least between 1839(Anon, 1839) and 1930(Sydney Council, 1930). William Henry Wells reversed Elizabeth and Jones Bay names in his maps of the 1840s(e.g. Wells, 1842, 1843). The confusion continued into the late 1850s(Sands & Kenny, 1858), even though it was corrected by Reuss & Browne in their 1856 map.

* Johnston's Bay was known as Johnstone('s) Bay at least between 1838(Anon, 1838) and 1892(Anon, 1892) It was concurrently known as Johnston's Bay from at least 1836(Anon, 1836).

* Major Christie's Point was so named because William Harvie Christie had an establishment there. It was located on the rocky southern point of Pyrmont Bay behind where 'Pyrmont Bay Wharf' is now. The Australian National Maritime Museum is located there today. In evidence to the Select Committee on 'Railway through Ultimo Estate', Edward Flood commented: 'My opinion is, and always has been, that it [the railway] should lead to Mr Ewen's point, now known as Major Christie's'(NSW Legislative Assembly, 1864:245).

* Pyrmont was variously known by the Aboriginals as Pirrama, by the Cadigal, and Bolwarra, meaning 'open-eyed, to stare'(Slater, 1934:318).

* Pyrmont Point was first known as Jones Point after Thomas Jones, who was a foot soldier in the 102nd Regiment of Line(Matthews, 1982:7). Jones received a land grant of 55 acres, later to become Pyrmont Estate, on 14 March 1795. It was still called Jones' Point in 1834(Florance, 1834). The term 'Pyrmont Point' seems to have referred to several places in the 1850s. It was widely used in the early 1850s to refer to that part of Pyrmont closest to Glebe island, where the old Glebe Island Bridge still stands(e.g. Weaver, 1855). It also referred to the southern point of Pyrmont Bay, also known as Major Christie's Point(e.g.

Anon, 1858). Its first usage for the place we know today as Pyrmont Point appears to have been in an 1859 advertisement(Anon, 1859). The point was also known as Macarthur's, later Macarthur Point, at least between 1836 and 1892 (Higinbotham & Robinson, 1892).

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Abbreviations

The following abbreviations have been used in this report:

DG	Dixson Galleries
DL	Dixson Library
et seq.	and the following pages
GG	Government Gazette
Ibid	Short for ibidem, defined by the Free Dictionary as: 'in the same place: used to refer to a book, page, or passage previously cited'
ML	Mitchell Library
NLA	National Library of Australia
SMH	Sydney Morning Herald
SRL	State Reference Library
UN	United Nations
[ ]	Square brackets have been used to interpolate further information or comment into text from another source.

Part 1

General Introduction

General Introduction

A place is always what it was,
No matter how much we try to remake it.
The imagination can always go to first things.
Seeds from the Port Jackson fig, clematis, boronias,
And a hibiscus, stand in for seeds from all over the world.
And a necklace of shells in memory of the peninsula's lost beaches.
But these things can yet bloom in Pyrmont.
Visions of the past fire commitment to the present.
How will the new Pyrmont park by planted?
Will the selection of plants relate to the place and its ancient roots?
Deliver the past to a richer present.

Shirley Fitzgerald
(*in* Devenport, 2004)

This report describes the transformations of Pyrmont peninsula and their ecological consequences since European settlement of Australia in 1788. A useful definition of the word 'transformation' is:

> *'In an organizational context, a process of profound and radical change that orients an organization in a new direction and takes it to an entirely different level of effectiveness. Unlike 'turnaround'(which implies incremental progress on the same plane) transformation implies a basic change of character and little or no resemblance with the past configuration or structure'(*BusinessDictionary.com*)*

Human sociocultures have, for the most part, evolved incrementally. Their trajectory through time has been interspersed with events of a transformational nature –the shift from hunter-gathering to agriculture, the formation of cities, the advent of industrialisation. Transformations have typically been anthropocentric – intended to improve the wellbeing of humans.

It may be that transformational events have become more frequent in recent times, as we have become increasingly competent managers of our affairs and destiny. We are on the cusp of the most transformational event yet experienced - as we adjust, on a global scale, to the requirements of environmental and ecological sustainability.

For the first time in human history, humanity as a whole, faces a future which will be both anthropocentric and ecocentric. The centuries and millennia of neglect of ecology in favour of economy, are now catching up with us. Unless we engage in a change process of huge complexity and scale, ecology will move on without us - or our planet will again become lifeless.

Events on Pyrmont peninsula since 1788 have been a microcosm of these global processes. Remarkably, in a little over two centuries, the European inhabitants of the peninsula have made transformations which took humanity as a whole perhaps 10,000 years to realise. These transformations were from a natural place, inhabited by traditional hunter-gatherers, through agriculture, urbanisation, industrialisation in its manifold expressions, international networking through shipping, to the emergence of a globally-networked contemporary form of urbanism. Such transformations were all perceived as being of benefit to society at that time. Their ecological cost, however, was unrecognised or seen as inevitable collateral.

1.1 Prolegomenon

It was first intended to determine the ecology of Pyrmont peninsula at European settlement, in 1788, and again 220 years later, in 2008. The aim was to provide insights for rehabilitation projects within the present sociocultural context.

It was then decided to include a 'Transformations' section, in which the major changes in land use on the peninsula since European settlement were documented, with their ecological consequences. This part of the study made clear the need for radical change in the sociocultural status quo, which greatly devalues ecology in favour of economy. This realisation led to supplementation of previous project goals with a third and, in some ways, more urgent task. The rapid urbanisation of human populations on this planet is causing the systemic cultural loss of ecological knowledge. This loss is leading to acceptance of a drastic decline in planetary ecological resources, to the imperilment of human futures.

This general introduction outlines some considerations in this world view.

1.2 Environmental and ecological sustainability

It is essential at the outset to clearly differentiate environmental sustainability from ecological sustainability:

- The Commissioner for Environmental Sustainability, Victoria(2006) defined Environmental Sustainability as: ' … the ability to maintain the qualities that are valued in the physical environment. 'For example, most people want to sustain(maintain):
    - human life
    - the capabilities that the natural environment has to maintain the living conditions for people and other species(e.g. clean water and air, a suitable climate)
    - the aspects of the environment that produce renewable resources such as water, timber, fish, solar energy
    - the functioning of society, despite non-renewable resource depletion
    - the quality of life for all people, the liveability and beauty of the environment'

  This is an anthropocentric view, in which ecological concerns play an important but subsidiary role to human wellbeing. The City of Sydney has committed itself to environmental sustainability through its Sustainable Sydney 2030 initiative.
- Ecological sustainability is defined by Callicott & Mumford(1997) as: 'meeting human needs without compromising the health of ecosystems'.

  The Nature Conservation Council of NSW(2005) defined ecological sustainability as concerned with:
    - The precautionary principle
    - Intergenerational equity

- Conservation of biodiversity and ecological integrity
- The improved valuation and pricing of environmental resources

In both definitions, human needs are set in an ecological framework. Ecological sustainability is thus an ecocentric view, one in which ecological wellbeing is vital. The role of the City of Sydney in respect of ecological sustainability is in its infancy.

While environmental and ecological sustainability are highly interrelated world views, environmental sustainability will remain a chimera('a fanciful mental illusion or fabrication') unless and until there is also ecological sustainability.

1.3 Urbanisation

'In the last 100 years an extraordinary change has occurred on the face of the Earth: cities are becoming our primary habitat'

(Girardet, 2008:3).

Wikipedia defines urbanisation as 'the physical growth of urban areas from rural areas as a result of population migration to an existing urban area (http://en.wikipedia.org/wiki/Urbanization).

According to Larson and associates(2004), hominids began to occupy caves about one million years ago. The use and control of fire by humans, perhaps 500,000 years ago, led to more permanent cave dwelling and accelerated interactions between humans and the plants and animals around them. Urbanisation of humans began in the Fertile Crescent, Mesopotamia, some 7000 years ago. According to McMichael(2001:251): 'By around 3,000 years ago there were only four cities in the world with an estimated 50,000 or more inhabitants … By 2,000 years ago, when world population approximated 200 million people, there were still only about 40 such cities … less than 5% of world population lived in urban environments in 1800 …'. Urban populations increased rapidly with industrialisation, with 75% of populations in developed countries now living in urban areas; by 2030, this figure will be 84%. In Australia, about 88% of the population was urbanised in 2005; this is expected to reach almost 92% by 2030, making Australians one of the most urbanised societies on Earth(UN Department of International Economic & Social Affairs, 2005).

Globally, only about 13% of humans were urbanised in 1900, reaching 29% in 1950, 49% in 2005, 50% in mid-2007, and likely reaching 60% by 2030(UN Department of International Economic and Social Affairs, 2005; Moreno & Warah, 2006). Urban populations are now increasing by 180,000 people daily, with most of this growth in less developed countries – especially in Asia and Africa. Here, urban populations will grow from 1.9 billion today to 3.9 billion in 2030. The urban populations of developing countries are expected to reach 50% in 2020(UN, 2001). Urbanisation will continue apace across the globe throughout much of this century.

1.4 Ecological footprint

The concept of 'ecological footprint' helps us to appreciate the ecological consequences of urbanisation. An ecological footprint most simply is the amount of land, water and air needed to support a person (http://www.globaleducation.edna.edu.au/globaled/ go/cache/offonce/pid/1965). A more relevant definition here is 'the measure of how much land and water area a human population needs to produce the resources required to sustain itself and to absorb its wastes, given prevailing technology' (http://en.wikipedia.org/wiki/Ecological_footprint). Australians at present each have an ecological footprint of 7.8 hectares – that is, it requires almost eight football fields of productive land to sustain each one of us.

The City of Sydney had 170,000 residents in June 2009 who, with the Australian average individual footprint of 7.8 hectares, required 13,260 km^2 of productive land to support them. That is, over 500 times the city's area(26.15 km2), or an area greater than the whole of metropolitan Sydney(12,144.6km^2).

The human/nature relationship in cities worldwide will become an increasingly vital consideration as efforts to reduce the ecological footprint of humans intensify.

1.5 Loss of ecological knowledge

> *'Although usually seen as an economic or demographic phenomenon, urbanization also represents a human ecological transformation … Understanding the dramatic shift in human spatial and material relationships with the rest of nature is a key to sustainability'*
>
> Rees & Wackernagel(1996:223)

Girardet(2008:3) succinctly encapsulated the ecological consequences of urbanisation: 'All-out urbanisation is fundamentally changing the condition of humanity and our relationship to the Earth. We humans have been undergoing a staggering transformation: from living in a world of farms, villages and small towns, we are changing ourselves into an urban species. From relying primarily on nature's local annual harvest, more and more of us are drawing on global food and timber supplies. From a reliance on purely local energy sources, we have switched to tapping into stores of non-renewable energy resources across the world. From leading locally self-sufficient lives, more and more of us are becoming citizens of a human-centred planet'.

For some time, there has been concern about the nexus between the global decline of native cultures and the loss of traditional ecological knowledge. Native peoples have developed deep ecological understandings of their world, usually over millennia. Inter-generational communication of these understandings has been verbal. Yet: 'In one century, the world has lost about 600 languages. Today, half of the approximately 6,000 remaining languages are either extinct or highly threatened and, at current rates, 90 percent will be lost in the 31st century'(Judge, 2000). In Australia: 'Before European settlement in 1788 … [there] … were around 600 to 700 distinct nations on the Australian continent, many of which had their own language - over two hundred in fact. Today, only half this number survive in any given form and only 20 are in common use'(Anon, 2006). Loss of traditional ecological knowledge accompanies loss of culture/language.

The situation in Australia is particularly acute. European settlement in 1788 was by peoples from societies which had already experienced multiple invasions of their homelands by others, with a (sometimes partial) loss of native language and associated ecological knowledge. The early colonials brought with them ecological knowledge largely irrelevant to the Australian context, and furthermore were mostly dismissive of the ecological insights gained by Australian aboriginals over many millennia. This unfitness has led to huge ecological degradation of a vast continent in just over two centuries.

The move from traditional lifestyles into market economies further attenuates ecological knowledge in urban peoples, as the following quotes indicate:

- *'… individuals with greater wealth tend to pay for natural resources … rather than farming or getting them for themselves'*(Chase, 2008).
- *'Various studies have described the mutually exclusive relationship between economic growth and environmental conservation … Understanding ecological knowledge loss is important to understanding the declining capacities of communities undergoing economic development to manage their natural resources and the future of ecosystem diversity in the light of current patterns of economic growth'*(Pilgrim et al., 2007:1004)
- *'The rate of disconnection with nature, particularly amongst young people in industrialised communities, is likely to be amplified by the growing virtualisation of nature through television and computer screens. For some children, these virtual encounters may be their only experience of nature …'*(Pretty et al., 2008:8).

Pretty et al(2008:8) documented some of the consequences to individuals of a loss of ecological knowledge: 'Time spent directly experiencing and interacting with nature(a problematic term to define) has been shown to improve psychological health and well-being, as well as increase physical activity levels … Spending less time in nature subsequently comes at a cost to health. It can also create an intrinsic disconnection with nature, leading to feelings of biophobia and a fear of the outdoors, perceiving it to be a wild and unfamiliar environment. Feelings of estrangement create an inability to care for and connect with nature, as cultural worldviews, beliefs and narratives lose their meaning and context'.

Again, these trends are particularly troubling in Australia which, as noted above, is among the most urbanised societies on Earth.

There is thus a diminishing capacity among urban humans to recognise how vital natural ecosystems are to human survival, a process initiated early in life (Louv, 2005):

- 'Within a space of a few decades, the way children understand and experience nature has changed radically. The polarity of the relationship has reversed. Today, kids are aware of the global threats to the environment – but their physical contact, their intimacy with nature, is fading. That's exactly the opposite of how it was when I was a child'(p.1).
- ' … as the young spend less and less of their lives in natural surroundings, their senses narrow, physiologically and psychologically, and this reduces the richness of human experience'(p.3).
- 'Yet, at the very moment that the bond is breaking between the young and the natural world, a growing body of research links our mental, physical, and spiritual health directly to our association with nature – in positive ways'(p.3)
- 'How the young respond to nature, and how they raise their own children, will shape the configurations and conditions of our cities, homes – our daily lives'(p.3).

It may be disastrous for human futures that, at the very time when natural ecosystems are under accelerating erosion, urbanisation is rapidly weakening the bonds between humans and nature.

1.6 Historical perspectives

> *'Oslo shall manage its biological diversity in a sustainable way'*
>
> Oslo Kommune(2003)

City Council's recognition and acceptance of its ecological responsibility has emerged gradually, and haltingly, over the last quarter-century. The most compelling feature of this prolonged period has been the lack of policy development by Council regarding the City's ecology. Council's journey in respect of the issues of ecological sustainability and biodiversity is reviewed here.

The City of Sydney was incorporated in 1842, 167 years ago. For 140 years City Council neglected, indeed diminished, the ecology of this place. We have periodic insights into this process, such as a 1920 study into the birds of Sydney(Le Souëf & Macpherson, 1920).

A turning point in attitudes toward the natural environment of the City came with planting of the Moore Park Urban Forest - Stage 1 of which was completed in 1982 – largely at the instigation of Alderman Robert Tickner. At this time, City Council concerned itself with the generally accepted responsibilities of local government, so Tickner's initiative was exceptional.

In 1984, Council created a Parks and Recreation Department, which inter alia was concerned with street trees, Earth Week, and the Greening of Sydney awards. In 1989, under the administration of Jeremy Bingham, a 'Total Environment Policy' was being prepared for the City. The 1990 Annual Report noted that Council had participated in the Environment 90 Exhibition and Seminar at Darling Harbour and, under the heading 'Environmental Protection and Enhancement' the goal was 'to protect and enhance the environment of the City for the safe and orderly conduct of human activity' – a truly anthropocentric worldview!

Frank Sartor's administration established an Environmental Management Unit (EMU) in June 1991 to coordinate Council's newly endorsed 'Total Environmental Policy'. The policy aimed 'to conserve, enhance and improve the natural, built and social environment of the City through direct action and joint initiatives with public authorities, the business community and residents, with attention to changing community needs and the effects of possible future environmental changes'. At last, 150 years after its formation, Council had a policy(of sorts) to protect the City's natural environment.

By 1992, the Environmental Management Unit had been placed in the 'Corporate and Community Services' Division, and 'Council's Total Environmental Policy generated considerable interest among cities represented at the first World Urban Forum in Brazil'. Council became a founding member of the International Council for Local Environmental Initiatives. 1993 saw Council produce its first State-of-the-Environment Report and initiate an annual Sydney Environment Week. The former, under the heading 'Living Things and Habitats' described important wildlife, habitat corridors, management of weeds and feral animals, identification of unique landscapes or vegetation etc in the City.

This enthusiasm for the natural environment was short-lived. The 1995/6 Annual Report saw Environmental Management placed under 'Community Health, Safety, and the Environment' in the Urban Services portfolio. The

State-of-the-Environment Report reverted to traditional Council concerns, with biological diversity seen as vermin control, feral cats, street trees, parks and playgrounds.

The 1996/97 Annual Report further downgraded ecological issues: 'Environmental management is being integrated into management responsibilities across the range of City of Sydney's activities. This ensures that all operational units identify and respond to environmental issues as part of their core business activities. Management of cross-Divisional environmental issues is the responsibility of the Service Planning and Policy Unit'. Champion-less, ecological concerns were atrophying.

Ecologically-sustainable Development(ESD) was briefly mentioned in the 1997/98 and 1999/2000 Annual Reports, still in Frank Sartor's time, but the actions reported were all environmental rather than ecological. These actions were reported under such headings as 'Green City' and 'Sustainable City'; initiatives under the Cities for Climate Protection program were also reported.

The first year of Lucy Turnbull's administration, 2002/03, saw 'Sustainable City' as one of 11 key performance areas, with the goal 'to promote ecologically sustainable development principles into our everyday policy programs and practice'. The need to promote biodiversity was noted, but the actions and results reported were mostly environmental. The most significant ecological action was to produce 10,000 plantable postcards containing paperbark seeds. Also, 'the City inflated a 15-metre humpback whale in Hyde Park to celebrate the United Nations International Year of Water. Environment and Stormwater Officers offered environmental advice and gave calico shopping bags and tree seedlings to the public'!

Clover Moore has committed her administration to becoming an environmental leader, and a broad and welcome portfolio of programs has been developed since 2004. Her initiative includes biodiversity, along with the more traditional environmental concerns of local government. On National Tree Day in 2004/05, 6,547 native trees and plants were planted. Environmental development was placed into the Strategic Planning and Project Development Division in March 2005.

Emergence of the Sydney 2030 project in 2005/06 recognised the need to plan such transformative processes over timeframes well beyond the lifetime of any one Council. Council's Charter recognised the need 'to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically-sustainable development'.

The 2006/07 Annual Report committed Council to work towards 'reducing our environmental footprint and achieving 'carbon-neutral' status', and recorded Council's endorsement of a comprehensive Environmental Management Plan.

The Moore administration has achieved remarkable progress since 2004 towards improving the City's environmental performance. BUT, more than a quarter-century has passed since Rob Tickner planted the first tree of the Moore Park Urban Forest, now under the Eastern Distributor, and still the City's biodiversity is in decline.

1.7 This report

Burgeoning urban populations and global moves toward ecological and environmental sustainability require the long-standing relationship between humans and nature in and around cities be substantively revised. Reflecting the biocity concept developed for Adelaide(Daniels & Tait, 2006), this report makes the case for fundamentally changing the human/nature relationship in Sydney. The report examines Pyrmont peninsula as a microcosm of urban living in four parts:

1. The ecology of Pyrmont peninsula at European settlement in 1788
2. Transitions of the peninsula to the present, which have so profoundly diminished that ecology
3. The ecology of Pyrmont peninsula in 2008, 220 years after European settlement
4. Strategies to re-orient the administration and communities of the City of Sydney towards, rather than away from, ecological sustainability.

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Part 2

Early views of Pyrmont peninsula

2.1 Introduction

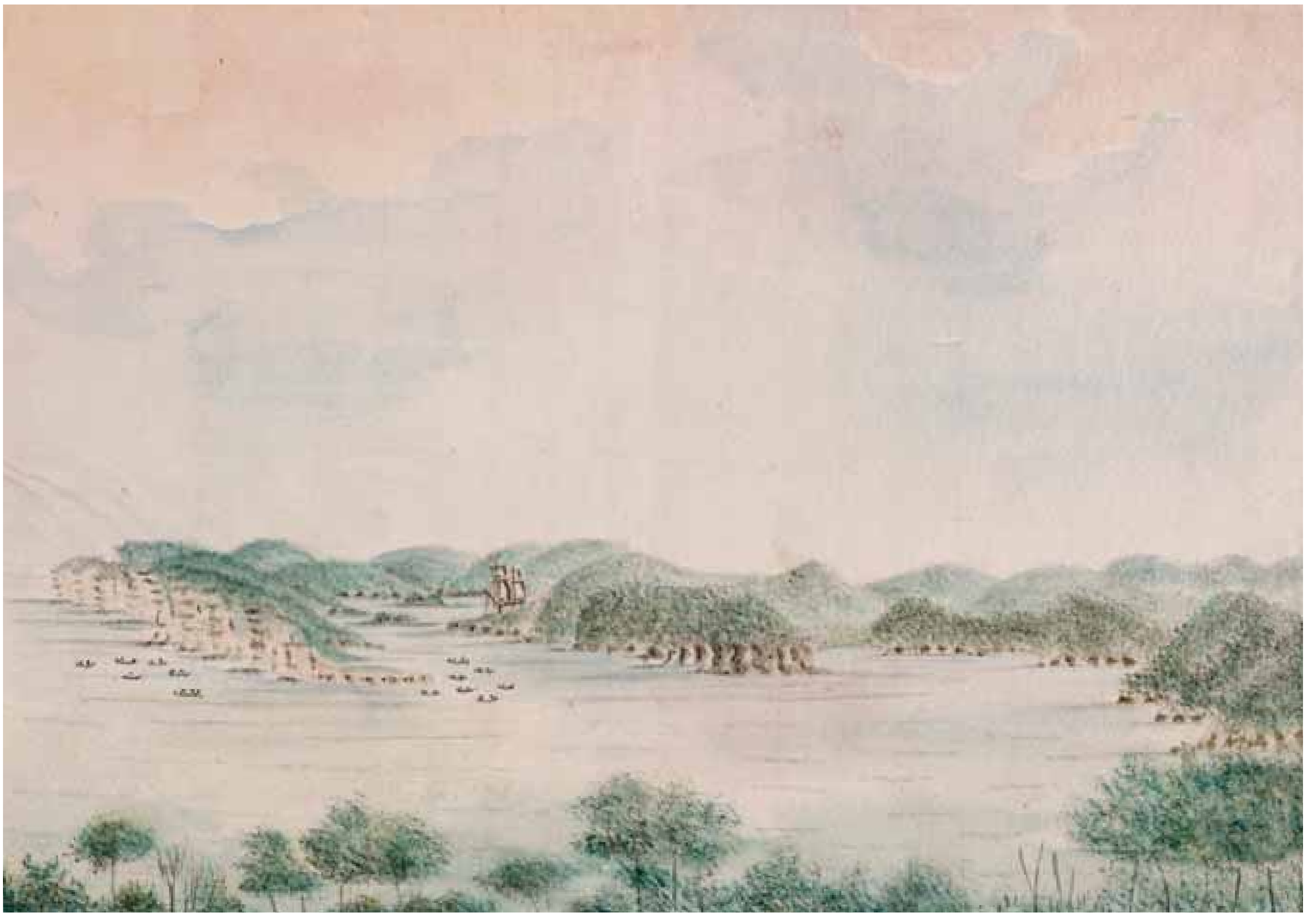
Early paintings, sketches and engravings can help establish the physical geography and nature of Pyrmont peninsula on European settlement. The following illustrations are mostly from the Mitchell Library collection in the State Library of New South Wales, with some items also from the National Library of Australia. An account is provided of how each illustration elaborates our understanding of Pyrmont peninsula as it was in 1788.

The reader is taken on a "guided tour" of Pyrmont peninsula as it was recorded by artists, mostly early in settlement. The tour starts and ends at Ultimo House, the country home of John Harris and his family built in 1804. It is preceded by some illustrations of Port Jackson more generally. Library catalogue notes have been used at times to supplement personal observations.

2.2 Prelude to a tour

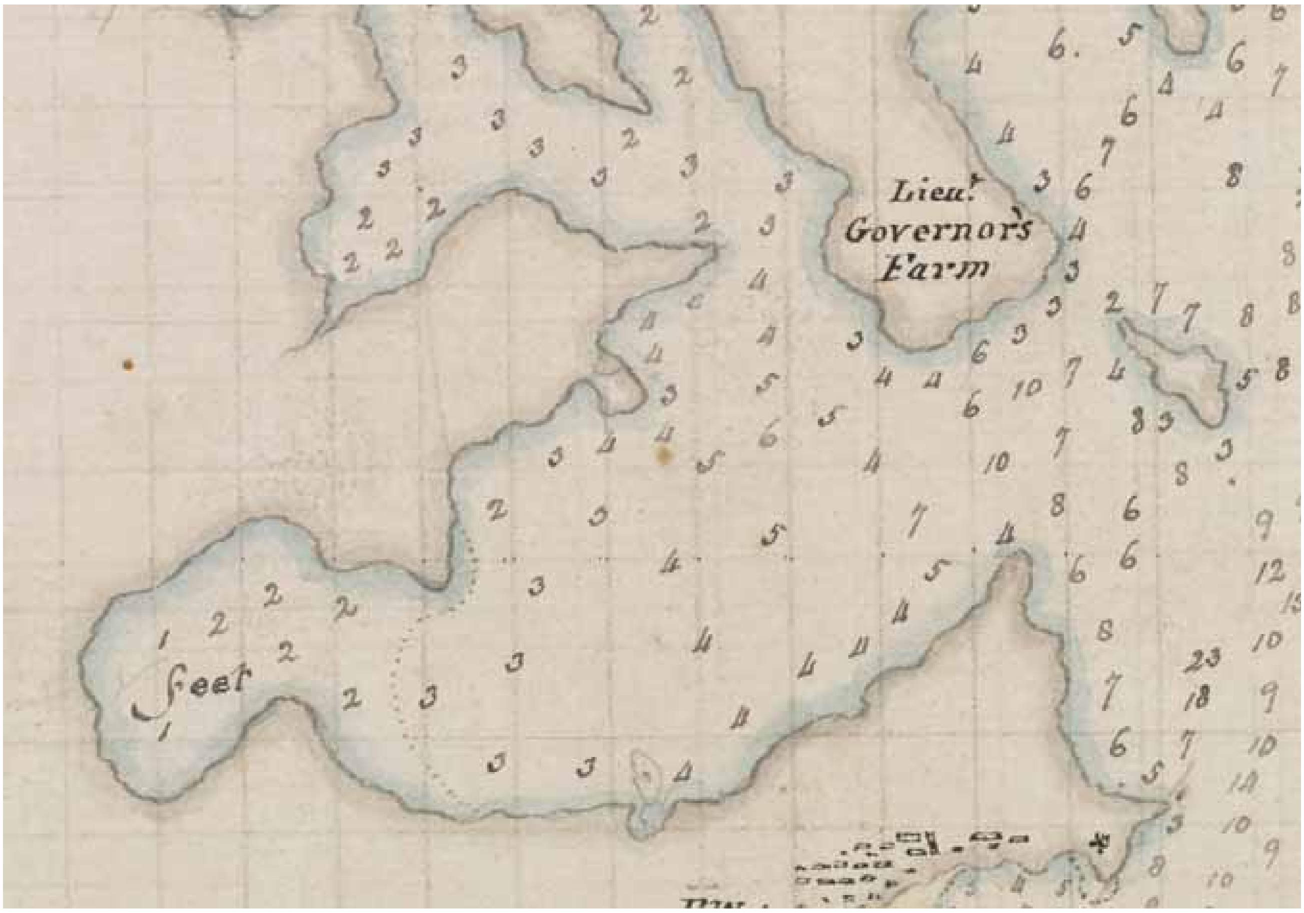
These three illustrations were prepared within a little over a decade of European settlement of Port Jackson. Indeed, the first two drawings were made in 1788. They provide information which helps to contextualise the subsequent views of Pyrmont peninsula.

Figure 2.1: Bradley, W., 1786/92, A Voyage to New South Wales, Plate 17: View of Port Jackson from the South Head leading up to Sydney; *Supply* sailing in, opp. p.123
(ML Safe 1/14; digital order no. a138475)



Bradley captured well those features which would have particularly impressed early European observers on arrival at Port Jackson. The rugged nature of the coastline and then of the shoreline within Port Jackson is clear from the striking cliff-faces. The landscape is closely wooded. There are many indentations in the harbour itself, creating a complex vista for the viewer, and receding towards the horizon, defined by what we now know as the Blue Mountains. Bradley's sketch is signed and dated 'W.B. 1788'.

Figure 2.2: *Detail from* Raper, G., 1788, Chart of Port Jackson New South Wales: survey'd by Capt.n John Hunter, Second Captain of His Majesties ship the *Sirius*(drawn from the original by George Raper Midn)(ML M2 811.15/1788/1; digital order no. a127079)



Apparently prepared by George Raper from an original of William Bradley based on a 1788 survey of Port Jackson by John Hunter. The chart not only shows the relationship of Pyrmont peninsula to Sydney, Glebe, Glebe Island and Balmain, but also records the shallowness of the headwaters of Cockle Bay compared with those of Blackwattle Bay. While the former measured 1-2 feet, those in Blackwattle Bay were 2-3 fathoms(6-9 feet) deep.

Figure 2.3: Heath, J., 1798, By water to Parramatta, with a distant view of the western mountains, taken from the Windmill-hill at Sydney [Miller's Point], 25 May 1798, Strand, Cadell & Davies
(ML DL Pd 764; digital order no. a1528096)

On the extreme left is Glebe Island(before quarrying), nestled behind Balmain peninsula. Ballast and Yerroubin Points lie behind and to the right of Balmain. Partly hidden by the clump of trees on Miller's Point is Goat Island with Berry Island and Greenwich in the background. Just behind Goat Island is Balls Head with Waverton at the head of the inlet to its right. Blues Point with McMahon's Point are on the right of the engraving. Pyrmont peninsula is just out of view, across Johnston's Bay on the extreme left of the sketch. A decade after European settlement, Miller's Point has been largely cleared while the rest of the view seems undisturbed. The well-forested and wooded nature of this part of Port Jackson is evident. Heath gave no indication of agriculture on Balmain peninsula.

2.3 Early views of Pyrmont peninsula

Twenty-one illustrations of sections of Pyrmont are presented here. The approximate locations from which they were drawn or painted are shown in Figure 2.4. Descriptions of each illustration, with a particular emphasis on their contribution to our knowledge of the physical geography or nature of Pyrmont peninsula follow.

Figure 2.4: Approximate locations of artists, and extent of their views,

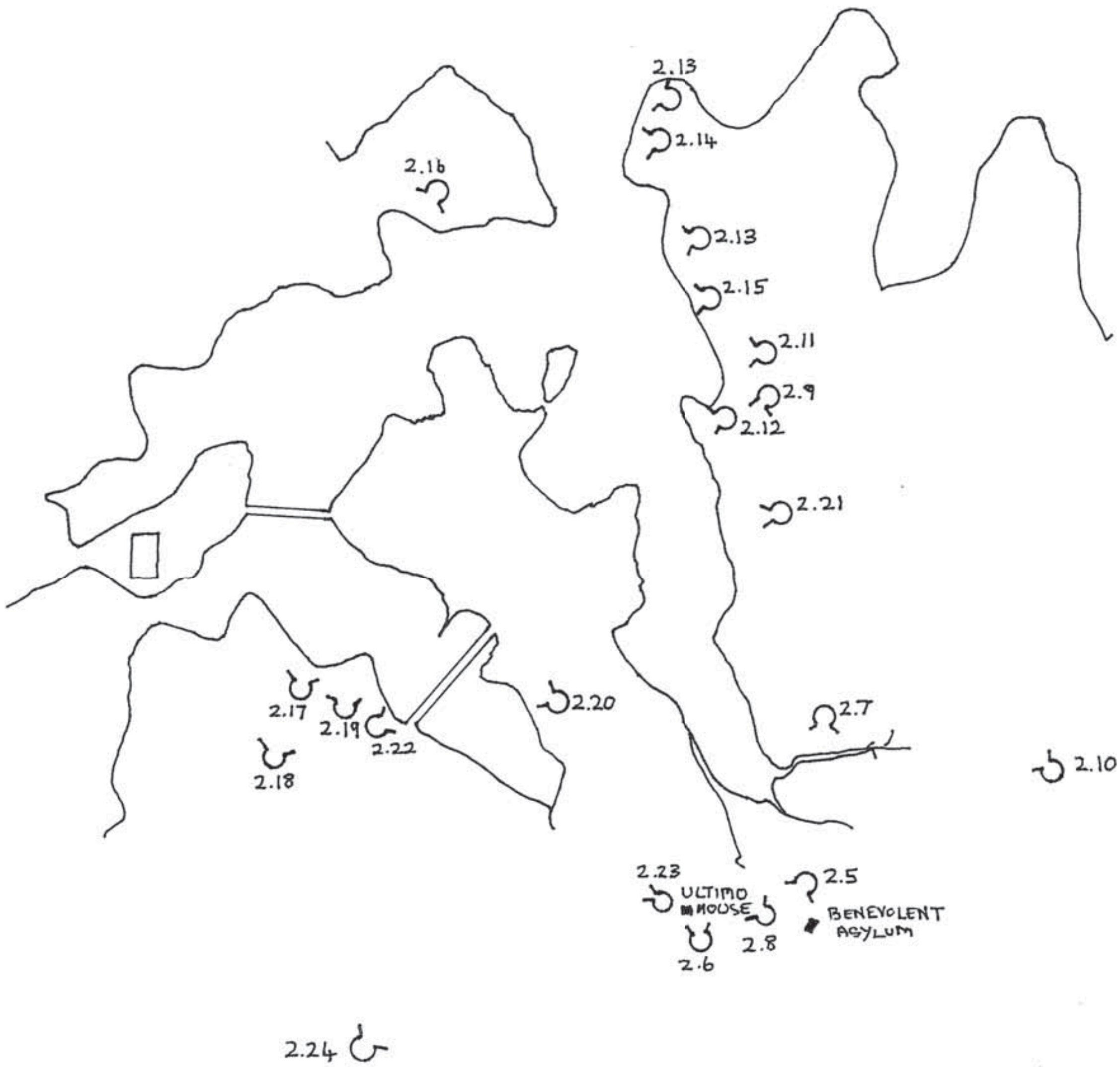


Figure 2.5: Mason, Edward, c.1820, Views of Sydney and surrounding district, Plate 7: Toll Gate, and the new Poor House, on the Parramatta Road (ML PXC 459, plate 7)

TOLL GATE, AND THE NEW POOR HOUSE ON THE PARRAMATTA ROAD.

Mason was viewing the tollgates from the Sydney side, looking West. The Benevolent Asylum, the large building to the left of the gates, was constructed late in 1820 and opened 12 October 1821(Rathbone, 1994). Ultimo House is just visible on the far right. The majestic trees across the middle ground were thus close to the southern boundary of the Harris Estate, being contained by the Parramatta Road on the far left of the sketch. The magnificent trunks belong to Sydney Red Gums *Angophora costata*. As with John Eyre's view of Ultimo House(Figure 2.6), the great height of the trees is evident. According to Fitzgerald & Golder(1994:21): 'over the next decade the [Parramatta] road was widened and realigned'.

Figure 2.6: West, A., 1813/14, Views in New South Wales, Plate 14: Ultimo House

(ML PX*D 65)(digital order no. a1474022)

West(1814) published a view of Ultimo House from the south by John Eyre circa 1813, less than a decade after the house was built. The two-storeyed Georgian house is overtopped to about twice its height by dense eucalypt forest. It is approached by a curvilinear drive through a cleared and grassed area, which contains a small herd of deer, some sheep and a bull. The deer were apparently imported from India(Fitzgerald & Golder, 1994:18).

Figure 2.7: Dayes, Edward, 1797, The Brickfield Hill

(in Petherick collection, NLA, Accn No. R.282; digital order no. an 2716944-1)

Edward Dayes provided probably the earliest illustration of Pyrmont peninsula in this painting. At the bottom of the hill, in the middle ground of the picture, is the village of Brickfields which, according to illustrations by Lesueur(1802) straddled the major creek(Cockle Creek) feeding into the head of Cockle Bay. The road to Parramatta can be seen between the houses of the village. There are allotments extending up the slope behind the houses. Fringing the rear of the allotments, and extending across the entire middle ground of the painting, is an extensive belt of forest. This forested land became part of the Harris Estate in 1818. Note the track from the Parramatta Road between the further houses to the north-western corner of the cleared land, leading into the forest and, probably, on to the peninsula itself.

Figure 2.8: Mason, Edward, c.1820, Views of Sydney and surrounding district, Plate 34: Ultimo Place, with Cockle Bay (ML PXC 459, plate 34)

A sketch attributed to Edward Mason shows Ultimo House in about 1820 set in cleared lands which reached Cockle Bay and extended someway north behind the house. From the artist's viewpoint, the rest of the peninsula, and that of Balmain behind, appeared forested; from other viewpoints(see below) this was clearly not so. Macarthur's windmill is prominent in the view.

Figure 2.9: *Detail from* Taylor, James, 1820, Sydney looking south from Flagstaff Hill, ca 1820 (ML 69)

This watercolour shows the view across Cockle Bay, from just north of Flagstaff Hill, in about 1820. The painting shows the fully cleared eastern shore of Cockle Bay, around where Sussex Street is today, with some settlement. The reedy headwaters of Cockle Bay are evident with Ultimo House discernible at the base of Pyrmont peninsula. The land to the east and north of the house has been largely cleared of trees and shrubs. The southern end of the rocky promontory south of Pyrmont Bay is evident. The inlet further south is low-lying and filled with what are probably Grey Mangroves *Avicennia marina*. The shallow waters of Cockle Bay would support this species and possibly also saltmarsh. There is still woodland to a little south of the sandstone promontory. The wooded rise behind Ultimo

House is beyond the Parramatta Road, in what is now Chippendale(perhaps towards Cleveland Street). It seems that this area was being cleared at the time of painting.

Figure 2.10: Lycett, J., 1819, South view of Sydney, New South Wales, 1819, taken from the Surry Hills (NLA PIC T1634 NK6416/D LOC746; digital order no. an 2969712))

This painting was done a year before that of James Taylor(Figure 2.9). It also shows the substantially wooded nature of Pyrmont peninsula at this time, and Macarthur's windmill with Darling Island a little offshore. Of particular interest is the rocky, low-lying headland at the southern end of Pyrmont Bay(and jutting out well into Cockle Bay), with an extensive strip of rocky shoreline to its south. Further still toward the head of Cockle Bay is what is probably a goodly stand of mangroves. Ultimo House is not shown.

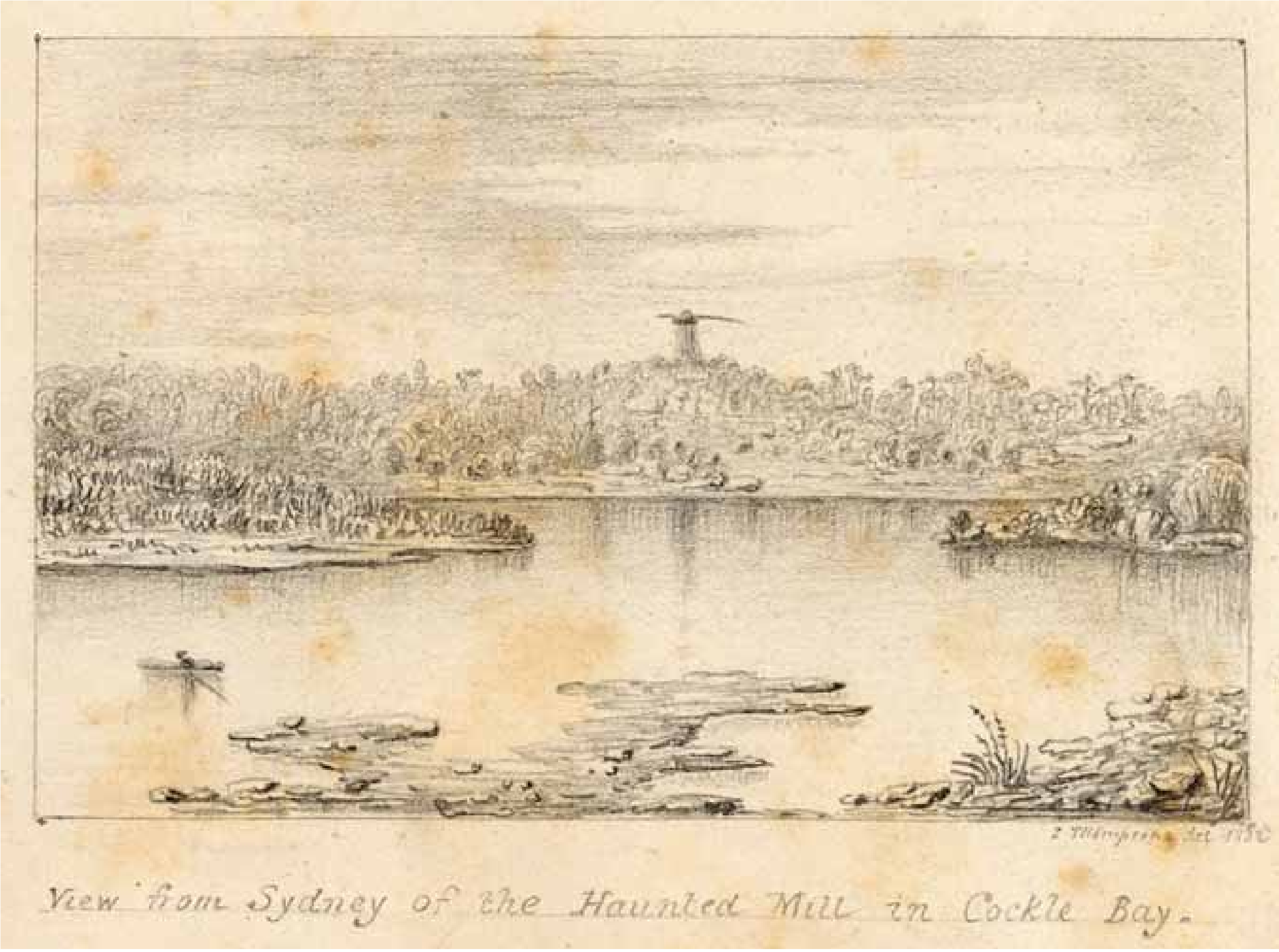
James Lycett also painted a similar view, Sydney from Surry Hills, 1819(ML 54; digital order no. a928334), but it does not extend so far up Cockle Bay as the above. Of interest, is the depiction of Darling Island as about half the height of the land where the windmill was located. The island appears tear-shaped, with a steep northern aspect and a more gently sloping southern aspect. The angle of the view suggests that the artist may have been near the old road to South Head, perhaps close to its junction with Crown Street.

Figure 2.11: *Detail from* Taylor, James, 1819/20, Cockle Bay, now Darling Harbour, ca. 1819-20 (ML 941)

Taylor's watercolour is Plate 3 in his 'Panoramic Views of Port Jackson'. It shows Macarthur's windmill, with a still-wooded Darling Island in the foreground. The area around the windmill is open land. There is a large open area to the left of a line between Darling Island and the windmill, running almost from the shore to about halfway to the ridge. This area would have been roughly where Star City casino is now. A substantial creek enters the head of Pyrmont Bay. Its mouth is defined by a low-lying, quite extensive swampy area which would have supported various wetland plants and animals. The northern head of Pyrmont Bay is rocky and wooded; behind it is another open area with some individual trees evident(unlike the other open areas). There could be tree stumps and a structure in this area. The headland(Pyrmont Point) separating Jones and Elizabeth Macarthur Bays was also rocky. Taylor's careful depiction of the high-tide mark on these rocks extends to adjacent trees, which suggests that the head of Jones Bay supported a small stand of the Grey Mangrove *Avicennia marina*; such is not evident in Pyrmont Bay.

As will be seen later(p 390), land clearance was well underway in parts of the peninsula at this time.

Figure 2.12: Thompson, John, 1832, Album: Sketches in New South Wales and Tasmania, Plate 3a: View from Sydney of the Haunted Mill in Cockle Bay (ML PXX 31)



Thompson's view is of Macarthur's windmill on Pyrmont Point, in an advanced state of disrepair. The artist would have been at or south of Soldier's Point. The midground shows the southern part of Darling Island to the right separated from the northern tip of Pyrmont Bay by a stretch of water, indicating that the sketch was done at high tide.

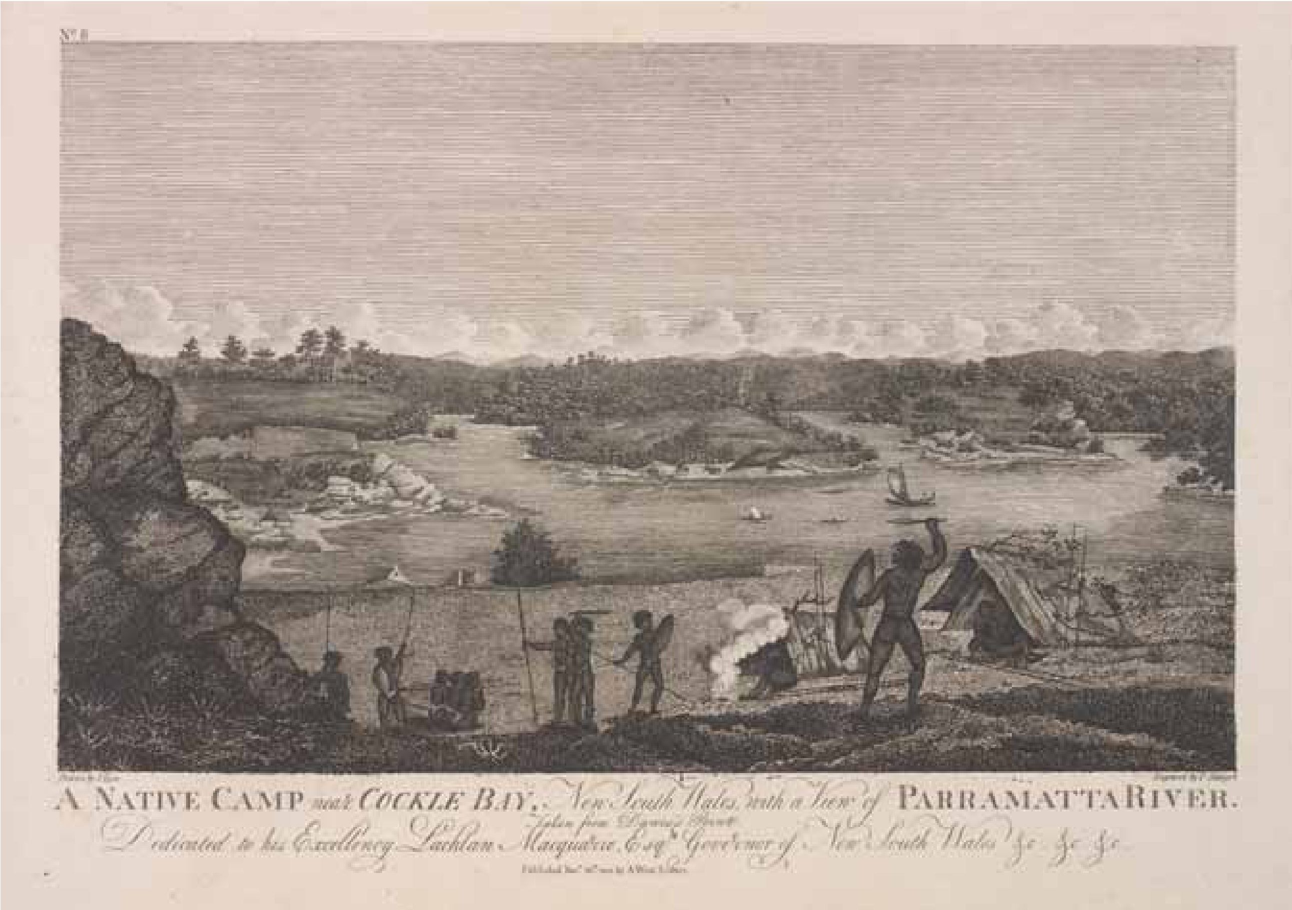
The peninsula remains well-wooded, although land directly below and north of the mill has been cleared. There appear to be substantial rocky outcrops in this latter area. While the shoreline at the northern tip of Pyrmont Bay is shown as rocky, that of Jones Bay(in front of the mill) is less clearly so. The slope leading to the mill appears steep but not cliffy. There appears to be a dip or saddle in the ridgeline just north of the mill, from which creeks would have flowed into Jones and Elizabeth Macarthur Bays respectively.

Figure 2.13: Anon[ca 1880s?] [View of Darling Harbour and Pyrmont from Millers Point, Sydney] (ML SPF/956; digital order no. a089956)

This photograph shows Darling Island in the middle-ground, behind the sailing ships. Importantly, it shows the original cliff-line which extended northwards more-or-less from where John Thompson's sketch(Figure 2.12) ended, but some 50 years later. St Bartholomew's Church, which was built on or near to where Macarthur's windmill once stood, can be seen above the Australasian Steam Navigation Company's main buildings on Darling Island.

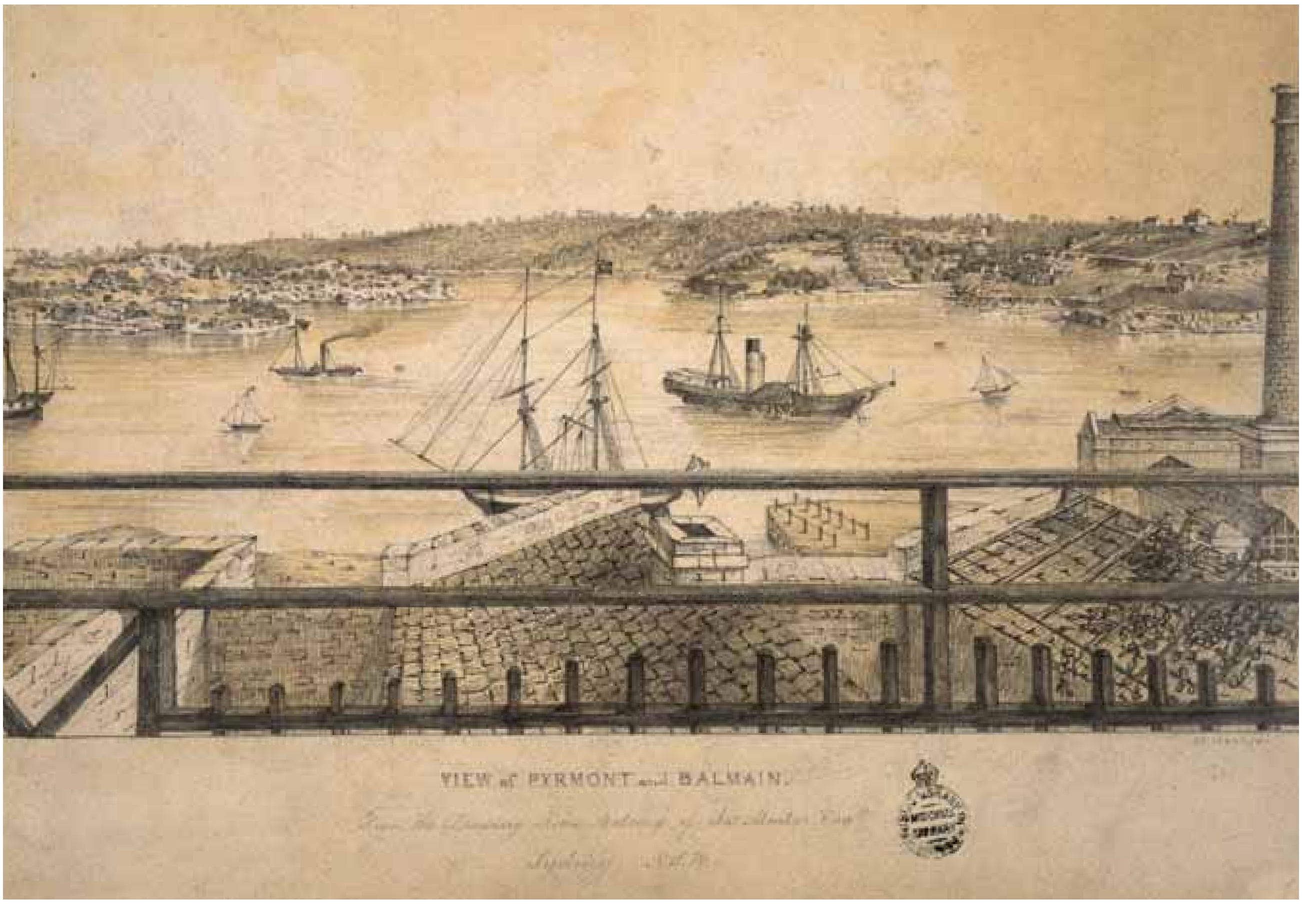
Towards Pyrmont Point, the cliff-line is interspersed with patches of soil for perhaps 100 metres, becomes almost sheer for the next 50 metres or so before again having rocky outcrops interspersed with soil up to the Point. West of the ASNCo buildings, the original line of John Street is clearly visible, as a diagonal leading down to the ferry. Rose Cottage or Dayswood can be seen nestled below a large fig tree just south of John Street. Pyrmont is substantially urbanised at this time.

Figure 2.14: West, Absalom, 1812/14, Views in New South Wales, Plate 8: A native camp near Cockle Bay, Sydney, A. West (ML PX*D65; digital order no. a1474013)



The rocky outcrop in the left middle-ground is Miller's Point, with some early settlement. Behind it is the north-eastern tip of Pyrmont peninsula, with Balmain the central headland. To the right of Balmain is the Parramatta River, with sailing boat. The third headland, further to the right, could be Balls Head with Blues Point just visible on the extreme right. The tips of all three peninsulas appear to have been cleared apart from fringing vegetation along the shoreline. An open vegetation with high emergent trees is evident behind the cleared area on Pyrmont peninsula. This line of high vegetation most probably defines the boundary between the Macarthur and Harris Estates, as the former appears to have largely cleared his estate several years before this lithograph was made (see p. 390).

Figure 2.15: Martyr, J.J., n.d., View of Pyrmont and Balmain, from the drawing room balcony of Jas. Martyr Esq., Sydney, New South Wales (ML ZSS VIA/PYRM/1)



Kerr(1992:519) dated this pencil sketch at about 1844. Certainly, it precedes Conrad Marten's 1861 view(Figure 2.19), which shows a more-or-less urbanised Balmain. Kerr noted that Martyr was also known as Martyn. The view is from the eastern shore of Darling Harbour, in line with Johnstons Bay. Martyr's house was in Kent Street, just south of the gas works. Balmain peninsula is developed to Cameron's Cove but further west appears wooded.

The tip of Pyrmont peninsula occupies the middle ground of the sketch. The lower headland is Darling Island, the upper Pyrmont Point. The latter is seen to have a cliffy shoreline along its eastern side and at its head. There is a distinct rise about halfway down the peninsula from its tip. Darling Island has a rocky shoreline, with sand interspersed. It is much lower than Pyrmont Point, perhaps half its height.

There is limited settlement of the point, with some houses and several sheds. Scrubby vegetation interspersed with pasture is evident on Darling Island and around Jones Bay. Further west, towards Glebe, the land remains wooded.

There is a quarry inland of the two-storey house above the head of Jones Bay. This is likely located at the corner of Point and Bayview Streets, where the McCredie brothers in 1868 leased land from Edward Macarthur. Fitzgerald & Golder(1994:45) noted: 'This was the third time Macarthur had leased this land, but the other tenants had not been able to make anything of the steep rocky terrain and it went back to the Pyrmont estate'. The quarry permits the picture to be dated more closely, as it was near to where Macarthur's windmill stood until the mid/late 1830s, while St Bartholomew's church was built close by in 1850. These dates lend credence to Kerr's estimate. It also appears that the quarry was operational more than two decades before the McCredies leased it.

Figure 2.16: Elyard, Samuel, 1865, Johnstone's[i.e. Johnston's] Bay, 1865
(ML DG XV*/Spec.Coll/Elyard/18; digital order no. a1528106)

This watercolour presents a broad vista from just east of "Little Bay" on the Balmain peninsula, westwards along the latter to Glebe Island and Glebe peninsula in the background. Elyard included a substantial part of the northern section of Pyrmont peninsula from Glebe Island Bridge through Elizabeth Macarthur Bay to Pyrmont Point.

Moving along the coastline east from Glebe Island Bridge, the City Iron Works are defined by chimneys and smoke. There is a small series of cliffs along the shoreline from the iron works part-way towards Elizabeth Macarthur Bay. These could be the O'Brien ballast quarry illustrated by Matthews(1982:26). The land then slopes more gradually to Elizabeth Macarthur Bay, with a muddy/sandy beach extending to the base of Pyrmont Point, where the coast again becomes rocky and cliffy.

Above the coastal cliffs, and west of Elizabeth Macarthur Bay, grassy slopes with rocky outcrops rise gradually towards two major cliff-lines. The cliffs above the iron-works are darkly-coloured, indicating that they are natural and yet untouched by quarrying. The second cliff-line starts downslope of the first and extends eastwards at least to below the University of Sydney(on skyline) and possibly further. It is brightly coloured and likely to have arisen from quarrying. This latter cliff-line probably ran above what is now Bowman Street, almost to Mount Street.

The sky-line between the north-west headland and the University of Sydney appears to have experienced extensive quarrying. This is most evident above the darkly-coloured cliffs, where the quarry walls can be seen. This area thus extends from present-day Distillery Hill along Distillery Drive to shortly before the John/Mount Streets intersection. The skyline is convex in outline, falling away gradually eastwards about from where the Distillery Drive/Tambua Street intersection is now. It thus seems that the northern frontage of Pyrmont peninsula was being extensively worked for sandstone by the mid-1860s.

The tip of Pyrmont peninsula at this time appears free of native trees and shrubs. In contrast, the still largely wooded Glebe peninsula is visible behind Pyrmont peninsula and the bridge. Houses are clustered around Elizabeth Macarthur Bay and onto Pyrmont Point.

Figure 2.17: Lloyd, H.G., 1863, From Glebe Point with Pyrmont (DL PX 42 f.64)

Henry Grant Lloyd's view from Glebe Point was painted in September 1863, and shows the old Glebe Island Bridge and a portion of Glebe Island in the left middle-ground. Beyond the bridge is Johnston's Bay with Balmain peninsula behind. Pyrmont peninsula occupies most of the middle ground. Lloyd shows a rocky headland from which the Bridge leaves for Glebe Island, with a low-lying silty or sandy shoreline stretching back into Blackwattle Bay. Fairly steep, rock-strewn slopes lead up to a continuous cliffline from the headland to the southern limit of the painting. Above the cliffs the land is undulating and grassy, rising up to a second cliff-line set further back from the headland than the lower one. It is unclear where these latter cliffs yield to pasture. Quarrying is not evident in the field of view, indicating it has not yet reached this section of the peninsula.

Figure 2.18: Elyard, Samuel, n.d., Glebe Island Bridge

(ML DG XV*/Sp. Coll/Elyard/5; digital order no. a1528099)

This broad panorama was drawn from Glebe Point and incorporates Glebe Island – across the water to the left - Glebe Island Bridge with Balmain behind, and a substantial portion of Pyrmont peninsula. Although not dated, it is likely that this painting was done about the same time as others in his 'Pyrmont Series', that is, in the late 1860s. The City Iron Works, from which smoke is being emitted, opened in 1865.

Elyard details the appearance of the north-western portion of Pyrmont peninsula. The shoreline of Blackwattle Bay appears rocky for most of the frontage shown by Elyard, possibly becoming muddy/silty on the extreme right of the painting. There is a dirt road close to the waters of Blackwattle Bay, leading to Glebe Island Bridge. This is Abattoir Road, formed soon after 1861(Thorp, 1994). Above the road is a steep grassy slope, part of which - above the gutted house, has been excavated by quarrying. Above this slope is a line of cliffs which extended probably from a little north of the Blackwattle embankment(Glebe Bridge)(just outside the present painting) to the headland above Glebe Island Bridge. Above this cliff line was another grassy slope leading up to a second line of cliffs set back somewhat from the headland and running down the peninsula for a rather shorter distance than the lower cliffs. A third set of cliffs is shown just behind the Glebe Island Bridge gate house, a little above water level, but peters out fairly quickly into Blackwattle Bay.

Quarrying could be taking place on all three cliff-lines. A small quarry could be located behind and close to the bridge gate-house on the lowest cliff-line. Another, larger quarry is evident on the second cliff-line above the gutted house. The long cliff-face recorded by Martens may be in shadow towards the right side of the picture. The lighter patches towards the northern end of the highest cliff line could indicate quarrying there also. Nonetheless, it appears that the cliffs of north-west Pyrmont facing Blackwattle Bay were largely intact at this time.

Native shrubs and trees had been essentially eliminated from this part of the peninsula by the time of Elyard's painting, and replaced by pasture for grazing stock.

Figure 2.19: Martens, C., c.1861, View from Mr Blacket's
(ML XV*/Sp Coll/Martens/4)

This painting was made from 'Bidura House', home of the famous architect Edmund Blacket, at 357 Glebe Point Road. The house was designed, built and occupied by Blacket in 1858(Leichhardt Council, 2001).

The painting shows Glebe as largely wooded, but Pyrmont as cleared and extensively settled towards its eastern side. The houses straggle westwards at one point; they were on Mount Street, fronting the boundary between the Harris and Macarthur Estates. The area between the ring of buildings and Blackwattle Bay seems largely committed to sandstone quarrying at this time. The highest area, closest to the houses, seems to have been quarried already, and is characterised by large spoil heaps (probably from 'surface' quarrying). Below these is a long cliff-face, running south-eastwards almost from Blackwattle Bay towards the western cluster of houses. While the land immediately above these cliffs appears to have been worked, it is free of spoil heaps. The workings are part of the Paradise Quarry of Charles Saunders.

What appears to be largely pasture land slopes gradually northwards and downwards towards the gate house of Glebe Island Bridge. There appear to be natural cliffs on the slope above the gate house and along the nearby shoreline. The shoreline further into Blackwattle Bay is rocky, perhaps with some quarrying in progress.

Martens apparently based his painting on a pencil sketch titled 'Pyrmont and the North Shore from Mr Blacket's house, Glebe'(ML PXC 297, f.10). Dated as between 1844/60, according to the cataloguer's notes, the sketch would have been done in 1858 or later.

Figure 2.20: Elyard, S., n.d., Glebe Bridge (ML DG D5 Folio 12 Elyard)

This work provides a southerly view of the north-western headland, profiling the formations shown by Martens(Figure 2.19). Although not dated, it was likely painted in the mid 1860s.

The rocky shoreline at the entrance to Blackwattle Bay is clearly evident, with a dirt road some metres above the waterline. Glebe Island Bridge is partly behind the headland. The land towards the headland is seen to slope gradually upwards. A cliff-line occupies the mid-ground of the painting, with evidence of quarrying at its left end. At the right end the cliff-line evidently turns inland as it is in deep shadow. Above this major cliff-line are grassy slopes, leading up to a smaller cliff-line which gives way fairly quickly to more grassland. The dark colour of this latter cliff-line suggests that it has not yet been worked.

In-between the headland and the grassy slope in the foreground is another sandstone outcrop, located inland from the lance-shaped headland into Blackwattle Bay, but considerably lower than the main rock outcrops. This latter is located some distance north of Glebe Bridge, across which Pyrmont Bridge Road entered Glebe.

Blackwattle Bay above Glebe Bridge is seen to have a mostly muddy/sandy beach, with a small patch of sand dunes just south of the bridge. The shoreline remains muddy/sandy further into the bay.

Figure 2.21: Caire, N., 1878, Anglo-Australasian Photo Company: Views of New South Wales and Sydney Harbour, Folio 28: View from the Sydney Town Hall Tower looking S.W (ML PXA 467, f28)

This remarkable photograph was taken about a decade after Elyard's painting of Glebe Bridge, but the view across Blackwattle Bay is almost the same. On the Glebe, the main point is now Blackwattle Bay Park while the secondary point to the left of the view is where Sydney University's Womens Rowing Club house is now. The rock face to the right side of the view, below and to the right of the abattoirs on Glebe Island, was behind where Quarryman's Drive now runs. Quarrying is active along this face. Between this rock face and Blackwattle Bay is a large rock outcrop which has already been part-quarried and has since been removed entirely. Further into Blackwattle Bay the soil appears sandy possibly with sand dunes along the water's edge, interspersed with rocks. Further south still, and just north of Glebe Bridge(just outside the photograph) is another row of dunes. They are where the fishmarkets are now located.

The eastern foreshore of Pyrmont peninsula is also well illustrated. Mrs Bunn's cottage, with its Norfolk Island pines and Moreton Bay fig is located in the right middle-ground. The Darling Harbour branch line occupies the centre/left-hand middle-ground of the photograph, with the northern end of the Iron Wharf evident on the left. The water-body isolated from Darling Harbour by construction of the railway is clear. The railway embankment is badly eroded, adding to sedimentation problems in the harbour. Extensive quarrying of the cliff lines behind the railway line is evident. The house behind the waterbody has a high rock wall around its garden, presumably to protect plants from the livestock in the paddocks, probably horses.

Figure 2.22: Boyer, F.H., 1870/73, Sydney from Glebe Point
(ML SSVI/Bri/Gle1/1; digital order no. a1528098)

This view of the embankment across Blackwattle Bay(Glebe Bridge) was painted from the Glebe, and looks over Pyrmont peninsula to Sydney Town behind. The embankment was shown on Russell's(1858) map of Sydney and environs, although Thorp(1994) dated its construction as 1860. Bridge Road appears to run through a cleft in the sandstone ridge(as Pyrmont Bridge Road which, according to Thorp, was completed in 1859). Immediately north of this cleft is a cluster of five small houses, with a large double-storeyed building on the ridge-top. The rocky shoreline north of the embankment on the Pyrmont side is clearly evident, with cliffs of increasing height close to the water's edge. South of the embankment a low-lying shoreline, probably muddy/silty in nature, is evident. There is also a quarry, with a building. This was likely the 'Hellhole' quarry of Saunders. Above the quarries is a substantial double-storeyed building with three chimney-stacks; it is located by Russell(1858) as being just west of Harris Street a little over halfway from Parramatta Road to Elizabeth Macarthur Bay.

Sand's Sydney & NSW Directory of 1873 listed two sons of John Harris with addresses on Pyrmont peninsula – Matthew Harris in Crown(later Bulwara) Road, and William Henry in Harris Street. Later editions of the Directory indicate that Matthew Harris lived at 340 Crown Road, initially in 'Bismarck House' then 'Warrane' at least by 1884. William Harris was variously recorded as living at 366, 376 and 386 Harris Street, at 'Livingstone House' at least by 1882(Australian Dictionary of Biography). The grand houses illustrated by Boyer could perhaps have been those of Matthew Harris north of [Pyrmont] Bridge Road, and of William Henry Harris behind 'Hellhole' quarry.

The cleft in the sandstone backbone of the peninsula is particularly interesting. It may have been a natural feature but more likely was made by the Pyrmont Bridge Company in about 1858 while building Pyrmont Bridge Road. Although no direct evidence of this has been found, the challenges of road construction on the peninsula were well stated by John Rae in evidence to the Select Committee on the Pyrmont Bridge Company's Bill in 1855: 'We sent a surveyor to make a survey of the principal streets there[Pyrmont], lately, for the purpose of having them properly levelled, but we found that the expense of cutting down and forming them, would be so enormous, that we could not at present enter into it. There is a very large cutting in rock, to be done, before they would be at all accessible: Union-street, in particular, is very steep and rocky'.

Evidently, native trees and shrubs have been cleared from the part of Pyrmont illustrated, with the possible exception of two trees/clumps on the ridgeline just south of the cleft(probably the trees behind Mrs Bunn's cottage).

Figure 2.23: Manning, E., 1837, View from window, Ultimo House.
(V1/1837/2 f.2; digital order no. a2913002ut)

This delicate sketch was drawn by Emily Anne Manning, probably during her stay at Ultimo House in late 1837. It is a view from the north-western side of the house over Blackwattle Bay towards Lyndhurst House in Glebe. The latter was 'designed by architect John Verge for the Principal Colonial Surgeon Dr James Bowman and his family. It was built between 1833 and 1837 on 36 acres[14.6ha] overlooking Blackwattle Bay' (http://www.hht.net.au/discover/highlights/insites/lyndhurst). Manning's sketch may have been the first of the completed building.

The sketch shows a low-lying shoreline along the Glebe side of the bay – probably muddy/silty in nature - still largely clothed in native vegetation although possibly with an orchard south-east of Lyndhurst. Blackwattle Creek may just be seen on the extreme left of the sketch. The land between Ultimo House and Blackwattle Bay is cleared and fenced, apparently for stock.

Of particular interest is the vegetation beyond the paling fence bordering the paddocks. Palms and tree-ferns are evident, indicating that this was a patch of 'brush'. This is borne out by Knapp (in Leslie & Douglas, 2004:18) . While the headwaters of Blackwattle Bay show little evidence of the sedimentation painted by Samuel Elyard some 30 years later(Figure 5.8.14), there appears to be emergent vegetation, indicating the shallowness of these waters by this time.

Figure 2.24: Lycett, J., 1819, West view of Sydney taken from Grose's[sic] Farm, New South Wales
(NLA Rex Nan Kivell Accession T. 1631; digital order no. nla.pic.2969708-v)

This view of Sydney town from the west would have been made from near where the footbridge over Parramatta Road into Sydney University is now (Grose Farm became the campus of the university). Lycett shows Sydney 'straggling along Brickfield Hill'. Ultimo House is clearly visible in the middle ground, with glimpses of Cockle Bay. A second house is shown high on the peninsula, probably above Pyrmont Bay. The head of Blackwattle Bay is seen to be low-lying and probably swampy; it features a few rocky outcrops. The vegetation around the bay is very dense, with the crowns of the trees differing from those further upslope on Pyrmont peninsula. This suggests that a distinct wetland/swampland vegetation, possibly dominated by paperbark *Melaleuca* species, fringed the upper reaches of the bay, with eucalypts on the slope behind.

Figure 2.25: Anonymous, 1884, Blackwattle Swamp thirty years ago
(Illustrated Sydney News, 22 November 1884, p.8)

BLACKWATTLE SWAMP THIRTY YEARS AGO.

This sketch shows the mouth of Blackwattle Creek as it enters Blackwattle Bay, in 1854. The artist's vantage point would have been high ground towards the Parramatta Road. There are what appear to be two Grass Trees close to the artist, with other ground plants. Gum trees also occur nearby, on high ground towards Blackwattle Bay, and on steep ground to the left of the artist. Otherwise the land in the foreground is largely cleared with that close to the creek appearing swampy. The low-growing shrubs close to the creek mouth may be mangroves.

2.4 Conclusions

The early illustrations of Pyrmont peninsula capture well the complexity of the geology, topography and ecology of place. While sandstone ridges with imposing bluffs dominated the northern part of the peninsula, the landscape at the southern end was more gently undulating and flanked by biologically-productive heads to Cockle and Blackwattle Bays. There would doubtless have been movements of fauna around the peninsula in response to the seasons and major events(e.g. fires, drought). The two bays and their catchments would have been ecologically complex. The changes to the peninsula wrought by the early settlers are well-recorded by these early artists.

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Part 3

Physical geography of Pyrmont peninsula

3.1 Introduction

Described as the study of the Earth's surface features and associated processes, physical geography is concerned with climate, soils, vegetation, hydrology and landform. The physical characteristics of Pyrmont peninsula are described here and vegetation in Part 4.

The purpose of this section is to bring together information which cumulatively helps us to understand how Pyrmont peninsula would have looked in 1788. Accounts based on readily available information for climate, geology and soils are presented. Three other considerations – topography, shoreline and drainage of the peninsula –required collation of information from many sources and the generation of new insights.

If one subscribes to the view that the Parramatta River becomes Port Jackson at an imaginary line between Greenwich Point, Greenwich, and Robinson's Point, Birchgrove, Pyrmont peninsula is located in the upper reaches of Port Jackson and on its southern side. Indeed, the peninsula occupies a pocket of water which is entered between Balmain East and Millers Point and is comprised of Blackwattle, Rozelle, White and Johnston's Bays and Darling Harbour. It is in a sheltered part of Sydney Harbour.

Reference is widely made here to art works described in Part 2, where full citations are given.

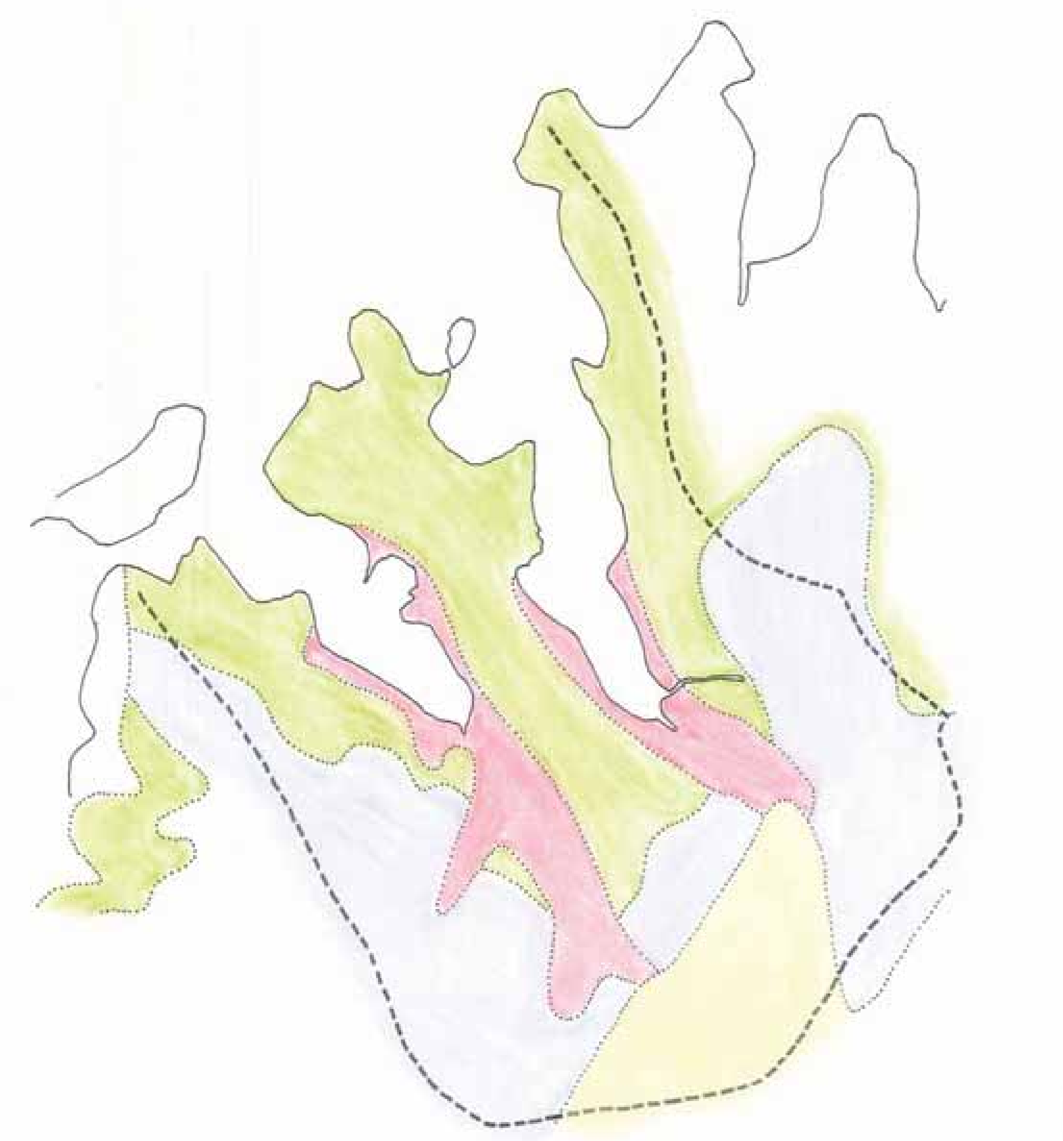
3.2 Climate

According to Benson & Howell(1995:11): 'Sydney is part of the subtropical east coast, and experiences a warm wet summer-autumn and cool drier winter-spring'. Mean monthly temperatures at Observatory Hill are a maximum of 25.9°C in January and a minimum of 8.0°C in July(Australian Bureau of Meteorology, 2007). Mean annual rainfall at two weather stations flanking Pyrmont peninsula, Observatory Hill and Riverview, are 1214mm and 1131mm per annum respectively.

3.3 Geology

This account is based on Herbert(1983). Pyrmont peninsula itself and much of the adjoining Sydney and Glebe peninsulas consist of Hawkesbury Sandstone(Figure 3.1). Moving southwards from Pyrmont peninsula, the underlying rock becomes Wianamatta Shale from just north of the Parramatta Road, but sooner on both the Sydney and Glebe peninsulas. Wianamatta Shale is thus the dominant rock beneath the catchments of the major creeks feeding into Cockle and Blackwattle Bays; overall, some 60% of the catchments of the two bays are underlain by shale. There is an intrusion of Quaternary Alluvium(Botany Sands) into the catchment of Cockle Bay in its southernmost part.

Figure 3.1: Geology of Pyrmont peninsula (after Herbert, 1983)



Interpretation:

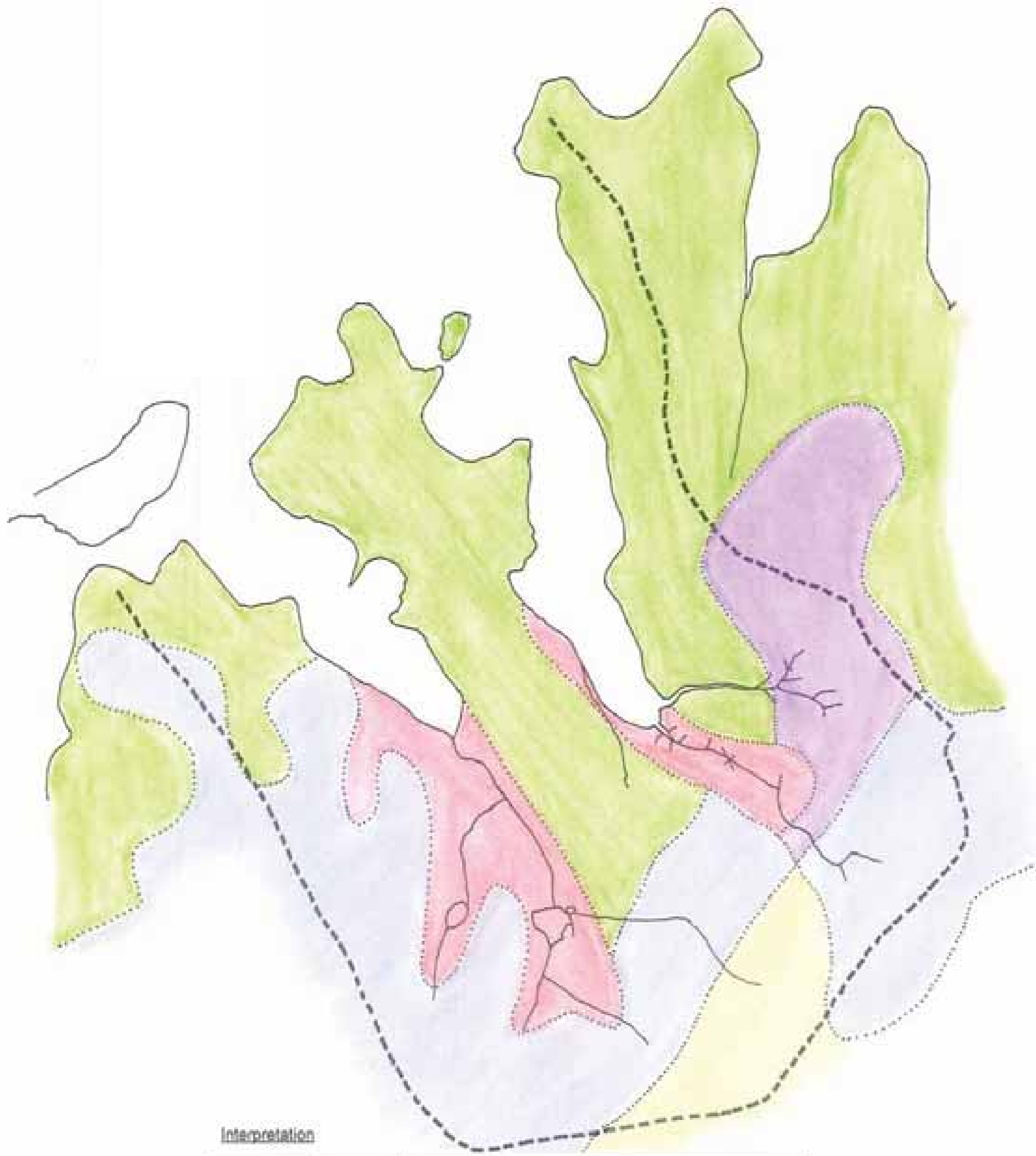
Colour	Code	Material
	Qha	Quaternary river delta deposits
	Qhd	Sand dunes(Botany Sands)
	Rh	Hawkesbury Sandstone
	Rwa	Ashfield Shale Wianamatta Group

Herbert(1983) also showed a deposit of quaternary alluvium at the head of Darling Harbour. However, this reflects sedimentation of the bay since European settlement and is not considered here. There were, in fact, significant historical deposits of quaternary alluvium at the heads of both Cockle and Blackwattle Bays at European settlement, and these are shown in Figure 3.1.

3.4 Soils

Five soil landscapes occur on Pyrmont peninsula and in the catchments of Blackwattle and Cockle Bays(Chapman & Murphy, 1989). Their extent is shown in Figure 3.2, and each is described below.

Figure 3.2: Soil landscapes of Pyrmont peninsula (after Chapman & Murphy, 1989)



Interpretation

Colour	Symbol	Soil landscape
	bt	Blacktown, on Wianamatta Group Shales
	dc	Deep Creek fluvial deposits
	gy	Gymea, on Hawkesbury Sandstone
	lh	Lucas Heights, on plateau surfaces of the Mittagong Formation
	tg	Tuggerah, Aeolian rolling coastal dunefields

3.4.1 Blacktown soil landscape(bt)

Both creek catchments, but especially that of Blackwattle Creek, receive drainage from areas with a Blacktown soil landscape. This gently undulating landscape occurs on Wianamatta Group shales. Its soils support tall open forest(wet sclerophyll forest) and open woodland(dry sclerophyll forest). According to Chapman & Murphy (1981:31) remnants of the former at Ashfield Park contain Sydney Blue Gum *Eucalyptus saligna* and Blackbutt *Eucalyptus pilularis.*

This soil landscape abuts the Hawkesbury Sandstone at the base of Pyrmont peninsula.

3.4.2 Deep Creek soil landscape(dc)

A small area of this soil type runs in a south-eastern arc from the headwaters of Darling Harbour. There is a more extensive area in the lower catchment of Blackwattle Creek. According to Chapman & Murphy(1989:74) this soil landscape is a 'level to gently undulating alluvial floodplain draining the Hawkesbury Sandstone. Local relief <5m, slopes <3%'. The authors described three plant communities associated with this soil landscape:

- Tall open-forest, dominated by Sydney Red Gum *Angophora costata*, Red Bloodwood *Eucalyptus gummifera*, Old Man Banksia *Banksia serrata*, and Sydney Peppermint *Eucalyptus piperita*.
- A tall wet sclerophyll forest in more sheltered areas, dominated by Sydney Blue Gum *Eucalyptus saligna,* River Peppermint *Eucalyptus elata* and Blackbutt *Eucalyptus pilularis*. Water gums *Tristaniopsis neriifolia* and *Tristania laurina* commonly line creekbanks.
- In other areas, depauperate rainforest occurs, with *Pittosporum undulatum*, Black Wattle *Callicoma serratifolia*, Native Myrtle *Backhousia myrtifolia* and the tree ferns *Cyathea australis* and *Dicksonia antarctica.* Cabbage tree palms *Livistona australis* are occasionally present.

3.4.3 Gymea soil landscape(gy)

This soil landscape comprises the core of Pyrmont peninsula to about Broadway/George Street. According to Chapman & Murphy this landscape comprised: 'undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief 20-80m, slopes 10-25%. Broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps'. The soils were shallow to moderately deep on the crests and inside of benches, shallow on the leading edges of benches, with localised soils derived from shale lenses. Drainage lines would have contained siliceous and leached sands.

According to the authors, low, dry sclerophyll open-woodland would have dominated the ridges and upper slopes, with species commonly present including Red Bloodwood *Eucalyptus gummifera*, Scribbly Gum *Eucalyptus haemastoma,* Brown Stringybark *Eucalyptus capitellata* and Old Man Banksia *Banksia serrata*. More sheltered slopes would have commonly supported Black Ash *Eucalyptus sieberi*, Sydney Peppermint *Eucalyptus piperita* and Sydney Red Gum *Angophora costata*. The understorey of these plant communities would have consisted of shrubs from the families Ericaceae, Myrtaceae, Fabaceae and Proteaceae.

This soil landscape is susceptible to severe sheet erosion following bushfires or disturbance.

3.4.4 Lucas Heights soil landscape(lh)

Cockle Bay Creek catchment contains an area of this soil landscape to the east/south-east of the fluvial Deep Creek sediments. It is derived from Mittagong Formation rocks, with alternating bands of shale and fine-grained sandstones. Local relief to 30m, slopes <10%. Rock outcrops are absent. This soil type supports sclerophyll open-forest and low eucalypt woodland with a sclerophyll shrub understorey. Dominant trees include Turpentine *Syncarpia glomulifera*, Sydney Red Gum *Angophora costata*, Red Bloodwood *Eucalyptus gummifera*, Thin-leaved Stringybark *Eucalyptus eugenioides* and Scribbly Gum *Eucalyptus haemastoma*.

3.4.5 Tuggerah soil landscape(tg)

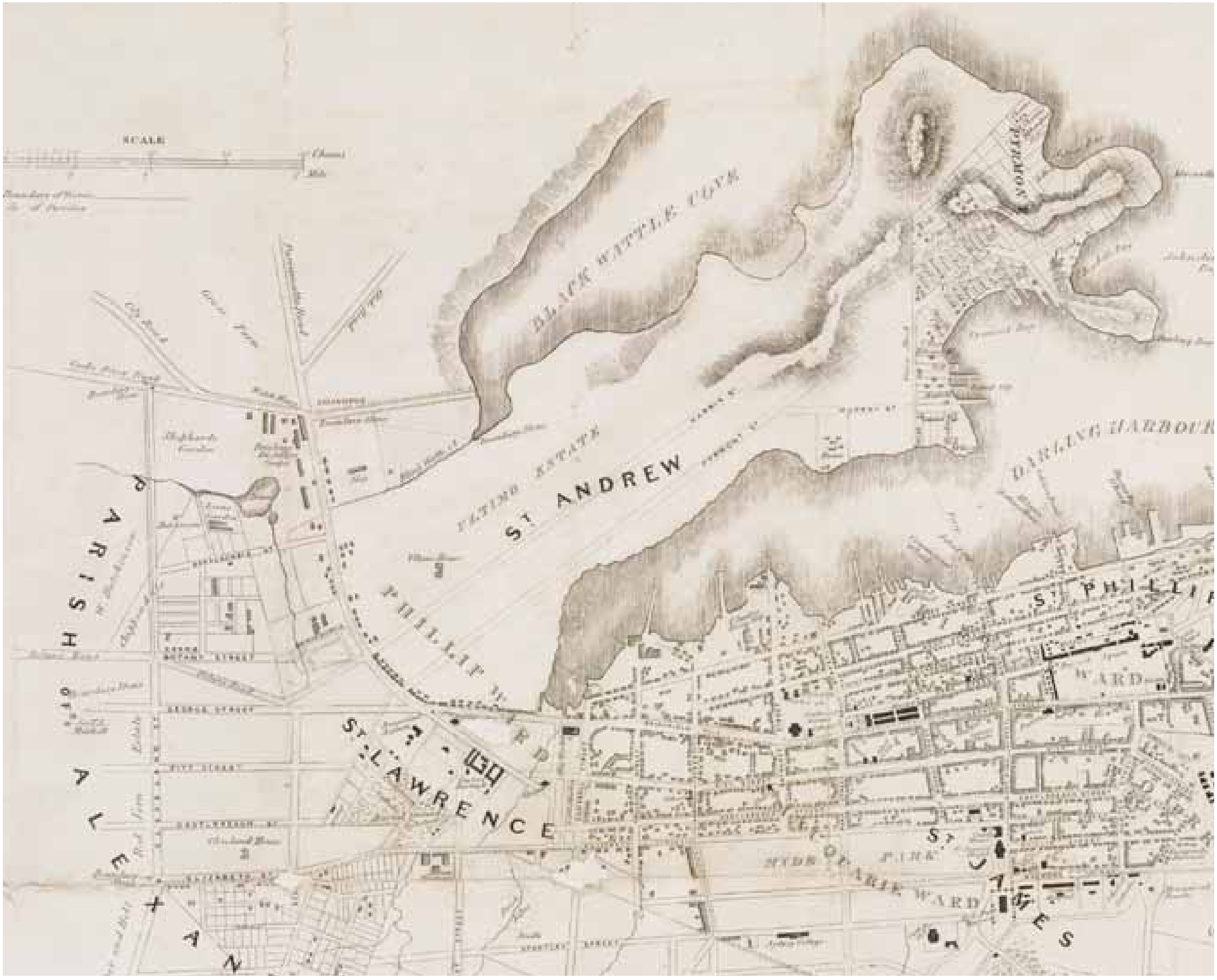
Blackwattle Creek system also drains an area of Tuggerah soil landscape. This is comprised of gently undulating to rolling coastal dunefields, with north-south oriented dunes. This soil type is now heavily urbanised, but once supported the Eastern Suburbs Banksia Scrub, now highly endangered. The soils here were of very low fertility and prone to extreme wind erosion hazard.

3.5 Topography

3.5.1 Previous Studies

Pyrmont peninsula is oriented north-west/south-east. Its rugged nature was acknowledged in early surveys of lands around Port Jackson. John Septimus Roe(1822), for example, denoted high ground with hachures from the tip of the peninsula south to about where William Henry Street now runs. Nonetheless, compared with the Hornsby Plateau north of Port Jackson, the lands south of the harbour are low-lying.

Figure 3.3: *Detail from* Wells, W.H., 1843, To the Right Worshipful the Mayor, Aldermen, Councillors & Citizens this Map of the City of Sydney is most respectfully dedicated by their obed.t humble serv.t Will.m Henry Wells, Land Surveyor, Sydney, James Tegg (ML ZM2 811.17/1843/1; Digital order no. a128333)



Maps which illustrated subdivisions of the Macarthur Estate in the early 1840s (e.g. Wells, 1843) distinguished four discreet areas of high ground on the peninsula, again through hachures(Figure 3.3). Thomas Mitchell(1853) provided an altogether more complex interpretation of the peninsula's topography (Figure 3.4). His survey was the first based on trigonometrical methods and thereby achieved levels of accuracy previously unattainable.

Figure 3.4: *Detail* from Mitchell, T.L., 1853, Plan of Sydney, [London], [T&W Boone] (ML 981.11/P)

Other topographical maps of Pyrmont peninsula using hachures were produced in the mid-nineteenth century. One, in the NSW Official Publication (1857), illustrated the topography of the eastern side of the peninsula. It had been generated by trigonometric means and showed the form of the high ground from Pyrmont Point to about Mary Ann Street in Ultimo. Notably, it showed a spur off the main ridge leading to the western end of Pyrmont Bridge, and an isolated hillock between Pyrmont Bridge Road and Bunn Street. Another map, prepared by Morell(1865) was less informative, but also showed the side spur leading to Pyrmont Bridge.

The topography of Pyrmont peninsula was further defined by Higinbotham & Robinson(1892), who showed high ground along the central spine of the peninsula northwards from the Parramatta Road. Towards the tip of the peninsula this ridge divided into three fingers leading to Distillery Hill, Pyrmont Point, and Darling Island respectively. In common with their predecessors, these authors used hachures to denote high ground. They also provided spot heights at four points on the peninsula:

- 55 feet(16.8m) at Parramatta Road/Harris Street intersection
- 70 feet(21.3m) at about the Fig/Bulwara Streets intersection
- 50 feet(15.2m) on Harris Street between Pyrmont Bridge Road and Union Square
- 60 feet(18.3m) on Point Street near to Giba Park

The idea of lines which join points of equal value is very old, being used by Pieter Buuinss in 1584 to define a water body(Mulcahy, 1995). Contours (isobaths) were widely used in this way from the early eighteenth century. Their use to describe a land surface was studied theoretically in 1771: 'In 1791, a map of France by J.L. Dupain-Triel used contour lines at 20-metre intervals, hachures, spot-heights and a vertical section'(Wikipedia, 2008), thereby incorporating the various topographical devices of the time.

From about 1843, the Ordnance Survey started to use contour lines on maps in Great Britain and Ireland, by which time they were already in general use in continental Europe.

An early use of contour lines in Australia was to describe the site for the federal capital, for which a survey with contours at 5ft(1.5m) intervals was prepared in 1910. It does not appear, though, that contour lines came into general use in Australian mapping until the classic 1:63,360(inch-to-the-mile) maps were prepared some two decades later. These maps were made by the Australian Section Imperial General Staff following surveys in the early 1930s by the Australian Survey Corps with the aid of air photos by the Royal Australian Air Force. Contours were at 50ft(15m) intervals and spot heights were provided. The Sydney map was published in 1936. While it has a single contour on Pyrmont peninsula, this is largely obscured by other map features!

3.5.2 Current Study

Major changes to the topography of Pyrmont peninsula, mostly from quarrying, occurred before it was fully and accurately mapped. So it is necessary to reconstruct the peninsula's topography as far as possible from sources both contemporary and historical.

An important contemporary resource is the Orthophoto Map Images prepared by the NSW Department of Lands in November 2005. Images relevant to the study area were all taken in February 1978, and overlaid with contours at two-metre intervals. These latter were abstracted and a topographical map was drawn from this information with a reasonable likeness to the peninsula's current landform. This map was then set in the shoreline of the peninsula as it was believed to be in 1788. The resultant image was used to interpret information from paintings, sketches and photographs from between 1797 and 1884(Part 2) and, in the process, create a vision of how the peninsula might have appeared in 1788.

The NSW Department of Lands orthophoto maps of Pyrmont give several spot heights, the more notable of which are:

- Ultimo Community Centre - 23 metres
- Ultimo Uniting Church - 23.4m
- Fig Street Park - 22.8m
- Near Bunn Street - 21.0m
- Distillery Hill - 37.9m
- McCaffery Stables - 35.1m
- John Street Square - 29.8m
- Bayview/Point Streets - 20.8m

Which of these were the heights of these places at European settlement, and which have been altered by events since?

They can be compared with those established by Higinbotham & Robinson for adjacent ridges, such as Glebe(to 100ft or 30.5m), Balmain(to 140ft or 42.7m), Darlinghurst/ Paddington(to 150ft or 45.7m), Sydney University(to 140ft or 42.7m), and Newtown(to 190ft or 57.9m). Other contemporary spot heights nearby include:

- Observatory Hill - 39m
- Hyde Park/Town Hall - 51m
- Balmain Fire Station - 42m

Interpretations of these spot heights are incorporated into the following account.

3.5.3 Interpretation

It was first necessary to define the form of Pyrmont peninsula at European settlement, together with its relationship to adjoining lands. Mitchell's(1853) survey was mostly used for this purpose (Figure 3.4). There were, however, two parts of the peninsula which had been modified by 1853 – the head of Cockle Bay and Pyrmont Bay. John Dickson had constructed a dam across the head of Cockle Bay in 1815, to provide fresh water to his steam mill. Although John Septimus Roe(1822) apparently did not publish his 'Plan of the Town and Suburbs of Sydney' until 7 years after Dickson had built his dam, it shows the head of Cockle Bay in its original form, and has been used here to define that part of the peninsula.

Reclamation of Pyrmont Bay was well in hand by 1853, as shown in Mitchell's survey. The map used to define the form of this bay at settlement was that attached to an account of reclamations made in Sydney Harbour during 1862/ 63(NSW Legislative Assembly, 1867/8). Another source useful in defining the original coastline of the peninsula was published by the Australian Gas Light company (1870): it details the eastern and western coastlines of the central part of Pyrmont peninsula.

In this section, materials gathered in Part 2 together with the above and other information are brought together to create an image of how Pyrmont peninsula may have looked topographically in 1788. This process of interpretation was further aided by reference to the topographies of the peninsula from the mid-nineteenth century by Wells(1843), Mitchell(1853), NSW Official Publication (1857), and Morell(1865). These maps were all prepared after European settlement of the peninsula, and incorporate the resultant changes.

A) Wetlands

It is hard today to envisage the wetlands which once occupied the heads of Cockle Bay/Darling Harbour and Blackwattle Bay. Norman Selfe(1906:245) provided the following insights into the Haymarket Valley swamps:

> *'Brickfield Hill* [George Street] *up to the middle of 1837 was not only steep, but difficult and dangerous to traverse with a loaded vehicle, and in the Haymarket Valley the swamps were intersected by tidal creeks. It is on the records of this period that the evacuation*[sic] *taken off Brickfield Hill below Bathurst Street was over one million cubic feet. Now if the length to be cut down extended as far as Goulburn Street – about a quarter of a mile – and the rock was removed for a width of a chain and a half, then a million cubic feet would give an average or mean depth of about seven and a half feet over the whole area, or say fifteen feet at the high places. This corresponds with the depth of filling*

in at the valley bottom, which has been raised to sixteen feet above high water at Hay Street. If we can picture Brickfield Hill with the upper part all irregular rocks fifteen feet higher than now, and the Haymarket Valley fifteen feet lower, we may be able to form an idea of its original condition …'

B) Southern peninsula

It seems likely that the contemporary spot heights for the southern section of the peninsula today are similar to those of 1788. The general form of the southern(Ultimo) section of the peninsula is well illustrated in a series of four photographs, taken in the mid 1860s/1870s(Various, 1865/1930). The photographs broadly show the landform of the peninsula at that time. They show the land rising gently from Parramatta Road to an elongated knoll, from which the land falls away slightly before again rising to a second slight knoll behind Mrs Bunn's Cottage. The land again falls away before rising more distinctly in the vicinity of Union Street. This sequence of gentle rises and falls in the land can be seen today as one walks northwards along Bulwara Road. The road rises gently until just north of William Henry Street, near the Ultimo Community Centre, where the first knoll starts. It extends northwards almost to Fig Lane, where the land falls away towards Allen Street. Northwards from here, perhaps sooner, the form of the ridge has likely been changed by quarrying.

The east-facing slopes of this ridge fall away to what was once Cockle Bay and were once dotted with rocky outcrops. The western perspective on this part of the peninsula is well illustrated by Samuel Elyard in two of his paintings from the mid-1860s. The first, titled 'Glebe Bridge'(Figure 2.20) shows the west-facing slope of Ultimo gently rising from Blackwattle Bay with occasional rocky outcrops. His second, 'Pyrmont, 1868'(Figure 5.8.14) is also of Blackwattle Bay with the Glebe Bridge across it, but is painted from further south, not far from the Parramatta Road. Again, the gently sloping nature of the western flank of Ultimo, interspersed with rocky outcrops, is evident.

It is likely that there has been little historical change in overall land form of this section of the peninsula since 1788, apart from construction of the Darling Harbour Branch Railway line in the 1850s and reclamation of the two bays; disturbance to the peninsula's topography as a result was relatively minor and easily recognisable. Increasing construction of substantial buildings is changing this situation.

C) Hellhole and Purgatory

The Saunders family quarries 'Hellhole' and 'Purgatory' clearly much altered the peninsula's topography north from Quarry Street almost to Pyrmont Bridge Road and between Bulwara Road and Wattle Street(Irving, 2006:29). It is believed that the topography of this section of the peninsula historically resembled that of the section immediately to the south, between Quarry and William Henry Streets. Wells(1843) indicated through hachures a steepening of the slope towards the knobby headland into Blackwattle Bay.

D) Pyrmont Bridge Road to Miller Street

Boyer, in 'Sydney from Glebe Point'(Figure 2.22), depicted this section of the peninsula as gently sloping from Blackwattle Bay up to the ridge crest, but with cliffs starting a little north of Glebe Bridge. Elyard offered a similar interpretation in his 'Glebe Island Bridge' painting(Figure 2.18). An early photograph(Various, 1865/1930) shows the land west of Harris Street rising gradually from about Pyrmont Bridge Road towards Mount Street. The northern section of this part was being actively quarried at the time of the photograph. It seems likely that this section of the peninsula was greatly changed by quarrying. The cleft in the sandstone ridge depicted by Boyer in the early 1870s has gone, indicating that substantial quarrying took place on both sides of Pyrmont Bridge Road. This quarrying extended northwards to the present cliff-face below McCafferys and Upper Mount Street. It seems likely that the order of 10 metres of sandstone was removed at the upper end of what was to become Miller Street. It is possible that the depth of sandstone removed in this section increased from about Bank Street to the eastern end of Miller Street, so as to create a level enough surface for housing.

E) North-western headland

This section of the peninsula is defined approximately by Miller and Harris Streets and that part of the peninsula's coastline which links them. It was drawn by Wells(1843) as an isolated monolith, called 'Mount Street hill' (Matthews, 1982:25), characterised all round by steep rocky or cliffy slopes. Mitchell(1853) defined its southern boundary as running south-east from Blackwattle Bay to Harris Street in alignment with the Bunn Street formation. He delineated a rectangular area west of Upper Mount Street as having been quarried although, at this time, this would have been surface rock only, later indicated by Conrad Martens(1861) as a series of spoil heaps (Figure 2.19).

It seems clear that, in the fullness of time, the monolith was quarried on all four sides, although that along Harris Street would have been relatively minor. The extent to which it was quarried on top is uncertain. Current heights above sea level of 37.7m (Distillery Hill) and 35.1m (McCaffery's Stables) relate well to contemporary heights at Observatory Hill(39m) and Glebe(30.5m), suggesting that little or no substantive quarrying of the top has taken place. These contemporary heights also relate well to the revised height suggested for the rise on which Macarthur built his windmill(33/34m, see F. below). Perhaps quarrying here went no further than the removal of surface rock.

As noted elsewhere, this monolith displayed two bands of cliffs in 1788. The lower band was substantial in depth along the Blackwattle Bay frontage, although tailing off towards its southern end. The upper band of cliffs was of a more modest height.

Considerable amounts of sandstone were removed from the monolith during quarrying, leaving a much diminished structure by the 1930s, when quarrying ceased. It seems likely that contemporary spot heights for Distillery Hill and McCaffery's stables have changed little since European settlement. They are intermediate in height between the Sydney and Glebe ridges, and are of an order similar to the highest point in Balmain. It would be interesting to know whether the rock surface at the top of Distillery Hill, currently covered by imported soil, shows signs of quarrying; it may still be the original land surface, although removal of easily accessible surface stone and construction of oil storage tanks would have had an effect.

The saddle which now exists between Distillery Hill and McCaffery's stables resulted from quarrying; in 1788 the land between these two places would have had a gentle downslope eastwards. The top of the monolith would also have extended further northwards towards Johnston's Bay and the alignment of Bowman Street. Mitchell(1853) showed a spur running out from the monolith to the west side of Elizabeth Macarthur Bay. While the overall form of this spur remains today, it has been much modified by the activities of several small quarries.

F) Pyrmont Point, Jones Bay and Darling Island

Martyr's sketch 'View of Pyrmont and Balmain'(Figure 2.15) shows Pyrmont Point as steep-sided. The peninsula's ridge line rises gradually to a point about midway along, after which it falls away before rising again to the McCredie quarry. Thereafter it falls away sharply to Pyrmont Street. This rocky outcrop today rises some 6 metres above its environs, but would have been considerably higher before quarrying; it is also the place from where a spur once left for Darling Island.

Thompson's 'View from Sydney of the Haunted Mill'(Figure 2.12) likewise puts Macarthur's mill on a rise, with a dip in the ridgeline leading thence to the main peninsula. There is also an indication of a dip to the north of the windmill. Both cols would have sustained creeks leading to Jones and Elizabeth Macarthur Bays respectively.

These interpretations are supported by the maps of Mitchell(1853) and the NSW Official Publication(1857), both of which clearly indicate the cols on either side of St Bartholomew's, near where the windmill was once located.

Martyr's sketch may best indicate the height of the rise on which Macarthur built his windmill, before quarrying. Kerr(1992:519) believed that Martyr drew his sketch in 1844. The observations by Fitzgerald & Golder(1994:45) suggest that the site was not substantially quarried until the McCredies leased it in 1868. If these insights are correct, the rise would likely have been at, or close to, its original height when Martyr sketched it. Using the double-storey house nearby as a guide, it is likely that the McCredies lowered the rise by 3-4 metres through quarrying, suggesting an initial height of 33-34 metres.

Regarding Jones Bay, Wells(1843) showed a line of cliffs at the southern end of the bay. This relates well to a c.1880s photograph(fig. 2.13), showing a precipitous coastline to the bay with a cliff-face at the southern end, of perhaps 50 metres to mid-bay.

Darling Island has been transformed over time. It rose steeply out of Cockle Bay at its northern end, where there were "high cliffs"(p. 55), sloping gradually to sea-level at its southern end. The island's summit was originally about half the height of Pyrmont Point, at least 10-12 metres.

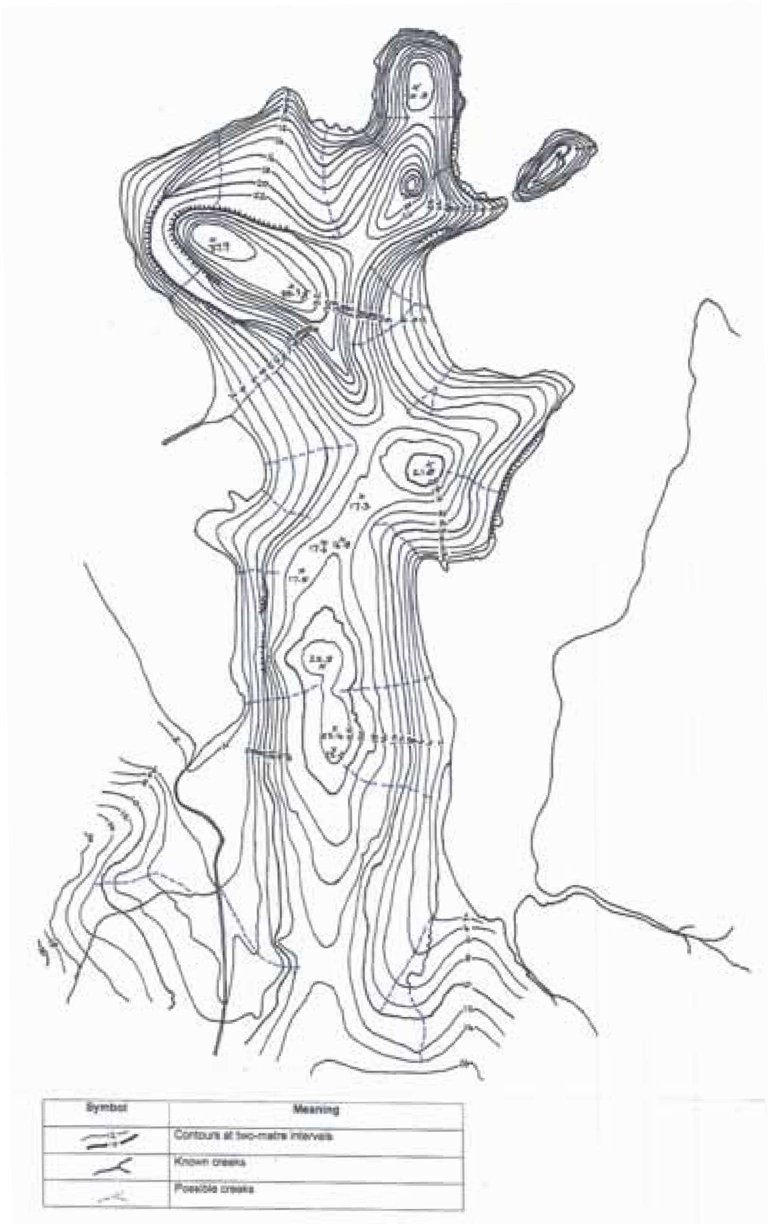
G) Pyrmont Bay and catchment

Mitchell's(1853) map is probably the most useful for understanding the topography around Pyrmont Bay. The immediate bay area is backed by the central spine of the peninsula. A large rocky promontory jutted out from the peninsula into Cockle Bay south of Pyrmont Bay. It had a more-or-less central knoll on Bunn Street from which four shallow ridges radiated in approximately NE, SE, SW and NW directions. The NE and SE ridges substantially defined the frontage onto Cockle Bay; Mrs Bunn's cottage was set between them, below the main knoll. The SW and NW ridges extended across Pyrmont Street and are today occupied by Paragon Apartments and the John Taylor building respectively.

3.5.4 Conclusions

A reconstructed topography of Pyrmont peninsula, as it might have appeared in 1788, is given in Figure 3.5. While much of the peninsula broadly retains its form at European settlement, there are sections which have experienced massive change. These latter extend from Quarry Street up the western flank of the peninsula and around its north-western headland, with less disturbance towards Elizabeth Macarthur Bay.

Figure 3.5: Proposed topography and drainage of Pyrmont peninsula in 1788



Pyrmont Point has been much diminished by quarrying, while Darling Island has been transformed by both quarrying and land reclamation. Pyrmont Bay has been substantially reclaimed from the harbour(p. 509). The eastern flank of the peninsula south of Pyrmont Bay has been extensively modified due to the requirements of railway and wharf construction, there having been a general levelling, lowering, and cutting back of the original western shore of Cockle Bay.

3.6 Shoreline

General surveys of Port Jackson were done by individuals like William Bradley and George Raper very soon after European settlement. By the early 1800s renditions of the eastern shoreline of Cockle Bay were being included in plans of Sydney town, for example by Charles Grimes, James Meehan and Charles Alexandre Lesueur(of the Baudin expedition to Australia, 1800/04).

John Septimus Roe reached Sydney in 1817 and within a few months started on three surveys of the Australian coast under the command of Lieutenant Phillip King(Uren, 1967). While he overall undertook sixteen journeys of exploration, he still was able to make a detailed survey of Port Jackson in 1822(Roe, 1822). His survey included the shorelines of the entire Pyrmont peninsula together with both Cockle and Blackwattle Bays. Roe went on to become Surveyor-General of the new settlement at Swan River, Western Australia, in 1829 until his retirement in 1870. Although Roe's survey was most informative of the condition of Cockle Bay in the early 1820s, surveying methods were still primitive and there were often marked differences between surveys of the same area. Regardless, his survey was used to define the major creek mouths at the head of Cockle Bay(Figure 3.5).

The standard of surveying in New South Wales was improved markedly with the arrival of theodolites in the colony in 1825(Kass, 2008:81). Mitchell began the first trigonometrical survey of NSW in 1828, using tent poles as trig points; proper rods and a standard chain(used to calibrate surveyors' chains) were procured in that year. Thomas Florance(1834) made a trigonometrical survey of Port Jackson in November/December 1828. His survey detailed the shoreline of Darling Harbour to Pyrmont Point. It was timely as there were already four jetties on the Sydney-side of the harbour, and a dam had been built at the head of the harbour, obliterating the mouths of two major creeks which fed into the waterbody there. Also, silting of Cockle Bay had been taking place at increasing rates since the first days of European settlement as the clearance of vegetation and construction activities gained momentum. This sedimentation was to figure prominently in the futures of both Darling Harbour and Blackwattle Bay (see 5.8).

Florance also described the nature of the eastern shoreline of Cockle Bay at the time of his survey. There was a muddy foreshore from the head of the bay northwards to a rocky promontory which separated this part from Pyrmont Bay. The foreshore of Pyrmont Bay was muddy, while that of Darling island was rocky. The rocky shoreline then stretched northwards around Jones Bay to Pyrmont Point.

An insight into the original state of Darling Island is given by Napier(1928), based on an account of one Hugh Morwick who came to Australia in 1838 'in a ship which sailed "right up to the bay opposite the peninsula of Balmain, and anchored close to Darling Island". It was really an island then, and the young immigrant pulled round it in the ship's boat. "High cliffs", he says, "towered skyward, and the only habitation on the island was a small cottage on the summit"(pp.260/261). The high cliffs would have been at the northern end of the island, receding towards water level at its southern end. Davies(1984:70) described Darling Island as: 'A rocky inhospitable place of no more than a couple of hectares …'.

Sir Thomas Mitchell(1853) also produced a survey of Port Jackson - some 25 years after Florance - by which time Darling Harbour had considerably developed as a port. Mitchell had become Surveyor-General of New South Wales in 1828, a post he held to his death in 1855(Baker, 1967). His survey used trigonometrical principles, indeed trig points shown on his map include Distillery Hill and Pyrmont Point. His survey broadly confirmed Florance's earlier work, and was used here to define the shoreline of Pyrmont peninsula south from Pyrmont Bay and from Darling Island as far as the western shore of Blackwattle Bay.

Finally, a map by Russell(1858) was used to define the western shoreline of Blackwattle Bay into Rozelle Bay, and Glebe Island.

Although Mitchell and Russell fully defined the shoreline of Pyrmont peninsula, neither described the nature of that foreshore. For this information, the works of several artists featured in Part 2 are helpful:

Samuel Elyard's 'Johnstone's Bay' painting(Figure 2.16) suggests that Elizabeth Macarthur Bay was sandy when he painted it in 1865. It is possible that this was in part material from the sedimentation of Darling Harbour during the settlement of Sydney. Probably, the bay's shoreline was rocky interspersed with sandy patches.

Samuel Elyard's 'Glebe Island Bridge' painting(Figure 2.18) clearly defines the rocky nature of the Blackwattle Bay shoreline from where the bridge leaves Pyrmont to the right-hand end of the gutted house, where the painting becomes indistinct

Samuel Elyard's 'Glebe Bridge'(Figure 2.20) illustrates well the north-eastern side of Blackwattle Bay. Both spits of land into the bay – the northern being lance-like, the southern knob-like – had rocky shorelines, while the bays between them and to the south had muddy shorelines. A small patch of sand-dunes is evident just south of the bridge.

Nicholas Caire's(1878) photograph(Figure 2.21) indicates that the shoreline of Blackwattle Bay from about where Miller Street once reached the bay to just north of Glebe Bridge was sandy, sometimes interspersed with rocks and in places with dunes; it is not known how much change may have occurred in the 90 years since settlement though.

Francis Boyer's painting 'Sydney from Glebe Point'(Figure 2.22) shows a change in the nature of the Blackwattle Bay shoreline of Pyrmont peninsula from rocky to muddy/silty where Glebe Bridge was built

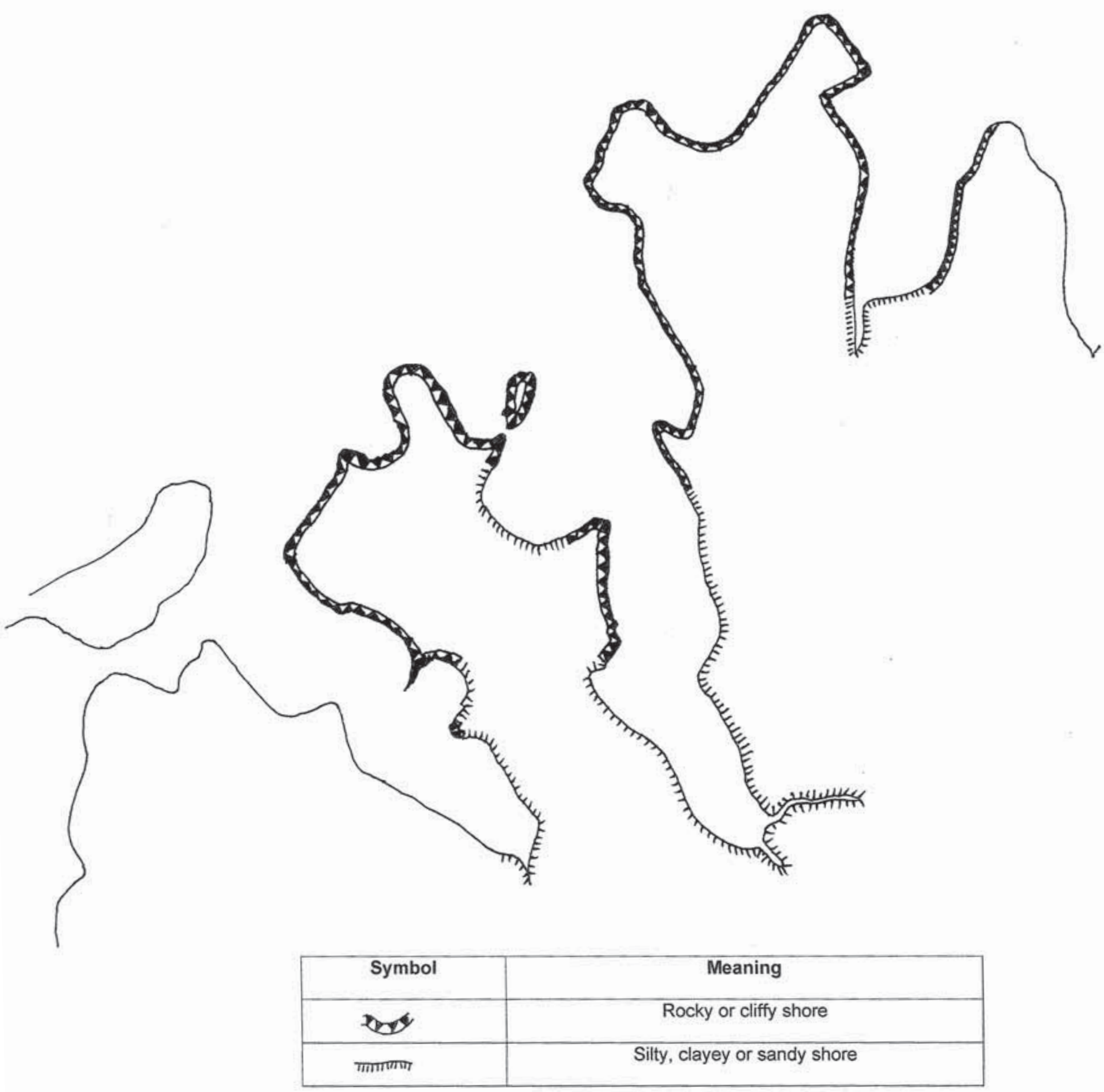
Joseph Lycett's painting 'West view of Sydney taken from Grose's Farm'(Figure 2.24) shows a muddy eastern foreshore towards the head of Blackwattle Bay periodically interspersed with clusters of large sandstone boulders

Also, A.M.(1925) described the section of Blackwattle Bay between Miller Street and Glebe Island Bridge as having a 'muddy shore'

It is concluded from these observations that the nature of the foreshore in Blackwattle Bay at European settlement resembled that in Cockle Bay, with rocky headlands to the bay extending some distance in from Johnston's Bay, and the head of the bay having mostly muddy foreshores.

A synthesis of these observations is given in Figure 3.6.

Figure 3.6: Likely shoreline of Pyrmont peninsula in 1788

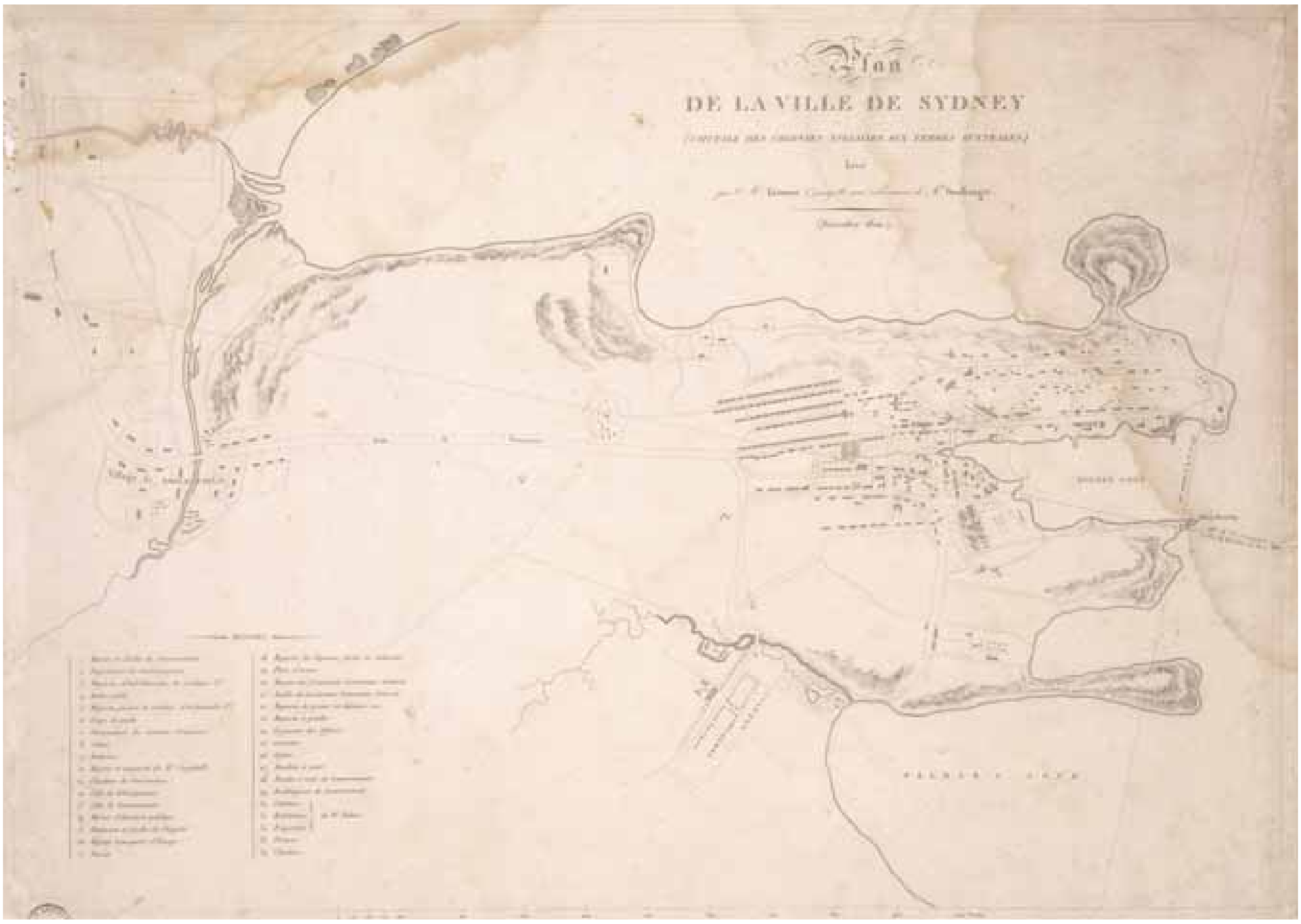


3.7 Drainage

Major waterways fed into the heads of Cockle and Blackwattle Bays at European settlement. Those feeding into Cockle Bay were defined in some detail by Charles Alexandre Lesueur in 1802(Figure 3.7). Several versions of this sketch exist. One, published in Peron(1807) and dated September 1802, shows Cockle Creek crossed by a bridge in Brickfield village on the road to Parramatta. About a third of a kilometre below the bridge, the creek separated into three branches with became ill-defined, perhaps running through swampland or mangroves before entering Cockle Bay. A smaller creek entered the bay some 400 metres to the west of the main creek.

A second version, dated November 1802, is attributed to Lesueur in the Mitchell Library catalogue(M Ser 4000/1 Mss 4530 Map 3). Here, the main creek did not branch, but instead entered a delta formed jointly with the smaller creek described in the first version. This complex contained four islands, ranging widely in size. Some 200 metres north-west of the delta, three clumps of dense vegetation - possibly marshy land – were shown. This version is shown in Figure 3.7.

Figure 3.7: <u>Lesueur, C.A., 1812, Plan de la ville de Sydney, [Bordeaux], [Chaumas-Gayet]</u>
(ML M Ser4000/1 Mss 4530 Map 3; Digital order no. a128189)



A third version, this time in water colour, ink and pencil, is illustrated in Bonnemains, Forsyth & Smith(1988:106). This version is undated and is somewhat intermediate between the two dated versions. It also incorporated the mouths of the two creeks into one large delta system, which appeared to have islands interspersed between branches of the creeks.

Lindner(1815) published yet another version of Lesueur's work, in which the eastern creek formed three branches near its mouth and both creeks entered wetlands which extended from the creek mouths some way along the eastern shoreline of the peninsula itself.

While the individual versions differ somewhat, it is clear that a substantial wetland, of the order of 10 hectares, once existed at the head of Cockle Bay.

It may have been Mitchell(1853) who first mapped the course of Blackwattle Creek. By this time, the adjoining lands were being settled, and the creek itself was dammed in two places. The eastern of the two dams was built by Robert Cooper soon after he had constructed the Brisbane Distillery in late 1825(Fitzgerald, 1990:17). The Grose Farm dam had been built by 1830 and was to become Lake Northam, which now graces Victoria Park.

While Roe's 1822 survey shows short creeks running into Cockle Bay at the base of Pyrmont peninsula, it may be expected that the various coves and bays around the entire peninsula would have been fed by similar creeks. While no historical accounts of these waterways have been found, their courses can be roughly extrapolated from the reconstructed topography of the peninsula. These creeks are shown in Figure 3.5 as dashed lines.

Sheet V1 of the Trigonometrical Survey of the City of Sydney(Municipal Council of Sydney, 1865) showed several waterbodies on Pyrmont peninsula, southwards from about Fig Street. Whether any of these existed before European settlement is unknown.

Mention should be made of Tinker's Well. Matthews(1982:25) presented information from various sources that the well was:

- ' … high up among the crags and boulders on the north west of the Mount Street hill …'
- ' … high on the later site of the Vacuum Oil Company works …'
- ' … way up among the rocks'
- known to Europeans in the early 1850s and still usable by them in December 1912
- reached by a track from Bowman Street near the Glebe Island bridge

Even at the time Elyard painted 'Johnstone's Bay' in the early/mid 1860s little on the north-western face of Mount Street hill remained untouched by the quarrymen. A notable exception was the higher band of cliffs above the Pyrmont end of Glebe Island Bridge. Elyard painted these dark, as yet untouched by quarrying. It may be conjectured that this cliff line was where Tinker's Well was once located. A.M.(1925) mapped the well as fronting Bank Street between its junctions with Quarrymaster Drive and Bowman Street respectively.

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Part 4

Flora and fauna of Pyrmont peninsula in 1788

4.1 General Introduction

This part of the report describes the ecology of Pyrmont peninsula as it would have appeared to the first European settlers. An attempt has been made already to reconstruct the physical geography of the peninsula as it was in 1788(Part 3). Based on this reconstruction, together with early and contemporary accounts, the flora and vertebrate fauna likely present on the peninsula at that time are described. The resultant biophysical description of Pyrmont peninsula at European settlement will provide a baseline against which to assess ecologically several transformations experienced on the peninsula between 1788 and today(Part 5). The cumulative consequences of these transformations are expressed in the residual ecology of the peninsula today(Parts 6&7). These accounts allow consideration of strategies available to City Council to better achieve ecological sustainability for Pyrmont peninsula and its communities(Part 8).

Not surprisingly, this attempt at reconstruction had its difficulties. It may suffice for the moment to recount Joseph Fletcher's(1901) reflections on early attempts to describe the botany and zoology of Australia. Fletcher emphasised the biological significance of the moment when James Cook and his companions in 1770 initiated the process of European settlement of Australia: 'The Fifth Continent offered the first, as well as the last, opportunity for the investigation of an absolutely undisturbed continental land flora and fauna; for starting upon a new quest with a fund of experience and systematised knowledge already accumulated and to hand'(pp.72/73).

Fletcher summarised his subsequent detailed analysis of what actually happened as follows:

> *'How the botanists, after a little preliminary skirmishing, grandly rose to the occasion, and what they have accomplished, is a simple story, and on the whole from almost every standpoint a satisfactory story; moreover, it has been succinctly recorded.*
>
> *How the zoologists accepted their share of the golden opportunity, what they have to show in the shape of net results after one hundred and thirty years' work, and in what condition the land fauna finds itself after one hundred and twelve years' exposure to the "ravages of civilisation", are matters which do not seem quite so well known, or so easily ascertainable'*(p.70).

Fletcher noted the auspicious circumstances under which Cook, and more particularly his naturalists Joseph Banks and Daniel Solander, made their first contact with Australia on 28th April 1770. Linnaeus had not long completed his twelfth edition of Systema Naturae, published in the years 1766-68. Banks was among the comparatively few English followers of Linnaeus at this time, and Solander had been the "favourite pupil" of Linnaeus. The Systema Naturae 'contained a systematic exposition of all that was known on these subjects[Zoology and Botany] expressed in language the most terse and precise'(p.72), and would likely have been in Banks's library on board the Endeavour.

It seemed reasonable to expect that the extensive collections made by Banks and Solander along the east Australian coast(including nearly 1000 species of plants), would have been classified and the results available by the time European settlement of the continent began on 26th January 1788 some 18 years later. Fletcher also noted that the English botanist Sir James Edward Smith had acquired the Linnean collections and library after Linnaeus died in 1778, and continued: 'What could seem more hopeful, more promising than this, that the foundation of the oldest existing English scientific society which has always especially concerned itself with biology, should be concurrent with the first attempt at the colonisation of Australia?' [The Linnean Society of London was founded in 1788 with Sir James Edward Smith as its first President, and held its first meeting on 8th April 1788].

These high expectations soured as the Banks and Solander plant collection remained largely undescribed in Banks's herbarium and then the British Museum. George Bentham, writing in 1863, was scornful of the situation at the latter: 'It would appear as if the whole object were to accumulate stores, without caring to make them available for use. The rich herbaria collected at the public expense by the late A. Cunningham in his various expeditions … and many others either presented to the Museum or purchased out of the annual grants, have been stored away, many of them from a quarter to half a century, unarranged in their original parcels, without any thought of providing the staff and funds necessary to render them of use to scientific botanists'(p.9).

Despite this regrettable hiatus, the collection of specimens – initially around Port Jackson but quickly and progressively through the rest of Australia – continued apace from the early days of settlement.

4.1.1 Botanical collections

Of the botanists, Fletcher noted: 'Very early the botanist began to recognise the fact that the Australian flora was so intrinsically interesting that it was worth while going all the way to Australia to see the flora for himself, to study it under natural conditions, and to collect specimens for future examination'(p.75). Fletcher recognised that 'very much indeed depended upon the collectors, and their qualifications, aims, and methods'(p.75).

It is clear from Table 4.1.1 that botanists undertook a series of systematic studies in the Sydney region during the early years of settlement.

Table 4.1.1: Botanical collections made around Sydney early in settlement

Botanist	Dates in Sydney	Comments
David Burton	1791/92	Was in correspondence with Joseph Banks at least since 20 October 1790(Banks,1790). Arrived at Port Jackson on 22 September 1791. Privately commissioned by Banks, at £20/year, to collect seeds and botanical specimens exclusively for him. According to Gray(1966), Burton ' … collected and classified plants assiduously. On 18 December 1791 he informed Banks that he had put sixty tubs of plants and sundry boxes of seeds and specimens in the Gorgon … Early in March 1792 more boxes of seeds were sent in the Pitt and before the end of the month fifty tubs of plants were ready for dispatch in the Atlantic'.
William Paterson	1791/1810	Known to have contacted Joseph Banks about his botanical interests in 1781. In June 1789, he was gazetted a captain in the New South Wales Corp, probably owing his appointment to Banks(Macmillan, 1967). First arrived in Sydney in October 1791 and finally left there on 12 May 1810. According to Webb(2003:84): 'All his material, seeds, live specimens and herbarium specimens were sent to Banks, or nurserymen such as Lee and Kennedy, or other interested and wealthy patrons such as the Hon. Charles Greville'. Some items were from around Sydney. His botanical collections are preserved in the Natural History Museum at South Kensington.
George Caley	1800/1810	In correspondence with Joseph Banks at least since 30 March 1795. Appointed by Banks in 1798 to go to New South Wales as a collector, arriving in Sydney in April 1800: 'His main work was botanical and the vast numbers of plants, seeds and descriptions which he sent to Banks bear witness to his diligence and capacity as a collector'(Else-Mitchell, 1966). Caley resided ten years in the colony; his collections are preserved in the British Museum(Hooker, 1859:cxxiv).

Botanist	Dates in Sydney	Comments
Robert Brown	1802/05	While on a recruiting drive in London, Brown met Dryander, then Banks's botanist-librarian and, through him became as Associate of the Linnean Society. Brown allowed his name to be submitted to Banks for the position of naturalist on board The Investigator under Matthew Flinders. Collected plants around Port Jackson intermittently between 1802 and 1805. Hooker(1859:cxiv) summed up the contribution of Brown and his colleagues Ferdinand Bauer and Peter Good as follows: 'Brown united a thorough knowledge of the botany of his day, with excellent powers of observation, consummate sagacity, an unnerving memory, and indefatigable zeal and industry as a collector and investigator, he had further the advantage of being accompanied by a botanic draughtsman, Ferdinand Bauer, who proved no less distinguished as a microscopic observer than as an artist, and he had a gardener, Mr Peter Good, to assist in the manual operations of collecting and preserving'.
Charles Fraser (Frazer or Frazier)	1816	Arrived in Sydney in April 1816 and, shortly afterwards, was appointed superintendent of the Botanic Garden. As Colonial Botanist, Fraser joined several expeditions, some with Allan Cunningham(Gilbert, 1986). It is unclear whether he significantly added to our botanical knowledge of Port Jackson's flora or the extent, if any, of his relationship with Joseph Banks. According to Hooker(1859:cxxiii) Fraser's collections 'of dried plants are, I believe, in the British Museum, and many are in the Hookerian Herbarium'.
Allan Cunningham	1816/39	Initially worked at Kew as clerk to the curator of the Royal Gardens but, following negotiations between Banks and the Treasury, Cunningham was sent as a collector to Australia; he arrived at Port Jackson on 20 December 1816(Webb, 2003:87). Travelled widely in the region between 1816 and his death in 1839. According to Webb(2003:119): 'Allan Cunningham collected extensively on all his journeys, and in local forays he made from his base in Sydney. George Bentham in *Flora Australiensis* acknowledged over 840 New South Wales specimens collected by Cunningham.

Note: The dates in Sydney are inclusive; individuals often spent long periods outside of Sydney between the dates given

The central role of Sir Joseph Banks in facilitating, at times funding, the botanical exploration of Australia during the first two decades of European settlement is clear. Powell(1990:93) noted that 'Banks did have the Governor and many of the Officers collecting for him …'. As noted by Fletcher(p.76), Banks also played a primary role in the conservation of those early collections, which were concentrated at three main repositories:

- The original Banksian collections, supplemented by the collections of Caley, Brown and Cunningham, form 'a good deal more than the basis of the Australian collections now in the British Museum'(p.76)
- 'The magnificent series of Australian collections, which in various ways came into the possession of Sir William Jackson Hooker. These, with his library … and with supplementary collections, form the Australian constituent of the magnificent herbarium at Kew'(pp.76/77)
- 'The important reference collection in the Melbourne Herbarium brought together by Baron von Mueller'(p.77).

Banks deserved the epithet 'the patron of science' bestowed upon him by Barker & Barker(1990:76).

Fletcher(p.77) summed up the early studies of the Australian flora as follows:

> *'In a few words, after a little preliminary hesitation, the botanists settled down to the work of collecting on the right lines. Responsible, expert collectors were selected, sent out to Australia. If not already attached to expeditions, they received orders to seize the opportunity of visiting new settlements or new colonies, and of joining coast survey and inland exploring expeditions. Sir Joseph Banks was the organising head, and was in touch, not merely with the collectors and subsequently with the botanists who studied the collections, but with the Governors and officials in the colonies who could lend official aid in helping on the collecting. The result was that the exhaustive, representative collecting was undertaken by collectors drawn from the nation to which Australia territorially belonged. It was also largely carried out, as far as circumstances permitted, before the disturbance of the flora consequent upon the introduction of stock and of cultivated plants and weeds, and from the operations of civilised man.*
>
> *But if the important work of collecting specimens – of mustering the flora – was satisfactory, not less satisfactory has been the fate of the collections up to the present day. Not only are the really important, the classical collections extant, but they have always been so carefully safeguarded as never to have been in peril. Collection has been added to collection, and conservation and concentration have been well provided for'.*

4.1.2 Zoological collections

'As far as my knowledge goes, there is not even a published list of the early zoological collectors available. I have therefore tried to compile a provisional list, probably with only indifferent success'(Fletcher, 1901:78).

Fletcher observed that there was no 'organising head' for the early studies of Australian fauna, no equivalent to Joseph Banks:

> *'In his absence there were no official, expert British collectors comparable with, and responsible for their collections like Caley, Robert Brown, the two Cunninghams, and Fraser. As there was no one at the head of affairs to take the lead, so there was no one to secure and properly conserve such collections as were made'.*
>
> *'In the absence of expert official collectors the collecting was left to private, non-responsible collectors and dealers – to anybody who chose to do it. The collecting was consequently haphazard, and miscellaneous in character, not exhaustive and representative' (p.78).*

Collected materials found their way into private museums and collections, collections were sometimes broken up, indifferently treated, and unpublished. Documentation might be missing altogether, sometimes carelessly or even wilfully misstated, or of a very general nature. Details of habitat, collector, specimen history were often missing: 'The explanation is, of course, that many of the zoologists studied specimens and were interested in naming specimens, rather than collections as representing the fauna'(Fletcher, 1901:80).

Fletcher(1901) listed almost 60 British collectors of Australian fauna in the pre-Victorian era, and almost 50 British museums and collections to which some of their materials would have gone. The early French expeditions to Australia, in contrast, were generally well-organised, often with nominated collectors who knew that their material would go to the National Museum in Paris: 'For every one of these expeditions there is, at least, an officially-published narrative, and usually a great deal more in the shape of scientific results'(Fletcher, 1901:83).

Fletcher(p.83) summed up this sorry situation:

> *'The characteristics of the collecting during the Pre-Victorian Era are now intelligible. The exhaustive and representative general collecting should obviously have been the special work of resident British responsible collectors, ready to utilise new settlements, new colonies, coast surveys, and inland explorations as means to that end. Preferably, too, such collecting should have been carried on in the interests of the British National Museum. Unfortunately, the zoologists failed to profit by the example set by the botanists; and the collecting was accordingly left to private enterprise, and to whomsoever would undertake it. But, in the absence of organisation and co-operation, the task was too stupendous for merely private enterprise. The result was that the work got out of hand ...'.*

The result also was that the first real attempt to compile a faunal inventory, the bird list of Vigors & Horsfield, was not made until 1826 and was never completed. It was not until 1838 that John Gould and his colleague John Gilbert brought the methods of the botanical collectors to describing the Australian fauna: 'Gould estimated the number of Australian birds described up to the time of his departure for Australia at about 300 species. The estimated number given in his Introduction(1848) is "upwards of 600 species" ... The number of species enumerated in the "Handbook"(1865) is 672 species, and the number now recognised about 765'(Fletcher, 1901:83/84). One contemporary guide describes 'approximately 775 birds so far recorded in mainland Australia and Tasmania and at sea over the continental shelf' (Slater et al, 2003).

Fletcher's analysis of the early decades in defining Australia's flora and fauna has clear implications for the present study. Whereas the botanists had collected and described the plants around Port Jackson before they were lost to urbanisation, this was much less so for the animals. For the latter, there is a much greater need to extrapolate from later observations to what may once have occurred around Port Jackson.

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4.2 Flora

4.2.1 Introduction

As hunter-gatherers, Australian aboriginals would have had – and some still have - an intimate knowledge of this continent's flora. Norton(1900:765) commented that 'although they had no distinctive names for the various parts of flowers, and could not count the stamens or pistils on which Linnaeus founded his system, yet they had a distinctive and probably descriptive name for every conspicuous plant which grew in their respective territories, and, as I understand, for many classes of plants also, such, for instance, as ferns, gum trees, and acacias'.

Norton continued: 'For the first [European] glimmerings of light upon the vegetation of Australia … we are indebted to Dampier, who in 1688 visited Cygnet Bay. The genus *Dampiera* was named in his honour. His herbarium … contained 46 specimens, 18 of which(9 being Australian) were figured in the account of his voyage …'(p.766)(see Dampier, 1703).

Joseph Banks and his assistant, Dr. Daniel Solander, began the systematic study of Australian botany on reaching Botany Bay with James Cook on <u>HMS Endeavour</u> on 29 April 1770. Previously, Solander had attended the University of Uppsala in Sweden, where the Professor of Botany was the celebrated Carolus Linnaeus(Gilbert, 1967). Linnaeus advised Solander to go to England, where connections arranged his appointment as assistant librarian at the British Museum in 1763. Here he could promote the Linnaean system of taxonomy and, in 1768, was invited by Joseph Banks to join the scientific staff on Cook's expedition.

Benson & Eldershaw(2007) describe the remarkable story of the plant collections made by Banks and Solander during their eight days at Botany Bay. They prepared a definitive list of 132 plants collected by the adventurers during their visit. Solander subsequently wrote descriptive tickets for each item collected on the voyage, which he placed in systematic order and transcribed for publication. On returning to England in July 1771, Solander became Banks's botanist-librarian, but for various reasons the botanical descriptions were not published. Sydney Parkinson, who was the botanical artist on the Endeavour produced 280 finished and botanically accurate paintings and over 900 sketches before he died on the return voyage to England. About 700 plates were engraved on copper in folio at Banks's expense, but these too were not published at the time.

Joseph Gaertner(1732-1791), a German botanist, visited Banks in 1778, and consulted the Botany Bay collection, or illustrations based on it. According to Benson & Eldershaw(2007:118), Gaertner cited the collection as types for a number of species of which these authors listed nine. Of these seven are now attributed directly to Solander, while the remaining two species together with another six were described by Gaertner based on the Banks and Solander specimens.

The Botany Bay collection was cared for by Jonas Dryander, who succeeded Solander as Banks's botanist-librarian when the latter died in 1782. On Banks's death in 1820, Robert Brown(then Banks's botanist-librarian) inherited the herbarium, library and papers with instructions that they go to the Trustees of the British Museum upon Brown's death. It was not until 1900 that the British Museum started to publish illustrations of the Australian plants collected during the voyage of the <u>Endeavour</u> (Banks & Solander, 1900/05).

Figure 4.2.1: Britten, J., 1900/05, Illustrations of Australian plants collected in 1770 during Captain Cook's voyage round the world in H.M.S. Endeavour, by Sir Joseph Banks and Daniel Solander, with determinations by James Britten, By order of the British Museum, Folio 174: *Goodenia ovata* (ML X581.9901/2).

This remarkable text finally emerged from the British Museum more than two centuries after Cook's voyage. Sir Joseph Banks had 'proposed a grand botanical work on his Endeavour voyage, and, accordingly had many fine copper plates prepared. Some of these were later published with Solander's Latin descriptions in Illustrations …'(Gilbert, 1966:54)

Norton(1900:767) more fully contextualised this regrettable episode: 'After the death of Banks, the collections made by him and his assistant, together with considerable further collections, made during Cook's subsequent voyages by the Forsters, Mr. David Nelson, and Mr. William Anderson, were handed over to the British Museum, where, without having ever been published, they were hoarded for long years, as if they had been brought there solely for the purpose of being stored, and, as Bentham complains, became, with Cunningham's subsequent collections, practically unavailable for use'.

In consequence, 'the specimens collected at Botany Bay by Banks and Solander in 1770 did not play a major role in the subsequent systematic description of the Australian flora, and do not include the large number of taxonomic type specimens that might be expected for a major scientific expedition into new territory'(Benson & Eldershaw, 2007:118). This task fell to others, and the following section acknowledges those botanists who contributed most to our knowledge of the plants of Port Jackson generally and, hence, of Pyrmont peninsula specifically. The remaining sections attempt to reconstruct the flora of Pyrmont peninsula, both as species lists and as the plant communities to which these species belonged.

4.2.2 Early accounts

A) Introduction

Over 100 plant taxonomists have helped to describe the 675 species likely to have once occurred on Pyrmont peninsula(Appendix 4.2.1). Their contributions were made over a period of more than 230 years, starting with Carolus Linnaeus in 1753 and continuing to late last century. These figures give some idea of the remarkable collaborative effort involved in describing the plants of a region, and the ongoing nature of this task. New species may well be described in the future, by way of taxonomic revisions.

Nonetheless, a small number of individuals did most of the descriptive work. Brief accounts of these individuals and their contributions follow. The remarkable and early efforts of James Edward Smith and Robert Brown are particularly notable, they alone described almost 40% of the plants which may once have occurred on Pyrmont peninsula. Smith relied on materials sent from the fledgling colony, particularly by John White. This was also the practice of several other early taxonomists, such as Carolus Linnaeus, Antonio Cavanilles, Étienne Ventenat, Augustin Pyramus de Candolle, and George Bentham. Robert Brown, on the other hand, was among the first botanists to visit Australia and make their own collections. He was preceded by Banks and Solander, of course, and the Frenchman Jacques-Julien Labillardière, and was followed by other leading field botanists such as Allan Cunningham, Franz Sieber, and Ferdinand von Mueller. The exploits and privations experienced by these individuals in the pursuit of scientific knowledge were remarkable indeed.

B) Linnaeus, Carolus (1707-1778) (Erickson, 1983)

A biography of Linnaeus is given elsewhere (p. 227). Surprisingly, perhaps, Linnaeus was the fourth most significant contributor to describing the plants once likely present on Pyrmont peninsula. Some 29 species of the peninsula flora in 1788 had already been described by Linnaeus and his son, as these plants had been collected elsewhere in the world.

In the year Linnaeus finished his formal education, 1735, he also published his first major work, Systema Naturae, which laid down the principles of his approach to plant systematics. One species likely to have occurred on the peninsula – the Common Maidenhair Fern *Adiantum aethiopicum* – appeared in the tenth edition of this work, published in 1759.

In 1753, Linnaeus published his Species Plantarum, in which he applied his nomenclatural approach to all the plants then known. Twenty-one species likely to have occurred on the peninsula in 1788 were described in this work. Two other Linnaean works each contained a species of the Port Jackson flora – Amoenitates academicae(1759) and Mantissa Plantarum altera Generum(1771). Finally, his son Carolus Linnaeus the younger published formal descriptions of four species endemic to Port Jackson(three banksias and a grass) in his Supplementum Plantarum(1782).

C) Smith, James Edward (1759-1828) (Anon, 2007c)

Smith was born in Norwich on 2 December 1759, and died there on 17 March 1828. He showed an early interest in the natural world, enrolled in a medical course at the University of Edinburgh in the early 1780s and moved to London in 1783 to continue his studies. Here he was befriended by Sir Joseph Banks. Banks had been offered the entire collection of books, manuscripts and specimens of Linnaeus by the latter's widow. He declined to make the purchase, but advised Smith to do so. Smith paid the 'bargain' price of £1000 for the materials in 1784. The collection was brought to London that same year. Smith became a Fellow of the Royal Society in 1786. He founded the Linnean Society of London in 1788, to enable scientists to study the Linnaean collection. The latter was bought by the Society from Smith's widow on his death.

Smith was a prodigious writer, his books including Flora Britannica, The English Flora(4 volumes), Flora Graeca(to which he contributed 7 volumes) and the 36-volume English Botany. He also published The Natural History of the rarer Lepidopterous Insects of Georgia, the first book on American insects, in 1797, and contributed 3,348 botanical articles to Rees's Cyclopaedia between 1808 and 1819.

Smith also provided 5,000 plant specimens to the Roylean Herbarium, Liverpool, between 1806 and 1817, which was to become the Smith Herbarium of the Liverpool Botanic Garden. His donation included over 200 of the Port Jackson plants collected by John White(Gunn, 1987:34). Smith was regarded by some as among the most eminent botanists of the eighteenth century.

Smith made a considerable and early contribution to the botany of Port Jackson. He prepared formal descriptions of five new plants for John White's Journal of a Voyage to New South Wales, published in 1790. The descriptions were based on specimens sent by White to his agent, Thomas Wilson, in London. All five species would likely have occurred on Pyrmont peninsula at European settlement.

Smith's next significant contribution to our knowledge of the Port Jackson flora came with the publication of A specimen of the botany of New Holland, in four parts between 1793 and 1795. This contained 16 colour illustrations by James Sowerby 'from coloured drawings, made on the spot, and communicated to Mr Wilson by John White Esq. Surgeon General to the colony, along with a most copious and finely-preserved collection of dried specimens, with which the drawings have in every case been carefully compared'(Smith, 1793/5), together with descriptions of 31 species or varieties. Of these latter, four had already been described by Smith or others, 19 were species or subspecies new to science, while another 8 species were more fully described by Smith or others in later publications. All but one of these species would likely have occurred on Pyrmont peninsula at that time.

Figure 4.2.2: Smith, J.E., 1793, A specimen of the botany of New Holland, Plate 7: Embothrium speciosissimum[Telopea speciosissima], London, J. Sowerby (ML MRB/Q581.991/S)

According to Smith: 'The figures are taken from coloured drawings, made on the spot, and communicated to Mr. Wilson by John White Esq … Surgeon-General of the Colony, along with a most copious and finely-preserved collection of dried specimens, with which the drawings have in every case been carefully compared'.

Smith had already used the newly emerged Transactions of the Linnean Society of London, with accounts of two species likely to have then occurred on Pyrmont peninsula published in the first volume of this august journal in 1791. Over the next two decades he published in this journal accounts of another 29 species likely to have once occurred on the peninsula. He also published in the first volume of the Annals of Botany, in 1805, descriptions of 8 species likely to have then occurred on Pyrmont peninsula.

In Tracts relating to Natural History(1798), Smith brought together the writings of several authors and of his own. In one account, Smith(p.290) described four species of *Boronia* collected by John White near Port Jackson. Smith evidently had access to Solander's documentation on the Botany Bay collection, made in 1770, as his account of *Westringia fruticosa* noted that it was named *Cunila fruticosa* by Solander(p.279).

Further descriptions of new plants, some of which would have occurred on Pyrmont peninsula in 1788, were provided in Smith's Exotic Botany. Published in two volumes, in 1804/05 respectively, this text is beautifully illustrated with coloured drawings by James Sowerby, and contains many Australian plants omitted from earlier publications.

Smith also published some of his formal plant descriptions in Rees's Cyclopaedia(1802/20). This was first published by Ephraim Chambers in London in 1728, the Reverend Abraham Rees publishing a revised edition in 1778-1788, with subsequent revisions. Altogether, accounts of ten species likely to have once occurred on Pyrmont peninsula appeared in editions of this work between 1808 and 1816.

Through these various sources, Smith described 89 species which would have likely occurred on Pyrmont peninsula in 1788, second only to the contribution of Robert Brown.

D) Cavanilles, Antonio José (1745-1804)(Anon, 2007a: Davis et al, 2001: Hewson, 1999: King, 1990)

Born on 16 January 1745 in Valencia, Spain, Cavanilles was 'the leading Spanish taxonomic botanist of the 18th Century'(Anon, 2007a). He was a clergyman and botanist in Paris between 1777 and 1781, before moving to Madrid. Here he became director of the Botanic Garden and Professor of Botany from 1801 until his death in 1804.

Cavanilles's connection with Australia appears to have been through the Malaspina expedition of 1789 to 1794. Alejandro Malaspina commanded the two ships Descubieta and Atrevida on a prolonged voyage which included a visit to Sydney Cove, Port Jackson between 12 March and 11 April 1793. On board were two botanists – Luis Née(born in France) and Thaddaeus Haenke. Haenke was the King of Spain's Royal Botanist. He was of German extraction, born in the Bohemian village of Chrisbská in 1761(Ibanez & King, 1996:255). He attended the Jesuit College in Prague and then Carolus University, where he studied medicine, botany, and astronomy. He made various botanical studies before obtaining his degree of Magister in 1786, at which time he moved to Vienna. In July 1789, his name was put forward when the Spanish Government was recruiting for the Malaspina expedition.

After his visit to Port Jackson, Haenke wrote to Sir Joseph Banks on 15 April 1793, in part: 'The space of almost a month was presently spent in the pleasure of many Botanical and Zoological excursions, which we undertook daily from Sydney Cove, the capital of the Southern Wales, into the adjoining countryside and neighbouring places: of which the more memorable were the one to Botany Bay, and in the opposite direction the one which we undertook to the new towns of Parramatta, Toongabbie and Prospect Hill, from the heights of which place we beheld in the distance the wilder country of the mountain range called the Blue Mountains. The number of Plants, which everywhere in the places mentioned we gathered very freely by hand, surpassed all our expectations' (Ibanez & King, 1996:258).

On the expedition's return to Spain, the plant material was passed to Cavanilles, who identified and illustrated the specimens. Twenty-one of the plants likely to have occurred on Pyrmont peninsula at European settlement were thus described. Fifteen of the accounts were published in Icones et Descriptiones Plantarum, between 1797 and 1801. Another five were described in Anales de Historia Natural in 1799 and 1800.

E) La Billardière, Jacques-Julien Houtou de(1755-1834)(Anon, 1967; Duyker, 2003; Labillardière, 1802, 1804, 1824/25)

Born at Alençon in France on 23 October 1755, La Billardière studied botany at Montpellier before graduating as a doctor of medicine at Paris. He spent eighteen months in England, studying with Sir Joseph Banks and Sir James Edward Smith. He then botanised through southern Europe and the Middle East for several years.

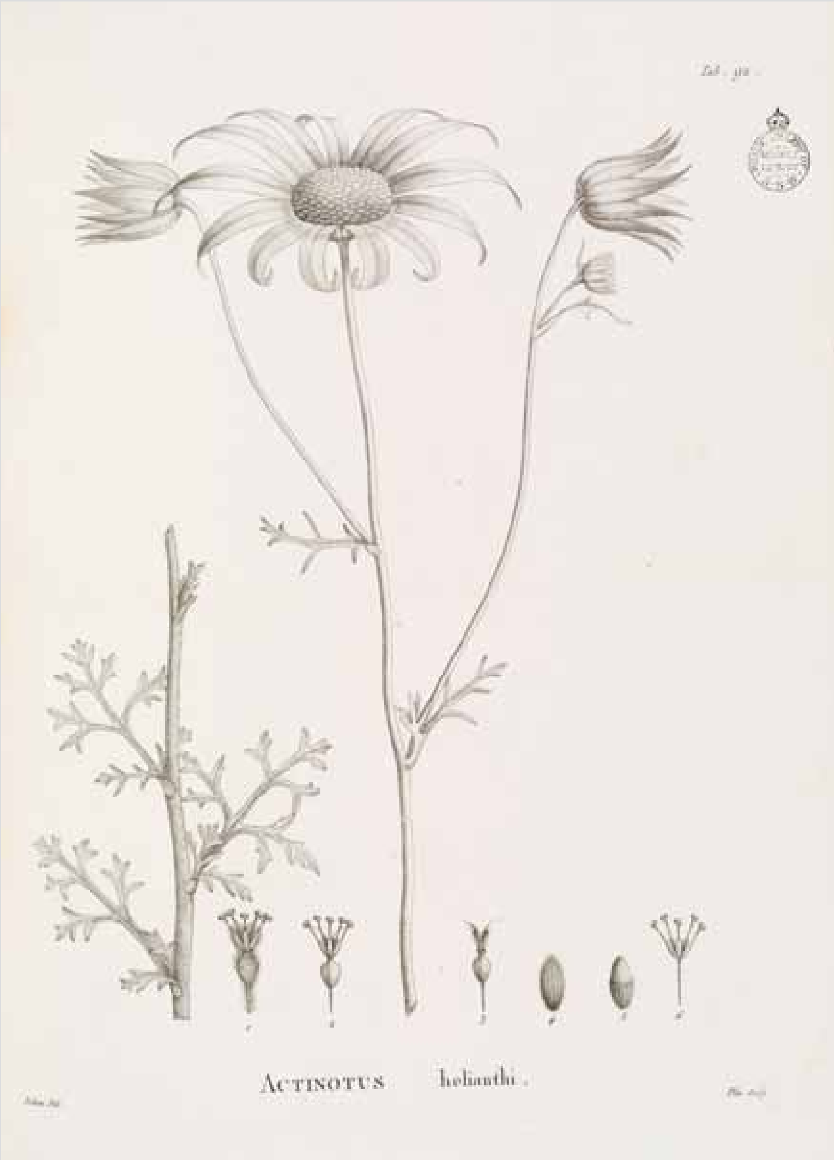
In 1791, La Billardière joined the expedition under Bruny d'Entrecasteaux to search for the lost ships of La Pérouse. Between April 1792 and October 1793 the expedition circumnavigated Australia and visited several islands in the South Pacific, landing twice in south-east Tasmania and also along the south-west coast of Australia between Capes Leeuwin and Adieu. During the expedition, La Billardière collected over 4,000 plants of which three quarters were previously unknown.

The return journey to France was a prolonged affair, with the French ships impounded at Sourabaya, as France and Holland were newly at war. From October 1793 until March 1795, La Billardière was imprisoned, leaving for Amsterdam with the expedition's materials soon afterwards. The Dutch ship was captured off St Helena by the English on 9 June 1795, the expeditionary materials were transferred, and the Dutch ship – which was unseaworthy – was burnt.

The expeditionary materials were taken to England and transmitted to the Lords Commissioners of the Admiralty, and La Billardière's collection in 21 cases was held in the care of Sir Joseph Banks. On 12 March 1796, La Billardière arrived in Paris from Mauritius, and asked the French government to retrieve his specimens from England. The request was supported by Banks and the materials 'were delivered up with the most scrupulous exactness …' (La Billardière, 1802:xix), reaching Paris in August 1796.

La Billardière published Novae Hollandiae Plantarum Specimen in 1804/06, with descriptions of the plants he collected in Australia. Thirty-two of these species occurred around Port Jackson, although most of these – 29 species – he had collected in Tasmania, the remainder in south-western Australia. In this way, La Billardière became the third major contributor to our knowledge of the flora of Pyrmont peninsula. Two decades later, La Billardière (1824/25) described *Glycine tabacina*, a trailing member of the pea family which also occurs around Port Jackson.

Figure 4.2.3: La Billardière, J-J., 1804/06, Novae Hollandiae plantarum specimen, Paris, Huzard, vol. 1, tab.92: Actinotus helianthi (ML MRB Q581.9901/L; a 1117011).



The Flannel Flower, *Actinotus helianthi*, is a member of the Apiaceae. Each 'flower' is actually a head of flowers ringed by petal-like bracts.

It should also be noted that La Billardière described the first fungus from Australia, thereby laying the foundations for Australian mycology(Parbery & Sheather, 1990).

F) Ventenat, Étienne Pierre(1757-1808)(Petterson, 1997: Hewson, 1999)

Étienne's brother, Louis, had accompanied La Billardière as assistant botanist on the d'Entrecasteaux expedition. He died on the Île de France(Mauritius) in 1794.

According to Hewson(1999:66), 'Étienne Ventenat was a man of many qualities, being a clergyman, amateur botanist and librarian in the Bibliothèque du Panthéon, Paris'. It was as a botanist that Ventenat was retained by the Empress Joséphine in 1798, as part of a team to establish and record the plants in her gardens at Malmaison and Navarre in particular. Joséphine had married Napoleon in 1796, and had bought the Château de Malmaison, near Paris, in 1799. In its gardens she grew many new species of plants from overseas.

Ventenat altogether described seventeen species which would likely have occurred on Pyrmont peninsula in 1788. Five of these he described in Descriptions des plantes nouvelles et peu connues, culturées dans le jardin de J.M. Cels(1800/03), two in Choix de plantes, dont la plupart sont culturées dans le jardin de Cels(1803/08), and nine in Jardin de la Malmaison(1804/05).

The sources of these plants seem various. At least three had been cultivated by J.M.Cels since 1792 – having been collected at Botany Bay – before being formally described by Ventenat. Cels was a horticulturalist-botanist, and advised Empress Joséphine on the acquisition of plants for her gardens. At least two were attributed to Nicolas Baudin, whose led an expedition to Australia between 1800 and 1804. Sweet Pittosporum *Pittosporum undulatum* was supposedly collected in the Canary Islands, where it is an introduced species.

Ventenat died on 13 August 1808, and was replaced by Aimé Jacques Alexandre Bonpland as botanist on Joséphine's team. Bonpland was a French explorer and botanist, whose fieldwork was done mostly in central and southern America (Hewson, 1999:66).

G) Robert Brown(Norton, 1900; Burbidge, 1966; Vallance et al., 2001; Anon, 2007b)

Brown was born on 21 December 1773 in Montrose, Scotland. He attended Montrose Academy, whence he proceeded to Marischal College, Aberdeen, as a Ramsay scholar in 1787. In 1789 he began studying at Edinburgh University, but did not take his degree. In 1795 he joined the military as a surgeon's mate but, by now, he had an abiding interest in natural history.

While on a recruiting drive in London, Brown met Jonas Dryander, then Banks's botanist-librarian and, through him became an Associate of the Linnean Society in November 1798. Brown allowed his name to be submitted to Sir Joseph Banks for the position of naturalist on board The Investigator under Matthew Flinders. They set sail from Portsmouth on 18 July 1801, reaching Western Australia in December, to chart the 'Unknown Coast of Australia'.

Brown visited Sydney three times during his Australian sojourn, initially between 9 May and 22 July 1802. During this visit, Brown and his colleagues Ferdinand Bauer and Peter Good ranged over the settled areas within pedestrian reach of Sydney. At this time, the forest country north of Port Jackson remained in the possession of tribal aboriginals(Vallance et al, 2001:201), although Brown did visit the North Shore in May 1802. Brown made only a few extensive excursions on this visit, being busy in the neighbourhood of Sydney. He and his colleagues walked from Sydney to Parramatta on 17 June 1802, thence on foot to the Hawkesbury on 20 June, returning to Sydney on 25 June. Brown and Good walked to Cook's River and Botany Bay, and back, on 3 July 1802, and to

South Head sometime between 4/12 July 1802. The naturalists thus had ample opportunities to collect specimens of flora and fauna. Investigator set sail on 21 July 1802.

Flinders completed his, the first, circumnavigation of Australia and reached Sydney on 9 June 1803. Peter Good died a few days later. Brown revisited the North Shore on 16 June 1803, South Head on 18 June, and left Sydney on 28 November for Tasmania. On 8 August 1803, Bauer wrote to Banks that he had made over 1000 plant sketches and 200 animal sketches.

Brown returned to Sydney on 24 August 1804, and visited Newcastle and the Hunter River between 12 October and 20 November that year. Although convicts had been sent to the mouth of the Hunter River in 1801, to raise coal, the outpost was abandoned sometime in 1803, and it was not until March 1804 that a lasting settlement at King's Town(Newcastle) was established. Brown remained in Sydney until 23 May 1805, then returned to England.

During his three and half year stay in Australia, Brown collected some 3400 plant specimens, of which about 2000 were unknown to science. According to Norton(1900:769): 'When Brown commenced his labours, the number of ascertained Australian plants amounted to 1,300, of which 1,000 had been collected for the most part by Sir Joseph Banks'. Not surprisingly, Brown has been variously known as 'The father of Australian botany'(Norton, 1900:769) and 'The founder of Australian systematic botany'(Maiden, 1908:65). According to Norton: 'Brown's extraordinary collection of specimens is admitted to be the foundation in England of the knowledge of Australian vegetation …'.

Brown spent the next five years working on his specimens and in 1810 published his major text, his Prodromus Florae Novae hollandiae et Insulae Van-Diemen, the first systematic account of the Australian flora. It was considered 'the greatest botanical work that had ever appeared' for the next half-century. At least 173 species described in the Prodromus would likely have occurred on Pyrmont peninsula at European settlement.

That same year, after the death of Jonas Dryander, Brown became librarian/botanist to Banks and held this post until Banks died in 1820. He published more descriptions of Australian flora in the Transactions of the Linnean Society of London, and his 1810 and 1817 papers contain at least another seven descriptions of plants likely to have occurred on Pyrmont peninsula in 1788. Formal descriptions of other species collected by Brown were published by Bentham, de Candolle and Aiton, who acknowledged him as the source of their material; at least 24 such descriptions were of plants likely to have once occurred on the peninsula. Altogether, Brown collected almost 200 species which would have probably been present on Pyrmont peninsula at European settlement.

Matthew Flinders finally published an account of his expedition to Australia in 1814, A Voyage to Terra Australis, after languishing for six and a half years in jail on Mauritius en route to England. An appendix contained Brown's general remarks on the botany of Australia. In 1813, Ferdinand Bauer published his Illustrationes Florae Novae Hollandiae, with sixteen plates of Australian plants. He completed about 236 paintings from his over 2000 drawings for the British Admiralty, 1542 of Australian plants(Hewson, 1999:45).

Figure 4.2.4: Bauer, F., 1813, Ferdinandi Bauer Illustrationes florae Novae Hollandiae, sive, Icones generum quae in Prodromo florae Novae Hollandiae et Insulae Van Diemen descripsit Robertus Brown, London; Plate 11: *Tricoryne elatior* (ML SAFE/F581.99/B copy 1, Digital Order No. a2734019).

According to the Mitchell Library catalogue: 'Plates stipple engraved on copper by Bauer between 1806 and 1813 after his watercolours drawn from nature on Captain Matthew Flinders' circumnavigation of Australia in H.M.S. Investigator in 1801-1803. The plates were first published in 1813 to accompany Brown's Prodromus florae Novae Hollandiae et Insulae Van Diemen: " … All that was published of the work was 8 preliminary pages, the last blank, and fifteen very fine plates"'.

Banks's herbarium, which Brown inherited on the former's death, was transferred to the British Museum in 1827, and Brown became Keeper of the Banksian Botanical Collection. Brown became a Fellow of the Linnean Sociey in 1822, and its President between 1849-53(Burbidge, 1966), after which he remained vice-president until his death on 10 June 1858.

H) de Candolle, Augustin Pyramus(1778-1841)

(Erickson, 2002)

Born in Geneva on 4 February 1778, Candolle was of an ancient family of Provence, but his ancestors had fled France in the mid-16th century due to religious persecution. He became interested in plants during his teens but, at his father's request, began medical studies in Geneva. In 1796 Candolle was invited to Paris to study both medicine and natural history, and gained a medical degree at the University of Paris in 1804. During this time he was befriended by such luminaries as Jean-Baptiste Lamarck and Georges Cuvier.

In 1806, Candolle was commissioned to conduct a botanical and agricultural survey of France. In 1808, he was appointed Professor of Botany at the University of Montpellier, publishing Théorie Élémentaire de la Botanique in 1813. This text has been considered a major intellectual contribution to plant taxonomy. Candolle became Professor of Natural History at the University of Geneva in 1816, remaining in this position until his death on 9 September 1841. He assembled what is now one of the world's largest herbariums at the university.

Candolle wrote texts on many topics, including taxonomy, plant biology, phytochemistry, plant pathology, medical botany, agronomy and phytogeography. He expanded his theories on plant classification in Regni Vegetabilis Systema Naturale(Natural Classification for the Plant Kingdom), published between 1818 and 1821.

Between 1817 and 1838, Candolle named eighteen plant species which likely occurred on Pyrmont peninsula in 1788. Three of his accounts appeared in the above text, the remainder in his major work Prodromus systematis naturalis regni vegetabilis. He began this latter – intended as a descriptive classification of all known seed plants – in 1824, and continued it to his death in 1841. His son, Alphonse, continued the work to its seventeenth volume, published in 1873.

Candolle obtained the Australian specimens he formally described from several sources. Sieber's collection was the largest single source of species from around Port Jackson. It was supplemented by materials from the herbarium and collectors(George Caley/Robert Brown) of Sir Joseph Banks. Two other species came from the Gaudichaud collection, made during the expedition of Louis de Freycinet in 1817/20. Freycinet visited Sydney in November/December 1819 (Bassett, 1962:179). Candolle is remembered as one of the major scientific figures of the nineteenth century.

I) Cunningham, Allan(1791-1839)

(Perry, 1966; Webb, 2003)

Cunningham was born on 13 July 1791 at Wimbledon, Surrey in England, went to a private school in Putney, then worked in a conveyancer's office at Lincoln's Inn. Variously dated 1808, 1810 or 1811, he joined the herbarium at the Royal Gardens, Kew, as clerk to the curator, William T. Aiton. Here he met Robert Brown and, on Banks's recommendation was appointed a botanical collector to the Royal Gardens.

With Napoleon's abdication in 1814, and the prospect of lasting peace between England and France, Cunningham was sent as Kew collector initially to Brazil and then, in 1816, to Australia. He arrived in Sydney on 20 December 1816 and botanised in the district around Parramatta until he left with John Oxley for the Lachlan River in April 1817. He returned to Parramatta in September 1817, and spent the last four months of 1817 preparing his specimens for dispatch to Kew.

Between 1818 and 1822, Cunningham joined Lieutenant Phillip Parker King on voyages to van Diemen's

Land(Tasmania) and, more particularly, the north-west coast of Australia. His four voyages to the latter were interspersed by brief stays at Parramatta, and local botanising around Sydney.

From September 1822, Cunningham turned his attention to inland New South Wales, again interspersed with botanising around the Sydney region and a visit to New Zealand in 1826/7. In 1828 Cunningham requested permission to return to England, and this was granted in November 1830. Again after some local botanising, Cunningham left Sydney on 25 February 1831, and for much of the next six years worked at Kew Gardens, arranging the specimens he had collected in Australia and preparing papers for publication.

Cunningham was offered the position of Colonial Botanist in New South Wales in 1832, but declined in favour of his younger brother, Richard. When Richard was killed by Aboriginals in April 1835, Cunningham was again offered the post, which he accepted, arriving in Sydney in February 1837. He disliked the position and resigned after a year, sailing to New Zealand in April 1838, but returned to Sydney seriously ill in October that year. He died of consumption on 27 June 1839, in the Botanic Garden cottage aged 48 years.

Cunningham's immense collection of Australian plants mostly went to Kew Gardens, and thence eventually to the British Museum, but also to leading amateur botanists in Europe and was further dispersed after his death.

Sixteen species formally described by Cunningham likely occurred on Pyrmont peninsula in 1788. Most were probably collected in the mid-1820s, although the formal description of *Epilobium hirtigerum* – which he had collected in New Zealand in 1833 - was not published until 1839, the year he died.

J) Sieber, Franz Wilhelm(1789-1844)
(Ducker, 1990)

Born in Prague on 30 May 1789, Sieber trained as an architect/engineer, but soon developed an interest in the natural sciences, botany in particular. After some collecting trips, Sieber returned to Prague to study medicine, but did not complete his degree.

Sieber set out for Australia by way of the Cape of Good Hope and Mauritius, arriving in Sydney on 1 June 1823. He was impressed by the diverse flora around the city, noting that 'he had collected 300 different species in the Colony Jackson composed of 64 square miles'. Sieber also explored in the Blue Mountains, which were then becoming accessible. He made excellent and extensive collections during his seven months in Sydney, leaving in December 1823.

Returning to Europe, Sieber provided manuscript names for his species, which others often adopted when formally describing them. Thus, of the twenty species collected by Sieber and likely to have once occurred on Pyrmont peninsula, eight each were formally described by Kurt Sprengel(1766-1833) and Augustin Pyramus de Candolle(1788-1841), another three by Schultes & son, and one by Fenzl. The formal naming of these species took place between 1825 and 1837.

K) Bentham, George(1800-1884)
(Hooker, 1884; Dyer, 1890; Burbidge, 1969)

Born at Stoke, Hampshire, England on 22 September 1800, Bentham's father was a naval architect whose work took the family to St Petersburg in 1805. By age six, Bentham could converse fluently in Russian, French, German, and had acquired Latin and a passion for music. A stopover in Sweden in 1807 on their return to England gave

Bentham the opportunity to converse in Swedish and read it with tolerable ease.

Bentham's interest in botany was stimulated by his mother's purchase of a copy of the elder de Candolle's Flore Française while residing at Angoulême. He successfully keyed out a plant from the courtyard of the house, which 'led him to pursue the diversion of naming every plant he met with in future' (Hooker, p.540).

In about 1816, Bentham became a student at the Faculté de Théologie, at Tours, where he studied mathematics, Hebrew and comparative philology, pursuing interests in music, Spanish, drawing, and botany at home.

In the early 1820s, Bentham became estate-manager and farmer on a 2000-acre family property near Montpellier, the farms and vineyards rapidly improving and becoming very profitable. He was sent to England in 1823 to further his agricultural interests. The attraction of English scientific and literary society led to the return of the Bentham family to England in 1826. 'On his arrival in London [Bentham] was at once received into the best literary and scientific society …'(Hooker, p.541). He also met Robert Brown, then busy with the botanical collections of Sir Joseph Banks, probably his introduction to the Australian flora.

In 1828 Bentham's herbarium arrived from France and in the same year he was elected a Fellow of the Linnean Society. Since his return to England, Bentham had been professionally engaged in law, but in 1829 he finally committed to a career in botany. Twenty-five years later, in 1854, 'finding that the expenses of his collections and books were exceeding his means, he determined on presenting the whole to the Royal Gardens at Kew'(Hooker, 1884:542). He also entertained the idea of abandoning botany, but was dissuaded from doing so and instead began working at Kew. He was asked to prepare colonial floras, and in 1861 his Flora Hongkongensis was published. There followed a major commitment, between 1863 and 1870, to preparing a seven-volume Flora Australiensis, which described about 7000 species, 'the most extensive exotic flora ever brought to a conclusion'(Hooker, p.542). He completed this task single–handed, 'aided by the observations, collections and numerous discoveries of his active and able correspondent, Baron Mueller, of Victoria'(Hooker, 1884:542).

Concurrently he was President of the Linnean Society of London(1863/74) and was also writing his Genera Plantarum(1862/83). Dyer(1890:74) sensitively described completion of this latter work: 'The flame of his intellectual powers never burnt more brightly, too brightly perhaps for a frame which slowly but perceptibly enfeebled. During the last years of what was a supreme effort it was impossible not to feel a degree of awe for the intense devotion with which he pursued without intermission his self-imposed labour. Towards the last it seemed to me that by mere effort of will he actually sustained his bodily vitality. When the last revise of the last sheet was returned to the printer, the stimulus was withdrawn; his powers seemed suddenly to fail him. Nature, long indulgent, would no longer be withstood'.

Dyer(1890:79) concluded: 'Linnaeus could never for a moment have dreamt that the methods of classification which he perfected would stimulate … through the indirect path of scientific method, the course in life of the greatest systematic botanist of our time'.

Bentham named twenty of the plant species likely to have occurred on Pyrmont peninsula in 1788(Appendix 4.2.1).

L) Mueller, Sir Ferdinand Jakob Heinrich von(1825-1896)(Argus, 1896; Maiden, 1897; Willis, 1949, Chisholm, 1962; Morris, 1974; Wikipedia, 2007)

Born at Rostock, in (now) north-eastern Germany, on 30 June 1825, Mueller was carrying out independent botanical researches in Schleswig-Holstein by age 15. He completed his pharmacy qualification at the University of Kiel and was awarded a Ph.D. at age 21 for a thesis on the flora of southern Schleswig.

Mueller emigrated to Australia, reaching Adelaide on 15 December 1847. He spent several years investigating the South Australian flora, before moving to Melbourne in 1852 where, at age 27, he became Government Botanist of Victoria – a position created for him by Lieutenant-Governor Charles La Trobe.

Mueller spent the next years exploring parts of Victoria, before being appointed botanist to the North Australian Exploring Expedition under A.C. Gregory. This took him initially to Sydney, early in July 1855, where: 'He had only a few days in Australia's oldest settlement and, inevitably, he employed most of the period seeking plants. He followed the footsteps of Banks at Botany Bay and collected specimens of many flowering shrubs on the sandstone ridges immediately north of Port Jackson'(Chisholm, 1962:7).

Within his first nine years in Australia, Mueller had become acquainted with fully 9,000 species of Australian plants. In 1857, six years after proclamation of the State of Victoria, Mueller had the herbarium built in Melbourne, where he worked for the next 39 years(Jessep, 1953:1). That year he combined being Government Botanist with Director of the Botanic Gardens, a position he held until 1873, when public disquiet with his 'scientific' approach to the latter saw him revert to being Government Botanist – a position he held until his death on 10 October 1896.

Mueller embarked upon a remarkable educational venture in August 1872, based on European experiences(Maroske, 2007). A year after arriving in South Australia, Mueller had advertised sets of 'mostly indigenous' plants for sale in the South Australian Register. In 1858, he lodged a herbarium at the Melbourne Public Library(now State Library of Victoria) to provide botanical information to the wider community. And at the end of the 1860s, he had provided a range of botanical displays to a technological and industrial museum being opened in Melbourne.

His 1872 venture was to use collections of plants, called exsiccatae, to impart botanical knowledge to the wider Victorian community. 'Each set of plants was to consist of 100 specimens, arranged in systematic order and with the seeds of each species also added'(Maroske, 2007). In October 1873, Mueller created 100 copies of his first fascicle, with 50 sheets each containing both a flowering and fruiting specimen of one species. By September 1874, 46 fascicles had been distributed, despite qualms about their durability. Mueller issued two more fascicles, in 1875 and 1876 respectively. There was no formal outcome to this extraordinary venture, although Maroske concluded that 'it is not difficult to imagine that there were at least some young Victorians who may have discovered an interest in Botany on the basis of Mueller's educational collection of dried plants. After all, this was consistent with Mueller's own history'.

Mueller was a prolific writer. He named 2000 new species of plants, wrote 800 books and major articles, collected some 45,000 specimens and wrote in the order of 3,000 letters a year. Among his works were Definitions of rare or hitherto undescribed Australian plants(1855), Australian vegetation, indigenous or introduced(1867), Descriptive notes on Papuan plants(1875), Forest culture and Eucalyptus trees(1876), Select plants readily eligible for industrial culture or naturalisation in Victoria(1876), Eucalyptographia(in 10 parts, 1879/84), The native plants of Victoria(1879), Fragmenta phytographiae Australiae(in latin in 11 volumes, 1858/81), Census of the genera of plants hitherto known as indigenous to Australia(1882), Key to the system of Victorian plants(2 volumes, 1885/88), Iconography of Australian salsolaceous plants(9 volumes, 1889/91). Mueller also made substantial contributions to the Flora Australiensis, written by George Bentham.

Mueller was an advocate for the naturalisation of plants. He was influential in the introduction of eucalypts into California, India, Italy, Algeria and Abyssinia. He was also responsible for introducing the Monterey Pine *Pinus radiata* into Australia. He distributed some 7,100 living plants and 22,400 packets of seed of this species throughout Victoria in 1858 alone. He was a sponsor of Victoria's Zoological and Acclimatization Society.

Mueller was a member of 150 learned societies in Europe and America. He jointly founded the Royal Society of Victoria in 1854, became a Fellow of the Royal Society of London in 1861, and received his baronhood from the King of Wurtemburg in 1871. According to Maiden(1897,38): 'Mueller was a member of the most distinguished trio of explorer-botanists who have made Australia the principal field of their labours, and association with Robert Brown and Allan Cunningham is high honour indeed'.

Mueller described twenty-five plant species likely to have been present on Pyrmont peninsula in 1788(Appendix 4.2.1), the fifth highest contribution after Robert Brown, Edward Smith, Jacques Labillardière and Linnaeus.

M) Conclusions

In contrast with efforts to describe the fauna of Port Jackson, work on its flora was systematic and timely. Within a little over 30 years of European settlement, almost three-quarters of the plant species likely to have occurred on Pyrmont peninsula(Appendix 4.2.1) had been formally described. Thus, most of the species on the peninsula were known, to science at least, by the time clearance of its vegetation became systematic. Although Robert Brown played a leading role in this work, there were several other significant contributors. Such was the richness of the flora around Port Jackson that new species have been described into the recent past. Most notable, in this respect, was the description of the Nielsen Park She-oak *Allocasuarina portuensis* by "Lawrie" Johnson, former Director of Sydney's Royal Botanic Gardens, in 1989.

Figure 4.2.5: Sweet, R., 1827/28, Flora Australasica, or, A selection of handsome, or curious plants, natives of New Holland, and the South Sea Islands, London, James Ridgway; plate 25: Pittosporum fulvum [revolutum] (ML DSM/581.99/4A1).

Essentially an English nurseryman, Robert Sweet(1783-1835) began life as a gardener and joined Colvills, a famous Chelsea nursery, in 1812. By 1818, he was publishing horticultural and botanic works: 'The fine plates were mainly drawn by Edwin Dalton Smith, a botanical artist, who was attached to the Royal Botanic Gardens, Kew'(Wikipedia).

4.2.3 Flora of Pyrmont peninsula in 1788

A) Introduction

It was not possible, in the time available, to assemble detailed profiles on the ecological distribution of each candidate species for the Pyrmont peninsula flora at European settlement. A two-tier approach was adopted instead.

First, the results of contemporary flora surveys of bushland relicts along Port Jackson were collated as a transect from North Head in the East to Lane Cove National Park in the West. These observations were assessed against several sources for the likelihood of each species having once occurred on Pyrmont peninsula. From this process Appendix A was compiled.

A second list was prepared(Appendix B), of species not recorded in the contemporary flora surveys but which, on information provided by other sources, may have once occurred on Pyrmont peninsula. The species listed in Appendix B may have occurred on Pyrmont peninsula with less certainty than those in Appendix A, apart from species in plant communities better represented on the south side of Port Jackson.

B) Contemporary flora surveys

The findings of flora surveys of 9 bushland relicts along Port Jackson are given in Table 4.2.1.

Table 4.2.1: Contemporary floras of bushland relicts along Port Jackson

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Ferns and fern allies									
Adiantaceae									
Adiantum aethiopicum	+	+	+	+	+		+	+	+
Adiantum formosum				+					
Adiantum hispidulum	+		+	+	+				
Adiantum silvaticum	+								
Cheilanthes distans				+			+		
Cheilanthes sieberi	+		+	+	+				+
Cheilanthes tenuifolia	+								
Pellaea falcata	+		+	+	+	+			+
Pellaea paradoxa			+						
Aspleniaceae									
Asplenium australasicum			+	+	+	+		+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Asplenium flabellifolium	+	+	+	+		+	+	+	+
<u>Blechnaceae</u>									
Blechnum ambiguum		+	+						+
Blechnum camfieldii					+				
Blechnum cartilagineum	+		+	+		+	+	+	+
Blechnum gregsonii				+					
Blechnum indicum					+				
Blechnum nudum	+		+		+				
Doodia aspera	+		+	+				+	
Doodia caudata			+	+				+	
<u>Cyatheaceae</u>									
Cyathea australis	+		+	+	+	+	+	+	+
<u>Davalliaceae</u>									
Davallia solida var. *pyxidata*			+	+	+	+		+	+
Rumohra adiantiformis				+					
<u>Dennstaedtiaceae</u>									
Dennstaedtia davallioides	+			+					
Histiopteris incisa	+	+	+	+	+	+	+	+	+
Hypolepis glandulifera				+					
Hypolepis muelleri	+			+	+		+	+	+
Pteridium esculentum	+	+	+	+	+	+	+	+	+
<u>Dicksoniaceae</u>									
Calochlaena dubia	+	+	+	+	+	+	+	+	+
<u>Dryopteridaceae</u>									
Lastreopsis decomposita								+	
Lastreopsis microsora								+	

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Gleicheniaceae									
Gleichenia dicarpa	+	+	+	+	+		+	+	+
Gleichenia microphylla		+					+	+	+
Gleichenia rupestris		+	+		+	+		+	+
Sticherus flabellatus	+		+	+	+			+	+
Grammitidaceae									
Grammitis billardierei					+				
Hymenophyllaceae									
Hymenophyllum cupressiforme	+		+						
Lindsaeaceae									
Lindsaea linearis	+	+	+	+	+	+	+	+	+
Lindsaea microphylla	+		+				+	+	
Lycopodiaceae									
Lycopodiella cernua		+							
Lycopodiella lateralis	+								
Lycopodium deuterodensum								+	
Osmundaceae									
Todea barbara		+	+	+			+	+	+
Polypodiaceae									
Microsorum pustulatum						+			
Microsorum scandens				+					
Platycerium bifurcatum			+	+	+	+		+	+
Pyrrosia rupestris	+		+	+	+	+		+	+
Psilotaceae									

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Psilotum nudum	+	+	+	+		+			+
Tmesipteris truncata		+							
Pteridaceae									
Pteris tremula			+	+					
Pteris umbrosa					+				+
Pteris vittata			+	+	+				
Schizaeaceae									
Schizaea bifida	+								+
Schizaea dichotoma									+
Selaginellaceae									
Selaginella uliginosa				+	+		+	+	+
Thelypteridaceae									
Christella dentata			+	+	+			+	+
Cyclosorus interruptus				+					
Cycads									
Zamiaceae									
Macrozamia communis			+	+	+			+	
Conifers									
Cupressaceae									
Callitris muelleri				+			+		
Callitris rhomboidea			+	+	+	+	+	+	
Podocarpaceae									
Podocarpus elatus				+					
Podocarpus spinulosus	+		+	+	+		+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Dicotyledons									
<u>Acanthaceae</u>									
Avicennia marina	+		+					+	
Brunoniella pumilio	+						+	+	
Pseuderanthemum variabile	+		+	+	+				
<u>Adoxaceae</u>									
Sambucus australasica							+		
<u>Aizoaceae</u>									
Carpobrotus glaucescens							+	+	+
Tetragonia tetragonioides	+	+	+	+	+		+	+	+
<u>Alismataceae</u>									
Alisma plantago-aquatica				+					
<u>Amaranthaceae</u>									
Alternanthera denticulata			+	+				+	
<u>Apiaceae</u>									
Actinotus helianthi	+		+	+	+	+	+	+	+
Actinotus minor	+		+	+	+	+	+	+	+
Apium prostratum								+	
Centella asiatica			+	+	+	+	+	+	+
Hydrocotyle acutiloba	+		+	+	+				
Hydrocotyle laxiflora				+	+	+			
Hydrocotyle peduncularis			+	+	+		+	+	+
Hydrocotyle tripartita				+			+	+	
Platysace ericoides							+	+	+
Platysace lanceolata	+	+	+	+	+	+	+	+	+
Platysace linearifolia	+			+	+		+	+	+
Platysace stephensonii				+			+	+	

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Trachymene incisa	+		+						
Apiaceae(continued)									
Xanthosia pilosa	+	+	+	+	+	+	+	+	+
Xanthosia tridentata	+	+	+	+	+	+	+	+	+
Apocynaceae									
Alyxia buxifolia					+				
Marsdenia rostrata				+	+	+		+	
Marsdenia suaveolens	+		+		+	+	+	+	+
Parsonsia straminea	+							+	+
Tylophora barbata	+								
Araliaceae									
Astrotricha floccosa	+		+	+	+		+	+	+
Astrotricha latifolia	+		+		+				
Astrotricha longifolia	+		+						
Polyscias elegans				+					
Polyscias murrayi				+					
Polyscias sambucifolia	+	+	+	+	+	+	+	+	+
Asteraceae									
Brachyscome angustifolia	+								
Cassinia aculeata			+						
Cassinia compacta							+		
Cassinia denticulata			+	+			+	+	
Cassinia uncata			+			+			
Cotula australis			+	+		+			
Epaltes australis									+
Euchiton gymnocephalus				+					
Euchiton involucratus							+		
Euchiton sphaericus				+					
Helichrysum elatum	+				+				+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Lagenophora gracilis				+					
Lagenophora stipitata			+					+	
Melanthera biflora								+	
Olearia microphylla	+				+				
Olearia tomentosa	+				+		+	+	+
Ozothamnus diosmifolius	+		+	+	+	+		+	
Pseudognaphalium luteoalbum							+	+	+
Senecio hispidulus			+	+			+		
Senecio lautus	+			+					
Senecio minimus				+(?)					
Senecio quadridentatus				+					
Sigesbackia orientalis			+	+					
Solenogyne bellioides	+				+				
Xerochrysum bracteatum	+				+				
Bignoniaceae									
Pandorea pandorana	+	+	+	+	+	+	+	+	+
Campanulaceae									
Wahlenbergia communis						+			
Wahlenbergia gracilis			+	+	+	+	+	+	+
Wahlenbergia stricta	+								
Casuarinaceae									
Allocasuarina distyla	+	+	+	+	+	+	+	+	+
Allocasuarina littoralis	+	+	+	+	+	+	+	+	+
Allocasuarina paludosa		+							
Allocasuarina portuensis						+			
Allocasuarina torulosa	+		+	+	+			+	
Casuarina cunninghamiana		+						+	
Casuarina glauca	+	+	+	+	+		+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
<u>Celastraceae</u>									
Maytenus silvestris								+	
<u>Chenopodiaceae</u>									
Chenopodium glaucum				+					
Einadia nutans	+								
Einadia trigonos				+					
Rhagodia candolleana subsp. *candolleana*							+	+	
Sarcornia quinqueflora	+		+						
Suaeda australis	+		+						
<u>Clusiaceae</u>									
Hypericum gramineum				+					
Hypericum japonicum	+			+					
<u>Convolvulaceae</u>									
Calystegia marginata			+						
Convolvulus erubescens					+				
Cuscuta australis									+
Dichondra repens	+		+	+	+	+	+	+	+
Polymeria calycina				+					
<u>Crassulaceae</u>									
Crassula decumbens									+
Crassula sieberiana	+		+	+		+			
<u>Cunoniaceae</u>									
Bauera capitata							+	+	
Bauera rubioides	+		+	+	+		+	+	+
Callicoma serratifolia	+		+	+	+		+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Ceratopetalum apetalum	+		+	+				+	
Ceratopetalum gummiferum	+	+	+	+	+	+	+	+	+
Schizomeria ovata	+								
<u>Dilleniaceae</u>									
Hibbertia aspera	+			+	+		+	+	
Hibbertia bracteata	+								
Hibbertia cistiflora	+								+
Hibbertia dentata	+		+	+	+	+	+	+	+
Hibbertia diffusa	+			+	+				+
Hibbertia empetrifolia	+		+	+	+		+	+	+
Hibbertia fasciculata					+		+		+
Hibbertia linearis	+		+	+	+		+	+	+
Hibbertia pedunculata						+			
Hibbertia riparia				+			+		
Hibbertia scandens	+		+	+	+			+	+
Hibbertia serpyllifolia								+	
<u>Droseraceae</u>									
Drosera auriculata	+					+			
Drosera binata									+
Drosera peltata		+(?)				+	+	+	+
Drosera pygmaea						+	+	+	+
Drosera spatulata	+		+				+	+	+
<u>Elaeocarpaceae</u>									
Elaeocarpus reticulatus	+	+	+	+	+	+	+	+	+
Tetratheca ericifolia			+						+
Tetratheca glandulosa	+			+					

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
<u>Ericaceae</u>									
Astroloma humifusum			+				+		+
Astroloma pinifolium								+	
Brachyloma daphnoides	+	+		+				+	+
Dracophyllum secundum	+								
Epacris crassifolia	+							+	+
Epacris longiflora	+	+	+	+	+	+	+	+	+
Epacris microphylla	+	+	+	+	+		+	+	+
Epacris obtusifolia							+		+
Epacris pulchella	+	+	+	+	+		+	+	+
Leucopogon amplexicaulis	+		+	+			+		+
Leucopogon ericoides	+	+	+				+		+
Leucopogon esquamatus							+		+
Leucopogon juniperinus	+	+	+	+					+
Leucopogon lanceolatus var. *lanceolatus*	+							+	
Leucopogon microphyllus	+		+	+	+	+	+	+	+
Leucopogon parviflorus			+	+					
Leucopogon setiger	+								
Lissanthe sapida	+								
Lissanthe strigosa				+					+
Melichrus procumbens	+								
Monotoca elliptica	+	+	+	+	+	+	+	+	+
Monotoca scoparia	+	+						+	+
Sprengelia incarnata			+						+
Styphelia laeta	+				+				
Styphelia longifolia			+	+	+		+		+
Styphelia triflora							+	+	+
Styphelia tubiflora	+			+	+	+	+		+
Styphelia viridis subsp. *viridis*				+	+				+
Trochocarpa laurina	+		+						
Woollsia pungens	+	+	+	+	+		+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Euphorbiaceae									
Amperea xiphoclada	+								+
Breynia oblongifolia	+	+	+	+	+	+	+	+	+
Chamaesyce psammogeton									+
Glochidion ferdinandi	+		+	+	+	+	+	+	+
Homalanthus populifolius	+	+	+	+	+	+	+	+	+
Micrantheum ericoides	+	+	+	+	+		+	+	+
Micrantheum hexandrum							+	+	+
Monotaxis linifolia									+
Phyllanthus gunnii				+					
Phyllanthus hirtellus	+	+	+	+	+		+	+	+
Poranthes corymbosa	+								
Poranthera ericifolia									+
Poranthera microphylla				+	+		+		
Pseudanthus orientalis									+
Ricinocarpos pinifolius	+		+				+		+
Fabaceae									
Acacia binervata		+		+				+	+
Acacia binervia	+		+	+					+
Acacia brownii									+
Acacia buxifolia	+			+					
Acacia bynoeana				+					
Acacia decurrens			+					+	
Acacia echinula	+								
Acacia elata	+		+	+	+				
Acacia fimbriata				+					
Acacia floribunda			+	+			+	+	+
Acacia genistifolia				+					
Acacia hispidula	+								
Acacia implexa			+	+	+			+	
Acacia irrorata subsp. *irrorata*				+	+				+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Acacia linifolia	+	+	+	+	+		+	+	+
Acacia longifolia subsp. *longifolia*	+	+	+	+	+	+	+	+	+
Acacia longifolia subsp. *sophorae*								+	+
Acacia longissima			+	+			+	+	+
Acacia maidenii				+					
Acacia myrtifolia	+		+				+	+	+
Acacia oxycedrus				+					
Acacia parramattensis	+	+	+	+	+		+	+	+
Acacia parvipinnula				+					
Acacia prominens				+					
Acacia quadrilateralis									+
Acacia suaveolens	+	+	+	+	+	+	+	+	+
Acacia terminalis	+	+	+	+	+	+	+	+	+
Acacia ulicifolia	+	+	+	+	+	+	+	+	+
Aotus ericoides									+
Bossiaea ensata				+			+	+	+
Bossiaea heterophylla	+	+	+	+	+		+	+	+
Bossiaea obcordata	+	+							
Bossiaea scolopendria	+			+	+		+	+	+
Daviesia corymbosa						+			
Daviesia umbellulata							+		
Desmodium rhytidophyllum			+	+					
Dillwynia floribunda			+	+	+		+		}
Dillwynia elegans									}+ }
Dillwynia glaberrima							+	+	+
Dillwynia retorta	+	+	+	+	+	+	+	+	+
Dillwynia rudis	+								
Dillwynia sieberi				+					
Glycine clandestina	+	+	+	+	+	+		+	}
Glycine microphylla			+	+				+	}+ }
Glycine tabacina				+	+		+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Gompholobium glabratum	+		+						+
Gompholobium grandiflorum	+			+					+
Gompholobium latifolium	+	+(?)	+	+			+		+
Gompholobium pinnatum	+								
Goodia lotifolia					+				
Hardenbergia violacea	+	+	+	+	+	+	+	+	+
Hovea acutifolia				+					
Hovea lanceolata				+					
Hovea linearis	+		+	+	+		+	+	
Hovea longifolia					+				
Kennedia rubicunda	+	+	+	+	+	+	+	+	+
Mirbelia rubiifolia	+	+			+		+		+
Oxylobium cordifolium						+			
Phyllota phylicoides	+				+				+
Platylobium formosum	+		+	+	+	+	+	+	
Pultenaea blakelyi				+(?)					
Pultenaea daphnoides	+	+	+	+	+	+	+	+	+
Pultenaea ferruginea	+								+
Pultenaea flexilis	+		+	+				+	+
Pultenaea hispidula			+					+	
Pultenaea linophylla			+					+	+
Pultenaea microphylla								+	
Pultenaea parviflora			+						
Pultenaea polifolia				+				+	
Pultenaea retusa									+
Pultenaea scabra									+
Pultenaea stipularis	+		+	+	+	+	+	+	+
Pultenaea tuberculata (syn. *P. elliptica*)	+		+	+	+		+	+	+
Viminaria juncea	+	+	+	+	+		+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
<u>Geraniaceae</u>									
Geranium homeanum	+		+	+	+	+		+	
Pelargonium australe				+		+	+	+	
<u>Goodeniaceae</u>									
Dampiera purpurea	+		+						
Dampiera stricta	+		+	+	+	+	+	+	+
Goodenia bellidifolia	+			+		+	+		+
Goodenia dimorpha var. *dimorpha*	+								
Goodenia hederacea	+								
Goodenia heterophylla subsp. *eglandulosa*	+				+			+	+
Goodenia ovata	+								
Goodenia paniculata									+
Goodenia stelligera			+				+		+
Scaevola albida			+						
Scaevola ramosissima	+		+		+		+		
Velleia lyrata							+		
<u>Haloragaceae</u>									
Gonocarpus micranthus	+	+		+		+		+	+[1]
Gonocarpus salsoloides									+
Gonocarpus tetragynus							+		+
Gonocarpus teucrioides	+	+	+	+	+	+	+	+	+
Haloragis heterophylla			+	+					
<u>Lamiaceae</u>									
Ajuga australis								+	
Chloanthes stoechadis				+	+		+	+	+
Clerodendrum tomentosum	+		+	+	+	+		+	+
Hemigenia purpurea	+			+	+		+		+
Plectranthus parviflorus			+	+	+	+	+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Prostanthera denticulata			+						
Prostanthera linearis	+								
Prostanthera ovalifolia				+					
Westringia fruticosa		+	+	+	+	+	+	+	+
Lauraceae									
Cassytha glabella	+		+	+	+		+	+	+
Cassytha pubescens	+	+	+	+	+	+	+	+	+
Cryptocarya glaucescens								+	
Endiandra sieberi			+			+		+	+
Lentibulariaceae									
Utricularia dichotoma									+
Lobeliaceae									
Lobelia alata(syn. *L. anceps)*	+	+		+	+	+			+
Lobelia dentata		+							
Lobelia gracilis				+		+	+		+
Pratia purpurascens	+		+	+	+			+	
Loganiaceae									
Mitrasacme paludosa						+			
Mitrasacme polymorpha	+		+	+		+	+	+	+
Loranthaceae									
Amyema congener	+		+		+	+		+	+
Amyema miquelii				+					
Dendrophthoe vitellina	+								
Muellerina celastroides				+	+			+	
Lythraceae									

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Lythrum hyssopifolia				+					
Malvaceae									
Hibiscus heterophyllus			+						
Meliaceae									
Melia azedarach				+	+	+			+
Synoum glandulosum	+		+	+	+		+	+	+
Toona ciliata				+					
Menispermaceae									
Sarcopetalum harveyanum	+		+	+	+	+		+	+
Stephania japonica var. *discolor*	+		+	+	+	+	+	+	+
Monimiaceae									
Doryphora sassafras				+					
Palmeria scandens					+				
Wilkiea huegeliana								+	
Moraceae									
Ficus coronata	+						+	+	
Ficus rubiginosa		+	+	+	+	+	+	+	+
Myoporaceae									
Myoporum boninense subsp. *australe*							+	+	
Myrsinaceae									
Aegiciras corniculatum	+								
Myrsine howittiana				+			+	+	+
Myrsine variabilis		+	+	+	+		+	+	+
Myrtaceae									

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Acmena smithii	+	+	+	+	+	+	+	+	+
Angophora bakeri	+			+				+	
Angophora costata	+		+	+	+	+	+	+	+
Angophora crassifolia							+		
Angophora floribunda	+		+	+	+				
Angophora hispida	+			+	+	+	+	+	+
Austromyrtus tenuifolia	+			+			+		
Backhousia myrtifolia	+							+	
Baeckia brevifolia	+								+
Baeckea diosmifolia	+		+				+		+
Baeckea imbricata			+	+	+	+	+	+	+
Baeckea kandos									+
Baeckea linifolia			+	+					
Callistemon citrinus	+			+	+			+	+
Callistemon linearifolius					+				
Callistemon linearis	+		+	+	+	+	+	+	+
Callistemon rigidus		+				+	+	+	
Callistemon salignus	+		+	+				+	+
Callistemon viminalis				+					
Calytrix tetragona	+		+				+	+	+
Corymbia eximia									+
Corymbia gummifera	+	+	+	+	+	+	+	+	+
Corymbia maculata		+	+	+	+			+	
Darwinia biflora	+								
Darwinia diminuta									+
Darwinia fascicularis	+		+	+	+		+	+	+
Darwinia leptantha									+
Darwinia procera					+				
Eucalyptus botryoides			+	+	+	+	+	+	+
Eucalyptus camfieldii				+					+
Eucalyptus capitellata		+						+	+
Eucalyptus eugenioides						+			

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Eucalyptus globoidea				+					
Eucalyptus haemastoma	+		+	+		+	+	+	
Eucalyptus luehmanniana		+	+	+					
Eucalyptus moluccana								+	
Eucalytpus multicaulis									+
Eucalyptus oblonga	+			+	+			+	
Eucalyptus obstans			+	+		+	+	+	+
Eucalyptus paniculata	+		+						
Eucalyptus pilularis	+		+	+					
Eucalyptus piperita	+	+	+	+	+	+	+	+	
Eucalyptus punctata			+	+				+	
Eucalyptus resinifera	+		+	+					
Eucalyptus robusta		+		+		+			
Eucalyptus saligna	+	+	+	+				+	
Eucalyptus scias subsp. *scias*								+	+
Eucalyptus sclerophylla		+				+		+	
Eucalyptus sieberi			+	+				+	
Eucalyptus sparsifolia								+	
Eucalyptus stricta								+	
Eucalyptus tereticornis	+		+	+	+(?)	+			
Eucalyptus umbra				+	+		+	+	+
Euryomyrtus ramosisima	+								+
Kunzea ambigua	+	+	+	+	+	+	+	+	+
Kunzea capitata	+		+				+	+	+
Leptospermum arachnoides	+						+		+
Leptospermum juniperinum							+		+
Leptospermum laevigatum	+		+	+	+		+	+	+
Leptospermum polygalifolium	+	+		+	+	+	+	+	+
Leptospermum squarrosum	+		+	+	+		+	+	+
Leptospermum trinervium	+	+	+	+	+		+	+	+
Melaleuca armillaris		+	+	+	+		+		+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Melaleuca biconvexa				+					
Melaleuca decora				+					
Melaleuca ericifolia				+				+	
Melaleuca hypericifolia				+	+		+	+	+
Melaleuca linariifolia				+				+	+
Melaleuca nodosa					+	+	+	+	+
Melaleuca quinquenervia			+	+	+		+	+	+
Melaleuca styphelioides		+	+	+				+	
Micromyrtus ciliata	+		+						+
Rhodamnia rubescens								+	
Sannantha pluriflora	+			+					
Syncarpia glomulifera	+		+	+	+	+			+
Syzygium australe				+			+	+	
Syzygium oleosum				+				+	
Syzygium paniculatum			+	+			+	+	
Tristania neriifolia		+							
Tristaniopsis laurina	+		+	+				+	
<u>Olacaceae</u>									
Olax stricta	+		+				+		+
<u>Oleaceae</u>									
Notelaea longifolia	+	+	+	+	+	+		+	+
Notelaea ovata		+	+	+			+	+	+
Notelaea venosa			+						
<u>Onagraceae</u>									
Epilobium billardierianum subsp. *cinereum*				+			+		
Epilobium hirtigerum							+		
<u>Oxalidaceae</u>									

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Oxalis perennans					+				
Passifloraceae									
Passiflora herbertiana	+								
Pittosporaceae									
Billardiera scandens var. *scandens*	+	+	+	+	+	+	+	+	+
Bursaria spinosa			+	+					
Pittosporum revolutum	+		+	+	+	+	+	+	+
Pittosporum undulatum	+	+	+	+	+	+	+	+	+
Rhytidosporum procumbens	+								
Plantaginaceae									
Plantago debilis			+			+			
Polygalaceae									
Comesperma defoliatum	+								
Comesperma ericinum	+								+
Comesperma volubile								+	
Polygonaceae									
Persicaria decipiens		+	+	+	+	+	+	+	
Persicaria hydropiper					+				
Persicaria lapathifolium			+						
Rumex brownii			+						
Portulacaceae									
Calandrinia pickeringii	+		+	+		+			
Portulaca oleracea				+					
Proteaceae									

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Banksia aemula								+	+
Banksia ericifolia var. *ericifolia*	+	+	+	+	+	+	+	+	+
Banksia integrifolia	+	+	+	+	+	+	+	+	+
Banksia marginata	+		+	+				+	+
Banksia oblongifolia	+	+	+	+		+	+	+	+
Banksia robur				+				+	+
Banksia serrata	+	+	+	+	+	+	+	+	+
Banksia spinulosa var. *spinulosa*	+	+	+	+	+		+	+	
Conospermum ellipticum									+
Conospermum ericifolium			+						+
Conospermum longifolium			+						+
Conospermum taxifolium	+								+
Grevillea buxifolia subsp. *buxifolia*	+	+	+	+	+	+	+	+	+
Grevillea caleyi					+				
Grevillea linearifolia	+		+	+	+		+	+	+
Grevillea longifolia								+	
Grevillea mucronulata									+
Grevillea sericea	+	++	+	+	+		+	+	+
Grevillea speciosa			+	+	+		+	+	+
Hakea bakeriana	+								
Hakea dactyloides	+	+	+	+	+		+	+	+
Hakea gibbosa	+		+	+			+	+	+
Hakea propinqua	+				+				
Hakea salicifolia	+			+				+	
Hakea sericea	+	+	+	+	+		+	+	+
Hakea teretifolia	+	+	+	+	+		+	+	+
Isopogon anemonifolius	+				+				
Isopogon anethifolius	+		+		+		+	+	+
Lambertia formosa	+	+	+	+	+		+	+	+
Lomatia ilicifolia								+	
Lomatia myricoides	+			+				+	

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Lomatia silaifolia	+	+	+	+	+	+	+	+	+
Persoonia hirsuta subsp. *hirsuta*									+
Persoonia lanceolata	+		+	+	+	+	+	+	+
Persoonia laurina	+	+	+						+
Persoonia levis	+		+	+	+	+	+	+	+
Persoonia linearis	+	+	+	+	+	+	+	+	+
Persoonia pinifolia	+		+	+				+	
Petrophile pulchella	+		+	+	+			+	+
Petrophile sessilis	+							+	+
Stenocarpus salignus	+			+					
Telopea speciosissima	+								
Xylomelum pyriforme	+		+	+				+	+
<u>Ranunculaceae</u>									
Clematis aristata	+		+	+	+			+	+
Clematis glycinoides var. *glycinoides*	+			+				+	+
<u>Rhamnaceae</u>									
Cryptandra amara var. *amara*							+		+
Cryptandra ericoides							+	+	+
Pomaderris discolor	+		+	+					
Pomaderris elliptica				+					
Pomaderris ferruginea			+	+	+			+	+
Pomaderris intermedia			+		+		+	+	
Pomaderris lanigera				+				+	
<u>Rosaceae</u>									
Rubus moluccanus				+					+
Rubus parvifolius					+			+	

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Rubiaceae									
Morinda jasminoides				+	+			+	+
Opercularia aspera	+	+	+	+	+	+	+		+
Opercularia diphylla									+
Opercularia hispida								+	
Opercularia varia	+				+				+
Pomax umbellata	+		+	+	+	+		+	+
Rutaceae									
Acronychia oblongifolia						+		+	
Boronia ledifolia	+		+		+				+
Boronia parviflora									+
Boronia pinnata	+		+						
Boronia polygalifolia	+								
Boronia serrulata			+		+				+
Correa alba var. *alba*								+	+
Correa reflexa	+		+	+[2]	+		+	+	+
Crowea exalata			+		+	+			+
Crowea saligna			+	+	+	+	+	+	+
Eriostemon australasius				+	+		+		
Leionema dentatum	+		+	+				+	
Phebalium squamulosum subsp. *argenteum*				+				+	
Philotheca buxifolia					+	+	+	+[3]	+[4]
Philotheca myoporoides			+	+					
Philotheca salsolifolia	+							+	+
Zieria cytisoides			+						
Zieria laevigata			+	+	+		+	+	+
Zieria pilosa	+		+	+			+	+	+
Zieria smithii	+		+	+				+	

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Santalaceae									
Exocarpos cupressiformis	+		+		+	+		+	+
Leptomeria acida	+		+						
Sapindaceae									
Cupaniopsis anacardioides			+	+		+		+	
Dodonaea triquetra	+		+	+	+	+	+	+	+
Dodonaea viscosa				+					
Scrophulariaceae									
Gratiola pedunculata							+		
Veronica plebeia	+		+	+	+	+		+	+
Solanaceae									
Duboisia myoporoides								+	
Solanum aviculare			+						
Stackhousiaceae									
Stackhousia monogyna							+		
Stackhousia spathulata									+
Stackhousia viminea	+						+		
Sterculiaceae									
Brachychiton acerifolius				+					
Lasiopetalum ferrugineum			+	+	+	+	+	+	+
Lasiopetalum rufum				+			+		+
Rulingia dasyphylla	+								
Rulingia hermannifolia				+		+			+
Stylidiaceae									
Stylidium graminifolium			+						
Stylidium lineare	+		+		+		+		+
Stylidium productum	+								

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
<u>Theophrastaceae</u>									
Samolus repens	+						+		
<u>Thymelaeaceae</u>									
Pimelea curviflora var. *curviflora*								+	+
Pimelea linifolia subsp. *linifolia*	+		+		+		+	+	+
Wikstroemia indica			+	+			+	+	+
<u>Ulmaceae</u>									
Trema tomentosa	+		+	+			+	+	
<u>Violaceae</u>									
Hybanthus monopetalus	+								
Viola hederacea	+			+	+		+	+	+
<u>Vitaceae</u>									
Cayratia clematidea								+	
Cissus antarctica				+	+	+		+	+
Cissus hypoglauca	+		+	+	+	+	+	+	+
Monocotyledons									
<u>Agavaceae</u>									
Cordyline stricta			+			+			
<u>Amaryllidaceae</u>									
Crinum pedunculatum						+	+	+	
<u>Anthericaceae</u>									
Caesia parviflora	+		+	+	+	+		+	
Laxmannia gracilis	+								
Sowerbaea juncea		+	+					+	+
Thysanotus tuberosus	+		+		+				+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Tricoryne elatior									+
Tricoryne simplex	+		+						
Araceae									
Alocasia brisbanensis				+				+	
Gymnostachys anceps								+	
Arecaceae									
Archontophoenix cunninghamiana							+		
Livistona australis		+	+	+	+	+	+	+	
Blandfordiaceae									
Blandfordia nobilis							+	+	+
Centrolepidaceae									
Centrolepis fascicularis									+
Centrolepis strigosa									+
Colchicaceae									
Burchardia umbellata	+		+			+			+
Commelinaceae									
Commelina cyanea	+		+	+	+	+	+	+	+
Pollia crispata				+					
Cyperaceae									
Baumea acuta							+	+	+
Baumea juncea	+								+
Baumea rubiginosa	+				+			+	
Baumea teretifolia								+	+
Carex appressa					+				+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Carex breviculmis				+	+				+
Carex inversa			+	+					
Caustis flexuosa	+		+	+	+	+	+	+	+
Caustis pentandra	+			+	+	+	+	+	+
Caustis recurvata							+		+
Chorizandra cymbaria									+
Chorizandra sphaerocephala									+
Cyathochaeta diandra	+				+		+	+	+
Cyperus difformis				+					
Cyperus gracilis			+	+					
Cyperus imbecillis			+						
Cyperus mirus				+		+			
Cyperus polystachyos				+			+	+	+
Cyperus sanguinolentus				+					
Eleocharis sphacelata									+
Ficinia(Isolepis) nodosa	+	+	+	+	+	+	+	+	+
Fimbristylis dichotoma				+					
Gahnia aspera			+	+				+	
Gahnia clarkei				+	+		+		+
Gahnia erythrocarpa								+	+
Gahnia melanocarpa			+	+	+			+	
Gahnia microstachya									+
Gahnia radula							+	+	
Gahnia sieberiana	+			+	+		+	+	+
Gymnoschoenus									+
sphaerocephalus									
Isolepis inundata	+		+	+	+				+
Lepidosperma concavum				+			+[5]		+[6]
Lepidosperma filiforme	+		+	+	+		+	+	+
Lepidosperma gunnii				+					
Lepidosperma laterale (syn. *Lepidosperma lineare*)	+		+	+	+	+	+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Lepidosperma limicola				+					+
Lepidosperma longitudinale					+				
Lepidosperma neesii				+					+
Lepidosperma viscidum				+					+
Ptilothrix deusta	+						+	+	+
Schoenoplectus validus	+								
Schoenus apogon	+				+				+
Schoenus brevifolius	+			+					+
Schoenus ericetorum	+							+	+
Schoenus imberbis	+			+			+	+	+
Schoenus maschalinus									+
Schoenus melanostachys	+		+	+	+			+	
Schoenus paludosus									+
Tetraria capillaris				+					+
Tricostularia pauciflora									+
<u>Doryanthaceae</u>									
Doryanthes excelsa								+	
<u>Eriocaulaceae</u>									
Eriocaulon scariosum									+
<u>Haemodoraceae</u>									
Haemodorum corymbosum							+		
Haemodorum planifolium	+			+			+		+
<u>Hydrocharitaceae</u>									
Ottelia ovalifolia	+								
<u>Hypoxidaceae</u>									
Hypoxis hygrometrica	+								

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Iridaceae									
Patersonia fragilis									+
Patersonia glabrata	+		+	+	+		+	+	+
Patersonia longifolia							+		
Patersonia sericea	+		+	+	+		+	+	+
Juncaceae									
Juncus bufonius			+						
Juncus continuus			+	+	+			+	+
Juncus homalocaulis			+						
Juncus kraussii	+		+					+	
Juncus pallidus									+
Juncus planifolius	+	+	+	+					+
Juncus polyanthemus			+	+					
Juncus prismatocarpus				+	+				+
Juncus subsecundus			+	+	+				
Juncus usitatus			+	+	+		+	+	+
Juncaginaceae									
Triglochin striatum	+		+						
Lomandraceae									
Lomandra brevis			+				+	+	
Lomandra confertifolia subsp. *pallida*				+					
Lomandra cylindrica	+		+	+	+		+	+	+
Lomandra filiformis	+		+	+[7]	+			+	+
Lomandra glauca	+		+	+	+		+	+	+
Lomandra gracilis	+		+	+		+		+	+
Lomandra longifolia	+	+	+	+	+	+	+	+	+
Lomandra micrantha			+						
Lomandra multiflora	+		+		+	+		+	
Lomandra obliqua	+		+	+	+	+	+	+	+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
<u>Luzuriagaceae</u>									
Eustrephus latifolius	+		+	+	+	+	+	+	+
Geitonoplesium cymosum	+		+	+	+	+	+	+	+
<u>Orchidaceae</u>									
Acianthus exsertus	+			+					
Acianthus fornicatus			+	+	+	+			
Caladenia carnea	+		+						
Caladenia catenata								+	
Caleana major									+
Calochilus campestris	+		+	+					
Calochilus gracillimus			+						
Calochilus paludosus				+					
Calochilus robertsonii			+		+				
Chiloglottis trapeziformis			+						+
Cryptostylis erecta	+		+	+	+	+			+
Cryptostylis subulata	+			+			+	+	+
Cymbidium suave	+			+	+		+		
Dendrobium aemulum						+			
Dendrobium linguiforme				+		+	+	+	+
Dendrobium speciosum		+		+		+			
Dipodium punctatum			+		+		+	+	
Diuris aurea	+								
Erythrorchis cassythoides									+
Glossodia minor	+				+				
Liparis reflexa			+						
Microtis angusii								+	
Microtis unifolia					+				
Orthoceras strictum									+
Prasophyllum elatum	+								
Pterostylis cocinna	+								
Pterostylis concinna			+			+			

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Pterostylis grandiflora			+						
Pterostylis longifolia			+						
Pterostylis nutans			+		+	+			
Rimicola elliptica	+								
Thelymitra ixioides var. *ixioides*	+		+						+
Philydraceae									
Philydrum lanuginosum									+
Phormiaceae									
Dianella caerulea	+	+	+	+	+	+	+	+	+
Dianella congesta						+		+	
Dianella longifolia var. *longifolia*								+	
Dianella revoluta	+	+	+	+	+	+		+	+
Stypandra glauca				+					
Thelionema caespitosum	+								+
Thelionema umbellatum					+	+			+
Poaceae									
Anisopogon avenaceus	+		+		+	+	+	+	+
Aristida calycina var. *calycina*					+				
Aristida ramosa	+								
Aristida vagans	+		+	+	+				
Austrodanthonia caespitosa				+					
Austrodanthonia racemosa			+						
Austrodanthonia tenuior			+				+	+	+
Austrostipa pubescens				+	+				
Austrostipa ramosissima			+						
Bothriochloa macra				+	+				
Chloris truncata			+						
Cymbopogon refractus			+	+	+			+	

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Cynodon dactylon		+		+	+		+		+
Deyeuxia quadriseta					+				
Dichelachne crinita			+	+	+	+		+	+
Dichelachne micrantha	+		+	+					+
Dichelachne rara			+						
Digitaria didactyla				+					+
Digitaria parviflora			+			+	+	+	+
Echinopogon caespitosus	+		+	+	+	+		+	+
Echinopogon ovatus				+	+				
Elymus scaber var. *scaber*					+				
Entolasia marginata			+	+	+		+	+	+
Entolasia stricta	+		+	+	+	+	+	+	+
Eragrostis benthamii			+						
Eragrostis brownii			+	+	+	+	+	+	+
Eragrostis elongata				+					
Eragrostis leptostachya			+	+					
Hemarthria uncinata var. *uncinata*									+
Imperata cylindrica	+		+	+	+	+	+	+	+
Lachnagrostis aemula				+			+		
Lachnagrostis filiformis				+	+				+
Microlaena stipoides var. *stipoides*	+		+	+	+	+		+	+
Notodanthonia longifolia			+	+			+		+
Oplismenus aemulus	}+		+	+	+	+		+	+
Oplismenus imbecillis	}		+	+	+	+	+	+	+
Panicum simile	+		+	+	+			+	+
Paspalidium distans			+	+	+	+		+	
Paspalidium gracile				+					
Paspalum distichum				+					
Paspalum vaginatum		+							
Phragmites australis	+							+	
Plinthanthesis paradoxa									+

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Poa affinis			+	+	+	+		+	+
Poa labillardieri				+	+			+	
Poa sieberiana var. *sieberiana*					+				
Sacciolepis indica								+	
Spinifex sericeus									+
Sporobolus creber				+					
Sporobolus elongatus			+						
Sporobolus virginicus	+	+		+			+	+	+
Tetrarrhena juncea			+						
Tetrarrhena turfosa							+		
Themeda australis	+		+	+	+	+	+	+	+
Zoysia macrantha				+			+		+
<u>Restionaceae</u>									
Baloskion tetraphyllum (syn. *Restio tetraphyllus*)			+					+	+
Caustis pentandra								+	
Chordifex dimorphus			+					+	+
Empodisma minus	+			+				+	+
Eurychorda complanata			+						+
Guringalia dimorpha (*syn. Restio dimorphus*)			+					+	+
Hypolaena fastigiata				+	+		+		+
Leptocarpus tenax									+
Lepyrodia muelleri								+	
Lepyrodia scariosa	+		+	+	+	+	+	+	+
Restio fastigiatus (syn. *Saropsis fastigiata*)				+	+		+	+	+
Sporadanthus gracilis					+				
<u>Ripogonaceae</u>									
Ripogonum fawcettianum					+				

	Lane Cove	Kelly's Bush Woolwich Dock	North Sydney Remnant Bush	Mosman Bushland	Middle Head George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
<u>Smilacaceae</u>									
Smilax australis	+		+		+			+	
Smilax glyciphylla	+		+		+	+	+	+	+
<u>Typhaceae</u>									
Typha domingensis					}+	}			+
Typha orientalis	+			+	}	}+ }		+	+
<u>Uvulariaceae</u>									
Schelhammera undulata	+		+	+	+(?)	+	+	+	+
<u>Xanthorrhoeaceae</u>									
Xanthorrhoea arborea	+		+	+	+			+	+
Xanthorrhoea concava					+				+
Xanthorrhoea macronema				+					
Xanthorrhoea media	+		+		+		+	+	
Xanthorrhoea minor								+	
Xanthorrhoea resinosa				+			+	+	
Xanthorrhoea sp						+			
<u>Xyridaceae</u>									
Xyris gracilis subsp. *gracilis*			+						+
Xyris operculata			+						+

1. Subspecies *ramosissimus*
2. Varieties *reflexa* and *speciosa*
3. Subspecies *obovatus*
4. Subspecies *obovatus*
5. *Lepidosperma concavum/latens*
6. *Lepidosperma latens*
7. Subspecies *coriacea* and *filiformis*

Sources of information:

Location	Source
Lane Cove	Clarke, P.J. & Benson, D.H., 1987
Kelly's Bush/Woolwich Dock	Skelton, N. et al., 2003b
North Sydney remnant bush	Biosphere Environmental Consultants, 2001
Mosman bushland	Oculus, 2001; Ashton Park Trust, 1968
Middle Head/George's Heights	Biosis Research, 1999
	Australian Museum Business Services, 1995
	Conacher Travers, 2003
Nielsen Park	Hirschfeld, D. et al.,1998/2002
Dobroyd Head	Skelton, N., 2002
Manly Reserves	Skelton, N. et al., 2004
North Head	Skelton, N. et al., 2003a

787 native species were recorded in one or more of the bushland reserves. To establish the likelihood of their former occurrence on Pyrmont peninsula, these species were evaluated with the following texts and databases on the native floras of the Sydney Region, New South Wales, and Australia:

- Flora of the Sydney Region (Carolin & Tindale, 1993)
- Flora of New South Wales (Harden, 1990/93)
- Ecology of Sydney Plant Species (Benson & McDougall, 1993/2005)
- Native plants of the Sydney district (Fairley & Moore, 2000)
- The PLANTNET database, National Herbarium of New South Wales (http://plantnet.rbgsyd.nsw.gov.au/)
- Australia's Virtual Herbarium (http://www.rbg.vic.gov.au/cgi-bin/avhpublic/avh.cgi)

Through this process, 675 species were placed in Appendix A as likely to have once occurred on Pyrmont peninsula. Species listed in Table 4.2.1 but omitted from Appendix A were:

- considered to have an essentially coastal distribution
- unlikely, on present knowledge, to have occurred naturally around Port Jackson
- rainforest species unlikely to have occurred on Pyrmont peninsula

C) Limits to distribution around Port Jackson

There are several species which reach a limit to their distribution at Port Jackson, in respect either of their overall range or around Sydney. Some of these species used to exploit the dune systems south of Port Jackson, while others essentially grew on sandstone. In principle, it might be expected that these latter species would have occurred on the Hawkesbury sandstone outcrops both north and south of Port Jackson. It appears from Table 4.2.2, however, that this is not so. Only 10%, or two of the listed species, have been recorded from sandstone sites on both sides of the harbour.

These observations indicate that conditions differ enough between the two sides of Port Jackson to determine the distribution of the listed species. There was generally insufficient information to examine this nuance when determining whether or not other sandstone species would have occurred on Pyrmont peninsula at settlement. As a result, it is possible that some determinations in favour of a species occurring on Pyrmont peninsula would not have been made had more information been available.

Table 4.2.2: Occurrence of select species around Port Jackson

Locality	Species
North of Port Jackson only	*Angophora crassifolia*
	Astrotricha floccosa
	Dillwynia elegans
	Conospermum ericifolium
	Darwinia procera
	Eucalyptus umbra
	Gonocarpus teucroides
	Persoonia isophylla
	Philotheca buxifolia subsp. *obovata*
	Prostanthera denticulata
	Tetratheca glandulosa
Predominantly north of Port Jackson but records also on south side	*Eucalyptus racemosa*
	Grevillea speciosa
South of Port Jackson only	*Banksia paludosa*
	Caustis recurvata var. *hirsuta*
	Eucalyptus botryoides x *saligna*
	Euphrasia collina subsp. *paludosa*
	Lepidosperma forsythii
	Leptosperma continentale
	Oxylobium cordifolium
	Prasophyllum affine

D) Additional species

A second listing was prepared(Appendix B) of species considered likely to have once occurred around Port Jackson, and on Pyrmont peninsula in particular, but not recorded in the contemporary flora surveys. Possible reasons for their omission from these surveys include:

- although widely distributed in this region of New South Wales, they occur infrequently and are not always detected
- they were not flowering during the surveys, and were inconspicuous (e.g. grasses, sedges, orchids)
- they are associated with plant communities better developed on the south side of Port Jackson, for example mangrove, saltmarsh and swamp communities

Appendix B lists 202 species, which belong in one of these three categories.

Figure 4.2.6: Fitzgerald, R.D., 1882/94, Australian Orchids, Sydney, Thomas Richards, Government Printer, Volume 2, Part 4: Dendrobium speciosum (ML DSM/X584.15/4J).

Fitzgerald was a surveyor/naturalist born at Tralee, County Kerry, Ireland in 1830. He arrived in Sydney in 1856 and showed an enthusiasm for Australian natural history from the outset. His work on Australian Orchids was considered masterly by his contemporaries. The Rock Lily or Orchid occurs between Northern Queensland and south-eastern Victoria, its specific name being derived from the Latin speciosus, 'showy' or 'beautiful'.

4.2.4 Plant communities of Pyrmont peninsula

A) Introduction

Flora lists can also be interpreted at a broader level, as assemblages of species or plant communities. These assemblages were described, as landscapes, by the first Europeans in Port Jackson. Progressively through time, these broad-brush accounts have been refined until, today, a diverse array of plant communities is recognised in the Sydney region.

In this section, this progressive refinement in our understanding of the vegetation around Port Jackson is reviewed. General descriptions of the early settlers are followed by the increasingly detailed accounts of the 20th Century. These, in turn, are followed by accounts of the individual plant communities which likely once existed on Pyrmont peninsula.

B) Early accounts

The early settlers described well the land they were colonising. Captain Watkin Tench[1789](1961), for example, noted: 'We continued to run up the harbour[Port Jackson] about four miles, in a westerly direction, enjoying the luxuriant prospect of its shores covered with trees to the water's edge …'(p.38). He elaborated(p.64): 'The general face of the country is certainly pleasing, being diversified with gentle ascents, and little winding vallies, covered for the most part with large spreading trees, which afford a succession of leaves in all seasons. In those places where trees are scarce, a variety of flowering shrubs abound, most of them entirely new to an European, and surpassing in beauty, fragrance and number, all I ever saw in an uncultivated state'.

According to Phillip(1790:74/75): 'The necks of land that form the coves are mostly covered with timber, yet so rocky that it is not easy to comprehend how the trees could have found sufficient nourishment to bring them to so considerable a magnitude … Between Sydney Cove and Botany Bay, the first space is occupied by a wood, in some parts a mile and a half, in others three miles across; beyond that, is a kind of heath, poor, sandy, and full of swamps. As far as the eye can reach to the westward, the country is one continued wood'.

Benson & Redpath(1997:300) interpreted early observations by John White as revealing that: 'the vegetation around Sydney contained a mosaic diversity of vegetation with areas of heavily wooded forests(both dense and open understoreys) and thickets of scrub and swamps'.

Peter Cunningham(1827:27) described his entry to Port Jackson in 1819 thus: 'The shores onwards are bold, and often precipitous, - agreeably varied in their general outline by romantic little bays, which, with their white sandy beaches, open irregularly to the right and left as you sail along. On each side the land, broken and moderately high, terminates toward the shore in narrow ridges, covered with native shrubs in perpetual summer verdure, among which, rocks of varied hues peep here and there abruptly out, while slender streams of water, gurgling down the narrow valleys between the ridges, just reveal themselves at intervals, and retire again from view'. He described the areas inland from the coastal zone as consisting of ' … a poor clayey or ironstone soil, thickly covered with our usual evergreen forest timber and underwood', while beyond Parramatta is 'a fine timbered country, perfectly clear of brush …'(p.82).

Cunningham(1827:43) described the vegetation along the road to South Head lighthouse, as follows: 'Midway, a road to the left carries you to a rising ground named Bellevue … this spot, where low undulating hills(of rock and sand) lie scattered about in disorderly array, garnished with shrubs in liveries of the freshest green, and flowers of the liveliest hue, cannot fail to impress its beauty on the heart too deeply to be readily forgotten'. This description of heathland on low fertility soils would have applied equally well to parts of Pyrmont peninsula at the time.

According to Atkinson(1826:1/2): 'The barren scrubs almost everywhere border the sea coast, and extend various distances inland … The soil in these scrubs is either sandstone rock or sterile sand and gravel, covered, however, with a profusion of beautiful shrubs and bushes, producing the most elegant flowers, and affording a constant succession throughout the whole year'.

C) Contemporary accounts

Kartzoff(1969) described nine plant associations within the Sydney basin. He considered that Blackbutt *Eucalyptus pilularis* – Sydney Blue Gum *Eucalyptus saligna* high forest was restricted to Wianamatta shale in the high to moderate rainfall zones. Relative to Pyrmont peninsula, this association would have occurred from east of North Sydney to Hornsby and from 'the Inner City of Sydney, from about Hyde Park, running south-west to Hurstville …'(p.23). This forest type would thus have occurred a little to the north and south of Pyrmont peninsula, but was unlikely to have existed on the peninsula itself.

The dominant vegetation on the Hawkesbury sandstone, including the basins of Lane Cove River and the foreshores of Middle and Sydney Harbours was what Kartzoff referred to as the Smooth-barked Apple *Angophora costata* association. Co-dominants were the Sydney Peppermint *Eucalyptus piperita* and Red Bloodwood *Corymbia gummifera* with Scribbly Gum *Eucalyptus haemastoma* dominant on some ridges: 'The understorey largely consists of Proteaceae and Leguminosae[Fabaceae] families, and where the country is fairly open, many of the native flowering plants'(p.27). This vegetation would have largely defined Pyrmont peninsula at European settlement.

Another association recognised by Kartzoff, the Scribbly Gum *Eucalyptus haemastoma* association, would also have once occurred on Pyrmont peninsula: 'This association appears in the midst of the Smooth-bark Apple association on the same Hawkesbury sandstone formation and in the same high rainfall zone location. This is generally country with poorer drainage than the one supporting the *Angophora* association. It comprises very open woodland passing into heath', and would once have occurred on the upper slopes of the peninsula. Although the understorey of this association shared many species with the *Angophora* association, it also supported a large number of heaths in the families *Ericaceae* and *Rutaceae*.

Benson & Howell(1988:4) described the woodlands and heaths of the Hawkesbury Sandstone, such as would have once occurred on Pyrmont peninsula, thus: 'On the infertile soils of the dissected sandstone plateaus were scrubby woodlands, with Scribbly Gums, Red Bloodwoods, and Angophoras … On deeper soils in the gullies was open-forest of Sydney Peppermint and Blackbutt, while on shallow exposed soils, particularly on the coast, were extensive patches of heath'.

Pyrmont peninsula would also have shared elements of Kartzoff's 'Seaside vegetation' with elsewhere on Sydney Harbour. Between the harbour and the Angophora association would have been a fringe of Bangalay *Eucalyptus botryoides* and Wiriyagan *Banksia serrata*. Damper locations, especially gullies, would have carried 'moist-type vegetation' including several rainforest species. Kartzoff continued: 'There are patches of Coastal Oak(*Casuarina littoralis*). It is safe to assume that [typical sandstone vegetation] was the type of vegetation around Sydney Cove at the time of the arrival of the First Fleet, with the proviso that the Tank Stream, which had washed down clay deposits along its bank from Wianamatta Shale country at its source, would have carried a stand of Blackbutt(*E. pilularis*) or Blue Gum (*E. saligna*), with possibly a considerable amount of rainforest understorey'(p.39). These comments by Kartzoff bear consideration in respect of the vegetation of Cockle and Blackwattle Creeks.

Benson and Howell(1990) provided a more informative account of how the bushland of Sydney may have looked in 1788. Based on geology, soils, and climate, these authors recognised eight vegetation types in the Sydney region. Although they made no mention of Pyrmont peninsula, dividing it according to local government boundaries, they clearly regarded the predominant vegetation types of the peninsula as those of the Hawkesbury Sandstone, with woodlands of Scribbly Gum *Eucalyptus haemastoma*, Red Bloodwood *Corymbia gummifera*, Sydney Peppermint *Eucalyptus piperita*, and Smooth-barked Apple *Angophora costata*.

Benson & Howell(1994) much elaborated the above insights. They recognised 42 plant communities in the Sydney region, which they grouped into 16 map units. The most extensive vegetation, on Hawkesbury Sandstone, they broadly subdivided into three units – Sydney Sandstone Gully Forest(10ag), Sydney Sandstone Ridgetop Woodland(10ar), and Coastal Sandstone Heath(21g) – each of which contained two or three plant communities. These plant communities together would have accounted for most of the vegetation once found on Pyrmont peninsula. Two other units – Estuarine Complex(4a) and Coastal Swamp Forest Complex(27a) – also incorporating two or more plant communities – would have occurred at the heads of Cockle and Blackwattle Bays(Table 4.2.3).

Table 4.2.3: Likely plant communities of Pyrmont peninsula in 1788

Plant community	Main canopy species	Geology	Occurrence
Estuarine Complex(4a)			
Open-scrub	Grey Mangrove *Avicennia marina* River Mangrove *Aegiceras corniculatus*	Holocene alluvium	Estuarine mudflats with tidal inundation
Herbland	Glasswort *Sarcocornia quinquenervia* Austral Seablite *Suaeda australis*	Holocene alluvium	Occasional tidal inundation
Rushland	Sea Rush *Juncus kraussii* Common Reed *Phragmites australis*	Holocene alluvium	Infrequent tidal inundation; brackish water
Low open-forest	Swamp Oak *Casuarina glauca* Bare Twigrush *Baumea juncea*	Holocene alluvium	Saline soils with periodic flooding
Sydney Sandstone Gully Forest(10ag)			
Open-forest/ woodland	Sydney Peppermint *Eucalyptus piperita* Smooth-barked Apple *Angophora costata* Red Bloodwood *Corymbia gummifera*	Hawkesbury Sandstone	Sheltered hillsides, gullies
Closed-forest	Coachwood *Ceratopetalum apetalum* Water Gum *Tristaniopsis laurina*	Hawkesbury Sandstone	Sheltered gullies
Sydney Sandstone Ridgetop Woodland(10ar)			
Woodland/ low woodland	Red Bloodwood *Corymbia gummifera* Scribbly Gum *Eucalyptus haemastoma* Narrow-leaved Stringybark *Eucalyptus sparsifolia*	Hawkesbury Sandstone	Ridges, plateaux, dry exposed hillsides
Open-scrub	Heath-leaved Banksia *Banksia ericifolia* Dagger Hakea *Hakea teretifolia*	Hawkesbury Sandstone	Poorly-drained soils
Coastal Sandstone Heath(21g)			
Open-heath/ Closed scrub	Heath-leaved Banksia *Banksia ericifolia* *Darwinia fascicularis*	Hawkesbury Sandstone	Exposed sites with shallow, infertile soils
Open-heath/ Closed scrub	Heath-leaved Banksia *Banksia ericifolia* Scrub She-oak *Allocasuarina distyla*	Hawkesbury Sandstone	Widespread, shallow sandy, often poorly-drained soils
Rocky outcrop heath	Fringed Baeckea *Baeckea diosmifolia* Short-leaved Myrtle *Baeckea brevifolia*	Hawkesbury Sandstone	Small patches of soil on rock slabs

Plant community	Main canopy species	Geology	Occurrence
Wet heath	Fern-leaved Banksia *Banksia oblongifolia* Dagger Hakea *Hakea teretifolia*	Hawkesbury Sandstone	Sites with impeded drainage
Sedgeland/ Shrubland	Swamp Banksia *Banksia robur* Native Broom *Viminaria juncea* Button Grass *Gymnoschoenus sphaerocephalus*	Hawkesbury Sandstone	Sites with permanently impeded drainage
Coastal Swamp Forest Complex(27a)			
Open-forest	Swamp Mahogany *Eucalyptus robusta* Cabbage-tree Palm *Livistona australis*	Holocene stream alluvium and estuarine sediment	Creek flats or impeded drainage
Scrub	Snow-in-Summer *Melaleuca linariifolia* Prickly-leaved Paperbark *Melaleuca styphelioides*	Holocene stream alluvium and estuarine sediment	Creek flats or impeded drainage
Reedland	Common Reed *Phragmites australis* Cumbungi *Typha orientalis*	Holocene stream alluvium and estuarine sediment	Creek flats or impeded drainage
Herbland	Spotted Knotweed *Persicaria strigosa* *Blechnum camfieldii* Water Buttons *Troglochin procerum* Bare Twigrush *Baumea juncea*	Holocene stream alluvium and estuarine sediment	Creek flats or impeded drainage

D) Individual Plant Communities

i. Introduction

The complex physical geography of Pyrmont peninsula created diverse environments, which in turn once supported diverse plant communities. In describing these latter, extensive reference is made to the classical studies of plant communities on Hawkesbury Sandstone by Pidgeon(1937/41). Pidgeon (1938:20) developed her descriptions on the Hornsby Plateau, some 20km north-west of Pyrmont peninsula, but noted: 'The type communities as described are very constant and widely distributed, not only in the area studied, but in other Hawkesbury Sandstone localities'.

This account is also informed by the works of Douglas Benson, Jocelyn Howell and Lyn McDougall of the National Herbarium of New South Wales(Benson & Howell, 1988, 1990, 1994; Howell & Benson, 2000; Benson & McDougall, 1993/2005).

ii. Estuarine Complex(4a)

McLoughlin(2000:585) itemised early observations on mangroves in the upper reaches of Port Jackson and in the Parramatta River, including the following:

- 'Went into the SW branch, found it terminate in snug Coves, surrounded with Mangroves …'(Bradley[1788] 1969:76)

- ‘Those coves above where the ships lay were surrounded by Mangroves and had Mud flats at the bottom …’(Bradley[1788] 1969:79)
- ‘For it is strikingly singular that three such noble harbours as Botany Bay, Port Jackson, and Broken Bay, alike end in shallows and swamps, filled with mangroves’(Tench[1792] 1961:64)
- Daniel Paine noted the ‘mangrove which grows in the upper end of the Coves and swamps’(Paine[1794] 1983:38)

Early studies on the mangrove and saltmarsh communities in the Sydney region and Port Jackson specifically were made by Hamilton(1919) and Clarke & Hannon(1967). Documentation on the presence of estuarine communities around Pyrmont peninsula is limited, though. Benson & Howell(1990:56) believed that mangroves and saltmarsh occupied the bays to the west of Pyrmont – Brays, Yaralla, Majors, Exile(in Hen & Chicken) and Canada Bays – in 1788. They noted: ‘These mangrove communities, which were dominated by the Grey Mangrove, were fringed on the landward side by zones of saltmarsh, rushland and Swamp Oak Forest’(Benson & Howell, 1988:4). With respect to Port Jackson itself, they noted: ‘Though relatively uncommon around the Harbour, mangroves were prominent in the upper Parramatta and Lane Cove Rivers’(p. 3). MacLaurin & Hunt(1898:60) noted that Iron Cove Creek ‘runs south-west out of Long Cove, with mud flats and mangroves along one shore, and around the next point[Rudd Point], Iron Cove, a little semi-circular bay, also lined with mangroves at its head’. Particularly relevant is an account on sedimentation in Darling Harbour in 1874 which, in part, read: ‘Some few years ago that space of ground[where the New Iron Wharf had been built] was completely submerged by water at high tide, which flowed past groups of unhealthy looking mangrove trees as far up as where the Castlemaine Brewery now stands’(Anon, 1874). These mangroves would likely have been used early in settlement for making the mallets of stonemasons and cutters(McLoughlin, 1987) and the jelloes and stocks of wheels(Ritchie, 1971).

Incorporating insights from Part 2 of this report, it seems likely that mangroves occurred:

- in a large stand along the western foreshore of Cockle Bay, south of the rocky outcrop below Pyrmont Bay, and probably extending across the mouth of Cockle Creek
- to a limited extent in Jones Bay, at its southern end
- in a narrow fringe around the head of Blackwattle Bay

Mangroves may also have occurred on the extensive mudflats of Pyrmont Bay, although no evidence for this has been found.

To more broadly define the estuarine wetlands of Cockle and Blackwattle Bays, the following observation by Benson & Howell(1994:689) is helpful: ‘The nature of the surrounding country may influence the floristic composition. Estuarine areas on the southernside of the Parramatta River drain from low-relief country with clay soils from Wianamatta Shale. The clayey alluvium originally supported saltmarsh interspersed with broad bare mudflat areas, only infrequently flooded …’. Similarly, McLoughlin(2000:580) has observed that ‘On [the] south side of the [Parramatta] river the sandstone is broken by large embayments, where tributary creeks draining catchments substantially of shale built larger patches of alluvium and inter-tidal mudflats’. She noted that Wianamatta shales have a low resistance to denudation processes, thus producing deposits of alluvium along the river and its tributaries.

In respect of Cockle and Blackwattle creeks, their catchments contain significant areas of both Wianamatta Shale and Hawkesbury Sandstone, suggesting that while both would likely have had mudflats at their mouths, these would have been more limited in extent than those upriver. Their plant communities would have benefitted from the shale nutrients.

It is thus likely that the estuarine vegetation at the heads of the two bays had limited stands of each zone described by Benson & Howell(1994:689), viz:

- Open-scrub of the Grey Mangrove *Avicennia marina* on the seaward side of the mudflats and, possibly, the River Mangrove *Aegiceras corniculatum*
- Herbland of Glasswort *Sarcocornia quinqueflora* and Austral Seablite *Suaeda australis*, creating saltmarsh
- Rushland of Sea Rush *Juncus kraussii* and the Common Reed *Phragmites australis* inshore of the saltmarsh and subject to infrequent tidal inundation
- Low open-forest of the Swamp Oak *Casuarina glauca* and Bare Twigrush *Baumea juncea* further inshore still, but still subject to the saline influence and periodic flooding

Other species would have been associated with the dominants which characterise each of the above zones. To identify these, information on mangrove/saltmarsh communities along the Parramatta River was collated (Table 4.2.4). The species list and stages in succession identified by Pidgeon (1940:225/6) was used to frame this table, as it is more elaborate than that of Benson & Howell(1994). Information was collected at 16 sites along the Parramatta River from Rozelle Bay to Homebush Bay. These sites have been grouped according to the bays in which they occur, giving seven locations in Table 4.2.4.

Table 4.2.4: Floras of the Parramatta River estuarine wetlands

	Homebush Bay (1)	Brays Bay(2)	Yaralla & Majors Bays	Hen & Chicken Bay(3)	Five Dock Bay(4)	Iron Cove(5)	Rozelle Bay(6)
Mangrove open-scrub							
Aegiceras corniculatum	+		+				
Avicennia marina	+	+	+	+	+	+	+
Saltmarsh							
Atriplex australasica	+			+			
Atriplex semibaccata				+			
Halosarcia pergranulata	+						
Samolus repens	+	+				+	
Sarcocornia quinqueflora	+	+	+	+		+	+
Selliera radicans	+					+	
Suaeda australis	+	+	+	+		+	+
Tetragonia tetragonioides	+	+	+	+		+	

	Homebush Bay (1)	Brays Bay(2)	Yaralla & Majors Bays	Hen & Chicken Bay(3)	Five Dock Bay(4)	Iron Cove(5)	Rozelle Bay(6)
Triglochin striata	+	+				+	
Wilsonia backhousei	+	+					
Grass meadow							
Lachnagrostis aemula	+						
Sporobolus virginicus	+	+	+	+		+	
Zoysia macrantha				+			
Rush meadow							
Juncus kraussii subsp. *australiensis*	+	+	+	+		+	
Sedge meadow							
Baumea juncea							
She-oak Forest							
Casuarina glauca	+	+	+	+		+	
Melaleuca styphelioides		+					

Notes:

1. includes Newington Armament Depot
2. includes Lovedale Place Park
3. includes Cabarita, Prince Edward, Bayview and Henry Lawson Parks and Quarantine Reserve
4. includes Lysaght Park
5. includes Half Moon and Sisters Bays, Rodd and Leichhardt Parks, Callan Point
6. includes Bicentennial and Blackwattle Bay Parks

Sources of information:

Adam, P., 1993, Saltmarsh Vegetation Study, in CSIRO, Eds, Homebush Bay Ecological Studies, 1993-1995: Volume 2, Homebush, Sydney Olympic Co-ordination Study.

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City of Canada Bay, 2004, Drummoyne Area Comprehensive Development Plan, City of Canada Bay Council.

Fox & Associates, 1986, Homebush Bay Conservation Study, Sydney, Department of Environment & Planning.

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Lembit, R., n.d., Flora inventory for Canada Bay City Council, Canterbury, Gingra ecological surveys.

Parkland Environmental Planners, 2007, City of Canada Bay: Cabarita Park Plan of Management: Exhibition Draft, Harbord, Parkland Environmental Planners.

URS Australia Pty Ltd(URS), 2005, Rozelle Bay Marine Centre Environmental Assessment.

Eighteen species belonging to mangrove and saltmarsh communities on the Parramatta River are listed in the table. The richest site is the Homebush Bay/Newington Armaments Depot complex, where sixteen species were noted. While species diversity decreased downriver from these sites, dominant species in most successional stages are still found in Iron Cove. It appears that the mangrove/saltmarsh communities along the Parramatta River had good species diversity at European settlement but this has diminished over time as human activities have impacted upon this initial complexity. While *Halosarcia pergranulata* appears restricted to Homebush Bay area, all other species in Table 4.2.4 may once have occurred also in the mangrove/saltmarsh communities of Cockle and Blackwattle Bays.

In respect of Pyrmont peninsula, it seems likely that stands of Estuarine Complex(4a) vegetation, as defined here, occurred in 1788:

- between Cockle Creek mouth and the large sandstone outcrop south of Pyrmont Bay, as illustrated in the detail from Taylor's 'Sydney looking south from Flagstaff Hill'(Figure 2.9)
- perhaps in Pyrmont Bay itself, although there is no evidence of such in Taylor's 'Cockle Bay, now Darling Harbour'(Figure 2.11)
- possibly in Jones Bay, as suggested in the account of Taylor's 'Cockle Bay, now Darling Harbour'(Figure 2.11)
- at the head of Blackwattle Bay, as part of a larger wetland complex(p. 138)

iii. Sydney Sandstone Gully Forest(10ag)

The dominant vegetation across the base of the peninsula, where Ultimo House and its immediate surrounds were located, is shown in sketches of the time. One example is the lithograph of Ultimo House, published by Absalom West in 1814(Figure 2.6). Another is a view of the peninsula base from Brickfield Hill, by Edward Dayes in 1797(Figure 2.7).

This vegetation was most likely Pidgeon's(1938:15) High Forest or the Open-forest of Howell & Benson(2000:702/3). It was probably dominated by such species as Blackbutt *Eucalyptus pilularis*, Sydney Peppermint *Eucalyptus piperita*, and Sydney Red Gum *Angophora costata*. Turpentine *Syncarpia glomulifera* could also have been present, with *Allocasuarina littoralis* widespread as a smaller tree. Pidgeon(1940:15) gave its most frequent understorey species as *Grevillea linearis*, *Persoonia linearis*, *P. pinifolia*, *P. salicina*, *Acacia terminalis*, *A. linifolia*, *Dillwynia ericifolia*, *Gompholobium grandiflorum*, *G. latifolium*, *Platylobium formosum*, *Pultenaea daphnoides*, *Zieria smithii*, and *Dodonaea triquetra.*

- **Closed forest**

  Rainforest elements would likely have occurred on Pyrmont peninsula, particularly along Blackwattle Creek where it ran through the Harris Estate, but also in small patches in other suitable locations. Benson & Howell(1994:703) described this community as follows: 'This is the distinctive riparian flora occurring in narrow bands along perennial creeks. It may be locally of closed-forest structure, but is most commonly scrub, spaced out amongst boulders of the sandstone banks … Characteristic species are *Tristaniopsis laurina*, *Callicoma serratifolia*, *Lomatia myricoides*, *Leptospermum polygalifolium*, and *Austromyrtus tenuifolia*, with *Ceratopetalum apetalum* occurring in more favourable sites.'

Elsewhere, Benson & Howell(1990:61) have noted, in respect of Blackwattle Bay, that it 'appears to take its name from the small tree *Callicoma serratifolia* that probably occurred along creek lines entering the bays'. Indeed, according to Stephenson(1966:214/5): 'The name [Blackwattle] bay was evidently conferred on it by boat parties sent there from Sydney Cove in 1788 to gather wattles and reeds for hut-building'. Similarly, Godden Mackay(1990): noted: 'The stream feeding Blackwattle Bay is shown in early maps to have been swampy as it ran through low land in the vicinity of the present Broadway, and the name given to this area, Black Wattle Swamp, suggests that the Black Wattle(*Callicoma serratifolia*) grew in this vicinity, as it no doubt did along other streams entering the harbour'.

Leslie & Douglas(2004:18) provided a sketch map of a section of the Ultimo Estate towards 'Blackwattle Swamp Creek', prepared by E.Knapp(1830/31) (SRNSW, SG FNB, Reel 268). The map shows a patch of 'Brush' above flats fronting that creek. Knapp also showed a fenceline from the creek. His plan matches the sketch prepared by Emily Manning in 1837, a few years later (Figure 2.23). The 'brush'(or rainforest) illustrated by Manning would have extended over most of the river delta deposits traversed by Blackwattle Creek and would have continued towards Blackwattle Bay itself from the place illustrated by Knapp and Manning.

It is likely that elements of closed forest/rainforest also occurred along the creeks feeding into the head of Cockle Bay(see below).

Figure 4.2.7: Elyard, S., 1842, Bird's nest fern, cabbage tree palm, and rainforest vegetation (ML PX*D 61/31)

Although likely drawn in the Illawarra, this delightful sketch by Samuel Elyard illustrates two species likely to have occurred in better-formed rainforest patches on Pyrmont peninsula, especially near Blackwattle Creek.

iv. Sydney Sandstone Ridgetop Woodland(10ar)

This would have been the dominant vegetation unit on Pyrmont peninsula. Benson & Howell(1990:23) captured well the complex mosaic of this vegetation, resulting from the interplay of several factors:

> *'Vegetation patterns on the sandstone landscapes respond strongly to the variety of local habitats. Topography affects available soil moisture; steeper slopes tend to be better drained than gentler ones, and slopes facing north and west receive more sunlight, drying out faster than those facing south and east. South-facing slopes are generally steeper than north-facing ones. Deeper soils accumulate downslope, less exposed to the drying effects of the sun, providing moister and often more fertile conditions for plants. Lenses of shale, interbedded among the sandstone layers, weather to pockets of clay-rich soils, with higher fertility and better water holding capacity than the sandstone soils. Shale strata may also concentrate water, providing locally wetter conditions in springs or soaks'.*

- **Sandstone outcrop**

  Pyrmont peninsula once had a striking and highly visible sandstone spine, which would have sustained a particular flora. The likely nature of this flora is now described.

  Pidgeon(1940) provided a detailed account of the colonisation of rock outcrops. The pioneer colonisers are crustaceous lichens, followed by foliose and fruticose lichens, mosses and such higher life forms as herbs and shrubs. These latter often form small "vegetation islands" in depressions on the rock outcrop, where soil and moisture are sufficient for plant growth. Typical plants of these islands are *Lepyrodia scariosa*, *Ptilothrix deusta*, *Schoenus imberbis*, *Lepidosperma laterale*, *Lomandra longifolia*, and *Dianella caerulea*.

  Crevices in the rock outcrop, caused by weathering, would have supported such species as *Lomandra longifolia*, *Xanthorrhoea resinosa*, *Lepidosperma laterale*, *Dianella caerulea*, *Epacris longiflora* and, less commonly, *Schizaea bifida*. Crevice communities in moist, shady places would have supported plants like *Gleichenia microphylla*, *Doodia aspera*, *Doodia caudata*, *Calochlaena dubia*, and *Dracophyllum secundum*.

  Where there were water seepages in sunny locations on the rock outcrop, mosses and algae could have occurred together with such low-growing shrubs and herbs as *Epacris microphylla*, *Actinotus minor*, *Empodisma minus*, *Mitrasacme polymorpha*, *Dracophyllum secundum*, *Bauera rubioides* and *Epacris longiflora*. Sundews(*Drosera spp*) and geophytic orchids may also have been present. Taller shrubs near wet rock ledges could have included *Callistemon linearis*, *Leptospermum parvifolium*, and *Leptospermum arachnoides.*

- **Sandstone slopes**

  The north-western slope, which today occupies the land between the former Glebe Island Bridge and Pyrmont Point, inclined, sometimes steeply, downwards from the ridge tops to the water's edge. Its aspect would have exposed its vegetation and soils considerably to the sun, so that it likely supported typical sandstone woodland with 'multi-trunked trees and an understorey dense with shrubs'(Howell & Benson, 2000:30) along the ridge tops and on the upper slopes. Benson & Howell(1994:704) noted that 'this[vegetation] is structurally very variable and includes areas of woodland, open woodland, low woodland and low open-woodland, depending on local aspect, soil and drainage conditions, as well as the time since the last fire'. As such, it includes Pidgeon's(1940) scrub, tree-scrub, low scrub-forest and tall scrub-forest(Benson & Howell, 1994:701). Pidgeon(1940:242), whose mixed Eucalyptus Forest Assocation encompasses these vegetation units, noted: 'This Association differs from the typical coastal forests in the stunting of the trees(average height, approx. 15 metres), the open canopy, the well developed shrub strata, and relative absence of herbs and grasses'. Such a description would have applied to much of the original vegetation of Pyrmont peninsula.

  This community would have been characterised particularly by *Corymbia gummifera*, *Eucalyptus haemastoma*, *Angophora costata* and *Eucalyptus sparsifolia.* The understorey would have had a rich shrub and herb flora characterised by such species as *Banksia ericifolia*, *Boronia ledifolia*, *Dillwynia retorta*, *Lambertia formosa*, *Leptospermum attenuatum*, *Petrophile pulchella* and *Pultenaea elliptica*

(Benson & Howell, 1990:24).

Sydney Peppermint *Eucalyptus piperita* and Black She-oak *Allocasuarina littoralis* would have intermingled with the above species lower on the slope. The Swamp Oak *Casuarina glauca* could have grown where the saline influence of Johnston's Bay was felt.

The Darling Harbour frontage of Pyrmont peninsula has an almost easterly aspect. It also has a lower elevation than Pyrmont Point, for the most part being less than twenty metres above sea level. Its landform is well-described by Chapman & Murphy's(1981) account of the Gymea soil landscape: 'Broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps'.

As these slopes were less exposed to such harsh conditions as those across the top of the peninsula, they probably had a more forested appearance. The vegetation was most likely characterised by *Eucalyptus piperita*, *Angophora costata*, and *Corymbia gummifera*. *Allocasuarina littoralis* would have been a common smaller tree. Understorey dominants would most likely have included *Persoonia pinifolia*, *Acacia terminalis*, *Pultenaea flexilis*, and *Dodonaea triquetra*. More localised species would have likely included *Ceratopetalum gummiferum*, *Xylomelon pyriforme*, *Xanthorrhoea arborea*, *Ricinocarpus pinifolius*, and *Gompholobium latifolium*(Benson & Howell, 1994:702).

It is possible that the account of Richard Atkins(in Cobley, 1965) referred to this vegetation:

> *'This evening[17 April 1792] I walked by myself to the Brick fields, about a mile from the Camp ... A very good road is made the whole way through the wood, where trees of an immense size border it on both sides, their lofty and wide spread Branches look beautiful … An arm of the sea appears thro' the wood and beyond it another wood rising gradually to a moderate height which terminates the prospect'.*

Kartzoff(1969:14) believed this to be a view of Balmain, but it more likely was of Pyrmont peninsula, looking across Cockle Bay.

- **Closed-forest**

Small depauperate rainforest pockets would have occurred in sheltered sites in the sclerophyll vegetation of the peninsula, where shade-tolerant species could survive. Pidgeon(1937:333) remarked that: 'In favourable habitats on the sandstone, hardier marginal rain-forest species are frequently admixed with sclerophyllous types to form a true ecotone'. These patches may have resembled the closed-forest *Ceratopetalum apetalum-Tristaniopsis laurina* described elsewhere(p. 132/133).

v. Coastal Sandstone Heath(21g)

Although a community characteristic of coastal headlands, patches of heath would once have occurred more widely around Port Jackson where soils were not good enough to support woodland or forest vegetation. In particular, heathland would have occurred on Pyrmont peninsula in association with the sandstone spine and where soaks formed from the drainage of water seeping out of the sandstone.

Benson & Howell(1994:707/711) recognised eight heathland communities in the Sydney region, five of which may have once occurred on Pyrmont peninsula.

- **Open-heath/closed scrub *Banksia ericifolia-Darwinia fascicularis***

  This heathland would have occurred in exposed areas adjoining rock outcrops where soils were shallow and infertile, and the vegetation was subjected to winds from the sea. Frequent species listed by Benson & Howell(1994:709) were *Allocasuarina distyla, Hakea teretifolia, Melaleuca nodosa, Dillwynia floribunda, Lasiopetalum ferrugineum, Baeckea imbricata, Leucopogon microphyllus, Lepidosperma viscidum, Philotheca buxifolia* and *Epacris microphylla*. Benson & Howell considered drainage and soil depth were important in determining which species were present.

- **Open-heath/closed scrub *Allocasuarina distyla-Banksia ericifolia***

  According to Benson & Howell(1994:710), this community occurs further inland than the preceding one, and so could have been more widespread on Pyrmont peninsula. It grows up to 4m high, with species such as *Banksia ericifolia, Allocasuarina distyla, Leptospermum trinervium, Phebalium squamulosum, Phyllota phylicoides, Angophora hispida,* and *Pultenaea tuberculata.*

- **Rocky outcrop heath *Baeckea diosmifolia-Baeckea brevifolia***

  This community would have been associated with small pockets of shallow soil occurring patchily on expanses of bare rock along the sandstone spine of Pyrmont peninsula. A dense shrub cover to 1.5m would have been formed by species like *Baeckea diosmifolia, Baeckea brevifolia, Allocasuarina distyla, Darwinia fascicularis, Kunzea capitata, Isopogon anemoniifolius,* and *Dillwynia sericea*(Benson & Howell, 1994:710).

- **Wet heath *Hakea teretifolia-Banksia oblongifolia***

  This community would have occurred where drainage was impeded, particularly on rock platforms along the eastern flank of the peninsula. It is a closed heath, growing to 2 metres, and dominated by such shrubs as *Banksia oblongifolia, Banksia ericifolia, Hakea teretifolia, Dillwynia floribunda, Epacris obtusifolia, Leptospermum squarrosum, Baeckea imbricata,* and *Sprengelia incarnata*(Benson & Howell, 1994: 710). Such delightful herbs as *Burchardia umbellata* and *Blandfordia nobilis* would also have been present. Pidgeon(1938:18) gave a fuller species list for this community, which she called 'shrub swamp'.

- **Sedgeland/shrubland *Banksia robur-Viminaria juncea-Gymnoschoenus sphaerocephalus***

  It is likely that in some places along the eastern flank of Pyrmont peninsula water movement downslope would have been permanently impeded, creating a soil which was waterlogged for most of the time (c.f. Benson & Howell, 1994:710). Such sites would have been dominated by species of the Cyperaceae, Restionaceae, and Xyridaceae, *such as Lepidosperma filiforme, Schoenus brevifolius, Schoenus moorei, Eurychorda complanata, Xyris complanata, Xyris gracilis, Xyris operculata, Leptocarpus tenax, Lepyrodia scariosa,* and *Baloskion tetraphyllum*(Pidgeon, 1938:17). Pidgeon gave a fuller species list for this community, which she called 'sedge swamp'.

vi. Coastal Swamp Forest Complex(27a)

There were once swamps towards the mouth of Cockle Creek, although descriptions appear sketchy and contemporary botanical accounts non-existent. Selfe's(1908:245) account of the Haymarket Valley swamps and their demise is given elsewhere(p. 50/51). Foster(1919:155/6) also described the former condition of the Haymarket area, as follows:

'The site chosen for the new Burial Ground was one of a range of sandhills lying south of the Brickfields, from which it was separated by a valley known to us as Belmore Park and the Haymarket.

'Through this valley a stream of water flowed, crossing George-street near its intersection with Hay-street, and emptied into Cockle Bay – now known as Darling Harbour – at that time much nearer George-street than it is to-day.

'It is easy to picture a stream of water running into the harbour at the foot of Brickfield Hill; but not so easy to picture – a stream crossing George-street near Goulburn-street; yet such was the case, and both there and at the Haymarket bridges were erected across these streams.

'We can gain some idea of the changed configuration of Brickfield Hill by recalling the fact that in the Thirties, not less than one million cubic feet of earth was removed from the hill and placed in the valley below. By such means, hills, hollows and rivulets so completely disappeared that to-day one can scarcely believe they ever existed'.

During the Baudin expedition, Charles-Alexandre Lesueur drew a plan of Sydney in 1802(Bonnemains et al., 1988:106). This plan shows, inter alia, the mouths of two creeks entering the head of Cockle Bay (Figure 3.7). It is probable that the distinctive vegetation at the mouth of the larger, Cockle Creek, was stands of mangroves, with saltmarsh behind. The swamps would have been located upstream of the mangrove/saltmarsh complex, probably above and below the bridge shown by Lesueur. If so, it is likely that the swamps were freshwater upstream of the bridge transitioning to brackish towards the mouth of Cockle Creek. They would have received nutrients from both the Wianamatta shale and Hawkesbury sandstone-derived soils in the creek catchment. Further upstream would have been the swamp forest of Benson & Howell(1990:42), characterised by Swamp Mahogany *Eucalyptus robusta* and Swamp She-Oak *Casuarina glauca.*

The flora of these swamps would have likely resembled the 'River Succession' of Pidgeon(1940:231/2). Submerged or floating plants were probably absent, without significant standing water. A small number of amphibious species would likely have occurred(Table 4.2.5). Of these, the salt-tolerant *Phragmites australis* would likely have occurred just upstream of the mangrove/saltmarsh complex. Other salt-tolerant herbs and the Swamp Oak *Casuarina glauca* would also have occurred within the limits of the saline influence, while salt-intolerant herbs would have occurred further upstream, where Swamp Mahogany became the dominant canopy species. Interspersed in the Swamp Mahogany forest would have been a small number of rainforest species, including the Cabbage Tree Palm *Livistona australis.* Tench[1793](1961:263) noted of this species: 'That species of palm –tree which produces the mountain cabbage, is also found in most of the fresh water swamps, within six or seven miles of the coast. But it is rarely seen further inland'. Cockle Creek would likely have been, along with Rose Bay and probably Double and Rushcutters Bays(Kartzoff, 1969:39), among the nearest sources of Cabbage-tree Palms *Livistona australis* with which the first structures at Sydney Cove were built.

Table 4.2.5: Likely flora of the Cockle Creek wetlands (see also Pidgeon, 1940)

	Scientific Name	Common Name
Mangroves	*Avicennia marina*	Grey Mangrove
	Aegiceras corniculatum	River Mangrove
Saltmarsh	*Sarcocornia quinqueflora*	Glasswort
	Suaeda australis	Seablite
	Triglochin striata	Streaked Arrowgrass
	Samolus repens	Creeping Brookweed
	Cotula coronopifolia	Waterbuttons[CHECK)
	Selliera radicans	
	Lobelia anceps	Angled Lobelia
Grass meadow	*Sporobolus virginicus*	Saltwater Couch
	Zoysia macrantha	Prickly Couch
	Cynodon dactylon	Couch
	Lachnagrostis aemula	Blown Grass
Rush and sedge meadows	*Juncus kraussii*	Sea Rush
	Baumea juncea	Bare Twig-rush
Tea-tree Thicket	*Melaleuca ericifolia*	Swamp Paperbark
Amphibious species (usually in water, but rooted in substrate)	*Eleocharis sphacelata*	Tall Spikerush
	Juncus usitatus	Common Rush
	Paspalum distichum	Water Couch
	Persicaria decipiens	Slender Knotweed
	Persicaria lapathifolia	Pale Knotweed
	Philydrum lanuginosum	Frogmouth
	Phragmites australis	Common Reed
	Triglochin procera	Water Ribbons

	Scientific Name	Common Name
She-oak Forest	*Casuarina glauca*(with epiphytic orchid *Dendrobium teretifolium*)	Swamp Oak
	Melaleuca linariifolia	Snow-in-Summer
	Melaleuca styphelioides	Prickly-leaved Tea-tree
Eucalypt Forest (with rainforest elements)	*Eucalyptus robustus*	Swamp Mahogany
	Livistona australis	Cabbage-tree Palm
	Acmena smithii	Lillypilly
	Backhousia myrtifolia	Grey Myrtle
	Breynia oblongifolia	Coffee Bush
	Callicoma serratifolia	Black Wattle
	Ceratopetalum apetalum	Coachwood
	Elaeocarpus reticulatus	Blueberry Ash
	Endiandra sieberi	Hard Corkwood
	Eupomatia laurina	Bolwarra
	Ficus spp.	Figs
	Glochidion ferdinandi	Cheesewood
	Homalanthus populifolius	Bleeding Hearts
	Pittosporum revolutum	Wild Yellow Jasmine
	Pittosporum undulatum	Sweet Pittosporum
	Synoum glandulosum	Scentless Rosewood
	Tasmannia insipida	Brush Pepperbush
	Tristaniopsis laurina	Kanuka
Associated Species		
a. Salt-tolerant	*Baumea juncea*	Bare Twigrush
	Blechnum camfieldii	
	Blechnum indicum	Swamp Water Fern
b. Freshwater	*Carex appressa*	
	Centella asiatica	Indian Pennywort
	Gahnia sieberiana	
	Goodenia paniculata	
	Juncus planifolius	Broad-leaf Rush
	Lachnagrostis filiformis	Blown Grass
	Oplismenus imbecillis	
	Schoenus apogon	Fluke Bogrush

It is likely that circumstances were similar in respect of Blackwattle Creek. Knapp(in Leslie & Douglas, 2004:18) showed the eastern frontage of Blackwattle Bay as having large swampy areas from the mouth of Blackwattle Creek at least to the southern side of the deeply-indented bay just below the lance-shaped point into the main bay. This information can be interpreted in conjunction with Joseph Lycett's 'West view of Sydney taken from Grose's farm'(Figure 2.24). Lycett showed a band of distinctively-foliaged trees on Knapp's 'swampy' ground, with the appearance of paperbarks. It is likely that at some point downstream of the fenceline depicted by Emily Manning(Figure 2.23) the rainforest along Blackwattle Creek gave way to a paperbark swamp forest which extended up most of the eastern side of Blackwattle Bay.

The mouths of other creeks feeding from Pyrmont peninsula into Cockle and Blackwattle Bays would likely to have also supported elements of this swamp complex.

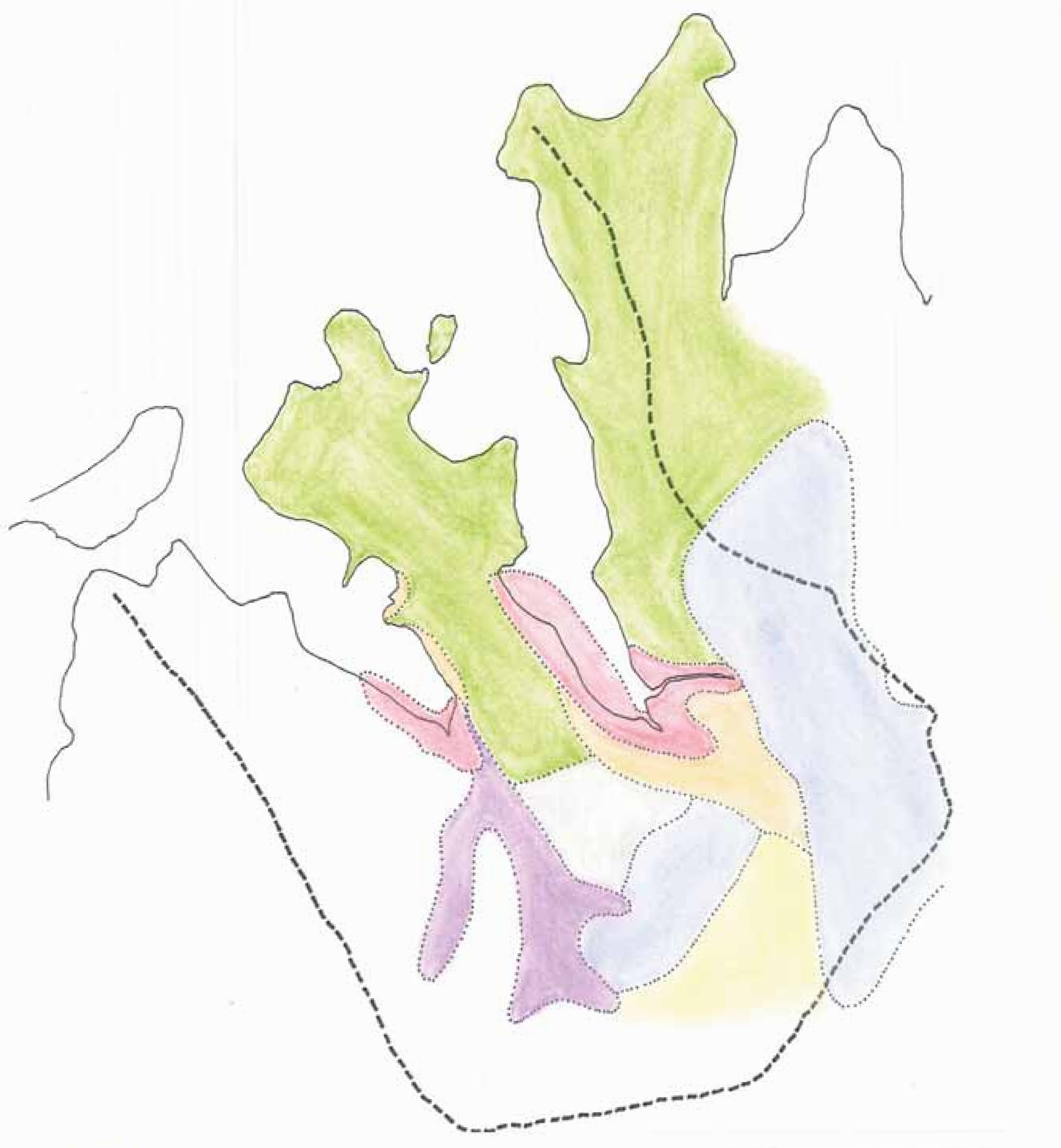
4.2.5 General Conclusions

Four individuals stand out in respect of their contributions to our knowledge of the flora of Port Jackson. Sir James Edward Smith and Robert Brown were plant taxonomists who together described many of the species which once would have occurred on Pyrmont peninsula. But their contributions would not have been possible without the involvement of two other people influential in the affairs of the new settlement. Sir Joseph Banks was one, creating and sustaining the organisation, funding and personnel needed to ensure early and extensive documentation of Australia's flora. Surgeon-General John White was the other. White sailed with the First Fleet and was a central figure in the early description of the colony's flora and fauna. His account, Journal of a Voyage to New South Wales, was completed in late 1788 and published in 1790: 'Accompanying the text were sixty-five engravings illustrating the natural history and products of the colony; drawn in England from specimens sent by White, with descriptions by English specialists(Rienits, 1967:594). Rienits(1967) further observed: '[White] pursued his natural history studies and sent many specimens and drawings to England. When Thomas Watling, convict and artist, reached the colony in October 1792 he was assigned to White and in the next two years made many drawings for him … White reached London in July 1795 … He contemplated publishing a second book and sent a rough manuscript and many drawings to A.B. Lambert, a noted botanist, but the project came to nothing. The manuscript appears to have been lost and the drawings are possibly those which form the so-called Watling Collection now preserved in the British Museum(Natural History)'(pp.594/5). White's collaboration with Smith is described elsewhere(pp. 73/74).

The diverse landscapes of Pyrmont peninsula, and the catchments of Cockle and Blackwattle Creeks, would have once supported a rich flora. It is estimated that some 675 species would have occurred on the peninsula at European settlement, supplemented by up to another 202 for which information is more scant.

Not surprisingly, so diverse a flora would have found representation through several plant communities on the peninsula, ranging from rich assemblages in the wetlands of the major creeks to the limited ones of rocky outcrops. Overall, some 17 plant communities may once have been represented on the peninsula. Some of these, especially ridgetop woodland and gully forest would have been widespread while the estuarine and coastal swamp communities would have been more restricted – particularly to the heads of the two bays and associated creeks. The likely distribution of the major vegetation types on Pyrmont peninsula is shown in Figure 4.2.8.

Figure 4.2.8: Likely distribution of major vegetation types on Pyrmont peninsula in 1788



	Sandstone Ridgetop Woodland, with heath elements, with species such as Red Bloodwood *Corymbia gummifera*, Scribbly Gum *Eucalyptus haemastoma*, Heath-leaved Banksia *Banksia ericifolia* and Scrub She-oak *Casuarina distyla*
	Open-forest on sandstone, with species like Sydney Red Gum *Angophora costata*, Blueberry Ash *Elaeocarpus reticulatus* and Sydney Peppermint *Eucalyptus piperita*
	Coastal dune heath, with species like Wallum Banksia *Banksia aemula* and Grass Tree *Xanthorrhoea resinosa* (Eastern Suburbs Banksia Scrub)
	Tall Open-forest on shale, with species like Blackbutt *Eucalyptus pilularis*
	Rainforest, with species like Black Wattle *Callicoma serratifolia*, Water Gum *Tristaniopsis laurina*, Lilly Pilly *Acmena smithii*, Coachwood *Ceratopetalum apetalum*, Cabbage Palm *Livistona australis* and ferns
	Coastal swamp-forest, dominated by Swamp Mahogany *Eucalyptus robustus* with rainforest elements
	Estuarine wetlands, with Grey Mangroves *Avicennia marina*, saltmarsh species, rushes including the Common Reed *Phragmites australis*, and low open-forest including Swamp Oak *Casuarina glauca*

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4.2.7 Appendices

Appendix A: Likely flora of Pyrmont peninsula in 1788

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Ferns and fern allies		
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair
	Adiantum formosum	Giant Maidenhair
	Adiantum hispidulum	Rough Maidenhair
	Adiantum silvaticum	-
	Cheilanthes distans	Bristly Cloak Fern
	Cheilanthes sieberi	Poison Rock Fern
	Pellaea falcata	Sickle Fern
	Pellaea paradoxa	-
Aspleniaceae	*Asplenium australasicum*	Bird's Nest Fern
	Asplenium flabellifolium	Necklace Fern
Blechnaceae	*Blechnum ambiguum*	Lance Water Fern
	Blechnum camfieldii	-
	Blechnum cartilagineum	Gristle Fern
	Blechnum indicum	Swamp Waterfern
	Blechnum nudum	Fishbone Waterfern
	Doodia aspera	Prickly Rasp Fern
	Doodia caudata	
Cyatheaceae	*Cyathea australis*	Black Tree-fern
Davalliaceae	*Davallia solida*	Hare's Foot Fern
Dennstaedtiaceae	*Dennstaedtia davallioides*	Lacy Ground Fern
	Histiopteris incisa	Bat's Wing Fern
	Hypolepis glandulifera	Downy Ground Fern
	Hypolepis muelleri	Harsh Ground Fern
	Pteridium esculentum	Bracken
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Dryopteridaceae	*Lastreopsis decomposita*	Trim Shield Fern
	Lastreopsis microsora	Creeping Shield Fern
Gleicheniaceae	*Gleichenia dicarpa*	Pouched Coral Fern
	Gleichenia microphylla	Scrambling Coral Fern
	Gleichenia rupestris	-
	Sticherus flabellatus	Shiny Fan Fern
Grammitidaceae	*Grammitis billardierei*	Finger Fern
Hymenophyllaceae	*Hymenophyllum cupressiforme*	Common Filmy Fern
Lindsaeaceae	*Lindsaea linearis*	Screw Fern
	Lindsaea microphylla	Lacy Wedge Fern
Lycopodiaceae	*Lycopodiella cernua*	Scrambling Club Moss
	Lycopodiella lateralis	Slender Clubmoss
	Lycopodium deuterodensum	Bushy Clubmoss
Osmundaceae	*Todea barbara*	King Fern
Polypodiaceae	*Microsorum scandens*	Fragrant Fern
	Platycerium bifurcatum	Elkhorn
	Pyrrosia rupestris	Rock Felt Fern
Psilotaceae	*Psilotum nudum*	Skeleton Fork-Fern
	Tmesipteris truncata	Fork-Fern
Pteridaceae	*Pteris tremula*	Common Tender Brake
	Pteris vittata	Chinese Brake
Schizaeaceae	*Schizaea bifida*	Forked Comb Fern
	Schizaea dichotoma	Branched Comb Fern
Selaginellaceae	*Selaginella uliginosa*	Swamp Selaginella

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Family	Botanical Name	Common Name
Thelypteridaceae	*Christella dentata*	Binung
	Cyclosorus interruptus	-
Cycads		
Zamiaceae	*Macrozamia communis*	Burrawang
Conifers		
Cupressaceae	*Callitris muelleri*	Mueller's Cypress
	Callitris rhomboidea	Port Jackson Pine
Podocarpaceae	*Podocarpus spinulosus*	Spiny-leaf Podocarp
Dicotyledons		
Acanthaceae	*Avicennia marina*	Grey Mangrove
	Brunoniella pumilio	Dwarf Blue Trumpet
	Pseuderanthemum variabile	Pastel Flower
Aizoaceae	*Tetragonia tetragonioides*	Native Spinach
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
Apiaceae	*Actinotus helianthi*	Flannel Flower
	Actinotus minor	Lesser Flannel Flower
	Apium prostratum	Sea Celery
	Centella asiatica	Indian Pennywort
	Hydrocotyle acutiloba	-
	Hydrocotyle laxiflora	Stinking Pennywort
	Hydrocotyle peduncularis	-
	Hydrocotyle tripartita	Pennywort
	Platysace ericoides	Heath Platysace
	Platysace lanceolata	Shrubby Platysace
	Platysace linearifolia	Narrow-leaf Platysace
	Platysace stephensonii	-
	Trachymene incisa	-
	Xanthosia pilosa	Woolly Xanthosia
	Xanthosia tridentata	Rock Xanthosia

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Family	Botanical Name	Common Name
Apocynaceae	*Marsdenia rostrata*	Milk Vine
	Marsdenia suaveolens	Scented Marsdenia
	Parsonsia straminea	Common Silkpod
	Tylophora barbata	Bearded Tylophora
Araliaceae	*Astrotricha floccosa*	Broad-leaf Star-hair
	Astrotricha latifolia	
	Astrotricha longifolia	Long-leaf Star-hair
	Polyscias elegans	Celery Wood
	Polyscias sambucifolia	Elderberry Ash
Asteraceae	*Brachyscome angustifolia*	-
	Cassinia aculeata	Dolly Bush
	Cassinia denticulata	Stiff Cassinia
	Cassinia uncata	Sticky Cassinia
	Cotula australis	Carrot Weed
	Epaltes australis	Spreading Nut-Heads
	Euchiton gymnocephalus	Creeping Cudweed
	Helichrysum elatum	Tall White Everlasting
	Lagenophora stipitata	Blue Bottle-Daisy
	Olearia microphylla	Small-leaved Daisy-Bush
	Olearia tomentosa	Toothed Daisy-Bush
	Ozothamnus diosmifolius	White Dogwood
	Pseudognaphalium luteoalbum	Jersey Cudweed
	Senecio hispidulus	Fireweed
	Senecio lautus	Variable Groundsel
	Solenogyne bellioides	-
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine
Campanulaceae	*Wahlenbergia communis*	
	Wahlenbergia gracilis	Australian Bluebell
	Wahlenbergia stricta	Tall Bluebell
Casuarinaceae	*Allocasuarina distyla*	Scrub She-oak

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Allocasuarina littoralis	Black She-oak
	Allocasuarina paludosa	Swamp She-oak
	Allocasuarina portuensis	Nielsen Park She-oak
	Allocasuarina torulosa	Forest Oak
	Casuarina glauca	Swamp Oak
Celastraceae	*Maytenus silvestris*	Orange Bark
Chenopodiaceae	*Chenopodium glaucum*	
	Einadia nutans	Climbing Saltbush
	Einadia trigonos	Fishweed
	Sarcocornia quinqueflora	Glasswort
	Suaeda australis	Seablite
Clusiaceae	*Hypericum gramineum*	Small St John's Wort
	Hypericum japonicum	Matted St John's Wort
Convolvulaceae	*Calystegia marginata*	-
	Convolvulus erubescens	Blushing Bindweed
	Dichondra repens	Kidney Weed
	Polymeria calycina	Polymeria
Crassulaceae	*Crassula decumbens*	-
	Crassula sieberiana	Australian Stonecrop
Cunoniaceae	*Bauera rubioides*	River Rose
	Callicoma serratifolia	Black Wattle
	Ceratopetalum apetalum	Coachwood
	Ceratopetalum gummiferum	Christmas Bush
	Schizomeria ovata	Snow Berry
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
	Hibbertia bracteata	Blue Mountains Guinea Flower
	Hibbertia cistiflora	-
	subsp. *cistiflora*	
	Hibbertia dentata	Trailing Guinea Flower

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Hibbertia diffusa	Wedge Guinea Flower
	Hibbertia empetrifolia	Trailing Guinea Flower
	Hibbertia fasciculata	-
	Hibbertia linearis	-
	Hibbertia scandens	Climbing Guinea-Flower
	Hibbertia serpyllifolia	Hairy Guinea-Flower
Droseraceae	*Drosera auriculata*	Sundew
	Drosera binata	Forked Sundew
	Drosera peltata	Pale Sundew
	Drosera pygmaea	Pygmy Sundew
	Drosera spatulata	Common Sundew
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
	Tetratheca ericifolia	-
	Tetratheca glandulosa	-
Ericaceae	*Astroloma humifusum*	Native Cranberry
	Astroloma pinifolium	Pine Heath
	Brachyloma daphnoides	Daphne Heath
	Dracophyllum secundum	-
	Epacris crassifolia	-
	Epacris longiflora	Fuchsia Heath
	Epacris microphylla	Coral Heath
	Epacris obtusifolia	Blunt-leaf Heath
	Epacris pulchella	Wallum Heath
	Leucopogon amplexicaulis	Beard-Heath
	Leucopogon ericoides	Pink Beard-Heath
	Leucopogon esquamatus	-
	Leucopogon juniperinus	Prickly Beard-Heath
	Leucopogon lanceolatus var. *lanceolatus*	Lance-leaf Beard-Heath
	Leucopogon microphyllus	Small-leaved Beard-Heath
	Leucopogon setiger	-
	Lissanthe sapida	Native Cranberry
	Lissanthe strigosa	Peach Heath

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Melichrus procumbens	Jam Tarts
	Monotoca elliptica	Tree Broom-Heath
	Monotoca scoparia	Prickly Broom-Heath
	Sprengelia incarnata	Pink Swamp-Heath
	Styphelia laeta	-
	Styphelia longifolia	Long-leaf Styphelia
	Styphelia triflora	Pink Five-Corners
	Styphelia tubiflora	Red Five-Corner
	Styphelia viridis	
	Trochocarpa laurina	Axebreaker
	Woollsia pungens	Woollsia
Euphorbiaceae	*Amperea xiphoclada*	Broom Spurge
	Breynia oblongifolia	Coffee Bush
	Glochidion ferdinandi	Cheese Tree
	Homalanthus populifolius	Bleeding Heart
	Micrantheum ericoides	-
	Micrantheum hexandrum	-
	Monotaxis linifolia	Monotaxis
	Phyllanthus gunnii	Scrubby Spurge
	Phyllanthus hirtellus	-
	Poranthera corymbosa	-
	Poranthera ericifolia	Heath-leaved Poranthera
	Poranthera microphylla	Small Poranthera
	Pseudanthus orientalis	-
	Ricinocarpos pinifolius	Wedding Bush
Fabaceae	*Acacia binervata*	Two-veined Hickory
	Acacia binervia	Coastal Myall
	Acacia brownii	Heath Wattle
	Acacia bynoeana	Bynoe's Wattle
	Acacia decurrens	Green Wattle
	Acacia echinula	Hedgehog Wattle
	Acacia elata	Cedar Wattle
	Acacia fimbriata	Fringed Wattle
	Acacia floribunda	Gossamer Wattle

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Family	Botanical Name	Common Name
	Acacia hispidula	-
	Acacia implexa	Hickory Wattle
	Acacia irrorata subsp. *irrorata*	Blueskin
	Acacia linifolia	White Wattle
	Acacia longifolia subsp. *longifolia*	Sydney Golden Wattle
	Acacia longissima	Long-leaf Wattle
	Acacia maidenii	Maiden's Wattle
	Acacia myrtifolia	Red-stemmed Wattle
	Acacia parramattensis	Parramatta Wattle
	Acacia parvipinnula	Silver-stemmed Wattle
	Acacia prominens	Gosford Wattle
	Acacia quadrilateralis	-
	Acacia suaveolens	Sweet Wattle
	Acacia terminalis	Sunshine Wattle
	Acacia ulicifolia	Prickly Moses
	Aotus ericoides	Common Aotus
	Bossiaea ensata	Sword Bossiaea
	Bossiaea heterophylla	Variable Bossiaea
	Bossiaea obcordata	Spiny Bossiaea
	Bossiaea scolopendria	-
	Daviesia corymbosa	
	Daviesia umbellulata	-
	Desmodium rhytidophyllum	Rusty Tick-trefoil
	Dillwynia floribunda	-
	Dillwynia glaberrima	Smooth Parrot-pea
	Dillwynia retorta	Eggs and Bacon
	Dillwynia rudis	
	Glycine clandestina	Twining Glycine
	Glycine microphylla	Small-Leaf Glycine
	Glycine tabacina	-
	Gompholobium glabratum	Dainty Wedge Pea
	Gompholobium grandiflorum	Large Wedge Pea
	Gompholobium latifolium	Golden Glory Pea
	Gompholobium pinnatum	Pinnate Wedge Pea
	Hardenbergia violacea	False Sarsparilla
	Hovea linearis	Narrow-leaf Hovea

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Family	Botanical Name	Common Name
	Hovea longifolia	Rusty Pods
	Kennedia rubicunda	Dusky Coral Pea
	Mirbelia rubiifolia	Heathy Mirbelia
	Oxylobium cordifolium	
	Platylobium formosum	Handsome Flat-pea
	Pultenaea blakelyi	-
	Pultenaea daphnoides	Large-leaf Bush-pea
	Pultenaea ferruginea	-
	Pultenaea flexilis	-
	Pultenaea hispidula	-
	Pultenaea linophylla	-
	Pultenaea polifolia	-
	Pultenaea retusa	-
	Pultenaea scabra	-
	Pultenaea stipularis	-
	Pultenaea tuberculata (syn. *P. elliptica*)	-
	Viminaria juncea	Native Broom
Geraniaceae	*Geranium homeanum*	-
	Pelargonium australe	
Goodeniaceae	*Dampiera purpurea*	Purple Dampiera
	Dampiera stricta	Blue Dampiera
	Goodenia bellidifolia	-
	Goodenia dimorpha var. *dimorpha*	-
	Goodenia hederacea	Ivy Goodenia
	Goodenia heterophylla subsp. *eglandulosa*	
	Goodenia ovata	Hop Goodenia
	Goodenia paniculata	Branched Goodenia
	Goodenia stelligera	Spiked Goodenia
	Scaevola albida	Pale Fan-Flower
	Scaevola ramosissima	Purple Fan-Flower
	Velleia lyrata	-

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Haloragaceae	*Gonocarpus micranthus*	Creeping Raspwort
	Gonocarpus salsoloides	-
	Gonocarpus tetragynus	-
	Gonocarpus teucrioides	Raspwort
Lamiaceae	*Chloanthes stoechadis*	
	Clerodendrum tomentosum	Hairy Clerodendrum
	Hemigenia purpurea	Common Hemigenia
	Plectranthus parviflorus	Cockspur Flower
	Prostanthera denticulata	Rough Mint-Bush
	Prostanthera ovalifolia	Mint Bush
	Westringia fruticosa	Coastal Rosemary
Lauraceae	*Cassytha glabella*	Devil's Twine
	Cassytha pubescens (syn. *Cassytha paniculata)*	Devil's Twine
	Cryptocarya glaucescens	Jackwood
	Endiandra sieberi	
Lentibulariaceae	*Utricularia dichotoma*	Fairy Aprons
Lobeliaceae	*Lobelia anceps*(syn. *L. alata)*	Angled Lobelia
	Lobelia dentata	-
	Lobelia gracilis	Trailing Lobelia
	Pratia purpurascens	Whiteroot
Loganiaceae	*Mitrasacme paludosa*	
	Mitrasacme polymorpha	Mitre Weed
Loranthaceae	*Amyema congener*	Mistetoe
	Amyema miquelii	Drooping Mistletoe
	Dendrophthoe vitellina	Mistletoe
	Muellerina celastroides	-
Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife

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Family	Botanical Name	Common Name
Meliaceae	*Melia azedarach*	White Cedar
	Synoum glandulosum	Scentless Rosewood
	Toona ciliata	Red Cedar
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine
	Stephania japonica var. *discolor*	Snake Vine
Monimiaceae	*Doryphora sassafras*	Sassafrass
Moraceae	*Ficus coronata*	Sandpaper Fig
	Ficus rubiginosa	Port Jackson Fig
Myoporaceae	*Myoporum boninense* subsp. *australe*	Boobialla
Myrsinaceae	*Aegiceras corniculatum*	River Mangrove
	Myrsine howittiana	Brush Muttonwood
	Myrsine variabilis	Muttonwood
Myrtaceae	*Acmena smithii*	Lilly Pilly
	Angophora bakeri	Narrow-leaved Apple
	Angophora costata	Sydney Red Gum
	Angophora floribunda	Rough-barked Apple
	Angophora hispida	Banda
	Austromyrtus tenuifolia	Narrow-leaf Myrtle
	Backhousia myrtifolia	Grey Myrtle
	Baeckia brevifolia	Short-leaved Myrtle
	Baeckea diosmifolia	Fringed Baeckea
	Baeckea imbricata	-
	Baeckea linifolia	Weeping Baeckea
	Callistemon citrinus	Crimson Bottlebrush
	Callistemon linearis	Narrow-leaved Bottlebrush
	Callistemon rigidus	Stiff Bottlebrush
	Callistemon salignus	Willow Bottlebrush
	Calytrix tetragona	Common Fringe-Myrtle
	Corymbia gummifera	Red Bloodwood
	Corymbia maculata	Spotted Gum
	Darwinia biflora	-

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Darwinia diminuta	-
	Darwinia fascicularis	-
	Darwinia leptantha	-
	Eucalyptus botryoides	Bangalay
	Eucalyptus camfieldii	Camfield's Stringbark
	Eucalyptus capitellata	Brown Stringybark
	Eucalyptus eugenioides	
	Eucalyptus globoidea	White Stringybark
	Eucalyptus haemastoma	Scribbly Gum
	Eucalyptus luehmanniana	Yellow Top Mallee Ash
	Eucalyptus multicaulis	
	Eucalyptus oblonga	Stringybark
	Eucalyptus obstans	Port Jackson Mallee
	Eucalyptus paniculata	Grey Ironbark
	Eucalyptus pilularis	Blackbutt
	Eucalyptus piperita	Sydney Peppermint
	Eucalyptus punctata	Grey Gum
	Eucalyptus resinifera	Red Mahogany
	Eucalyptus robusta	Swamp Mahogany
	Eucalyptus sclerophylla	
	Eucalyptus sieberi	Silver Top Ash
	Eucalyptus sparsifolia	Narrow-leaved Stringybark
	Eucalyptus stricta	Blue Mountains Mallee Ash
	Eucalyptus tereticornis	Forest Red Gum
	Eucalyptus umbra	
	Euryomyrtus ramosissima (syn. *Baeckea ramosissima*)	Rosy Baeckea
	Kunzea ambigua	Tick Bush
	Kunzea capitata	Pink Kunzea
	Leptospermum arachnoides	-
	Leptospermum continentale	Tea-Tree
	Leptospermum juniperinum	Prickly Tea-tree
	Leptospermum laevigatum	Coast Teatree
	Leptospermum polygalifolium	Tantoon
	Leptospermum squarrosum	Pink Tea-tree
	Leptospermum trinervium	Slender Tea-tree

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Melaleuca armillaris	Bracelet Honey-Myrtle
	Melaleuca decora	-
	Melaleuca ericifolia	Swamp Paperbark
	Melaleuca hypericifolia	Hillock Bush
	Melaleuca linariifolia	Budjur
	Melaleuca nodosa	-
	Melaleuca quinquenervia	Broad-leaved Paperbark
	Melaleuca styphelioides	Prickly-leaved Tea-Tree
	Micromyrtus ciliata	Fringed Heath-Myrtle
	Rhodamnia rubescens	Scrub Turpentine
	Syncarpia glomulifera	Turpentine
	Syzygium australe	Brush Cherry
	Syzygium oleosum	Blue Lilly Pilly
	Syzygium paniculatum	Daguba
	Tristaniopsis laurina	Kanuka
Olacaceae	*Olax stricta*	Olax
Oleaceae	*Notelaea longifolia*	Large Mock-olive
	Notelaea ovata	Mock Olive
	Notelaea venosa	Veined Mock-olive
Onagraceae	*Epilobium billardierianum* subsp. *cinereum*	Smooth Willow-herb
	Epilobium hirtigerum	Hoary Willow-herb
Oxalidaceae	*Oxalis perennans*	-
Pittosporaceae	*Billardiera scandens* var. *scandens*	Hairy Apple Berry
	Bursaria spinosa	Blackthorn
	Pittosporum revolutum	Wild Yellow Jasmine
	Pittosporum undulatum	Native Daphne
	Rhytidosporum procumbens	-
Plantaginaceae	*Plantago debilis*	Slender Plantain

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Polygalaceae	*Comesperma defoliatum*	Fairies' Wings
	Comesperma ericinum	Pyramid Flower
	Comesperma volubile	Love Creeper
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
	Persicaria hydropiper	Water Pepper
	Persicaria lapathifolia	Pale Knotweed
	Rumex brownii	Swamp Dock
Portulacaceae	*Calandrinia pickeringii*	Pink Purslane
Proteaceae	*Banksia aemula*	Wallum Banksia
	Banksia ericifolia var. *ericifolia*	Wadanggari
	Banksia integrifolia	Coast Banksia
	Banksia marginata	Silver Banksia
	Banksia oblongifolia	Fern-leaved Banksia
	Banksia robur	Swamp Banksia
	Banksia serrata	Wiriyagan
	Banksia spinulosa var. *spinulosa*	Hairpin Banksia
	Conospermum ellipticum	Coneseeds
	Conospermum ericifolium	
	Conospermum longifolium	Long-leaf Smoke-bush
	Conospermum taxifolium	Variable Smoke-bush
	Grevillea buxifolia subsp. *buxifolia*	Grey Spider-flower
	Grevillea linearifolia	Linear-leaved Grevillea
	Grevillea longifolia	-
	Grevillea mucronulata	Green Spider-flower
	Grevillea sericea	Pink Spider-flower
	Grevillea speciosa	Red Spider-flower
	Hakea dactyloides	Finger Hakea
	Hakea gibbosa	Needlebush
	Hakea propinqua	-
	Hakea salicifolia	Willow-leaved Hakea
	Hakea sericea	Needlebush
	Hakea teretifolia	Needlebush
	Isopogon anemonifolius	Broad-leaf Drumsticks

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Family	Botanical Name	Common Name
	Isopogon anethifolius	Narrow-leaf Drumsticks
	Lambertia formosa	Mountain Devil
	Lomatia myricoides	River Lomatia
	Lomatia silaifolia	Crinkle Bush
	Persoonia hirsuta subsp. *hirsuta*	Hairy Geebung
	Persoonia lanceolata	Lance Leaf Geebung
	Persoonia laurina	
	Persoonia levis	Broad-leaved Geebung
	Persoonia linearis	Narrow-leaved Geebung
	Persoonia pinifolia	Mambara
	Petrophile pulchella	Conesticks
	Petrophile sessilis	Conesticks
	Stenocarpus salignus	Scrub Beefwood
	Telopea speciosissima	Waratah
	Xylomelum pyriforme	Woody Pear
Ranunculaceae	*Clematis aristata*	Old Man's Beard
	Clematis glycinoides	Headache vine
	var. *glycinoides*	
Rhamnaceae	*Cryptandra amara* var. *amara*	Bitter Cryptandra
	Cryptandra ericoides	Heathy Cryptandra
	Pomaderris discolor	-
	Pomaderris ferruginea	Rusty Pomaderris
	Pomaderris intermedia	-
	Pomaderris lanigera	Woolly Pomaderris
Rosaceae	*Rubus moluccanus* (syn. *Rubus hillii*)	Molucca Bramble
	Rubus parvifolius	Native Raspberry
Rubiaceae	*Morinda jasminoides*	Sweet Morinda
	Opercularia aspera	Coarse Stinkweed
	Opercularia hispida	Hairy Stinkweed
	Opercularia varia	Variable Stinkweed
	Pomax umbellata	Pomax

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Family	Botanical Name	Common Name
Rutaceae	*Acronychia oblongifolia*	White Aspen
	Boronia ledifolia	Showy Boronia
	Boronia parviflora	Swamp Boronia
	Boronia pinnata	Pinnate Boronia
	Boronia polygalifolia	Dwarf Boronia
	Boronia serrulata	Native Rose
	Correa reflexa	Native Fuchsia
	Crowea exalata	-
	Crowea saligna	-
	Eriostemon australasius	Wax Plant
	Leionema dentatum	Toothed Phebalium
	Phebalium squamulosum	Scaly Phebalium
	Philotheca buxifolia subsp. *buxifolia*	-
	Philotheca myoporoides	Long-leaf Wax Flower
	Philotheca salsolifolia	Philotheca
	Zieria laevigata	Smooth Zieria
	Zieria pilosa	Hairy Zieria
	Zieria smithii	Sandfly Zieria
Santalaceae	*Exocarpos cupressiformis*	Native Cherry
	Leptomeria acida	Native Currant
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
	Dodonaea triquetra	Large-Leaf Hop-Bush
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell
Solanaceae	*Duboisia myoporoides*	Corkwood
Stackhousiaceae	*Stackhousia monogyna*	Creamy Candles
	Stackhousia viminea	Slender Stackhousia
Sterculiaceae	*Lasiopetalum ferrugineum*	Rusty-petals
	Lasiopetalum rufum	Red Rusty-petals
	Rulingia hermanniifolia	Wrinkled Kerrawang

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Family	Botanical Name	Common Name
Stylidiaceae	*Stylidium graminifolium*	Grass Trigger-Plant
	Stylidium lineare	Narrow-leaved TriggerPlant
	Stylidium productum	Trigger-Plant
Theophrastaceae	*Samolus repens*	Creeping Brookweed
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*	Curved Rice-flower
	Pimelea linifolia subsp. *linifolia*	Slender Rice-flower
	Wikstroemia indica	Wikstroemia
Ulmaceae	*Trema tomentosa* (syn. *Trema aspera)*	Native Peach
Violaceae	*Hybanthus monopetalus*	Slender Violet-bush
	Viola hederacea	Ivy-leaved Violet
Vitaceae	*Cayratia clematidea*	Kangaroo Vine
	Cissus antarctica	Kangaroo Vine
	Cissus hypoglauca	Water Vine
Monocotyledons		
Amaryllidaceae	*Crinum pedunculatum*	Swamp Lily
Anthericaceae	*Caesia parviflora*	Pale Grass-Lily
	Laxmannia gracilis	Slender Wire-Lily
	Sowerbaea juncea	Vanilla Plant
	Thysanotus tuberosus	Common Fringe-Lily
	Tricoryne elatior	Yellow Rush-Lily
	Tricoryne simplex	Yellow Rush-Lily
Araceae	*Gymnostachys anceps*	Boorgay
Arecaceae	*Livistona australis*	Daranggara

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Family	Botanical Name	Common Name
Blandfordiaceae	*Blandfordia nobilis*	Christmas Bells
Centrolepidaceae	*Centrolepis fascicularis*	Tufted Centrolepis
	Centrolepis strigosa	Hairy Centrolepis
Colchicaceae	*Burchardia umbellata*	Milkmaids
Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Cyperaceae	*Baumea acuta*	Pale Twig-rush
	Baumea juncea	Bare Twig-rush
	Baumea rubiginosa	Soft Twig-rush
	Baumea teretifolia	Wrinkle-nut Twig-rush
	Carex appressa	Tall Sedge
	Carex breviculmis	-
	Carex inversa	-
	Caustis flexuosa	Curly Wig
	Caustis pentandra	Thick Twist Rush
	Caustis recurvata var. *hirsuta* and var. *recurvata*	-
	Chorizandra cymbaria	Bristle-rush
	Chorizandra sphaerocephala	Roundhead Bristle-sedge
	Cyathochaeta diandra	-
	Cyperus difformis	Variable Flat-sedge
	Cyperus gracilis	Slender Flat-Sedge
	Cyperus mirus	-
	Cyperus polystachyos	-
	Cyperus sanguinolentus	-
	Eleocharis sphacelata	Tll Spike-rush
	Ficinia(Isolepis) nodosa	Knotted Club-rush
	Fimbristylis dichotoma	Common Fringe-sedge
	Gahnia aspera	Rough Saw-sedge
	Gahnia clarkei	Tall Saw-sedge
	Gahnia erythrocarpa	-
	Gahnia melanocarpa	Black Fruit Saw-sedge
	Gahnia sieberiana	Red-Fruit Saw-sedge

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Family	Botanical Name	Common Name
	Gymnoschoenus sphaerocephalus	Button Grass
	Isolepis inundata	Swamp Club-rush
	Lepidosperma concavum	-
	Lepidosperma filiforme	-
	Lepidosperma gunnii	-
	Lepidosperma laterale	Variable Sword-edge
	Lepidosperma limicola	Razor Sedge
	Lepidosperma lineare	
	Lepidosperma neesii	Stiff Rapier-edge
	Lepidosperma viscidum	-
	Ptilothrix deusta	-
	Schoenoplectus validus	River Club-rush
	Schoenus apogon	Common Bog-rush
	Schoenus brevifolius	Zig-zag Bog-rush
	Schoenus ericetorum	Heath Bog-rush
	Schoenus imberbis	Beardless Bog-rush
	Schoenus maschalinus	Dwarf Bog-rush
	Schoenus melanostachys	Black Bog-rush
	Schoenus paludosus	
	Tricostularia pauciflora	Needle Bogrush
Doryanthaceae	*Doryanthes excelsa*	Gymea Lily
Eriocaulaceae	*Eriocaulon scariosum*	Common Pipewort
Haemodoraceae	*Haemodorum corymbosum*	Rush-leaf Bloodroot
	Haemodorum planifolium	Strap-leaf Bloodroot
Hypoxidaceae	*Hypoxis hygrometrica*	Golden Weather-Grass
Iridaceae	*Patersonia fragilis*	Swamp Iris
	Patersonia glabrata	Bugulbi
	Patersonia sericea	Silky Purple-flag
Juncaceae	*Juncus continuus*	-
	Juncus homalocaulis	-

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Juncus kraussii subsp. *australiensis*	Sea Rush
	Juncus pallidus	Pale Rush
	Juncus planifolius	Broad-leaf Rush
	Juncus prismatocarpus	Branching Rush
	Juncus subsecundus	Finger Rush
	Juncus usitatus	Tussock Rush
Juncaginaceae	*Triglochin striata*	Streaked Arrowgrass
Lomandraceae	*Lomandra brevis*	Tufted Mat-rush
	Lomandra confertifolia subsp. *rubiginosa*	Mat-rush
	Lomandra cylindrica	Needle Mat-rush
	Lomandra filiformis	Wattle Mat-rush
	Lomandra glauca	Pale Mat-rush
	Lomandra gracilis	-
	Lomandra longifolia subsp. *tuberculata*	Spiny-Headed Mat-rush
	Lomandra multiflora	Many-flowered Mat-rush
	Lomandra obliqua	Twisted Mat-rush
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
	Geitonoplesium cymosum	Scrambling Lily
Orchidaceae	*Acianthus fornicatus*	Pixie Caps
	Caladenia carnea	Pink Fairy
	Caladenia catenata	White Fingers
	Caleana major	Large Duck Orchid
	Calochilus campestris	Copper Beard Orchid
	Calochilus paludosus	Red Beard Orchid
	Calochilus robertsonii	Purplish Beard Orchid
	Cestichis reflexa	Yellow Rock Orchid
	Cryptostylis erecta	Bonnet Orchid
	Cryptostylis subulata	Large Tongue Orchid
	Cymbidium suave	Snake Orchid
	Dendrobium linguiforme (syn. *Dockrillia linguiformis)*	Tongue Orchid

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Dendrobium speciosum (syn. *Thelychiton speciosus*)	Rock Lily
	Dipodium punctatum	Hyacinth Orchid
	Erythrorchis cassythoides	Climbing Orchid
	Glossodia minor	Small Waxlip Orchid
	Microtis unifolia	Common Onion Orchid
	Orthoceras strictum	Bird's-Mouth Orchid
	Prasophyllum elatum	Tall Leek Orchid
	Pterostylis concinna	Trim Greenhood
	Pterostylis grandiflora	Cobra Greenhood
	Pterostylis longifolia	Tall Greenhood
	Pterostylis nutans	Nodding Greenhood
	Thelymitra ixioides var. *ixioides*	Dotted Sun Orchid
Philydraceae	*Philydrum lanuginosum*	Woolly Waterlily
Phormiaceae	*Dianella caerulea*	Blue Flax-Lily
	Dianella longifolia var. *longifolia*	Blueberry Lily
	Dianella revoluta	Blueberry Lily
	Thelionema caespitosum	Tufted Blue-Lily
	Thelionema umbellatum	-
Poaceae	*Anisopogon avenaceus*	Oat Speargrass
	Aristida ramosa	Purple Wiregrass
	Aristida vagans	Three Awn Speargrass
	Austrodanthonia caespitosa	Ringed Wallaby Grass
	Austrodanthonia racemosa	Wallaby Grass
	Austrodanthonia tenuior	Wallaby Grass
	Austrostipa pubescens	Tall Spear-grass
	Bothriochloa macra	Red-Leg Grass
	Chloris truncata	Windmill Grass
	Cymbopogon refractus	Barbed Wire Grass
	Cynodon dactylon	Couch
	Deyeuxia quadriseta	Reed Bent-grass
	Dichelachne crinita	Longhair Plume-grass

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Dichelachne micrantha	Shorthair Plume-grass
	Digitaria didactyla	Queensland Blue Couch
	Digitaria parviflora	Small-Flowered Finger-grass
	Echinopogon caespitosus	Bushy Hedgehog-grass
	Elymus scaber var. *scaber*	Common Wheat-grass
	Entolasia marginata	Bordered Panic
	Entolasia stricta	Wiry Panic
	Eragrostis benthamii	-
	Eragrostis brownii	Brown's Lovegrass
	Eragrostis elongata	Clustered Lovegrass
	Eragrostis leptostachya	Paddock Lovegrass
	Hemarthria uncinata var. *uncinata*	Matgrass
	Imperata cylindrica	Blady Grass
	Lachnagrostis aemula	Blowngrass
	Lachnagrostis filiformis	Blowngrass
	Microlaena stipoides var. *stipoides*	Weeping Grass
	Notodanthonia longifolia	Long-Leaved Wallaby Grass
	Oplismenus aemulus	-
	Oplismenus imbecillis	-
	Panicum simile	Two-coloured Panic
	Paspalidium distans	-
	Paspalum vaginatum	Saltwater Couch
	Phragmites australis	Common Reed
	Plinthanthesis paradoxa	Wiry Wallaby-grass
	Poa affinis	-
	Poa labillardierei	Tussock Grass
	Sacciolepis indica	Indian Cupscale Grass
	Sporobolus elongatus	Slender Rat's Tailgrass
	Sporobolus virginicus var. *minor*	Saltwater Couch
	Tetrarrhena juncea	Wiry Ricegrass
	Tetrarrhena turfosa	-
	Themeda australis	Kangaroo Grass
	Zoysia macrantha	Prickly Couch

Appendix A - Likely flora of Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Restionaceae	*Baloskion tetraphyllum*	Tassel Rush
	Caustis pentandra	
	Chordifex dimorphus	-
	Empodisma minus	-
	Eurychorda complanata	Flat Cord-rush
	Hypolaena fastigiata	Tassel Rope-rush
	Leptocarpus tenax	-
	Lepyrodia scariosa	Scale Rush
	Sporadanthus gracilis	Slender Scale-rush
Smilacaceae	*Smilax australis*	Lawyer Vine
	Smilax glyciphylla	Sweet Sarsparilla
Typhaceae	*Typha domingensis*	Narrow-Leaved Cumbungi
	Typha orientalis	Broadleaf Cumbungi
Uvulariaceae	*Schelhammera undulata*	Lilac Lily
Xanthorrhoeaceae	*Xanthorrhoea arborea*	Grass Tree
	Xanthorrhoea media	Gulgadya
	Xanthorrhoea resinosa	Grass Tree
Xyridaceae	*Xyris gracilis* subsp. *gracilis*	Slender Yellow-eye
	Xyris operculata	Tall Yellow-eye

Appendix B: Supplementary flora list for Pyrmont peninsula in 1788

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Family	Botanical Name	Common Name
Dryopteridaceae	*Polystichum australiense*	
Gleicheniaceae	*Dicranopteris linearis*	
Ophioglossaceae	*Botrychium australe*	Parsley Fern
Apiaceae	*Hydrocotyle geraniifolia*	Forest Pennywort
	Lilaeopsis poryantha	
Asteraceae	*Helichrysum collinum*	
	Leptinella longipes	Creeping Cotula
	Olearia elliptica	Sticky Daisy Bush
	Senecio bipinnatisectus	
	Senecio diaschides	
	Senecio minimus	
Boraginaceae	*Cynoglossum australe*	
	Cynoglossum suaveolens	
Brassicaceae	*Rorippa laciniata*	
Casuarinaceae	*Allocasuarina diminuta* subsp. *mimica*	
Chenopodiaceae	*Atriplex australasica*	
	Dysphania glomulifera subsp. *glomulifera*	
	Einadia hastata	Berry Saltbush
Convulvulaceae	*Calystegia sepium*	
	Wilsonia backhousei	Wilsonia
Cunoniaceae	*Bauera capitata*	
	Bauera microphylla	
Dilleniaceae	*Adrastaea salicifolia*	

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Family	Botanical Name	Common Name
	Hibbertia nitida	Shining Guinea Flower
Elaeocarpaceae	*Tetratheca juncea*	
	Tetratheca neglecta	
	Tetratheca thymifolia	
Ericaceae	*Acrotriche divaricata*	Ground-berry
	Leucopogon appressus	
	Leucopogon virgatus	
	Sprengelia sprengelioides	
Euphorbiaceae	*Pseudanthus pimeleoides*	Pseudanthus
Eupomatiaceae	*Eupomatia laurina*	Bulwarra
Fabaceae	*Acacia elongata*	Swamp Wattle
	Acacia obtusifolia	Blunt-leaf Wattle
	Acacia stricta	Hop Wattle
	Almaleea paludosa (syn. *Pultenaea paludosa)*	
	Bossiaea rhombifolia subsp. *rhombifolia*	
	Daviesia acicularis	
	Daviesia alata	
	Daviesia ulicifolia	Gorse Bitter Pea
	Dillwynia ramosissima	
	Dillwynia sericea	Showy Parrot-pea
	Gompholobium minus	Dwarf Wedge Pea
	Gompholobium virgatum var. *virgatum*	Leafy Wedge Pea
	Indigofera australis	Native Indigo
	Kennedia prostrata	Scarlet Coral Pea
	Mirbelia pungens	
	Phyllota grandiflora	
	Phyllota phylicoides	Heath Phyllota
	Podolobium ilicifolium (syn. *Oxylobium ilicifolium)*	Prickly Shaggy Pea
	Pultenaea paleacea	

Appendix B - Supplementary flora list for Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Pultenaea villosa	
	Senna odorata	Smooth Senna
	Sphaerolobium minus	
Geraniaceae	*Pelargonium inodorum*	
Goodeniaceae	*Selliera radicans*	
Haloragaceae	*Gonocarpus humilis*	
	Myriophyllum gracile	
	Myriophyllum simulans	
	Myriophyllum variifolium	Common Water-milfoil
Lentibulariaceae	*Utricularia uniflora*	
Loganiaceae	*Logania albiflora*	
Loranthaceae	*Amyema pendulum*	Drooping Mistletoe
	Muellerina eucalyptoides	
Menyanthaceae	*Villarsia exaltata*	Yellow Marsh Flower
	Villarsia reniformis	
Myrtaceae	*Callistemon pinifolius*	Pine-leaved Bottlebrush
	Harmogia densifolia (syn. *Baeckea densifolia*)	
	Leptospermum grandifolium	Woolly Tea-tree
	Leptospermum parvifolium	Small-leaf Tea-tree
	Melaleuca deanei	
	Melaleuca squamea	
	Melaleuca thymifolia	Thyme Honey-Myrtle
	Tristaniopsis collina	Mountain Water Gum
Polygalaceae	*Comesperma sphaerocarpum*	Broom Milkwort
Polygonaceae	*Persicaria strigosa*	Spotted Knotweed

Appendix B - Supplementary flora list for Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Proteaceae	*Banksia paludosa*	Swamp Banksia
	Conospermum tenuifolium	Sprawling Coneseeds
	Grevillea sphacelata	Grey Spider Flower
	Hakea laevipes subsp. *laevipes*	
	Symphionema paludosum	Swamp Symphionema
Ranunculaceae	*Ranunculus inundatus*	River Buttercup
	Ranunculus lappaceus	Common Buttercup
Rhamnaceae	*Cryptandra propinqua*	Silky Cryptandra
	Pomaderris ligustrina	
Rosaceae	*Rubus rosifolius* var. *rosifolius*	Rose-leaf Bramble
Rutaceae	*Boronia anemonifolia*	Sticky Boronia
	Boronia rigens	Stiff Boronia
	Nematolepis squamea (syn. *Phebalium squameum)*	Scaly Phebalium
	Philotheca scabra subsp. *scabra*(syn. *Eriostemon scaber* subsp *scaber)*	
Santalaceae	*Choretrum candollei*	White Sour Bush
	Omphacomeria acerba	Leafless Sourbush
Sapindaceae	*Dodonaea falcata*	Thread-leaf Hop Bush
	Dodonaea multijuga	
Scrophulariaceae	*Euphrasia collina*	Eye-bright
	Limosella australis	Australian Mudwort
Solanaceae	*Solanum campanulatum*	
	Solanum prinophyllum	Forest Nightshade
	Solanum pungetium	Eastern Nightshade
	Stackhousia nuda	Leafless Stackhousia
Sterculariaceae	*Lasiopetalum macrophyllum*	Shrubby Rusty-petals

Appendix B - Supplementary flora list for Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Stylidiaceae	*Stylidium debile*	Frail Triggerplant
	Stylidium laricifolium	Larch-leaf Triggerplant
Violaceae	*Hybanthus vernonii*	
	Viola betonicifolia	Showy Violet
	Viola sieberiana	
Viscaceae	*Notothixos subaureus*	Golden Mistletoe
Winteraceae	*Tasmannia insipida*	Brush Pepperbush
Anthericaceae	*Thysanotus juncifolius*	Fringe Lily
Cyperaceae	*Baumea gunnii*	
	Baumea nuda	
	Cyperus laevigatus	
	Cyperus lucidus	
	Cyperus trinervis	
	Eleocharis acuta	Common Spike-rush
	Eleocharis gracilis	
	Fimbristylis velata	
	Isolepis cernua	Nodding Club-rush
	Lepidosperma forsythii	Stout Rapier-sedge
	Lepidosperma latens	
	Lepidosperma quadrangulatum	
	Lepidosperma urophorum	
	Lipocarpha microcephala (syn. *Rikliella australiensis*)	
	Schoenoplectus mucronatus	
	Schoenoplectus subulatus	
	Schoenus lepidosperma subsp. *pachylepis*	
	Schoenus moorei	
	Schoenus nitens	
	Schoenus turbinatus	
Hydrocharitaceae	*Halophila decipiens*	Seawrack

Appendix B - Supplementary flora list for Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Halophila ovalis	Seawrack
Juncaginaceae	*Triglochin procerum*	Water Ribbons
Lemnaceae	*Spirodela punctata*	
Orchidaceae	*Acianthus caudatus*	Mayfly Orchid
	Caladenia alata	Fairy Orchid
	Caladenia picta	
	Caladenia tesselata	Thick-lip Spider Orchid
	Caladenia testacea	Honey Caladenia
	Chiloglottis reflexa	Autumn Bird-Orchid
	Corybas aconitiflorus	Spurred Helmet Orchid
	Corybas fimbriatus	Fringed Helmet Orchid
	Corybas pruinosus	Toothed Helmet Orchid
	Corybas unguiculatus	Small Helmet Orchid
	Cyanicula caerulea	Blue Caladenia
	Cyrtostylis reniformis	Gnat Orchid
	Dendrobium teretifolium	Rat's Tail Orchid
	Dipodium roseum	
	Dipodium variegatum	
	Diuris punctata	Purple Donkey Orchid
	Eriochilus autumnalis	
	Eriochilus cucullatus	Parson's Bands
	Genoplesium baueri	
	Genoplesium fimbriatum	Fringed Midge-orchid
	Genoplesium nudiscapum	Dense Midge Orchid
	Genoplesium pumilum	Green Midge Orchid
	Genoplesium rufum	Red Midge Orchid
	Glossodia major	Waxlip Orchid
	Lyperanthus suaveolens	Brown Beaks
	Microtis parviflora	Slender Onion Orchid
	Microtis rara	Scented Onion Orchid
	Paracaleana minor	Small Duck Orchid
	Prasophyllum brevilabre	Short-lipped Leek Orchid
	Prasophyllum flavum	Yellow Leek Orchid

Appendix B - Supplementary flora list for Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
	Prasophyllum fuscum	
	Prasophyllum patens	Broad-lipped Leek Orchid
	Prasophyllum striatum	Streaked Leek Orchid
	Pterostylis acuminata	Pointed Greenhood
	Pterostylis curta	Blunt Greenhood
	Pterostylis daintreana	
	Pterostylis obtusa	
	Pterostylis parviflora	Tiny Greenhood
	Pterostylis pedunculata	Little Red Riding Hood
	Pterostylis reflexa	Dainty Greenhood
	Pterostylis revoluta	
	Spiranthes sinensis subsp. *australis*	Austral Ladies' Tresses
	Thelymitra carnea	Tiny Sun Orchid
	Thelymitra media var. *media*	Tall Sun Orchid
	Thelymitra pauciflora	Slender Sun Orchid
Poaceae	*Amphipogon strictus* var. *strictus*	Greybeard Grass
	Aristida jerichoensis	Jericho Wiregrass
	Aristida warburgii	
	Austrostipa mollis	Soft Spear Grass
	Cenchrus caliculatus	Hillside Burrgrass
	Deyeuxia decipiens	
	Dichelachne inaequiglumis	
	Digitaria diffusa	
	Digitaria longiflora	
	Eriachne glabrata	Wanderrie Grass
	Lachnagrostis billardierei subsp. *billardieri*(syn. *Agrostis billardieri)*	Coast Blowngrass
	Paspalum orbiculare	Ditch Millet
	Pennisetum alopecuriodes	Swamp Foxtail
	Poa poiformis	
	Pseudoraphis paradoxa	Slender Mudgrass
Posidoniaceae	*Posidonia australis*	Seagrass
Potamogetonaceae	*Ruppia maritima*	
	Ruppia polycarpa	

Appendix B - Supplementary flora list for Pyrmont peninsula in 1788		
Family	Botanical Name	Common Name
Restionaceae	*Baloskion gracile* (syn. *Restio gracilis)*	Slender Cord-rush
Xyridaceae	*Xyris bracteata(*syn *Xyris gracilis* subsp. *laxa)*	
	Xyris complanata	
	Xyris juncea	Dwarf Yellow-eye
Zosteraceae	*Zostera capricorni*	Eel Grass

4.3 Invertebrates

Documentation of the likely invertebrate fauna of Pyrmont peninsula at European settlement was well beyond the resources of this study. So bold a venture might be attempted sometime, although it would be much more difficult than those described here for vertebrates. This is partly because the invertebrate fauna of the peninsula would have been huge in 1788. Also, an attempt to define its likely composition would be made difficult by taxonomic issues and the poorly understood ecology of many invertebrate species.

4.4 Frogs and Reptiles

4.4.1 Introduction

The earliest descriptions of Australian herpetofauna reside in the cave paintings and carvings of Aboriginals(Cogger, 1993:92). The first observations by Europeans appear to be those of seafarers who visited Australian waters in the seventeenth century; these were mostly of marine species, such as crocodiles, turtles and sea snakes. The English buccaneer William Dampier was the first to describe an endemic Australian reptile – the shingleback lizard – in 1699(Cogger, 1993:92).

Settlement brought Europeans face to face with a particularly rich and diverse herpetofauna, there being over 1000 species of frogs and reptiles now known on this continent(Cogger, 2000:19). Engagement with these animals was, however, slow(Main, 1993). A handful of biologists began to describe the herpetofauna of Port Jackson through the first decades of settlement. But it was not until Gerard Krefft arrived in Sydney in 1860 that this task was approached systematically. By then, the herpetofauna in and immediately around Sydney would have changed significantly. No early records of the frogs and reptiles of Pyrmont peninsula have been found – they may not exist. Instead, the herpetofauna of Pyrmont peninsula in 1788 has been extrapolated from knowledge of the current distribution and ecology of species around Port Jackson and in the Sydney region more widely, coupled with the records of early herpetologists.

These matters are elaborated upon below. The gradual accretion of knowledge about the frogs and reptiles of Port Jackson is rehearsed through brief accounts of the main contributors. An attempt is then made to describe the likely herpetofauna of Pyrmont peninsula in 1788, based on historic accounts and contemporary surveys.

4.4.2 Early accounts

A) Introduction

Description of the frogs and reptiles of Port Jackson relied upon very few individuals. Their efforts over the early decades of settlement were, by today's standards, spasmodic and limited. Nonetheless, these pioneers started to accumulate what, today, has become a substantial body of knowledge about Australian frogs and reptiles. The following short notes acknowledge the contributions of these early biologists.

B) John White

The first formal scientific descriptions of Australian herpetofauna were initiated by John White in 1788. The final entry in White's published journal was dated 11 November 1788, so that his collections and accounts were made during the first year of European settlement at Port Jackson. One frog and twelve reptiles were illustrated in his Journal, published in 1790(Table 4.4.1).

Table 4.4.1: Frog and reptiles collected around Sydney by John White in 1788

Current common name	Initial scientific name	Current scientific name
Green Tree Frog	*Rana caerulea*	*Litoria caerulea*
Jacky Lizard	*Lacerta muricata*	*Amphibolurus muricatus*
Copper-tailed Skink	*Lacerta taeniolata*	*Ctenotus taeniolatus*
Southern Leaf-tailed Gecko	*Lacerta platura*	*Phyllurus platurus*
Eastern Blue-tongue Lizard	*Lacerta scincoides*	*Tiliqua scincoides*
Lace Monitor	*Lacerta varia*	*Varanus varius*
Eastern Water Dragon	*	*Physignathus lesueurii*
Garden Skink	*	*Lampropholis* sp
Diamond Python	*	*Morelia spilota spilota*
Bandy-bandy	*	*Vermicella annulata*
Eastern Brown Snake	*	*Pseudonaja textilis*
Green Tree Snake	*	*Dendrelaphis punctulata*
Brown Tree Snake	*	*Boiga irregularis*

*Illustrated but not named

C) Dr George Shaw(1751-1813) (Calaby, 1967: Wikipedia, 2007)

It is believed that Dr George Shaw prepared the descriptions which accompanied White's illustrations. George Shaw was born in 1751, and was an English botanist and zoologist. He became a deputy botanical lecturer at Oxford University in 1786, co-founder of the Linnean Society of London in 1788, and Fellow of the Royal Society in 1789. In 1791, Shaw became assistant keeper of Natural History at the British Museum. He became Clock Keeper in 1807, a post he held until his death in 1813(Hankel, 1998). Shaw published original descriptions of Australian herpetofauna in three ways:

- through John White's Journal, as described above
- in his Zoology of New Holland, the first book on Australian animals, published in 1794. This book contains the first descriptions of the Red-bellied Black Snake *Pseudechis porphyriacus* and the Eastern Snake-necked Turtle *Chelodina longicollis*.
- In his Vivarium naturae, or The Naturalist's Miscellany, prepared jointly with his associate Frederick Polydore Nodder between August 1789 and about July 1813. Original descriptions of Australian herpetofauna published here include the Giant Burrowing Frog *Heleioporus australiacus*, described then as *Rana australiaca*(1795), and the Death Adder *Acanthophis antarcticus* (1802).

Shaw and Nodder were thus the first to engage with the taxonomy of Australian herpetofauna, naming ten species of frogs and reptiles during the 1790s/early 1800s. All of these species would have occurred on Pyrmont peninsula at European settlement.

Figure 4.4.1: White, J., 1790, Journal of a voyage to New South Wales, plate 21: Blue Frogs[Green Tree-frogs] in Günther, A.C.L.G., [1789-1901], Illustrations relating to Australian fauna; collected and arranged systematically by A.G., Volume 3: Australian amphibia and fishes(ML F591.9901/G).

This remarkable image was based on Green Tree-frogs *Litoria caerulea* which had been transported to England in spirits, their pigmentation changing in the process! A common frog which would once have been widely distributed on Pyrmont peninsula

D) Charles-Alexandre Lesueur(1778-1846) (Wikipedia, 2007)

The next significant contribution to our knowledge of Australian herpetofauna came from the Baudin Expedition to Australia between 1800 and 1804(Bonnemains et al., 1988). The first natural history collections from this expedition left Sydney on the Naturaliste in 1802, arriving in France in 1803. The remainder returned with the Géographe in 1803, reaching France in 1804. The collections overall amounted to more than 180,000 specimens 'comprising, it was said, more than 2500 new species'(Bonnemains, 1988:22). These collections were made primarily by François Péron and Antoine Guichenot, the expedition's naturalists. They were illustrated by Charles-Alexandre Lesueur, who enlisted into the expedition as an assistant gunner but became one of its two artists. The frogs illustrated by Lesueur as occurring in Port Jackson in 1802 are listed in Table 4.4.2.

Table 4.4.2: Port Jackson frogs illustrated by Charles-Alexandre Lesueur

Current common name	Initial scientific name	Current scientific name[1]
Lesueur's Frog	*Hyla citripoda*	*Litoria lesueurii*
Green and Golden Bell Frog	*Hyla cyanea*	*Litoria aurea*
Leaf-green Tree Frog	*Hyla erythropa*	*Litoria phyllochroa*
Red-eyed Tree Frog	*Hyla xanthogaster*	*Litoria chloris*
Whistling Tree Frog	*Hyla bufonoides*	*Litoria verreauxii*
Blue Mountains Tree Frog	*Hyla violaceapoda*	*Litoria citropa*
Spotted Grass Frog	*Rana pustulosa*	*Limnodynastes tasmaniensis*
Common Eastern Froglet	*Bufo leucogaster*	*Crinia signifera*
Striped Marsh Frog	*Rana patersonia*	*Limnodynastes peronii*

[1] Determinations by M. Tyler and J-J Morère(Bonnemains et al., 1988)

The determination of *Hyla xanthogaster* as *Litoria chloris* is interesting. François Péron recorded the specimen as from Port Jackson, whereas the current known southern limit of its distribution is Gosford.

Reptiles of Port Jackson illustrated by Lesueur are listed in Table 4.4.3. Other reptiles which Lesueur could have seen while in Port Jackson include the Eastern Blue-tongued Lizard *Tiliqua scincoides*(which he illustrated) and the Eastern Water Skink *Eulamprus quoyii*(Cogger, 1993:93).

Table 4.4.3: Port Jackson reptiles illustrated by Charles-Alexandre Lesueur

Current common name	Initial scientific name	Current scientific name[1]
Eastern Snake-necked Turtle	Not named	*Chelodina longicollis*[2]
Southern Leaf-tailed Gecko	*Gecko platurus*	*Phyllurus platurus*
	Gecko Jacksoniensis[3]	

1. Determinations by Rolande Roux-Estève(Bonnemains et al., 1988:285)
2. Locality not specified, but would have occurred at Port Jackson
3. Identified by Roux-Estève as a *Hemidactylus* species, but no members of this genus occur in the Sydney region

E) Bernard-Germain-Étienne de Lacépède(1756-1825) (Wikipedia, 2007)

Lacépède was another early contributor to our knowledge of Port Jackson reptiles. In 1804, he described the Common Scaly-foot *Pygopus lepidopodus*, White's Skink *Egernia whitii* and the Diamond Python *Morelia spilota spilota*(which had been illustrated but not described in John White's Journal) - all of which would have been present on Pyrmont peninsula at European settlement. Presumably the specimens used by Lacépède were from the Baudin Expedition.

F) John Edward Gray(1800-1875)(Calaby, 1966)

It was not until the 1820s that the naming of Australian herpetofauna which would have once occurred around Port Jackson gained momentum again. John Edward Gray described the Three-toed Skink *Saiphos equalis* in 1825 and the Green Tree Snake *Dendrelaphis punctulata* in 1827. During the 1830s and 1840s, he described another nine species of frog and reptiles which would have been present around Port Jackson. Gray had joined the Zoological Department of the British Museum in 1824. During his fifty years there, he wrote nearly 500 papers, including many descriptions of species new to science.

Figure 4.4.2: Krefft, G., Giant Burrowing Frog *Heleioporus australiacus*, in Günther, A.C.L.G., [1789-1901], Illustrations relating to Australian fauna; collected and arranged systematically by A.G., Volume 3: Australian amphibia and fishes(ML F591.9901/G).

Although described by John Gray in 1841, this delightful sketch by Gerard Krefft captures well essential features of the Giant Burrowing Frog *Heleioporus australiacus*. This species would have been widely distributed on Pyrmont peninsula at European settlement.

G) André Marie Constant Duméril(1774-1860) (Wikipedia, 2007)

Duméril was a French zoologist who joined the Muséum National d'Histoire Naturelle, Paris in 1801, becoming Professor of Herpetology and Ichthyology in 1812. Mostly in collaboration with his assistant, Gabriel Bibron, Duméril described ten of the frog and reptile species which would likely have occurred on Pyrmont peninsula at European settlement. His contributions were made between 1836 and 1854.

These four taxonomists – Shaw, Lacépède, Gray and Duméril – together described over half of the frog and reptile species likely to have once occurred on Pyrmont peninsula. Yet, the peninsula would have been largely cleared of its original vegetation – and much of the associated fauna – before three-quarters of its frog and reptile species were known to science, let alone appreciated by wider society.

H) Krefft, Johann Ludwig Gerard(Louis)(1830-1881) (Whitley & Rutledge, 1974)

Born in Braunschweig in (now) northern Germany, Krefft attended St Martin's College, then worked with a mercantile firm at Halberstadt. In 1850, he migrated to the United States and, in 1852, to Victoria. Here he worked in the goldfields until 1857, when he joined an expedition to the Lower Murray and Darling Rivers. He was employed by the National Museum, Victoria to catalogue the large natural history collection he made during this expedition.

After briefly returning to Germany, Krefft moved to Sydney in 1860, where he was appointed assistant curator of the Australian Museum. He became curator in 1864. Although Krefft is probably best known for his contributions to herpetology, he had a broad knowledge and involvement in vertebrate zoology - both recent and fossil - and geology. Krefft described many new species, and wrote some 200 articles. His more important texts include The Snakes of Australia(1869) and The Mammals of Australia(1871). He was a capable artist. (See figures 4.4.2 and 4.4.3)

Figure 4.4.3: Krefft, G., Blue Mountains Tree Frog *Litoria citropa* in Günther, A.C.L.G., [1789-1901], Illustrations relating to Australian fauna; collected and arranged systematically by A.G., Volume 3: Australian amphibia and fishes(ML F591.9901/G).

A delightful watercolour of the Blue Mountains Tree Frog *Litoria citropa* by Gerard Krefft, dated 1882 - a species described by Duméril and Bibron in 1841 - with handwritten notes. Although this species once occurred widely north of Port Jackson, only one doubtful record has been found for immediately south of the harbour

Krefft was involved in a bitter dispute with the Australian Museum in the early 1870s, leading to his dismissal in mid-1876. The dispute embroiled the government of the day. These events came at a heavy financial cost to Krefft, whose estate was sequestrated in 1880. He died from congestion of the lungs in early 1881, and was buried at Randwick.

I) Fletcher, Joseph James(1850-1926)

(Anon, 1926; Lucas, 1930; Walsh, 1981)

Fletcher was born in Auckland, and did his schooling at Ipswich, Queensland and Newington College, Sydney. He did an Arts course at the University of Sydney, taking his BA in 1870 and MA in 1876. That year he went to England, to complete his scientific studies with a BSc at London University in 1881. He returned to Sydney that year and taught at Newington College until 1885.

Fletcher started as Director and Librarian of the Linnean Society of NSW on the first day of 1886. He served the Society for 33 years, seven as Director and Librarian and 26 years as Secretary, with 'judgment and devotion'. He edited the Society's Proceedings for many years. During his career Fletcher developed a wide range of knowledge which encompassed marsupial embryology, frogs, earthworms, and planarians. He was regarded as an authority on all three branches of natural science, and a world authority on amphibia. He published 38 important papers in the Society's Proceedings.

On his retirement in 1919, Fletcher turned his attention to the sandstone flora of the Sydney region, particularly the eucalypts and acacias. He also wrote papers on the Macleay family, generous benefactors of the natural sciences, and made a notable contribution to the history of natural science in Australia in his 1900 presidential address to the biology section of the Australasian Association for the Advancement of Science.

J) Waite, Edgar Ravenswood(1866-1928)

(Glover, 2007; Tyler & Hutchinson, 1993; Hale, 1928)

Waite was born at Leeds in Yorkshire. After school, he attended Owens College, Manchester, where he read biology. In 1888 he was appointed assistant curator, and in 1891 curator, of the museum of the Leeds Philosophical and Literary Society(later Leeds City Museum), the start of his museum-based career.

Between 1893-1905, Waite was assistant curator for all vertebrates except birds at the Australian Museum in Sydney. It was here that he began the collecting expeditions which characterised his career. In 1906, Waite moved to Christchurch to become Curator(effectively Director) of the Canterbury Museum where he remained until he became Director of the South Australian Museum in 1914. He held this position until the year he died.

Waite was a prolific writer across a number of disciplines. Tyler & Hutchinson(1993:iv) estimated he wrote some 250 publications, with 50 titles in herpetology. His principal speciality was fishes, but he also wrote on mammals. Among his works were The Fishes of South Australia (1923) and The Reptiles and Amphibians of South Australia, which was published posthumously in 1929.

Waite was a Fellow of the Linnean Society of London, and a senior vice-president of the Royal Society of South Australia. He was regarded as a world authority on fishes of the Australasia-Antarctic region. He was considered an exceptionally capable and innovative museum director.

4.4.3 Herpetofauna of Pyrmont peninsula in 1788

A) Introduction

The frogs and reptiles likely to have inhabited Pyrmont peninsula at European settlement were determined in two ways:

- the contemporary herpetofaunas of bushland relicts on Port Jackson were assembled from recent sources(Table 4.4.4). The cumulated observations were used to contextualise the individual species accounts noted below.
- Other information on the herpetofauna of the Sydney region was assembled as individual species accounts(Appendix C).

Regrettably, unlike birds, scarce any systematic information is available on Sydney's herpetofauna until the 1860's, when Gerard Krefft began to assemble such. By this time, the environs of the city, and Pyrmont peninsula in particular, had been greatly modified and their herpetofaunas much diminished. More so than with birds, reliance has been placed on general patterns of species distribution in the Sydney region and habitat preferences to determine whether a species might once have occurred on Pyrmont peninsula. Individual species profiles include this information.

These two information flows are then used to predict the herpetofauna likely present on Pyrmont peninsula at European settlement.

B) Contemporary herpetofaunal surveys

Ten contemporary species lists for bushland relicts between North Head and Canada Bay were tabulated(Table 4.4.4). These relict sites lie on a transect between the coast and the riverine environments inland; it is presumed that they reasonably span the habitat diversity which would have existed on Pyrmont peninsula at European settlement. Nonetheless, in that the relict sites lie mostly along the north shore of Port Jackson, their ecology at European settlement would have differed somewhat from that of Pyrmont peninsula.

Table 4.4.4: Herpetofauna of bushland reserves adjoining Port Jackson

Common Name	Canada Bay	Lane Cove	Kelly's Bush/ Woolwich Dock	North Sydney Remnant Bush	Mosman bushland	Middle Head/ George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Common Eastern Froglet	+	+	+	+	+	+		+	+	+
Ornate Burrowing Frog					+			+		
Striped Marsh Frog	+	+	+	+	+	+		+	+	+
Spotted Grass Frog					+			+		
Red-crowned Toadlet		+			+			+	+	
Smooth Toadlet		+				+				
Green and Golden Bell Frog					+(1963)					
Green Tree Frog		+								
Bleating Tree Frog	+	+								
Eastern Dwarf Tree Frog	+								+	
Freycinet's Frog										+
Peron's Tree Frog	+	+				+			+	+
Leaf-green Tree Frog		+								
Eastern Snake-necked Turtle	+	+								
Sydney Short-necked Turtle		+								
Jacky Lizard		+								
Eastern Water Dragon		+		+	+	+		+	+	+
Eastern Bearded Dragon	+								+	+
Wood Gecko					+			+		
Lesueur's Gecko		+		+	+			+		+
Southern leaf-tailed Gecko		+		+	+		+	+	+	+
Thick-tailed Gecko					+			+		+
Burton's Legless Lizard		+			+			+		+
Common Scaly-foot					+				+	+
Red-throated Skink		+						+		+
Tree-base Skink					+(1978)			+(1976)		
Fence Skink	+	+			+			+		+
Striped Skink									+	
Copper-tailed Skink		+			+		+	+	+	+
Oak Skink								+		
Cunningham's Skink								+		+
White's Skink		+						+		+

Common Name	Canada Bay	Lane Cove	Kelly's Bush/ Woolwich Dock	North Sydney Remnant Bush	Mosman bushland	Middle Head/ George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Eastern Water Skink	+	+	+	+	+			+	+	+
Greater Bar-sided Skink	+	+			+					
Delicate Garden Skink	+	+	+	+	+	+		+	+	+
Common Garden Skink	+	+		+	+	+	+	+	+	+
Three-toed Skink		+					+	+	+	
Weasel Skink		+	+			+	+	+	+	+
Eastern Blue-tongued Skink	+	+			+	+	+	+	+	+
Lace Monitor		+							+	+
Green Tree Snake		+				+			+	+
Diamond Python		+				+		+		+
Blackish Blind Snake		+			+			+		
Brown Tree Snake								+		
Golden-crowned Snake		+			+			+	+	+
Yellow-faced Whip Snake		+								+
Black-bellied Swamp Snake										+
Eastern Tiger Snake					+					
Red-bellied Black Snake		+							+	+
Eastern Brown Snake		+			+			+		+
Bandy-Bandy					+			+(1788)		

<u>Sources of information:</u>

<u>Location</u>	<u>Source</u>
Canada Bay	Hobcroft(200?)
Lane Cove	Department of Environment and Conservation(NSW) (2004)
Kelly's Bush/Woolwich Dock	Skelton <u>et al</u>(2003b)
North Sydney Remnant Bush	Biosphere Environmental Consultants(2001)
Mosman Bushland	Oculus Environmental Planning(2001)
Middle Head/George's Heights	Australian Museum Business Services(1995) Conacher Travers(2001)
Nielsen Park	Hilliard <u>et al</u>.(n.d.)
Dobroyd Head	Skelton(2004)
Manly Reserves	Skelton <u>et al</u>(2004)
North Head	Skelton <u>et al</u>(2003a)

C) Individual species descriptions

Such are the changes in the herpetofauna of the Sydney Region since European settlement, that we are fortunate to have, albeit limited, historical accounts to draw on. The species accounts compiled from this historical literature are given in Appendix C, and have been much augmented by Museum holdings for the Port Jackson region(broadly interpreted) available through the Online Zoological Collections of Australian Museums(OZCAM).

Species were selected for inclusion in this appendix by reference to the text of Griffiths(2006), supplemented for frogs by a fact-sheet of the Frog and Tadpole Study Group of NSW(White, 2006).

D) Interpretation

Information assembled by the above two processes was interpreted for each species, in conjunction with the known ecology of that species, to produce the series of tables which follow. These tables list the frogs and reptiles likely to have occurred on Pyrmont peninsula in 1788, more or less by family.

i. Ground Frogs

Also known as the Southern Frogs, they occur only in the Australian region. Egerton(2005:366) provided an excellent review of these frogs:

> *'The southern frogs are so named because of their ancestral links. Many millions of years ago, South America, Antarctica and Australia formed part of the southern super-continent known as Gondwana. Australia's southern frogs evolved from this time and are close relatives of other frogs found today in other parts of the southern hemisphere, especially in South America. Indeed, the fossil record shows that the skeletons and muscles of these frogs are so similar to those of a South and Central American group, the Leptodactylidae, that many frog experts believe them to belong to one family'.*
>
> *'Many southern frogs spawn in water, where the hatched tadpoles are fully aquatic before they metamorphose into terrestrial frogs, but one striking family feature is the trend towards increasing independence from free water for the developing larvae'.*

There could have once been eight species of Ground Frogs across Pyrmont peninsula(Table 4.4.5).

Table 4.4.5 : Ground frogs likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Tusked Frog *Adelotus brevis*	Limited historical information. Not recorded in contemporary surveys.	Suitable habitat would have once been widely available on peninsula; this species would have been present prior to European settlement.
Common Eastern Froglet *Crinia signifera*	Historical records widely distributed through Sydney, with known localities to the north and south of Port Jackson.	Would have once been widespread on peninsula.
Giant Burrowing Frog *Heleioporus australiacus*	Historical records well distributed on the north shore of Port Jackson, but no records for the south side. Not recorded in contemporary surveys.	May have disappeared around Sydney before systematic collecting started. More likely, did not occur immediately south of Port Jackson at European settlement.
Eastern Banjo Frog *Limnodynastes dumerilii*	Historical records widely distributed especially to the south of Port Jackson, less so on the north side. Absent in recent surveys of bushland relicts along Port Jackson.	Would have once occurred on peninsula where permanent water was available.
Striped Marsh Frog *Limnodynastes peronii*	Historical records well distributed to the north and south of Port Jackson, and along Parramatta River. Currently present in most bushland relicts along Port Jackson	Would have once occurred on peninsula where permanent water was available.
Spotted Grass Frog *Limnodynastes tasmaniensis*	Historical records distributed to the north and south of Port Jackson and along Parramatta River.	Would have once been widespread on peninsula.
Haswell's Frog *Paracrinia haswelli*	Not described until 1976, so historical records limited. Near Maroubra and in Royal National Park, south of Port Jackson.	Could have once occurred in wetlands at head of Cockle and Blackwattle Bays.
Red-crowned Toadlet *Pseudophryne australis*	Historical records widely distributed on the upper and lower north shore of Port Jackson. Currently in several bushland relicts north of Port Jackson. Records south of the harbour could have been of confiscated animals.	Not detected just south of Port Jackson by early collectors, even though suitable habitat would have once occurred there. Probably absent from Pyrmont peninsula at European settlement.

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Brown Toadlet *Pseudophryne bibronii*	Historical records widely distributed on the upper and lower north shore of Port Jackson. Records from Parramatta and Petersham indicate a distribution also along the Parramatta River and south of Port Jackson.	Although not widely obtained south of Port Jackson by early collectors, suitable habitat would once have existed on Pyrmont peninsula; it should have occurred there at European settlement.
Smooth Toadlet *Uperoleia laevigata*	Historical records widely distributed to the north and south of Port Jackson.	Would have once been widely distributed over the peninsula.

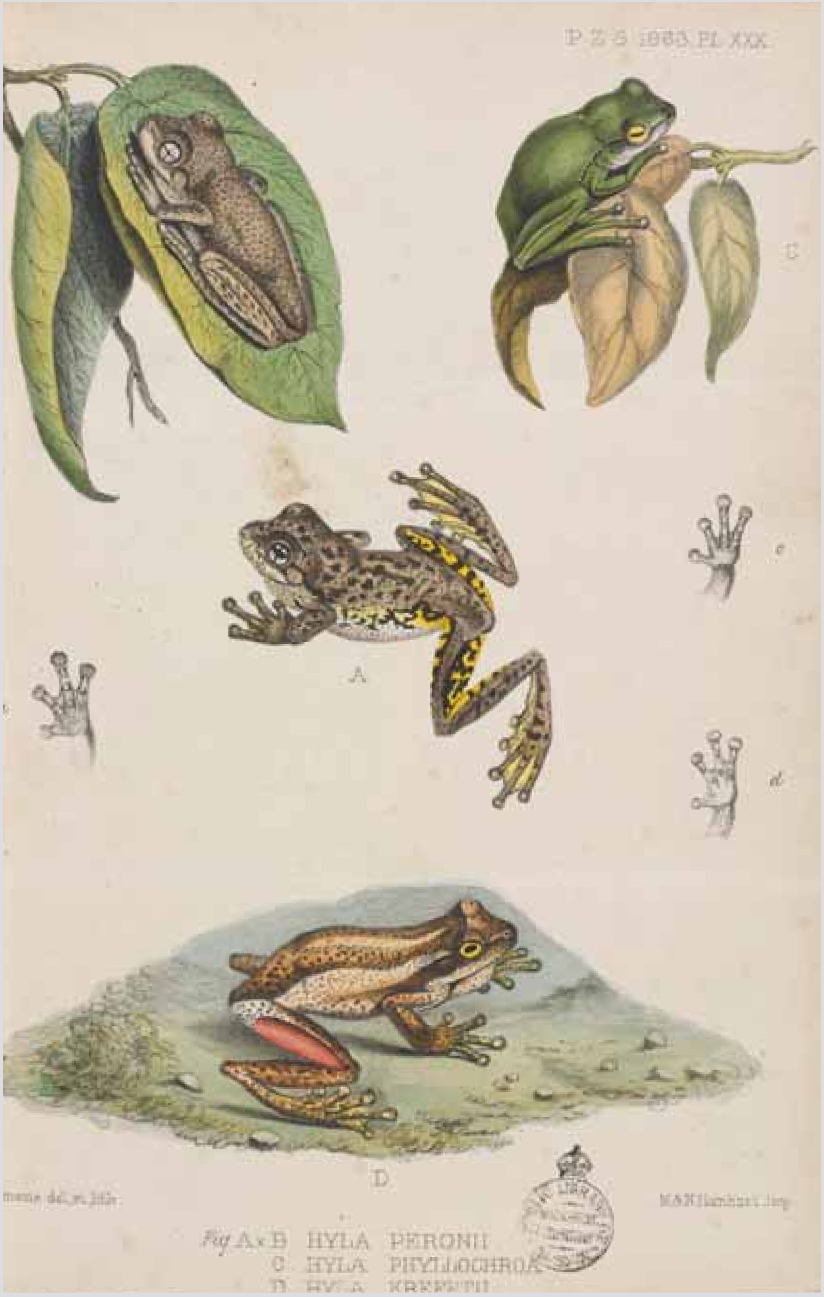
ii. Tree Frogs

According to Egerton(2005:379),

> *'tree frogs is the common name for hylids, and many species of tree frogs do live in trees in wet forests. These frogs have large round suction pads on their fingers and toes, which help them to climb efficiently. A tree frog can scale the smooth vertical surface of a window with ease.'*
>
> *'Like the southern frogs, Australian hylids are members of a widespread and ancient family, but – unlike southern frogs – tree frogs are found all over the world. They probably evolved, diversified and spread out from the great southern continent of Gondwana. Today, the greatest variety of hylids is found in South America and Australasia, both of which were once part of Gondwana'.*

The strongholds of the hylids are in north and east Australia, along the wetter margins of the continent(Cogger, 2000:116). All tree frogs are thought to lay their eggs in water, from which the stereotypical free-living tadpoles quickly emerge.

Figure 4.4.4: <u>Günther, A., 1863, Observations on Australian tree-frogs living in the Society's menagerie, Proceedings of the Zoological Society of London, 23 June 1863, pp. 1-3</u> (ML DSM/590.8/Pa8)



Günther describes the recent arrival of eight frog specimens at the Society's menagerie in London 'imported by a collector from New South Wales, and which belonged to four species [including] an apparently undescribed form, which we shall name *Hyla phyllochroa*'(p.1). This latter was indeed a species new to science, although *Hyla krefftii*, which Günther had only recently described, was later found synonymous with *Litoria jervisiensis*, described by Duméril & Bibron in 1841.

Pyrmont peninsula would once have supported a striking variety of these frogs, perhaps thirteen species in all. These would, however, have required suitable water bodies for their life-cycles, and so would have occurred particularly in the wetlands associated with Cockle and Blackwattle Creeks. Of the Tree Frogs known in the Sydney Region, the Heath Frog *Litoria littlejohni* and perhaps the Blue Mountains Tree Frog *Litoria citropa* would not have occurred on Pyrmont peninsula in 1788.

Table 4.4.6: Tree frogs likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Green and Golden Bell Frog *Litoria aurea*	Historical records particularly widespread between Port Jackson and Botany Bay. Fewer records on the north side of Port Jackson. Well distributed along Parramatta River.	Would have once occurred on Pyrmont peninsula, especially around wetlands at head of Cockle and Blackwattle Bays.
Green Tree Frog *Litoria caerulea*	Historical records well-distributed in localities north and south of Port Jackson.	Would have once been widespread on the peninsula, especially in moister areas.
Blue Mountains Tree Frog *Litoria citropa*	Historical records widely distributed on the upper and lower north shores of Port Jackson. Only one record immediately south of the harbour, i.e. for 'Sydney'. Also occurs on sandstone south of Sydney.	The dearth of observations just south of Port Jackson by early collectors suggests that this species may not have occurred on Pyrmont peninsula at European settlement, presumably due to lack of suitable habitat.
Bleating Tree Frog *Litoria dentata*	Historical records widely distributed north and south of Port Jackson, with contemporary observations along the south side of the Parramatta River.	Would have once occurred on the peninsula, particularly at heads of Cockle and Blackwattle Bays.
Brown Tree Frog *Litoria ewingii*	Historical status around Port Jackson unclear, due to taxonomic difficulties.	Status on Pyrmont peninsula in 1788 unclear, but likely present.
Eastern Dwarf Tree Frog *Litoria fallax*	Historical records broadly but thinly spread across the Sydney region. Several records around Port Jackson, also on the Parramatta River.	Would have once occurred on the peninsula, particularly around wetlands at the head of Cockle and Blackwattle Bays.
Freycinet's Frog *Litoria freycineti*	Historical records widely distributed coastally in the Sydney region. Widely distributed north and south of Port Jackson.	Would have once occurred on the peninsula, especially around wetlands at heads of bays, but more widely also.

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Jervis Bay Tree Frog *Litoria jervisiensis*	Most records southwards from Port Jackson. One north shore record, at Lindfield. Not recorded in contemporary surveys of lower north shore bushland relicts.	Would have once occurred on the peninsula, particularly around wetlands at heads of bays and along major creeks.
Broad-palmed Frog *Litoria latopalmata*	This species was not described until 1867, by which time its habitat around Sydney would have been much modified. The few historical records are mostly for western Sydney and Royal National Park. None from contemporary surveys of bushland relicts along Port Jackson.	Would have once occurred widely on the peninsula.
Lesueur's Frog *Litoria lesueuri*	Several records north of Port Jackson. Apart from a Sydney record, no records south of Port Jackson until Royal National Park.	Would have once been well-distributed over the peninsula.
Rocket Frog *Litoria nasuta*	Although approaching its southern limit around Sydney, this frog likely once occurred in suitable habitat south of Port Jackson	If Krefft's(1863, 1865, 1867) observations of this species at Sydney and Randwick were correct it could have also occurred in suitable habitat on Pyrmont peninsula – particularly at the heads of Cockle and Blackwattle Bays.
Peron's Tree Frog *Litoria peronii*	Historical and contemporary records well distributed to the north and south of Port Jackson, and along Parramatta River.	Would have once occurred widely on the peninsula.
Leaf-green Tree Frog *Litoria phyllochroa*	Historical records widely distributed in the Sydney region.	Would have once occurred on the peninsula, especially around wetlands and creeks at heads of Cockle and Blackwattle Bays.
Tyler's Tree Frog *Litoria tyleri*	Limited historical records are widely distributed south of Port Jackson, with fewer records to the north.	Would likely have once occurred widely on Pyrmont peninsula.
Whistling Tree Frog *Litoria verreauxii*	Limited historical records widely distributed through the Sydney region.	Would have once occurred on Pyrmont peninsula, especially around the wetlands and creeks at heads of Cockle and Blackwattle Bays.

iii. **Turtles** (see Egerton, 2005)

Turtles have an ancestry of over 200 million years. Australia has 35(almost 15%) of the world's species. Male sea-turtles spend their lives at sea, while females come ashore to lay their eggs. The hatchlings of all turtles must fend for themselves and only one in several thousand survives the two decades or so it takes to reach sexual maturity. There are two turtle species which may once have been associated with Pyrmont peninsula. The Eastern snake-necked Turtle belongs to the genus *Chelodina*, which is predominantly Australian in its distribution with some species extending into Papua New Guinea or Indonesia. Almost half of the species in this genus have been described in the last decade (http://www.herpbreeder.com/worldspecies/Turtles/chelidae/chelodina.htm, accessed 2 July 2007). The Snake-necked Turtle is 'sometimes called the stinker because it releases a strong-smelling liquid from its anal glands the first few times it is handled … [They feed] on aquatic invertebrates, tadpoles and small fishes. They will travel up to two kilometres overland to reach waterholes containing food or search for places to hibernate or nest … Mating at the end of spring and well into summer, these turtles lay an average of 16 eggs in holes in the banks of billabongs and streams'(Egerton, 2005:303).

The second is the Leathery Turtle *Dermochelys coriacea*. According to Cogger(2000:185), on the eastern seabord of Australia '… large adults are found, the year round, in larger bays, estuaries and rivers, the number of sightings suggesting that the species actively seeks out temperate feeding grounds … This interpretation is supported by the meagre feeding observations in this country; many casual observers have seen these turtles feeding on unidentified jellyfishes … and on Bluebottles ...' Jellyfishes occur frequently and in large numbers along the contemporary Pyrmont coastline.

Table 4.4.7: Turtles likely to have occurred on/around Pyrmont peninsula in 1788

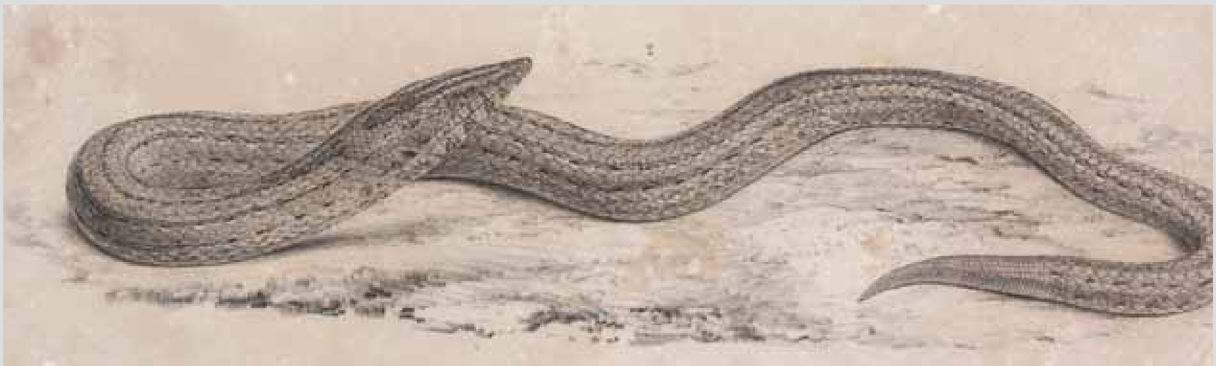
Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Leathery Turtle *Dermochelys coriacea*		May have periodically visited Cockle and Blackwattle Bays in search of food
Eastern snake-necked Turtle *Chelodina longicollis*	Contemporary surveys located this species at Lane Cove and Canada Bay.	Would have once occurred in wetlands at heads of Cockle and Blackwattle Bays.

iv. **Geckos and Snake Lizards** (see Greer, 1989)

Geckos are the second largest family of lizards, after the skinks. There are 87 species in Australia, over 10% of the world total. Of these, four would probably have occurred on Pyrmont peninsula at European settlement.

Most geckos have well-developed limbs, large eyes and small, bead-like scales which give the skin a soft, velvety feel. All Australian species are nocturnal, generally becoming active just after sunset. They may be terrestrial or arboreal. Most geckos feed on small arthropods. They can remain active to temperatures of about 16^{0}C, lower than for most other lizards. Geckos have the best-developed capacity among lizards to produce sound, usually during aggressive displays or confrontation with a predator. Some geckos have developed pads on their feet, allowing them to negotiate vertical surfaces and even the undersides of structures such as ceilings.

Figure 4.4.5: Gray, J.E., 1867, Lizards of Australia and New Zealand, London, Quaritch, Table 8, Figure 2: Lialis burtonis (DSM Q598.11/G).



John Gray had described this "legless lizard" in 1835. Distinguished from other pygopodids by its angular snout, this lizard occurs across all but the southernmost parts of Australia and in many habitats. Early records suggest that it was once widely distributed around Port Jackson

The pygopodids – or snake lizards – are most closely related to the geckos; indeed, a recent revision has placed the two groups together(Cogger, 2000:277). About thirty species are currently recognised in Australia, all but two of which occur only on this continent. They are the only reptile family endemic to the Australian region(Cogger, 2000:277). Although resembling snakes, pygopodids in fact retain their hind limbs albeit usually as vestiges. Most species are insect-eating and, as with geckos, pygopodids have a capacity to regrow their tails. Both pygopodids would have occurred on Pyrmont peninsula at European settlement.

Table 4.4.8: Geckos and Snake Lizards likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Wood Gecko *Diplodactylus vittatus*	Historical records well distributed south and north of Port Jackson.	Would have once been widely distributed on Pyrmont peninsula.
Lesueur's Gecko *Oedura lesueurii*	Historical records well distributed north and south of Port Jackson. Widely recorded in contemporary surveys.	Would have once occurred on Pyrmont peninsula, particularly in association with rock crevices, exfoliating rocks, caves, etc.
Southern Leaf-tailed Gecko *Phyllurus platurus*	Historical and contemporary records well distributed north and south of Port Jackson	Would have once occurred widely on Pyrmont peninsula, particularly in association with rock outcrops.
Thick-tailed Gecko *Underwoodisaurus milii*	Historical records well distributed south and especially the north of Port Jackson.	Would have once been widely distributed on Pyrmont peninsula.
Burton's Legless Lizard *Lialis burtonis*	Historical records well distributed south and north of Port Jackson	Would have once been widely distributed on Pyrmont peninsula.
Common Scaly-foot *Pygopus lepidopodus*	Historical records well distributed north and south of Port Jackson, also further south.	Would have once occurred widely on Pyrmont peninsula.

v. Dragon Lizards (see Greer, 1989)

Australia has 64 species of dragon lizards, about 20% of the world total. Dragon lizards can be readily distinguished from other Australian reptiles by their diurnal habits, rough scales, well-developed limbs and slightly rounded heads. Collectively, they belong to the Family Agamidae – the agamids. It is thought that dragons are related to the chameleons of southern Asia and Africa. Some dragons can run very rapidly – one has been estimated to average 20-24km/hr – a feat achieved by running bipedally. Unlike many other lizards, dragons typically sit and wait for their prey which, once located, is pursued. Most consume insects and other small arthropods, although some feed on other reptiles, nestling birds and small mammals (Cogger, 2000:298). Dragons are the most visually oriented of all Australian lizards – some are able to sight prey, conspecifics and predators up to 50 metres away. Most dragons can change their colour over short periods of time by altering the pigmentation in their skin cells; this ability is variously associated with thermoregulation, social behaviour and predator avoidance. All four species of dragon lizards in the Sydney Region likely occurred on Pyrmont peninsula in 1788.

Table 4.4.9: Dragon Lizards likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Jacky Lizard *Amphibolurus muricatus*	Historical records north and especially south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.
Eastern Water Dragon *Physignathus lesueurii lesueurii*	Historical and contemporary records well distributed north of Port Jackson. A recent record from Parsley Bay Reserve(Woollahra Municipal Council, 2004).	Would probably have occurred on Pyrmont peninsula in 1788, especially along the major creeks.
Eastern Bearded Dragon *Pogona barbarata*	Historical records widely distributed north and south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.
Mountain Dragon *Rankinia diemensis*	Historical records mostly around Royal National Park, but record from Nielsen Park indicates that the species may once have occurred to Port Jackson.	Could have been on Pyrmont peninsula at European settlement.

vi. Goannas (see Cogger, 2000:356)

A group of about 30 species which range widely from Africa, through Asia and the Indo-Papuan archipelago to Australia. Australia has 25, or about 80%, of these species. They are among the largest lizards, both in the world and in Australia; the Lace Monitor, for example, can grow to two metres in length. Goannas have well-developed limbs, and – unlike other lizards – a forked tongue like that of snakes.

According to Egerton(2005:324), 'the word 'goanna' is an Australian corruption of 'iguana', which is the name of an unrelated group of reptiles from the Americas … Because they do not have to keep their body temperature constant (unlike mammals and birds), goannas need to eat only about five times their weight in a year. By comparison, every year the eastern quoll eats 65 times its weight and the little penguin consumes 115 times its weight; clearly there is a survival advantage for goannas and other reptiles in being cold-blooded(ectothermic)'.

Table 4.4.10: Goannas likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Heath Monitor *Varanus rosenbergi*	Not described until 1957, so few historical records. Available records in two clusters, one around Terrey Hills/ Narrabeen, the other around Menai/ Loftus.	Unlikely to have occurred on the peninsula at European settlement.
Lace Monitor *Varanus varius*	Historical records widely distributed particularly to the north to a lesser extent the south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.

vii. Skinks (see Greer, 1989: Egerton, 2005)

Skinks are the largest and most diverse family of lizards, both in the world and in Australia. There are about 1200 species globally, of which almost a third occur in Australia where they comprise about 60% of all lizard species present. Some skinks cope well with urban environments, so they tend to be among the reptiles most familiar to city-dwellers. Seven species were recorded in a garden less than 4.4 km north of Sydney GPO.

Skinks are among the most morphologically diverse of all Australian reptiles, varying in respect of the relative size of their limbs, trunk, and tail. According to their particular configuration, skinks may either move using their limbs or their body.

Table 4.4.11: Skinks likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Red-throated Skink *Bassiana platynota*	Historical records to the north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
Tree-base Skink *Carlia foliorum*	This species was not described until 1884, by which time its habitat around Sydney would have been much modified. Historical records sparsely but widely distributed, with contemporary records along the north side of Port Jackson.	While status on Pyrmont peninsula at European settlement unclear, suitable habitat would have been available. Probably would have once occurred on the peninsula.
Fence Skink *Cryptoblepharus virgatus*	Historical and contemporary records particularly along the north side of Port Jackson, less so on the south side.	Would have once been widespread on Pyrmont peninsula.
Striped Skink *Ctenotus robustus*	Historical and contemporary records sparsely but widely distributed, especially to the south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
Copper-tailed Skink *Ctenotus taeniolatus*	Historical and contemporary records both north and south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.
Oak Skink *Cyclodomorphus michaeli*	Historical and contemporary records both north and south of Port Jackson.	Would have favoured rocky locations on Pyrmont peninsula.
Cunningham's Skink *Egernia cunninghami*	Historical records sparingly distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
White's Skink *Egernia whitii*	Historical records north and south of Port Jackson.	Would have once occurred on rock outcrops on Pyrmont peninsula.
Eastern Water Skink *Eulamprus quoyii*	Historical and contemporary records widely distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
Greater bar-sided Skink *Eulamprus tenuis*	Historical records well distributed north and south of Port Jackson.	Would have once occurred particularly near creeks on Pyrmont peninsula.
Delicate Garden Skink *Lampropholis delicata*	Historical records well distributed north and south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Common Garden Skink *Lampropholis guichenoti*	Historical records well distributed north and south of Port Jackson.	Would have once occurred widely on Pyrmont peninsula.
Three-toed Skink *Saiphos equalis*	Historical records well distributed north and south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.
Weasel Skink *Saproscincus mustelinus*	Historical records well distributed north and south of Port Jackson.	Would have once occurred widely on Pyrmont peninsula.
Eastern Blue-tongued Skink *Tiliqua scincoides*	Historical records well distributed north and south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.

viii. Non-venomous Snakes(see Cogger, 2000)

The division of snakes according to their danger to humans is a practical rather than taxonomic convenience. Four families of snakes contribute species to the non-venomous snakes of Australia. One of these is comprised of worm-like, burrowing, so-called Blind Snakes. These snakes feed on ants and termites and typically live underground, under rocks or logs, or in termite nests, so they are seldom seen except at night.

Quite different, the second family is comprised of the boas and pythons, with 16 species in Australia. Only one of these, the Diamond Python *Morelia spilota spilota,* would have once occurred on Pyrmont peninsula. These snakes constrict their prey, by coiling around and squeezing the prey until it suffocates. They are able to swallow prey much wider than themselves, leading to an unsightly bulge in the snake for some time afterwards. Most species have strongly prehensile tails, allowing them to move through vegetation and over rocks, etc.

The Brown and Green Tree Snakes belong to the third family; they both would have occurred on Pyrmont peninsula. Although the former is venomous, it is not regarded as dangerous to humans.

Table 4.4.12: Non-venomous snakes likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Green Tree Snake *Dendrelaphis punctulata*	Historical records well distributed north of Port Jackson, with only one record to the south.	Would have once occurred on Pyrmont peninsula.
Diamond Python *Morelia spilota spilota*	Historical records widely distributed north and south of Port Jackson.	Would have once occurred in varied habitats on Pyrmont peninsula, but particularly areas with extensive rock formations.
Blackish Blind Snake *Ramphotyphlops nigrescens*	Historical records distributed south and especially north of Port Jackson.	Would have once occurred on Pyrmont peninsula. A burrowing snake which is not normally seen.

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Brown Tree Snake *Boiga irregularis*	Few historical or contemporary records for this species around Port Jackson.	Would have once occurred on Pyrmont peninsula.

ix. Venomous snakes (see Cogger, 2000:629)

About half the land snakes in Australia – which total some 65 species - belong to the family Elapidae; most are mildly venomous, and essentially harmless to humans, but this family includes several of the most poisonous snakes in the world. There are over thirty elapid snakes in Australia, of which twelve would once have occurred on Pyrmont peninsula. Of these latter, the Death Adder would have been the most deadly, then the Brown Snake, Tiger Snake and Red-bellied Black Snake.

Elapid snakes are distinguished from other snakes by being proteroglyphous – that is having fixed or immovable fangs at the front of the upper jaw. Recent taxonomic studies have shown that these snakes are most closely related to the viviparous(live-bearing) sea-snakes.

Table 4.4.13: Venomous snakes likely to have occurred on Pyrmont peninsula in 1788

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Death Adder *Acanthophis antarcticus*	Historical records well distributed north and south of Port Jackson.	Would have once occurred widely on Pyrmont peninsula.
Golden-crowned Snake *Cacophis squamulosus*	Historical records distributed south and especially north of Port Jackson.	Would have once occurred, perhaps infrequently, on Pyrmont peninsula.
Yellow-faced Whip Snake *Demansia psammophis*	Limited historical records for both the north and south of Port Jackson.	Would have once been widespread on Pyrmont peninsula.
Red-naped Snake *Furina diadema*	Historical records well distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
Black-bellied Swamp Snake *Hemiaspis signata*	Historical records well distributed north and south of Port Jackson.	Would have once occurred widely on Pyrmont peninsula.
Broad-headed Snake *Hoplocephalus bungaroides*	Historical records north and south of Port Jackson, and along the Parramatta River.	This species would have once occurred on rocky outcrops of Pyrmont peninsula.
Eastern Tiger Snake *Notechis scutatus*	Historical records widely distributed south of Port Jackson to Botany Bay, less so on the north shore of Port Jackson.	Would have once occurred widely on Pyrmont peninsula.

Species	Historical status around Port Jackson	Likely status on Pyrmont peninsula in 1788
Red-bellied Black Snake *Pseudechis porphyriacus*	Historical records well distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula, especially around the wetlands.
Eastern Brown Snake *Pseudonaja textilis*	Historical records well distributed between Port Jackson and Botany Bay, with coastal records on the North Shore. The Sydney Gazette of 13 January 1805(p.4) carried an amusing account of 'A brown snake … killed a few days ago on the Blackwattle Swamp, which, appearing unusually large below the gorge …[produced] a brace of enormous frogs to all appearance newly swallowed, and the bulk of each exceeding that of the reptile cormorant at least in the proportion of seven to three'. The snake was likely this species, and the frogs were likely Green Tree Frogs *Litoria caerulea*.	Would have once occurred on Pyrmont peninsula.
Eastern Small-eyed Snake *Rhinocephalus nigrescens*	Historical records well distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula, usually under rocks or logs.
Bandy-bandy *Vermicella annulata*	Historical records scarce, but once widely distributed around Sydney.	Would have once occurred on Pyrmont peninsula; mostly lives underground.
Elegant Sea-snake *Hydrophis elegans*	Once not uncommon in Port Jackson.	This species might have once periodically reached the waters around Pyrmont peninsula.
Brown-lipped Sea-krait *Laticauda laticaudata*	Limited observations suggest this species once frequented Port Jackson.	This species might have once periodically reached Pyrmont peninsula.

4.4.4 Conclusions

The diverse array of habitats available in Pyrmont peninsula, the adjoining bays, and their associated wetlands once supported a rich herpetofauna of:

- 8 ground frog species
- 14 tree frog species
- 2 turtle species
- 6 gecko and snake-lizard species
- 4 dragon lizard species
- 1 goanna species
- 15 skink species
- 4 non-venomous snakes
- 13 venomous snakes

In all, perhaps 22 frog species and 45 reptile species once inhabited Pyrmont peninsula and adjoining bays. This richness reflects the diversity of available habitats.

An important dynamic would have existed between the relatively dry ridges of the peninsula itself, the swampy areas around soaks on the slopes, the creeks draining these uplands, and the wetlands associated with Cockle and Blackwattle Creeks. In periods of drought the herpetofauna would have moved to moister localities in the area while, conversely, in times of flood species would have moved into uphill locations.

The results of herpetofaunal surveys of bushland reserves adjoining Port Jackson are given in Table 4.4.4. A comparison of this listing with that of species assessed for Pyrmont peninsula(see Appendix C) reveals several points:

- It seems likely that Pyrmont peninsula once supported all the species still present in bushland around Port Jackson, with the exception of the Sydney Short-necked Turtle *Emydura macquarii dharuk*. This species, recorded in Lane Cove National Park, lives in freshwater and is unlikely to have found suitable habitat on Pyrmont peninsula
- About two-thirds of the Ground Frogs and half of the Tree Frogs believed to have once occurred on Pyrmont peninsula were not found in the contemporary surveys
- Almost all the lizards believed to have once occurred on Pyrmont peninsula still occur in bushland adjoining Port Jackson, although some seem scarce
- Almost a third of the snakes believed to have once occurred on Pyrmont peninsula were not recorded in the contemporary surveys

The reasons for these findings are likely various. In 1889, commenting on the frog fauna of Sydney, Fletcher(1889:358) was moved to comment: ' … owing to the steadily increasing area required for settlement, the consequent removal of sheltering logs and stones, the contamination of the ponds and creeks with sewage, and the increasing numbers of ducks, geese, and small boys, the collector of frogs already has to lament the devastation of some of the best collecting grounds in the neighbourhood'. Over a century later, Ehmann and co-workers(1997) studied 25 frog species which are threatened in New South Wales, almost one-third of the State's frog species. Reasons for declining populations relevant to the present circumstance included habitat fragmentation, degradation and loss, deteriorating water quality, disease, climate change, introduced fishes that prey on pre-frog life stages and even the frogs themselves. It is likely that such reasons largely account not only for a general decline in frog populations but also for the differences between a listing of frog species likely to have occurred on Pyrmont peninsula in 1788 and those present today in bushland reserves around Port Jackson.

While the lizards believed to have been on Pyrmont peninsula at European settlement are mostly still found today in bushland reserves around Port Jackson, a significant decline in the diversity(and probably populations) of snake species around Port Jackson seems to have occurred since European settlement. Probable reasons include habitat loss, degradation and fragmentation, predation by feral animals, persecution by humans, and illegal collection(Griffiths, 2006:10/11).

4.4.5 References

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4.4.6 Appendix

Appendix C: Accounts of candidate frogs and reptiles

It should be noted that some museum specimens were obtained from confiscated collections of frogs and, more especially, reptiles, so some locations listed reflect this fact. Nonetheless, the overall assemblage of records provides an impression of the occurrence of each species in the vicinity of Pyrmont peninsula.

It is also worth noting that there are no records for Pyrmont peninsula itself. This likely reflects the loss of natural habitat from the peninsula early in European settlement, before much was known of the Australian herpetofauna.

The common and scientific names used below follow Griffiths(2006).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Ground Frogs	
Tusked Frog *Adelotus brevis*	This species ranges from central-eastern Queensland coastally to about Jervis Bay(Cogger, 2000:56). It may be found in forests, woodlands and heaths (Australian Museum, 2007a), and occurs under logs, stones, and leaf litter near puddles or creeks(Frogs Australia Network, 2007). 'undoubtedly the most common of the Southern Frogs in the Sydney district'(Cogger, 1972:39). White (2006) included sites at Darke's Forest and Terrey Hills. The Australian Museum collection has a specimen from Waterloo(OZCAM, 2007).
Common Eastern Froglet *Crinia signifera*	This frog occurs in a wide belt through the coast, ranges and western slopes and plains, from south-east Queensland to South Australia. It occurs in almost every habitat, being found beneath rocks, logs, in thick vegetation etc and breeding in e.g. rock holes, creeks etc(Cogger, 2000:63). Noted for 'Sydney'(Günther, 1867:9). 'One of our commonest species [in Sydney](Fletcher, 1889:375). 'Occurring in the neighbourhood of Sydney' (Fletcher, 1890). Waite(1993) illustrated a specimen of this species collected at Woolwich in 1893. Moore(1961:232) included museum records from Lindfield, Smithfield, Rose Bay, Mosman, Longueville, Northwood, Killara, and Long Bay. Specimen collected at Thornleigh (Goldman et al, 1969:429). Found in 'all parts of Sydney'(White, 2006). The Australian Museum collection has a specimen from Castle Cove(OZCAM, 2007).
Giant Burrowing Frog *Heleioporus australiacus*	This species ranges from about Brisbane Water National Park, on the NSW central coast, to north-east Victoria(Cogger, 2000:70). It occurs in 'open, mainly dry forests and heathlands of the coast and ranges … usually around sandy creeks…'(Cronin, 2001:24). 'Giant Burrowing Frogs only occur on deeply weathered sandstone areas. They seem to need deep, moist sand beds as burrowing sites. Often these areas are overgrown by wet heath'(White, 2006). 'A single specimen of this frog … said to be captured near Ryde on the Parramatta River'(Krefft handwritten note in Günther, n.d.). Fletcher(1894a) recorded this species from Thornleigh. Parker(1940) collected a specimen at Hornsby. Moore (1961:182) included museum records from Lindfield, Killara and French's Forest.

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Eastern Banjo Frog *Limnodynastes dumerilii*	This species occurs broadly from south-east Queensland southwards into South Australia(Cogger, 2000:76). It is found in most habitats, including heaths, sclerophyll forests and woodlands, close to permanent waterholes, swamps etc (Cronin, 2001:26). Recorded at Manly(Fletcher, 1889:374). According to Fletcher(1891): '… must be one of our most abundant Sydney frogs'. Moore(1961:189/190) included museum records from Randwick, Maroubra, and Coogee. White(2006) included sites at Malabar, Voyager Point, Lugarno, Hornsby, and Berowra. The Australian Museum has specimens from Gladesville and Kensington(OZCAM, 2007).
Striped Marsh Frog *Limnodynastes peronii*	This frog is widely distributed through the coast and ranges of east/south-east Australia(Cogger, 2000:78). Noted for 'Sydney'(Günther, 1867:10). 'One of the most common frogs near Sydney'(Krefft, 1871:59). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Moore(1961:201) included museum records from Killara, Waverley, Ashfield, Lindfield, Rushcutter's Bay and Rockdale. 'Found throughout Sydney'(White, 2006). Listed for Sydney Harbour (Australian Museum, 2007b), this species requires permanent water in swamps, marshes etc.
Spotted Grass Frog *Limnodynastes tasmaniensis*	This species occurs across much of eastern Australia, in forests, woodlands, and freshwater habitats in heath(Australian Museum, 2007b), 'it usually shelters under logs and stones on the edge of both permanent and temporary swamps, lagoons and creeks'(Cogger, 2000:80). 'One of our commonest frogs [in Sydney]'(Fletcher, 1889:374). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Moore(1961:206) included museum records from Cook's River(Petersham), Smithfield, Randwick, Parramatta, Ashfield, Killara, and Guildford. Sites listed included Homebush, Mt Ku-ring-gai(White, 2006). The Australian Museum collection has specimens from Newington, Silverwater and Earlwood(OZCAM, 2007).
Haswell's Frog *Paracrinia haswelli*	This species occurs coastally from Myall Lakes to eastern Victoria(Cogger, 2000:94). Its habitats include wet sclerophyll forests, wet and dry heathlands and in vegetation bordering creeks and swamps(Cronin, 2001:36). This species is associated with coastal swamps(Wikipedia, 2007). Moore(1961:225) included museum records from Maroubra Bay and Royal National Park. White(2006) recorded this species from Darke's Forest, Helensburgh, and Jibbon Lagoon(nr. Bundeena). Assessed as 'quite common' by the Australian Museum(2007e). According to Cogger(nd): 'Patchy distribution in Sydney basin; ecology poorly known'.
Red-crowned Toadlet *Pseudophryne australis*	This species is highly adapted to Hawkesbury Sandstone, to which it is almost entirely confined; it usually lives close to ephemeral creeks, in which it breeds after rain(Cogger, 2000:98/99). Krefft(1867:108) recorded this species from the North Shore. 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890. Collected in 1893 at Woolwich(Waite, 1993). Moore(1961:239) included museum records from Killara, Lindfield, French's Forest, Mosman's Bay, Balmoral, Sydney, Hornsby, and Royal National Park. 'They were once widespread throughout the upper and lower north shore, but have almost totally disappeared from the lower north shore'(White, 2006); sites he listed included Killara, North Head, Bradley's Head. Museum collections include specimens from Waterloo and Cremorne.

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Brown Toadlet *Pseudophryne bibronii*	Widely-distributed throughout south-east Australia, this species is well-represented from the Sydney region in the Australia Museum collection (OZCAM, 2007). 'Usually found singly under rocks, logs etc. in both wet and dry sclerophyll forest'(Cogger, 2000:99). Noted for 'Sydney'(Günther, 1867:11). Krefft(1867:108) recorded it from the North Shore. 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Moore(1961:242/3) included museum records from Lindfield, French's Forest, Manly, Mosman's Bay, Cook's River(Petersham), and Parramatta. Sites listed included Hornsby Heights and Beacon Hill(White, 2006).
Smooth Toadlet *Uperoleia laevigata*	This frog occurs in eastern Australia, from south-east Queensland to Victoria (Cogger, 2000:112). Associated with dry sclerophyll forest along the coast, slopes and ranges(Wikipedia, 2007), it breeds in temporary water-bodies after rain. Noted for 'Sydney'(Günther, 1867:11). Moore(1961:222) included museum records from Sydney, Cook's River(Petersham), Randwick, Kensington, and Parramatta. Sites listed included Baulkam Hills, Terrey Hills, and Menai(White, 2006). The Australian Museum collection has specimens from Windsor Downs NR(OZCAM, 2007).
Tree Frogs	
Green and Golden Bell Frog *Litoria aurea*	Restricted to NSW and north-east Victoria, primarily at low altitudes(Cogger, 2000:128).). Associated with almost every kind of habitat, but requires waterbodies with certain characteristics for breeding. 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Copland(1957:75) included records from Waverley, Sans Souci, North Sydney, Wentworthville, and Five Dock Quarry. Moore(1961:316) included museum records from Maroubra, Sydney, Cook's River, Botany Bay, and Eastlakes. 'Its numbers are now very low in the Sydney region and I can remember how common they were in the 1960s'(Griffiths, 1996:60). Sites listed included Homebush Bay to Parramatta, Arncliffe, Rosebery, Greenacre(White, 2006). Regarded as a frog of Sydney Harbour (Australian Museum, 2007b), and recorded from Botany Swamp, Homebush and Lane Cove(Ehmann, 1997:153). Museum collections have specimens from Sydney Showground and Waterloo (OZCAM, 2007).
Green Tree Frog *Litoria caerulea*	Found over most of northern and eastern Australia(Griffiths, 2006:24), this species uses a wide variety of habitats. Noted from Sydney by White(1790). Noted for 'Sydney'(Gunther, 1867:13). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Copland (1957:27) included records from Curl Curl and Wentworthville. Moore(1961:260/1) included museum records from Sydney, Bondi, Waverley, Parramatta, Smithfield, and Sans Souci. Griffiths (2006:24) recorded it from the Beecroft area. Sites included Engadine(White, 2006). The Australian Museum collection includes specimens from Tamarama, Neutral Bay, Randwick, and Dobroyd Head(OZCAM, 2007); the Museum considers it a frog of Sydney Harbour.

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Blue Mountains Tree Frog *Litoria citropa*	Coast and ranges of NSW and eastern Victoria; 'primarily an inhabitant of heaths and both wet and dry sclerophyll forests. Usually found resting under rocks or in rock crevices'(Cogger, 2000:133). Recorded for 'Port Jackson' by Günther(1858). Krefft(1867:108) recorded this species from Ryde and the Parramatta River. 'they occur near Sydney, at Kissing Point, Ryde, at Hunter's Hill, and other localities' (Krefft, 1871:64). Recorded at Waterfall(Fletcher, 1889:383). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Copland(1957:53) included records from Hornsby and Port Jackson. Moore(1961:274) included museum records from Pennant Hills, Middle Harbour, Sydney, and Waterfall. Museum collections include specimens from Lindfield, and Manly (OZCAM, 2007).
Bleating Tree Frog *Litoria dentata*	Coast and adjacent upland areas of NSW and south Queensland; preferred habitats include wet and dry sclerophyll forests(Cogger, 2000:136). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Considered a 'Sydney frog' by Fletcher(1892). Moore(1961:277) included museum records from Smithfield, Parramatta, and Sydney. Sites included Hornsby and Manly Dam(White, 2006). Australian Museum collection includes specimens from Tamarama and Newington (OZCAM, 2007).
Eastern Dwarf Tree Frog *Litoria fallax*	Coast and adjacent areas from central-eastern Queensland to southern NSW; habitats include vegetation besides creeks and swamps(Cogger, 2000:136). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Moore(1961:252) included museum records from Clyde, Seven Hills, and Sydney. The Australian Museum collection includes specimens from Kingsdene and Kurnell(OZCAM, 2007).
Freycinet's Frog *Litoria freycineti*	'Coastal areas of south-east Queensland and NSW south to Jervis Bay; '… found in a wide variety of heath and forest habitats…'(Cogger, 2000:138). 'Common about the swamps near the coast from Botany to Narrabeen'(Fletcher, 1889:385). Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Moore(1961:304) included museum records from Lindfield, French's Forest, Sydney, Maroubra Bay, and Botany. Sites included La Perouse and Bundeena(White, 2006). Australian Museum collection includes specimens from Darlinghurst, Waterloo, Paddington and Manly(OZCAM, 2007).
Jervis Bay Tree Frog *Litoria jervisiensis*	Coastal NSW from about Wyong to extreme north-east Victoria; 'usually found among streamside vegetation in deeply forested gullies in wet sclerophyll forest, and in coastal heaths and swamplands'(Cogger: 2000:140). An adult recorded for 'Sydney'(Gunther, 1858). 'Not very common around Sydney': collected at Randwick (Fletcher, 1889:384). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). 'Mr Krefft's favourite locality for this species near Randwick has been devastated during the last few years; and it is now difficult to procure specimens near Sydney'(Fletcher, 1897:670). Moore(1961:283) included museum records from Sydney and Waterfall. Sites included Kurnell and Centennial Park. Australian Museum collection includes specimens from Waterloo and Lindfield(OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Broad-palmed Frog *Litoria latopalmata*	Coast, ranges and interior of eastern Australia from central Queensland almost to Braidwood, NSW(Cogger, 2000:142). Habitats include forests and woodlands (Cronin, 2001:58). Occurred 'near Sydney'(Krefft, 1871:63). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Moore(1961:301) included museum records from Prospect Reservoir and South Creek(St Mary's). Sites included Engadine and Helensburgh(White, 2006). Museum collections mostly from the central NSW coast and western Sydney(OZCAM, 2007).
Lesueur's Frog *Litoria lesueuri*	Coast, ranges and slopes of eastern Australia, from north Queensland to central Victoria: 'found in a wide range of habitats from dry sclerophyll and coastal heathlands to rainforest'(Cogger, 2000:143). Noted for 'Sydney'(Günther, 1867:11). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Copland(1957:91) included records from Lindfield, Galston Gorge, and Port Jackson. Moore (1961:296/7) included museum records from Sydney, Killara and Royal National Park. Sites included Audley(White, 2006). Museum collections include a specimen from Mosman(OZCAM, 2007).
Heath Frog *Litoria littlejohni*	'Coast and ranges of south-eastern Australia, [southwards] from about Newcastle'; found in sclerophyll forests, woodlands and heaths(Cogger, 2000:737), from 100 to 950m above sea level(White & Ehmann, 1997). Has been confused with *L. jervisiensis* in the past(Cogger, 2000, 737). Recorded from Darkes Forest by White(2006). 'It tends to favour higher woodland areas within the Sydney region and a typical habitat for this frog is Barren Grounds Nature Reserve'(Griffiths, 2006:30).
Brown Tree Frog *Litoria ewingii*	'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). 'One of our commonest frogs in the County of Cumberland …'(Fletcher, 1892:14). Moore(1961: 289) included museum records from Lindfield, Sydney, Parramatta, Smithfield, Stanmore, Maroubra, Kuring-gai Chase, Killara, and Eastlakes, but he did not distinguish *L. ewingii* and *L. verreauxii*. The National Museum of Victoria has a specimen from Menai(OZCAM, 2007). Not listed for Sydney by either White(2006) or Griffiths(2006). Cogger(nd) considered the original habitat at Sydney Olympic Park as 'probably marginal for this species'.

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Rocket Frog *Litoria nasuta*	Occurs in coastal and adjacent areas of northern and eastern Australia, from the Kimberleys to the mid-coast of NSW(Cogger, 2000:146). The southern limit to its distribution is unclear. Barker et al(1995:72) considered it to be 'from north of Newcastle', while Griffiths(2006:31) regarded it as 'from about the Newcastle region northwards'. On the other hand, the Australian Museum's 'Rocket Frog Fact File' noted that 'Sydney is close to the most southerly extent of the Rocket Frog's range'. Although Krefft(1863, 1865, 1867) recorded this species from Sydney and Randwick, Fletcher(1894a&b) believed this was a mistaken identification of *L. freycineti*. This view was supported in that the British Museum collection has specimens of the latter but not the former from Krefft(Moore, 1961:307). However, Copland(1957:102) listed two individuals from Randwick Swamp in the National Museum of Victoria collection, dated 1863; he acknowledged 'it is quite possible that stragglers did form colonies as far south as Sydney and have been wiped out by close settlement'. Günther(1867:11) listed the species for Sydney. The Wikipedia entry (http://en.wikipedia.org/wiki/Rocket_Frog) placed the southern limit of the main population as 'around Gosford', with 'a disjunct population occurring further south to the Sydney suburb of Avalon'. According to Robinson(1993:96): 'This species is found in open forests and *Melaleuca* swamps. It is usually associated with streams, ponds, lakes, and water-covered grassy areas'.
Peron's Tree Frog *Litoria peronii*	'This species is found over most of NSW and southern Queensland in a great variety of habitats, even well away from permanent water'(Griffiths, 2006:32). 'Occurring in the neighbourhood of Sydney'(Fletcher, 1890). Copland(1957:37) listed a record from Sydney. Moore(1961:270/1) included museum records from Parramatta, Marrickville, Wahroonga, Botany, and Long Bay. 'All parts of the Sydney region'(White, 2006). Museum collections include specimens from Sydney Showground, Waterloo, and Tamarama(OZCAM, 2007).
Leaf-green Tree Frog *Litoria phyllochroa*	Occurs in coastal and adjacent areas from south-eastern Queensland into South Australia(OZCAM, 2007). Noted for 'Sydney' by Günther(1858). A common inhabitant of most creeks and streams(Griffiths, 2006:33). Copland(1957:44) included records from Turramarra and Bobbin Head. Moore(1961:257) included museum records from Killara, Lindfield, Seven Hills, Sydney, and Royal National Park. Sites included Hornsby, Audley, Engadine(White, 2006). Museum collections include specimens from Osborne Park, Lane Cove NP, and Bexley(OZCAM, 2007).
Tyler's Tree Frog *Litoria tyleri*	From southern coastal Queensland through New South Wales to Bateman's Bay; found in a wide variety of habitats, similar to those of *L.peronii*(Cogger, 2000:156). Sites included Kurnell, Voyager Point, and Picnic Point. Australian Museum collection includes specimens from Sydenham, Parramatta, Oatlands, and Kirribilli(OZCAM, 2007).
Whistling Tree Frog *Litoria verreauxii*	Ranges from south-eastern Queensland to eastern Victoria, on the coast and ranges; habitats include coastal swamps, wet and dry sclerophyll forests(Cogger, 2000:156). Copland(1957:62) included records from Stanmore, Killara, and Smithfield. Sites included Baulkham Hills, Hornsby and Kurnell(White, 2006). Museum collections include specimens from Menai, Tamarama and Greystanes (OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Turtles	
Leathery Turtle *Dermochelys coriacea*	This species has the widest distribution of any sea turtle, from the North Sea and Alaska to Chile and New Zealand. According to Cogger(2000:185). It occurs in all coastal waters of Australia, with most sightings in temperate waters.
Eastern snake-necked Turtle *Chelodina longicollis*	'Occurs widely in east Australia from central Queensland into South Australia: 'typically an inhabitant of swamps, oxbow lakes and billabongs, or slow-moving rivers'(Cogger, 2000:191). 'This animal occurs in large numbers near Sydney'(Krefft, 1871:38). Listed for Sydney Harbour(Australian Museum, 2007d).
Geckos and Snake Lizards	
Wood Gecko *Diplodactylus vittatus*	Widely distributed in south-east Queensland, NSW, northern Victoria and south-east South Australia(Cogger, 2000:232). Habitats include dry sclerophyll forests, woodlands, heathlands and rocky outcrops(Cronin, 2001:148). Krefft(1867:106) recorded this species from Willoughby Falls(Cremorne Junction) and South Head. ' … they are also observed near Sydney'(Krefft, 1871:46. Australian Museum collection includes specimens from Chatswood, Darlinghurst, Leichhardt, and Forest Lodge(OZCAM, 2007).
Lesueur's Gecko *Oedura lesueurii*	Restricted to the coast and ranges of south-east Queensland and NSW(Cogger, 2000:263). 'Rocky ranges and outcrops, particularly sandstones and granites, in DSF and woodlands'(Wilson & Swan, 2003:82). Museum collections include specimens from Woronora River, Royal National Park, Coogee, Rodd Point, and Rose Bay(OZCAM, 2007).
Southern Leaf-tailed Gecko *Phyllurus platurus*	Central coast and ranges of NSW: 'an inhabitant of sandstone caves, overhangs and crevices in wet and dry sclerophyll forests and heathland'. Listed by White(1790). 'These species occur near Sydney, where they are much dreaded by some persons, who apply the name "Rock-Scorpions" to them'(Krefft, 1871:46). Listed for 'Sydney' by Günther(1875). 'The commonest Gecko in the neighbourhood of Sydney …'(Waite, 1898b:64). 'Also found under smaller exfoliating rocks on sandstone ridges'(Cogger, 2000:271). Krefft(1867:106) recorded this species from Double Bay, St Leonards and Botany Heads. Australian Museum collection includes specimens from Kirribilli, Neutral Bay, Mosman, Darlinghurst and Bradleys Head(OZCAM, 2007).
Thick-tailed Gecko *Underwoodisaurus milii*	Widespread across the southern third of Australia, including most of NSW(Cogger, 2000:275). Habitats include wet and dry sclerophyll forests and woodlands, and heathlands(Cronin, 2001:162). Listed for 'Sydney' by Gray(1867) and Gunther (1875). Krefft(1867:106) recorded this species from North Shore and Manly. Species occurred 'near Sydney'(Krefft, 1871:46). Museum collections include specimens from Lindfield, Darlinghurst, Goat Island, Fairlight and Rodd Point (OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Burton's Legless Lizard *Lialis burtonis*	'Virtually all habitats from desert sand ridges and gibber flats to woodlands, DSF, and margins of WSF and RF'(Wilson & Swan, 2003:118). Occurring almost throughout Australia(Cogger, 2000:294). 'Sydney'(Günther, 1867:2, 1875). Krefft(1867:106) recorded this species from North Shore and Botany. Museum collections include specimens from Darlinghurst, Mosman, Tamarama, Waterloo and Neutral Bay (OZCAM, 2007).
Common Scaly-foot *Pygopus lepidopodus*	Occurs widely in south-western and south-eastern Australia(Cogger, 2000:297). 'Favours open habitats such as heaths and woodlands. Shelters beneath low vegetation and in dense grasses'(Wilson & Swan, 2003:122). 'Sydney'(Gunther, 1867:1). 'It is common near Sydney …'(Krefft, 1871:41). Museum collections include specimens from East Hills, Darlinghurst, Rozelle, Double Bay, Rose Bay and Erskineville(OZCAM, 2007).
Dragon Lizards	
Jacky Lizard *Amphibolurus muricatus*	South-eastern Australia, from central Queensland to South Australia; 'an inhabitant of dry sclerophyll forests, rocky ridges, and coastal heathlands …'(Cogger, 2000:201). Listed by White(1790). Krefft (1867:106) recorded this species from Bondi. Hoser(1997) recorded this species from Waterfall, Engadine, Lane Cove River, Long Reef, and Gladesville. Australian Museum collection includes specimens from Woolwich, Darlinghurst, Double Bay, Leichhardt(OZCAM, 2007).
Eastern Water Dragon *Physignathus lesueurii lesueurii*	The ranges and slopes of eastern Australia from Cape York to eastern Victoria; a semi-aquatic lizard, often perched on a branch over the water in creeks and rivers(Cogger, 2000:346). Australian Museum collection includes specimens from Lane Cove West and Beacon Hill(OZCAM, 2007). Recently listed in Parsley Bay Reserve(Woollahra Municipal Council, 2004).
Eastern Bearded Dragon *Pogona barbarata*	Broadly in eastern Australia from Cape York discontinuously to South Australia (Cogger, 2000:347). Prefers dry woodlands and dry sclerophyll forests(Cronin, 2001:96). Krefft(1867:106) recorded this species from the North Shore. Hoser(1997) recorded it from Terrey Hills, Middle Cove, Kuring-gai Chase, and Middle Harbour. Museum collections include specimens from Yarra Bay, Darlinghurst, Lindfield, Manly and Nielsen Park(OZCAM, 2007).
Mountain Dragon *Rankinia diemensis*	Uplands of south-east Australia, coastally around Sydney in NSW then inland discontinuously through Victoria(Cogger, 2000:353). 'Heaths, woodlands, DSF and margins of WSF …'(Wilson & Swan, 2003:330). Australian Museum collection includes specimens from Waterfall, Heathcote, Woronora Dam, Nielsen Park and Darlinghurst(OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Goannas	
Heath Monitor *Varanus rosenbergi*	Southern Western Australia and South Australia; isolated populations in New South Wales(Cogger, 2000:372). 'Open woodlands and heaths on sandy soil'(Wilson & Swan, 2003:346). Listed for Sydney Harbour (Australian Museum, 2007d). Australian Museum collection includes specimens from Belrose, Lucas Heights, Narrabeen, Loftus, Terrey Hills, and Menai(OZCAM, 2007). According to Cogger (nd) this species has 'patchy distribution in Sydney basin: ecology poorly known'.
Lace Monitor *Varanus varius*	Coast, ranges, slopes and adjacent plains from Cape York into South Australia (Cogger, 2000:379). Habitats include woodlands and wet sclerophyll forests (Cronin, 2001:106). Listed by White(1790). 'This beautiful lizard is not uncommon at Port Jackson …'(Phillip, 1790:232). Listed for Sydney Harbour (Australian Museum, 2007d). Australian Museum collection includes specimens from Gladesville, Lindfield, Hurlstone Park, Darlinghurst and Forestville(OZCAM, 2007).
Skinks	
Red-throated Skink *Bassiana platynota*	Predominantly a species of the coast, ranges and western slopes of NSW; found in leaf-litter and around fallen timber and rock crevices and exfoliating rock slabs in coastal heaths, dry sclerophyll forests and woodlands(Cogger, 2000:568). Favours tussock grass(Wilson & Swan, 2003:126). Australian Museum collection has specimens from Lane Cove, Clontarf, Nielsen Park, and Double Bay(OZCAM, 2007).
Tree-base Skink *Carlia foliorum*	This species ranges through eastern Australia from about Townsville to Yerranderie, SW of Sydney; it is found in wet and dry sclerophyll forests(Cogger, 2000:539). Australian Museum collection includes specimens from Picnic Point, Abbotsbury, North Parramatta and Baulkham Hills. Recorded also in surveys of Mosman Bushland and Dobroyd Head(see Table 4.4.4).
Fence Skink *Cryptoblepharus virgatus*	Southern and eastern/north-eastern Australia south to about Sussex Inlet: 'Occupies a variety of habitats from wet and dry sclerophyll forests to heathlands and woodlands'(Cogger, 2000:407). Museum collections include specimens from Mosman, Cremorne and North Head(OZCAM, 2007).
Striped Skink *Ctenotus robustus*	Widely distributed from the Kimberley across northern and eastern Australia, into South Australia; it occupies a wide variety of habitats, including heaths, wet and dry sclerophyll forests and rocky situations(Cogger, 2000:440). Australian Museum collection includes specimens from Chullora, Darlinghurst, Rhodes and Rockdale (OZCAM, 2007); also recorded from the Manly Reserves(see Table 4.4.4).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Copper-tailed Skink *Ctenotus taeniolatus*	Listed by White(1790). 'Near Sydney … '(Krefft, 1871:43). Eastern Australia from Cape York to north-west Victoria; 'Found in a variety of habitats, from coastal heathlands to …dry sclerophyll forest and woodlands, but mostly in rocky situations where the lizards shelter in crevices or under logs or exfoliating rock slabs'(Cogger, 2000:448). 'Common in bushland peripheral to Sydney …'(Wilson & Swan, 2003:190). Museum collections have specimens from West Head, Darlinghurst, and Coogee(OZCAM, 2007).
Oak Skink *Cyclodomorphus michaeli*	A disjunct distribution between New England and eastern Victoria (Cogger, 2000:754). 'Edges and clearings in WSF to sandy coastal heaths and dense tussocks margining wetlands'(Wilson & Swan, 2003:200). Recorded from the Botany Swamps by Krefft(1867;106). 'Near Sydney …'(Krefft, 1871:42). Listed for 'Sydney' by Günther(1875). Australian Museum collection includes specimens from Centennial Park, Paddington, Rose Bay and Balgowlah Heights(OZCAM, 2007).
Cunningham's Skink *Egernia cunninghami*	South-east Australia, from south Queensland discontinuously to south-east South Australia(Cogger, 2000:458). Prefers 'open forests, woodlands, shrublands and heaths with cool rocky outcrops'(Cronin, 2001:116). 'Dwells communally in crevices in rock outcrops and basks on exposed rock close to cover'(Wilson & Swan, 2003:202). Krefft(1867:106) recorded this species from Maroubra Bay. 'This species is common near Sydney …'(Krefft, 1871:45). Listed for 'Sydney' (Gunther, 1875). Museum collections include specimens from Heathcote, Menai, Middle Harbour and Mt Colah (OZCAM, 2007).
White's Skink *Egernia whitii*	South-east Australia, from south Queensland discontinuously to south-east South Australia(Cogger, 2000:474). 'DSF, woodlands and heaths, particularly where rock outcrops are present …'(Wilson & Swan, 2003:212). Listed for Sydney by Krefft (1871:42) and Günther(1875). Museum collections include specimens from Waterloo, Coogee, Northwood, Manly Dam and North Head(OZCAM, 2007).
Eastern Water Skink *Eulamprus quoyii*	Coast and ranges of east Australia from north Queensland to NSW south coast then inland to south-east South Australia; preferred habitats include wet and dry sclerophyll forests, coastal heaths, coastal wetlands(Cogger, 2000:487). 'Variety of waterside habitats … Basks on rocks or logs, readily taking to water if disturbed' (Wilson & Swan, 2003:220). Krefft(1867:106) recorded this species from Rose Bay. Australian Museum collection includes specimens from Coogee, South Coogee, Lindfield, Hurlstone Park, Bardwell Park, North Ryde, Meadowbank (OZCAM, 2007).
Greater bar-sided Skink *Eulamprus tenuis*	Central coast and ranges of NSW to Cape York(Cogger, 2000:488). Habitats include wet sclerophyll forests, moist refuges in dry sclerophyll forests and coastal woodlands(Cronin, 2001:126). Listed for 'Sydney'(Gunther, 1875). Australian Museum collection includes specimens from Bradley's Head, Goat Island, Mosman, Darling Point, Neutral Bay, Rose Bay, and Darlinghurst(OZCAM, 2007).
Delicate Garden Skink *Lampropholis delicata*	South-east Australia from north Queensland discontinuously to southern South Australia(Cogger, 2000:507). 'Habitats include RF, WSF, DSF, woodlands, heaths and disturbed areas'(Wilson & Swan, 2003:236). Australian Museum collection includes specimens from Tamarama, Double Bay, Darlinghurst, Nielsen Park, Darling Point(OZCAM, 2007). Listed for Sydney Harbour(Australian Museum, 2007d).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Common Garden Skink *Lampropholis guichenoti*	South-east Australia from south Queensland discontinuously to eastern South Australia(Cogger, 2000:507). Preferred habitats include dry sclerophyll forests, open woodlands and coastal heaths (Cronin, 2001:130). Krefft(1867:105) recorded this species from Middle Harbour. Listed for 'Sydney'(Günther, 1875). Australian Museum collection includes specimens from Darlinghurst, Tamarama, Darling Point, Double Bay, Erskineville and Forest Lodge(OZCAM, 2007). Listed for Sydney Harbour(Australian Museum, 2007d).
Three-toed Skink *Saiphos equalis*	Coast and adjacent ranges of NSW and far south-east Queensland; habitats include heathland, wet and dry sclerophyll forests(Cogger, 2000:572). 'Shelters in soft damp soil under rocks, logs and leaf litter'(Wilson & Swan, 2003:288). Listed for Sydney Harbour(Australian Museum, 2007d). Krefft(1867:106) recorded this species from Randwick. 'Near Sydney'(Krefft, 1871:42). Listed for 'Sydney' (Günther, 1875). Museum collections include specimens from Woollahra, Roseville, Rose and Double Bays, Nielsen Park, Darling Point, Glebe Island, Kirribilli, Lavender Bay(OZCAM, 2007).
Weasel Skink *Saproscincus mustelinus*	Coast and ranges discontinuously from northern NSW to central Victoria (Cogger, 2000:575). 'WSF, temperate RF and moist areas in woodlands and heaths'(Wilson & Swan, 2003:290). Listed for 'Sydney'(Günther, 1875). Museum collections include specimens from South Head, Tamarama, Double Bay, Mosman, Middle Head and Darling Harbour(OZCAM, 2007). Listed for Sydney Harbour(Australian Museum, 2007d).
Eastern Blue-tongued Skink *Tiliqua scincoides*	Widely through northern and eastern Australia into South Australia; found in a wide variety of habitats including coastal heaths and forests(Cogger, 2000:582). Krefft(1867:106) recorded this species from Long Bay. Listed for 'Sydney'(Günther, 1875). Australian Museum collection includes specimens from Neutral Bay, Woolloomooloo, Forest Lodge, Double Bay and Darlinghurst(OZCAM, 2007).
Non-venomous snakes	
Green Tree Snake *Dendrelaphis punctulata*	Coast and adjacent areas of northern and eastern Australia; found in a wide range of habitats, including mangroves, wet and dry sclerophyll forests, coastal heaths (Cogger, 2000:623). Listed for Sydney Harbour(Australian Museum, 2007d). Illustrated by White(1790). Krefft (1867:106) recorded this species at Rose Bay. Listed for 'Sydney'(Gunther, 1867:9). Australian Museum collection includes specimens from Gladesville, Manly and Northbridge(OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Diamond Python *Morelia spilota spilota*	Predominantly in northern and eastern Australia(Cogger, 2000:614). Found in various habitats, including forests, woodlands and shrublands(Cronin, 2001:178). In 1788, Tench noted: 'Large snakes beautifully variegated have been killed [around Sydney]…'; identified as this species by Flannery(1996:76). Illustrated in White (1790). Krefft(1866:39) considered this a common species in the County of Cumberland: '[they] are found in almost every kind of country as long as it offers sufficient shelter; they prefer open stony ridges studded with low trees and well supplied with water, the edges of swamps and lagoons are frequented by them'. Listed for Sydney Harbour(Australian Museum, 2007d), Observed by Krefft(1867:106) at Randwick, North Shore and South Head. One captured near Point Piper Road(Jersey Road) in Woollahra(Krefft, 1869:32). One found near Dover Heights(Fletcher, 1929:228). 'Although still common in many areas, its habitat, especially in the Sydney region, is being eroded at such a fast rate that it may be under threat'(Griffiths, 1996:8). Museum collections include specimens from Darlinghurst, Malabar, St Peters, Beauty Point, Balmoral and Coogee(OZCAM, 2007).
Blackish Blind Snake *Ramphotyphlops nigrescens*	Eastern Australia from south-eastern Queensland to Victoria(Cogger, 2000:595). Habitats include wet and dry sclerophyll forests, woodlands, heath, shrublands, and rocky outcrops(Cronin, 2001:168). 'Frequently encountered beneath rocks or logs, in cavities under embedded stumps …'(Wilson & Swan, 2003:362). Krefft (1867:106) recorded this species at Manly and North Shore. The type specimen was collected at Parramatta(Krefft, 1869:18). Listed for Sydney Harbour(Australian Museum, 2007d). Australian Museum collection includes specimens from Nielsen Park, Mosman, Middle Head, Cremorne Point, Double Bay, Neutral Bay and Bradley's Head(OZCAM, 2007).
Brown Tree Snake *Boiga irregularis*	Coast and adjacent areas of northern and eastern Australia; found in a range of habitats, including mangroves, wet and dry sclerophyll, paperbark swamps and coastal heathlands(Cogger, 2000:619). 'There is a Tree-snake(*Dipsas fusca*) common in the woods about Sydney'(Bennett, 1860:277). Krefft(1867:106) found this species at Middle Harbour. The National Museum of Victoria has a specimen from Waterloo(OZCAM, 2007).
Venomous snakes	
Death Adder *Acanthophis antarcticus*	Widespread in Australia, including most of New South Wales(Cogger, 2000:632). Preferred habitats include wet sclerophyll forests, woodlands, shrublands and coastal heath on the plains, slopes and lower ranges(Cronin, 2001:184). Robert Brown described this species at Port Jackson(Mabberley, 1985:129). Krefft (1866:58) recorded this species from Randwick, and Long Bay, later(Krefft, 1867:107) also from Botany. Hoser(1991) reported this species from North Head and Bantry Bay. Museum collections include specimens from Willoughby, Balmoral, Darlinghurst, Seaforth and Haberfield(OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Golden-crowned Snake *Cacophis squamulosus*	Coast and adjacent ranges from around Nowra to south-east Queensland; abundant in sandstone areas in the southern part of its range(Cogger, 2000:638). Found in RF, moist eucalypt forests or well-watered rock outcrops, on coast and ranges …'(Wilson & Swan, 2003:402). Krefft(1867:107) recorded this species from Randwick and Bondi. '… round Sydney it is found mainly in the Mosman and the northern suburbs'(Kinghorn, 1956:122). ' … often found close to the city in the northern harbour suburbs'(Cogger, 1972:38). 'It is mainly confined to the northern parts of the Sydney region(Griffiths, 1987:26). The Australian Museum collection includes specimens from Mosman, Greenwich, Darlinghurst, Neutral Bay, and Tamarama (OZCAM, 2007).
Yellow-faced Whip Snake *Demansia psammophis*	Throughout most of Australia except the central north(Cogger, 2000:641). 'Widely distributed in a variety of habitats, including DSF, woodlands, heaths, WSF and margins of RF …'(Wilson & Swan, 2003:408). '[It] is a common snake in New South Wales, even in the vicinity of Sydney, and is highly poisonous'(Bennett, 1860:278). Krefft(1866:42) wrote: 'I believe the present species to be the most common in our neighbourhood[Sydney]'. 'Around Sydney, this is one of the best-known snakes …'(Waite, 1898a:48). The Australian Museum collection includes specimens from Darlinghurst, Naremburn, Rose Bay, Neutral Bay(OZCAM, 2007).
Red-naped Snake *Furina diadema*	Widely distributed through New South Wales and south-east Queensland(Cogger, 2000:651). Habitats include dry sclerophyll forests, woodlands and shrublands, in sites with rocky outcrops (Cronin, 2001:198). According to Krefft(1866:46): 'This very handsome little snake not uncommon near Sydney …'; he collected it at Manly and Lane Cove. He later recorded this species from Bondi(Krefft, 1867:107). The Australian Museum collection includes specimens from Woronora Dam, Double Bay, Waterloo, Naremburn, Darlinghurst and Tamarama(OZCAM, 2007).
Black-bellied Swamp Snake *Hemiaspis signata*	Coastal or near coastal areas from far northern Queensland to southern NSW; found in a wide range of habitats including wet and dry sclerophyll forests and coastal heaths(Cogger, 2000:656). 'Most abundant on edges of creeks or swamps and in RF or WSF'(Wilson & Swan, 2003:418). Krefft (1866:50) noted: 'The present species abounds in sandy or swampy localities near Sydney; the country between the city and Botany is much frequented by these snakes …'. Later, he recorded this snake from the Botany Swamps and Randwick(Krefft, 1867:107). 'It is very common round Sydney, but is restricted to marshy areas'(Kinghorn, 1956:166). Reported by Hoser(1991) from Bellevue Hill, Artarmon, Northbridge, and Cammeray. Museum collections include specimens from Moore Park, Manly, Double Bay, Willoughby (OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Broad-headed Snake *Hoplocephalus bungaroides*	Coast and ranges within about 250km of Sydney, 'largely confined to the Hawkesbury Sandstone formation, where it is usually found under large slabs or rocky ledges, or in rocky crevices'(Cogger, 2000: 658). 'I have been able to collect several hundreds of these snakes, which are strictly nocturnal in their habits, and seldom if ever observed during the daytime. They may be procured from under stones in sunny localities during the cold season, and all the stony ridges around Sydney harboured them in large numbers. At the present time they begin to become scarce, many of their favourite haunts being invaded by the gardener or builder'(Krefft, 1866:52). Krefft(1869:57) noted that: 'On the shores of Middle Harbour, and of the Lane Cove and Parramatta inlets, many specimens occur'. 'At one time common around Sydney … this snake is becoming very scarce'(Waite, 1898a:58). 'The most southerly record is of a specimen from Randwick, collected in 1934(Kinghorn, 1956:180). 'Though once common in southern Sydney, indiscriminate collecting of snakes and the removal of sandstone slabs for gardens has caused numbers to severely decline'(Wilson & Swan, 2003:420). Museum collections include specimens from Mosman, Middle Harbour, Coogee and Homebush Bay(OZCAM, 2007).
Eastern Tiger Snake *Notechis scutatus*	Mostly south-eastern NSW and most of Victoria(Cogger, 2000:660). Found in a broad range of habitats, which include wet and dry sclerophyll forests, woodlands, and heathlands(Cronin, 2001:202). Favours 'cool moist areas such as swamp edges and creek banks'(Wilson & Swan, 2003:424). Krefft(1867:107) recorded this species from Botany Heads and La Perouse. Reported by Hoser(1991) from Botany Bay and Kurnell. Museum collections include specimens from Forest Lodge, Centennial Park, Coogee and Neutral Bay(OZCAM, 2007).
Red-bellied Black Snake *Pseudechis porphyriacus*	Widely distributed through eastern and south-eastern Australia(Cogger, 2000:668). Found in wet and dry sclerophyll forests, woodlands, shrublands … along the slopes, ranges and lowlands, often around waterways'(Cronin, 2001:208). 'Associated with moist areas such as swamps, river banks or WSF and RF'(Wilson & Swan, 2003:432). Illustrated in Shaw's Zoology of New Holland(Mathews, 1912). 'The Black Snake is, I believe, the most common of all our venomous snakes; it frequents low marshy places, is fond of water, dives and swims well, and subsists principally on frogs, lizards, insects, and the smaller mammalia …'(Krefft, 1866:46/7). Krefft(1867:107) recorded this species from Randwick and Botany Swamps. Reported by Hoser(1991) from Lane Cove, Malabar, and Parramatta. Museum collections include specimens from Moore Park, Coogee, Chatswood and Darlinghurst(OZCAM, 2007).
Eastern Brown Snake *Pseudonaja textilis*	Present over much of eastern Australia, including all of NSW; occupies a wide range of habitats, including wet and dry sclerophyll forests and heaths(Cogger, 2000:675). Listed and illustrated in White(1790). According to Krefft(1866:45) ' … found generally in rocky locations'. Australian Museum collection includes specimens from Darlinghurst, Narremburn, Double Bay, Rose Bay, Randwick and Neutral Bay(OZCAM, 2007).

Appendix C - Accounts of candidate frogs and reptiles	
Species	Comments
Eastern Small-eyed Snake *Rhinocephalus nigrescens*	'Coast and ranges of eastern Australia; from Cape York peninsula to southern Victoria'(Cogger, 2000:677). 'Habitats include RF and WSF, woodlands, heaths and rock outcrops. Frequently encountered beneath bark on fallen logs'(Wilson & Swan, 2003:404). According to Krefft(1866:48/9): 'The rocky neighbourhood of Middle Harbour(Port Jackson) is the locality where I first found this new species … It is very singular that no snakes of this kind were ever met with between Sydney and Long Bay, or towards South-head, and I believe they never frequented that district otherwise the species would have been known long before this …'. Krefft (1867:107) recorded this species from Pittwater and Manly. 'Common, but not often seen due to secretive habits'(Griffiths, 1997:116). Museum collections include specimens from Maroubra South, Sydenham, Darlinghurst, Coogee Bay, and Middle Harbour Creek(OZCAM, 2007).
Bandy-bandy *Vermicella annulata*	Northern and eastern Australia: occurs in a wide range of habitats(Cogger, 2000:696). Illustrated by White(1790). Krefft(1866:57) noted: ' … very seldom met with, and apparently little known by the colonists'. Krefft(1867:107) recorded this species at Randwick and Rose Bay. Museum collections include specimens from Engadine, Wyong, and Wollongong(OZCAM, 2007).
Elegant Sea-snake *Hydrophis elegans*	According to Kinghorn(1956:108/9): 'Several specimens have been captured in Sydney Harbour and many years ago, according to records in the literature, it was not uncommonly seen basking on the rocks and beaches of Port Jackson and Botany Bay'.
Brown-lipped Sea-krait *Laticauda laticaudata*	According to Waite(1898a:68): 'They are sometimes observed on the beaches around Port Jackson …[This species is] … less aquatic than other sea snakes and [has] frequently been observed traversing land, sometimes at considerable distances from water'. Elsewhere(1898b:67) he noted: 'They enter streams and are frequently found some distance from the estuary, but they do not extend beyond tidal influence'. Cogger(2000:723) commented: 'These snakes are partly terrestrial, often being found in rocky or coral crevices along the shore, or in mangrove swamps, sometimes long distances from the sea. Unlike all other sea snakes, this group lays eggs on land'.

<u>Abbreviations:</u>

DSF Dry sclerophyll forest

RF Rainforest

WSF Wet sclerophyll forest

4.5 Birds

4.5.1 Introduction

Predicting the occurrence of bird species on Pyrmont in 1788 is complicated by the huge ecological changes in the intervening 220 years. The avifaunas around us today in highly urbanised settings like Pyrmont peninsula bear little resemblance to those at European settlement. It is not only the huge ecological changes on the peninsula itself that have altered its avifauna, but also those elsewhere in Australia and, indeed, on other continents. These are issues both for species which travel large distances as part of their annual cycle and for sedentary species whose survival can be determined by the extent and quality of habitat in their immediate vicinity. Cultural practices – for example, the shooting of birds for sport or food, the use of feathers in millinery – can also drastically alter bird populations – sometimes leading to local extinctions. The natural dynamic of species also can change over time, as individuals and then populations learn how to effectively use new habitat, for example. These and other factors make predicting the nature of earlier avifaunas hazardous.

Further complications arise from the circumstances under which the avifauna of Port Jackson became known. These circumstances have been broadly considered already, in the General Introduction, but are examined more fully here in respect of birds. There was no coordinated effort to describe the avifauna of either Port Jackson or New South Wales more generally. Instead, bird species were collected by various individuals, who sent them to others for formal identification. As Fletcher(1901) described so well, this led to incomplete collections, lost specimens, poor documentation, nomenclatural confusion and, most critically, a failure to develop a systematic view of bird life in the new colony.

This account aims to provide that systematic perspective. In doing so, those who contributed most to describing the birds of Port Jackson are acknowledged first. John Latham was particularly prolific in this respect, but it was not until John Gould visited Australia 50 years after settlement that some order was brought to a taxonomically chaotic situation.

By the time of Gould's visit, the avifaunas of Port Jackson and a rapidly expanding area around were experiencing major change. It is well to reflect on the drivers of this change, in terms of their scale and rapidity. This is done specifically for Pyrmont peninsula in section 4.5.3 below, while a more global view is presented here. Most destructive was habitat loss, as large tracts of land were cleared for agriculture and timber. This impact was compounded by the exploitation of birds in other ways.

Later, ornithologists documented the patterns of distribution and movement of birds around Sydney. The first 'complete' list of birds in the County of Cumberland was produced by Alfred North(1888), a century after European settlement. In the following decades, North further documented the region's avifauna, a process continued by a growing number of individuals to the present day. The interconnectedness of Pyrmont peninsula avifaunally with the rest of Australia, and beyond, became clear during this process.

The foregoing activities are broadly reviewed in this account, for they all help to contextualise the present study. The information gathered in a rather fragmented and haphazard way by the first observers of Port Jackson's avifauna has been elaborated and refined over time, but simultaneously that same avifauna has changed rapidly and substantively in response to growing human disturbance. There is evidence that we are still losing some of the diverse avifauna present at European settlement but that, at the same time, some species are recovering from the early impacts of settlement.

This account concludes with an attempt to accommodate these countervailing processes in a description of the likely avifauna of Pyrmont peninsula in 1788. Two approaches were taken. Fortunately areas of natural bushland remain along Port Jackson, and we know their current avifaunas. The insights so provided are historically contextualised by use of accounts of Sydney birds prepared intermittently since settlement; we are indebted to those who prepared these accounts. From these information sources, notes have been prepared for each species listed, to justify its inclusion either as within its natural range or as a vagrant to the peninsula in 1788.

4.5.2 Early studies

It is believed that Pyrmont peninsula was in the natural ranges of 220 bird species in 1788(Appendix D). These species were named by taxonomists mostly between the 1750s and 1850s. Eight taxonomists made significant contributions to this task, together naming 80% of these species.

A) Carl Linnaeus(who became Carl von Linné)(1707-1778)(Wikipedia)

Linnaeus was born in 1707 at Råshult, in southern Sweden. Early in life he showed an interest in botany, which he pursued through studies at Lund and Uppsala universities. In 1735, Linnaeus published Systema Naturae, the universally-accepted binomial nomenclature by which all living organisms have since been described. He also created the Linnaean taxonomy, a hierarchical means of classifying all living organisms. It is notable that the settlement of Sydney occurred so soon after these fundamental developments in our ability to describe natural systems.

The contribution of Linnaeus to describing the birds of Pyrmont peninsula was through accounts of cosmopolitan species, ranging across both Europe and Australia(mostly described in the 10th edition of Systema Naturae, published in 1758) or collected in south-east Asia but also occurring in Australia(mostly in the 12th edition of Systema, published in 1766). Twenty-six of the species described by Linnaeus would have likely had Pyrmont peninsula in their natural ranges in 1788.

B) Johann Friedrich Gmelin(1748-1804)(Wikipedia)

A German naturalist, botanist and entomologist, Gmelin studied medicine at the University of Tübingen, becoming a full professor of medicine and professor of chemistry, botany and mineralogy at the University of Göttingen in 1778. He published descriptions of thirteen species for which Pyrmont peninsula would have likely been in their natural ranges at European settlement, in editions of Linnaeus' Systema published in 1788 and 1789. Of these, eleven were formalisations of partial descriptions by John Latham. These latter had been published in Latham's A General Synopsis of Birds between 1781 and 1785. Most of Gmelin's specimens were from New Zealand and other South Pacific islands. His earliest species from New Holland were the Grey Goshawk *Accipiter novaehollandiae*(white morph), the Crimson Rosella *Platycercus elegans*, and probably the White-bellied Sea-Eagle *Haliaeetus leucogaster* – all described by Latham in 1781. Gmelin was assisted with specimens from Sir Joseph Banks.

C) John Latham(1740-1837)(Wikipedia)

While Latham lost naming priority to Gmelin for several species, he was nonetheless a prolific describer of Australian birds. Born in 1740, he became an English physician, naturalist and author. He practised in Dartford, Kent and, apart from A General Synopsis of Birds(published between 1781 and 1801), he also published an Index Ornithologicus(1790) and a General History of Birds (1821-1828).

It is worth elaborating on Latham's contribution to general ornithology, by way of the curator's notes on the Mitchell Library's catalogue entry for A General Synopsis. '[This text] … was one of the most influential ornithological publications of its time, not least because of its ambition and attempt at comprehensiveness. Latham's intention – which he soon realised was unachievable – was to describe all known birds from around the world: more than 3000 birds are discussed in the ten volumes … He hoped his illustrations would help educate the less informed Naturalist, and 'add somewhat to the stock of engravings in Ornithology …'. According to Mathews(1931): 'Latham dominated ornithology for half a century, and a perusal of his works leaves no doubt that he was not only a great worker, but in the front rank among the scientists of his time'. He described over a fifth of Australian bird species, and has justly been called the 'grandfather' of Australian ornithology.

Figure 4.5.1: Latham, J., 1785, Supplement to the general synopsis of birds, London, Leigh & Sowerby, plate CXXXVIII(opp. p.294): New Holland Jabiru(ML RB 2438)

In respect of Pyrmont peninsula, Latham formally described(i.e. used the Linnaean binomial system) sixty-four(12 in 1790, 52 in 1801/07) species which likely would have occurred there in 1788. This is more than a quarter of the species for which Pyrmont peninsula is believed to have been in their natural range at European settlement. Included were such iconic species as the Emu, Sulphur-crested Cockatoo, Wedge-tailed Eagle, and Australian Magpie.

D) George Shaw(1751-1813)

Overlapping John Latham was the contribution of Dr George Shaw. A biography of Shaw is given elsewhere(p. 182). He described 19 species which would have likely occurred on the peninsula in 1788 as part of their natural range, six of which were parrots.

By shortly after the turn of the century(1802), 150 bird species having Pyrmont peninsula within their natural range had been formally described. This is two-thirds of the believed total. The peninsula at this time was being cleared of its natural vegetation and, with it, most of its native birds.

E) Louis Jean Pierre Vieillot(1748-1831)

The next significant contributor, particularly during the second decade of the 19thC, was French ornithologist Vieillot. Born in Normandy in 1748, this master taxonomist contributed greatly to American ornithology. According to Oehser(1948:568): 'In all, 26 genera and 32 species of North American birds now bear Vieillot's name as the original describer, and from South America the number is much greater'. Although Oehser's article was written to celebrate the bicentenary of Vieillot's birth, it makes no mention of the latter's contribution to Australian ornithology. Vieillot described eleven species for which Pyrmont peninsula would have been in their natural range. The specimens of nine of these were collected in Australia, four specifically from Sydney. One of these latter, the White-naped Honeyeater *Melithreptus lunatus*, was a new species communicated to Audebert & Vieillot(1802) by Sydney Parkinson; the drawing was based on a living bird, which was placed in the collection of Dr. George Shaw.

F) Nicholas Aylward Vigors(1785-1840) & Thomas Horsfield(1773-1859) (Wikipedia)

Vigors and Horsfield described Australian birds during the 1820s. Nicholas Aylward Vigors, born in 1785, became a zoologist and politician. He was co-founder of the Zoological Society of London in 1826, and in 1833 founded what became the Royal Entomological Society of London. He was a Fellow of both the Linnean and Royal Societies. Thomas Horsfield, born in Philadelphia in 1773, worked extensively in the then Dutch East Indies before moving to London in 1891. In an unfulfilled collaboration, Vigors and Horsfield(1827) published Part 1 of a two-part account of Australian birds known at that time. Although primarily a taxonomic work, their publication was much enriched by notes from George Caley.

Vigors & Horsfield also described specimens provided to the Linnean Society of London by Robert Brown, collected around Port Jackson during 1802/03. According to Mabberley(1985:129), Brown collected 217 birds during his forays, while Brown himself thought he had collected overall 150 species of birds(p.128).

G) Coenraad Jacob Temminck(1778-1858)(Wikipedia)

Temminck was a Dutch aristocrat and zoologist. He was the first director of the National Natural History Museum at Leiden, from 1820 until his death in 1858. Among his several publications was a work on European birds, published in 1815, which became a standard reference. Between 1807 and 1824, Temminck described twelve species for which Pyrmont peninsula would likely have been in their natural ranges.

H) John Gould(1804-1881)
(Sauer, 1998/9, National Library of Australia, 2007)

Gould was the only taxonomist described here to visit Australia to further his studies. Born at Lyme Regis, Dorset, in 1804, Gould moved to London in early 1825 to become a taxidermist. He became "Curator and Preserver" at the Museum of the newly-formed Zoological Society of London in 1828. The next year, Gould, among other things, stuffed a giraffe for King George IV!

The Reverend Thomas Ewing, from van Diemen's land(Tasmania), proposed to Gould the publication of a work on the birds of Australia in February 1834, but it was not until November 1836 that Gould speculated on producing The Birds of Australia as his next illustrated work. Initially he intended to generate this work based on his collection of New Holland birds, which was probably the best in Europe at that time; indeed, Gould prepared two parts of a work entitled The Birds of Australia and the Adjacent Islands in 1837/38. Neither Gould nor his closer colleagues were particularly pleased with these efforts and, in January 1838, Gould announced his intention to leave that spring for Australia. Gould and his party sailed from London in the barque Parsee on 16 May 1838, reaching Hobart on 18 September 1838. Gould made two short visits to Sydney in 1839, with another in April 1840 prior to leaving for London. With the help of his collector, John Gilbert, Gould amassed 800 bird specimens while in Australia. The Birds of Australia was published between 1840 and 1848, and contained 681 plates – 595 of which were produced by H.C. Richter. A Supplement was published between 1851 and 1869.

Over his lifetime Gould generated 50 imperial folio sized volumes with over 3300 hand-coloured plates, on the birds of the world and mammals of Australia. He has been described as 'among the greatest taxonomists of all time in ornithology'.

I) Thomas Davies(Tovell, 2007)

The contributions of a ninth person, Thomas Davies, should also be acknowledged. Although not a taxonomist by profession, it seems that Davies nonetheless made an early contribution to our understanding of the birds of Port Jackson.

Davies was born at Shorter's Hill, in England, in 1737. He studied watercolouring at the Royal Military Academy in Woolwich, at the start of a career in the Royal Artillery. He eventually rose to the rank of lieutenant-general. His military career was spent mostly in North America, although he also served in tropical America.

His artistic abilities were noticed about 1760; 'Today Thomas Davies is considered one of the most talented and original artists to have worked in Canada'. A publication by the National Gallery of Canada lists 105 of his works.

According to Mathews(1925:32), Thomas Davies was: 'A great English ornithologist whose history is little known to Australian students …'. It is unclear when he became interested in ornithology. Mathews & Iredale(1920) have documented his contributions on Australian birds to Latham's second supplement to his A General Synopsis, published in 1801. There are also several and varied contributions by Davies in Latham's First Supplement to his work, published in 1787. Davies had illustrated birds from Australia and tropical America, at least. He had a collection of birds from Australia, tropical and north America, the Far East, and the Pacific islands, at least. He also advised Latham on bird migration in North America and at Gibraltar, and apparently kept live birds.

Figure 4.5.2: Davies, T., 1798, Account of a new species of Muscicapa from New South Wales, in Transactions of the Linnean Society of London, 798, vol. 4, pp. 240-242(DQ580.6/1 pp.240-242).

Described as one of the commonest birds around Sydney in the early 1820s, being found in great numbers in the Sydney Domain, this delightful species now occurs in much smaller numbers in the region.

Regarding the birds of Port Jackson, John Latham described at least nine species that would have once occurred on Pyrmont peninsula based on Davies's drawings, and another six on specimens in the latter's collection. Also, James Grant noted that his plate of the Gang Gang Cockatoo was based on a design by Thomas Davies. Davies was the first to describe and illustrate two Australian bird species – the Southern Emu-wren *Stipiturus malachurus*(1798) and the Superb Lyrebird *Menura novaehollandiae* (1799/1800)(see also Chisholm, 1960). Formalisation of these descriptions was left to George Shaw(1798) and John Latham(1802) respectively, so that Davies received no general recognition for his efforts(although Shaw acknowledged Davies in the title of his publication). Remarkably, Shaw(1800) also based descriptions of the Canadian Pouched Rat *Mus bursarius* and Magnificent Tubeworms *Tubularia magnifica*(from the Jamaican coastline) on drawings by Major-General Thomas Davies. It seems that Davies's contribution to our knowledge of the natural world is not yet fully recognised.

4.5.3 Drivers of change

A) Introduction

Our ability to describe avifaunas of the past increases with the knowledge available to us. The impacts of Europeans on native Australian birds have been systemic since settlement, and continue thus today. Sometimes these impacts are direct and obvious, but at other times they can be complex and subtle. Impacts likely to have affected the avifauna of Pyrmont peninsula are considered below. Habitat clearance, at one level, is direct and obvious. Clearance of native vegetation from Pyrmont peninsula would have had an immediate and drastic impact on the avifauna. Less obviously, the avifauna would have been impacted by habitat clearance remote from the peninsula, and it is this type of activity that is evaluated here. Other adverse impacts on the peninsula's avifauna are then briefly described. Here also, the peninsula's avifauna would have felt the impacts of such activities both on the peninsula itself and remotely.

B) Habitat clearance: Rainforest birds and Pyrmont peninsula

We examine the changing status through time of ten species likely to have periodically occurred on Pyrmont peninsula in 1788. All are generally associated with rainforest. Some would likely have used the peninsula as a resting point while moving between breeding and overwintering areas. Others may have exploited its resources more fully, possibly being more or less sedentary in the area.

i. Rainforest in New South Wales

It is well known that the rainforests of New South Wales were quickly exploited by the early settlers:

> *'In the first years of the colony, one of the mainstays of the economy was Red Cedar, Toona australis, a tree of rainforest. A major activity of the early nineteenth century can be seen as a series of "search and destroy" missions with cedar as the target. Later in the century, cedar was a major item of trade.*
>
> *In the footsteps of the cedar-getters came farmers seeking fertile land and collectors and scientists cataloguing the diversity of the rainforest'.*
>
> Floyd, 1990:xv

Clearance of the lowland rainforests of the Illawarra was well under way in the 1830s. By the 1860s, cedar getters had exploited the lower reaches of all the major rivers in New South Wales(Adam, 1987:79). These activities were thus occurring well before any systematic surveys had been done of the birds around Sydney.

Floyd estimated that the total area of rainforest in Australia today is about two million hectares, about a quarter of the area at European settlement. According to Floyd, nearly 200,000 hectares remain in New South Wales, while Angel et al(1985) estimated there were almost a million hectares of rainforest in this State at European settlement. If so, about 80% of NSW rainforest disappeared over two centuries.

Changes in the status of rainforest avifauna around Sydney are shown in Table 4.5.1. Even in 1848, Gould had only the most general understanding of the distribution of the species of interest here. He noted the commonness of some close to Sydney. By the time Alfred North(1898) assessed the avifauna of the County of Cumberland(in which Sydney resides), the situation for the species of interest was generally dire – with the exception of the Topknot

Pigeon. Destruction of NSW rainforests was well in hand when Gould made his observations, and was substantial when North made his. As an aside, we should note North's observation that: 'Although never common, all the Fruit Pigeons enumerated here were formerly more frequently met with in the coastal brushes of the county'(p.105). The situation was even worse by the mid-20th century, when Hindwood & McGill made their comments. Several species were approaching vagrant status around Sydney by then.

Table 4.5.1: Changing status of some rainforest species around Sydney

Species	Gould(1848)	North(1898)	Hindwood & McGill(1958)	Hoskin(1991)
Pacific Baza *Aviceda subcristata*	Little known of its distribution.	Not listed.	'An extremely rare straggler to the County.'	Once a rare straggler to the County, first recorded in 1923; several records since 1974. No breeding records.
Brown Cuckoo-dove *Macropygia amboinensis*	'From what I could personally observe during my residence in New South Wales, the Pheasant-tailed Pigeon resorts entirely to the brushes, as in no instance did I ever meet with it in the open parts of the country. From Illawarra to Moreton Bay it is a common and stationary species'.	'Not common. 'Frequents the coastal scrubs and brushes at Port Hacking and Geria. Previously it could be obtained at Randwick and Botany'(p. 106).	Rare. Inhabits heavily timbered gullies and rain-forests for the most part'.	'An uncommon bird of the coastal districts …'.
Topknot Pigeon *Lopholaimus antarcticus*	' … it appears to be exclusively confined to the rich and luxuriant districts of the southern and eastern portions of Australia; being particularly abundant in the brushes of Illawarra, the Hunter, the Clarence, &c., …'.	'Common from April to September in palm scrubs… (p. 105).	Irregular in occurrence. Usually arrives about May, and leaves in October. Nested in Royal National Park in 1923 and 1924.	Presence and movement governed largely by fruiting of its food plants. Has been recorded throughout the year. Its status has not changed very much over the years.
Emerald Dove *Chalcophaps indica*	'The Little Green Pigeon is sparingly dispersed in all the brushes of New South Wales, both those clothing the mountain ranges as well as those near the coast; how far it may proceed northwards has not yet been ascertained'.	'Not common. Frequents the coast brushes and contiguous mountain ranges … Formerly this pigeon could be obtained at Randwick and Long Bay' (p.105).	Rare: found breeding near Normanhurst in 1939.	Rare.

Species	Gould(1848)	North(1898)	Hindwood & McGill(1958)	Hoskin(1991)
White-headed Pigeon *Columba leucomela*	'This fine species of Pigeon is an inhabitant of those vast primaeval forests of New South Wales to which the colonists have applied the name of Brushes. I found it very numerous on Mosquito and the other low islands near the mouth of the river Hunter, as well as in the cedar brushes of the Liverpool range; I believe that it breeds in both these districts'.	'Rare. Found only in the brushes near the coast …'(p. 105).	'No recent observations, though the species has been reported from the Illawarra brushes some 40 miles south of Sydney during the past few years'.	Once a rare species to the County. Recent observations began in 1970; there has since been a steady increase in numbers.
Superb Fruit-dove *Ptilinopus superbus*	Little known of its distribution.	'Rare. Frequents chiefly the neighbourhood of Port Hacking and the National Park'(p. 105).	Three specimens recorded, twice on the "North Shore" in 1876 and one in 1953.	As per Hindwood & McGill(1958).
Rose-crowned Fruit-dove *Ptilinopus regina*	'The specimens from which my figures were taken are from the brushes of the Clarence River, situated between the Hunter and Moreton Bay; in the last-mentioned district it is tolerably abundant …'.	'Rare. Found only in the coastal brushes, and in the scrubs on the banks of George's River'(p. 104).	'The only record for the County concerns a bird shot on the northern side of Sydney Harbour(The "North Shore", as it was then termed), about the year 1865'.	'A very rare straggler'.
Wompoo Fruit-dove *Ptilinopus magnificus*	'This splendid bird, the finest of the Pigeons yet discovered in Australia, is abundant within the brushes on the south-east portion of that country but is less numerous in the Illawarra district than in the neighbourhood of the rivers Namoi, Macquarrie, Clarence & Macleay; how far its range may extend from thence to the northward has yet to be ascertained; …'.	"Rare. Sometimes met with in the scrub at Port Hacking'(p. 105).	'Only one recent occurrence is known, and that is for a bird seen at Wahroonga during August, 1942'.	'A bird of the coastal brushes, very rare in the County even in early years'.

Species	Gould(1848)	North(1898)	Hindwood & McGill(1958)	Hoskin(1991)
Noisy Pitta *Pitta versicolor*	'It is said to dwell in those almost impenetrable brushes of the eastern coast of Australia, and is tolerably abundant in such localities between the river Macquarrie and Moreton Bay'.	Not listed.	Range does not normally extend south of the Camden Haven district, some 200 miles north of Sydney. Birds shot near Wollongong in 1883 and 1877 considered likely aviary escapees.	Recent records of this species around Sydney began in 1976.
Spectacled Monarch *Monarcha trivirgatus*	Little known of its distribution.	Not listed.	Not listed.	Rare: a bird seen in 1970, the next in 1980. Since then recorded more frequently.
Regent Bowerbird *Sericulus chrysocephalus*	'This beautiful species, one of the finest birds of the Australian Fauna, is, I believe, exclusively confined to the eastern portion of the country, it is occasionally seen in the neighbourhood of Sydney, which appears to be the extent of its range to the southward and westward … I sought for and made every inquiry respecting it at Illawarra, but did not encounter it, and was informed that it is never seen there, yet the district is precisely similar in character to those in which it is abundant about two degrees to the eastward'.	Not listed.	A rare straggler, recorded in 1918(Pymble), 1921 (Lakemba), 1942 (Lakemba), 1947(Taronga Park Zoo).	Prior to 1961 a rare straggler. Since then observed on many occasions.

From the 1970s occurrence of the species of interest in Sydney was in recovery and, as will be shown below, their resurgence has been sustained. The seminal event behind this change was most likely the Rainforest Decision of the Wran government on 26 October 1982. With the ongoing creation of national parks, almost 900,000 hectares, or one third of the original 2.6 million hectares of State Forests have been removed from timber production; most of this land was in north-eastern New South Wales(Turvey, 2006:151/152).

According to Adam(1987:80), about half of the remaining rainforest in New South Wales is degraded: 'Estimates of the regeneration time for logged rainforest in N.S.W. suggest that it needs at least 200-300 years to restore canopy structure in heavily logged stands'(p.79). While the incidence of rainforest birds in the Sydney region is unlikely to ever match the levels experienced by the first European settlers, it is probable that these numbers will increase for some time yet as the rainforests themselves recover.

This short history of rainforest exploitation in New South Wales should aid our interpretation of the individual species profiles below.

ii. Brown Cuckoo-dove *Macropygia amboinensis*

This species is widely distributed from the Philippines, through much of the Indonesian archipelago, New Guinea, some small islands of the western Pacific, and eastern Australia. In the latter, Brown Cuckoo-doves occur at Cape York and then from about the Lockhart River southwards to the NSW/Victorian border. They are vagrants to Victoria, with some records in that State's north-eastern coastal area(Higgins & Davies, 1996:867/868).

The species is not regarded as threatened. Indeed, Brown Cuckoo-doves have extended their range from the Shoalhaven River to the Victorian border in recent times.

Sightings of Brown Cuckoo-doves are concentrated in the Hornsby/West Pennant Hills/Epping/Gordon area, Royal National Park and the lower Blue Mountains. However, small numbers have been more widely observed in the metropolitan area, up to 30km from the coast. Brown Cuckoo-doves are considered to be locally dispersive, with no large-scale seasonal movements – their movements are responsive to the availability of food resources(Higgins & Davies, 1996:867/868).

Table 4.5.2: Observations by month of Brown Cuckoo-doves *Macropygia amboinensis* around Sydney

Month	1	2	3	4	5	6	7	8	9	10	11	12
Observations	3	7	5	3	6	9	6	8	9	3	2	4

The distribution of observations by month(Table 4.5.2) shows that Brown Cuckoo-doves may be seen around Sydney throughout the year. There is some indication of increased populations in the months June through September with smaller populations between October and January. Egg laying in New South Wales occurs between October and January(Morris et al, 1981:33). These observations can be variously interpreted, e.g. to indicate an increased over-wintering population of the species around Sydney, or that the species is less conspicuous while breeding.

iii. Topknot Pigeon *Lopholaimus antarcticus*

This species is endemic to Australia, where it ranges from about Cape Flattery southwards through Queensland and New South Wales into Victoria, where observations have increased since the mid-1990s. The few records for Tasmania are at about 50-year intervals since European settlement, with some indication of an upsurge in the mid-1990s(Higgins & Davies, 1996:1010). Topknot Pigeons are not considered threatened either nationally or in New South Wales. The NSW population has been estimated at over 70,000 individuals.

The patterns of movement of Topknot Pigeons are complex and not well understood. The species has been variously considered nomadic, partly-nomadic, migratory, rather sedentary, and resident. While major annual migrations may not occur, it appears that Topknots can move long distances in response to fruiting cycles of their food plants and that this can result in regular shifts of population. Between-year differences in the availability of food result in the appearance of substantial numbers of Topknots along the NSW coast in some years. They also appear to undertake altitudinal movements(Higgins & Davies, 1996:1011).

Royal National Park has been traditionally the place to view Topknot Pigeons, and both Hindwood & McGill(1958:15) and Hoskin(1991:94) recorded breeding of the species at Bola Creek and the Upper Causeway in Royal National Park and also in nearby Cawley's Creek, Lilydale.

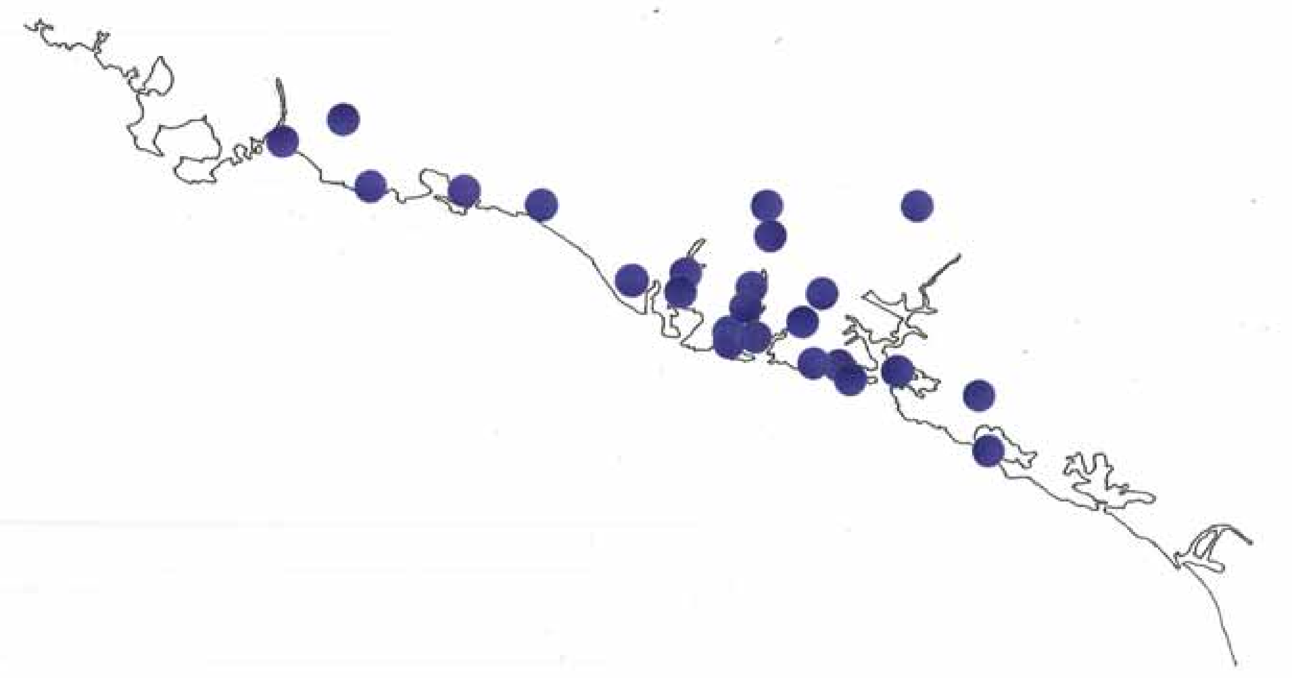
Table 4.5.3 details observations by month of Topknot Pigeons in the Sydney region, excluding those from Royal National Park(where observations should be more-or-less all-year-round due to a breeding population).

Table 4.5.3: Observations by month of Topknot Pigeons around Sydney, excluding Royal National Park

Month	1	2	3	4	5	6	7	8	9	10	11	12
Observations	0	0	1	5	3	2	4	1	8	17	3	3

A marked peak in observations is evident in September/October. This could be related to the breeding of Topknots, considered to be mostly from late October through December in New South Wales(Higgins & Davies, 1996:1014). Perhaps these birds were moving northwards to breed. There is also a small overwintering population of Topknots in the Sydney region.

Figure 4.5.3: September/October records of Topknot Pigeon *Lopholaimus antarcticus* around Sydney



Observations of Topknot Pigeons between the Central Coast and Shoalhaven River during September/October are shown in Figure 4.5.3. While reflective of the general distribution of the species in this region, these observations indicate its preference for coastal areas.

iv. Emerald Dove *Chalcophaps indica*

This species is widely distributed, eastwards from India to China, southwards through south-east Asia, the Indonesian archipelago and some islands of the western Pacific, to northern and eastern Australia. Within eastern Australia, Emerald Doves occur discontinuously from Cape York south to about Central Tilba on the NSW south coast. Vagrants periodically occur in coastal districts of eastern Victoria(Higgins & Davies, 1996:874).

Emerald Doves are not considered threatened in New South Wales. They have a Conservation Status of 'least concern' in the IUCN Red List of Threatened Species(BirdLife International, 2004a).

Movements of this species are poorly known; it is considered sedentary or locally nomadic, with no large-scale movements. This view is supported by the existence of three subspecies in Australia, with evidence of clinal variation between the subspecies present on the east coast of Australia. On the other hand, vagrancy south of its normal range indicates an ability to disperse over long distances, as do sightings at sea or far from land(Higgins & Davies, 1996: 875).

Table 4.5.4: Observations by month of Emerald Doves *Chalcophaps indica*, by region

Month	South Coast	Illawarra	Sydney	Central Coast	Hunter
1	1	2	2	-	-
2	1	4	3	1	-
3	4	6	3	-	1
4	1	-	5	-	-
5	1	4	7	1	1
6	1	2	4	2	-
7	-	2	1	6	-
8	1	3	2	3	2
9	-	2	3	2	-
10	-	-	1	3	-
11	-	4	2	5	1
12	-	-	2	1	1

Emerald Doves have been observed throughout the year around Sydney (Table 4.5.4). Although the numbers of observations are low, they peak in March on the South Coast(40% of all observations), February/March/May on the Illawarra(50%), April to June in Sydney(40%), and in July and November on the Central Coast(46%). Further, 90% of South Coast observations(10) were outside the main breeding period in New South Wales. Emerald Doves have eggs or young in all months in New South Wales, but mostly in June-August. These observations suggest a partial movement of the species southwards through central/southern NSW after breeding, with a slow northerly movement starting on the South Coast in March and reaching the Central Coast by July, early in the main breeding season. More observations should clarify this interpretation.

v. White-headed Pigeon *Columba leucomela*

Endemic to Australia, this species occurs discontinuously east of the Great Divide from far north-eastern Queensland to southern New South Wales. The southernmost population ranges from Byfield National Park to Tathra on the far south coast of New South Wales(Higgins & Davies, 1996, Morris, 2006:282).

White-headed Pigeons were heavily persecuted until protection in the 1950s. Also, Higgins & Davies(1996:847) noted: 'In Richmond R. district, populations declined after extensive clearing of rainforest(c.1860 to 1900) but, since 1940s, numbers have increased and range expanded into agricultural areas after planting of Camphor Laurels to provide shelter for stock and people'. More generally, Blakers et al (1984:220) noted:

> *'Last century the White-headed Pigeon was commonly seen by settlers clearing the rainforest. It became rare but recently has begun to increase again. These changes in abundance are attributed to changes in agricultural practice. At first, settlers clear-felled the forest, leaving no trees to provide fruit for the Pigeons, so that their numbers declined. Subsequently shelter trees were planted, often allowing pockets of rainforest to grow again. As these trees began to fruit the Pigeons increased in numbers, feeding on the fruit of native and exotic species'.*

Assessments of the status of White-headed Pigeons over recent decades in New South Wales and its relevant regions are shown in Table 4.5.5.

Table 4.5.5: Changing status of White-headed Pigeons *Columba leucomela*, by region

Region	Assessment
New South Wales	Moderately common, with numbers declining southwards 'but possibly increasing because of proliferation of *Ligustrum*[Privet]'(Morris et al.,1981:33)
County of Northumberland (Gosford, Wyong & Newcastle)	Scarce visitor, nomadic, possibly resident (Morris, 1975:59)
County of Cumberland(Sydney)	'Once a rare species in the County'. First 20th century observations in September 1970: 'There has since been a steady increase in numbers, particularly in the Lane Cove River Valley and associated streams and gullies, and the North Shore line'(Hoskin, 1991:94)
County of Camden (including the Illawarra district)	Scarce visitor, nomadic. Two shot in 1965, three separate sightings in early/mid 1970s(Gibson, 1977:59)
Illawarra, Shoalhaven and adjacent tablelands	Moderately common, resident '… this species was almost extirpated during the depression years of the 1930s. Numbers have recovered substantially since the 1970s …'(Chafer et al , 1999)

Recent field observations suggest that this species has shown striking increases in population and distribution in southern New South Wales. These trends are well illustrated by comments in the Annual Reports of the New South Wales Field Ornithologists Club since the mid-1980s(Table 4.5.6).

Table 4.5.6: Recent accounts of White-headed Pigeons *Columba leucomela* in southern New South Wales

Year	Observation
General	
1986	'Becoming much more common'(Cooper, 1990:83)
1991	'Numbers continue to increase in the Sydney-Illawarra Regions'(Morris & Burton, 1993:49)
1992	'The records for South Coast and Blue Mountains would indicate the continued expansion of range of this species'(Morris & Burton, 1993:104)
1993	'The spread through Sydney's north-west and northern suburbs, the Illawarra, South Coast and Lower Blue Mountains continues'(Morris & Burton, 1995:101)
1997	'Numbers continue to increase overall and spread further south and west'(Morris, 2000:27)
1999	'Continues to expand its range'(Morris, 2002:205)
2001	'Range expansion continues …'(Morris, 2003:117)
Sydney	
1985	'Reports and numbers from Sydney Region appear to be increasing'(Cooper, 1989:24)
1988	'Numbers in the Sydney Region continue to increase'(Cooper, 1989:24)

Year	Observation
Blue Mountains	
1990	'Few records for the lower Blue Mountains'(Burton & Morris, 1993:104)
1994	'… few records for Lower Blue Mountains'(Burton & Morris, 1996:85)
Illawarra	
1992	'… still uncommon but increasing in the Illawarra'(Morris & Burton, 1994:116)
1994	'…clearly this species is well established in this Region' (Morris & Burton, 1996:84)
2002	'Gradually cementing their range in the Illawarra'(Morris, 2004:199)
South Coast	
1989	'Rarely recorded on the south coast'(Morris & Burton, 1992:56)
1993	'[Observations] in Eurobodalla Shire indicating a continuing southern spread'(Morris & Burton, 1995:101)

Sources:

Burton, A.C.G. & Morris, A.K., 1993, New South Wales Annual Bird Report – 1990, Australian Birds 26(4), 89-136.

Cooper, R.M., 1989, 1985 New South Wales Bird Report, Australian Birds 22(1/2), 1-52.

Cooper, R.M., 1990, 1986 New South Wales Bird Report, Australian Birds 23(4), 68-101.

Morris, A.K., 2000, New South Wales Annual Bird Report 1997, Australian Birds 32(1), 1-64.

Morris, A.K., 2002, New South Wales Annual Bird Report 1999, Australian Birds, 32(4), 173-246.

Morris, A.K., 2003, New South Wales Annual Bird Report 2001, Australian Birds 33(2), 85-160.

Morris, A.K., 2004, New South Wales Annual Bird Report 2002, Australian Birds 33(3), 165-242.

Morris, A.K. & Burton, A.C.G., 1992, New South Wales Annual Bird Report – 1989, Australian Birds 26(2), 41-70.

Morris, A.K. & Burton, A., 1993, New South Wales Annual Bird Report 1991 Australian Birds, 27(1), 29-76.

Morris, A.K. & Burton, A., 1994, New South Wales Annual Bird Report 1992, Australian Birds, 27(4), 97-139.

Morris, A.K. & Burton, A., 1995, New South Wales Annual Bird Report 1993, Australian Birds 28(4), 81-128.

Morris, A.K. & Burton, A., 1996, New South Wales Annual Bird Report 1994, Australian Birds, 29(4), 63-112.

The breeding season of this species is protracted, nesting being recorded in all months of the year but mostly between September and December, and also in January in New South Wales(Higgins & Davies, 1996:847). Around Sydney, breeding has been confirmed on the Hunter, Illawarra and South Coast(Morris, 2002; Morris & Burton, 1996; Morris, 2000).

Movements appear complex and dependent on food resources, which vary considerably between seasons, location, and year.

The White-headed Pigeon has become widespread across the Sydney Region over the last three decades, with concentrations particularly in the Lane Cove Valley, along the North Shore line, and in Royal National Park.

vi. Superb Fruit-dove *Ptilinopus superbus*

This species occurs in Australia, Indonesia, Papua-New Guinea, the Philippines, and the Solomon Islands. It thus has a large global range, believed to occupy between 100,000 and 1,000,000 km^2(International Union for the Conservation of Nature and Natural Resources(IUCN), 2006). It is ranked as being of 'least concern' by this organisation.

The Superb Fruit-dove is considered secure at a national level, but is listed as vulnerable under the NSW Threatened Species Act(NSW NPWS, 2007). This is due to its population and distribution having been severely reduced, it being an ecological specialist, with poor recovery potential(it lays a single egg each year).

Figure 4.5.4: Records of Superb Fruit-dove *Ptilinopus superbus* around Sydney

The Superb Fruit-dove in Australia occurs principally in the coastal belt from north-eastern Queensland to north-eastern NSW. It is much less common further south, being found to Moruya and then, as a vagrant to eastern Victoria and Tasmania. Part of the population is migratory or nomadic, with some movement to New Guinea. Some individuals(young birds particularly) move south through Sydney in March-May(Morris, 1993, 2000, 2002b: NSW Department of Environment and Climate Change, 2007c), in search of late fruiting food resources further south. Indeed, almost two-thirds of all observations of this species in the Sydney region occur during these three months, peaking in April and May. Most records are within 25km of the coast(Figure 4.5.4). Morris(1993:94) considered this species a regular autumn/winter visitor to the Hunter, Sydney, Illawarra, and South Coast regions. The observation of a Superb Fruit Dove at Blaxland suggests that this species may be extending its range into the Blue Mountains.

vii. Rose-crowned Fruit-dove *Ptilinopus regina*

This species occurs in Indonesia, patchily across northern Australia from the Kimberley to Cape York, down the east coast from about Mossman to Berry on the Illawarra, with vagrants to Victoria(Higgins & Davies, 1996; Chafer et al, 1999).

It is regarded as being of 'least concern' in the IUCN Red List of Threatened Species(BirdLife International, 2004b) but is classified a threatened species by the NSW Department of Environment and Climate Change(2007a). The NSW population has been estimated at 1600-2000 individuals (Higgins & Davies, 1996:988).

Like other Australian fruit-doves, this species has probably suffered considerably in the past from shooting, collection and habitat loss.

Rose-crowned Fruit-doves are believed to have a partial North-South migration in east Australia, moving south in summer and north in winter(Higgins & Davies, 1996:989). On the other hand, observations of 30 individuals indicate that this species is present between the Central Coast and Illawarra mostly from June to November(Table 4.5.7).

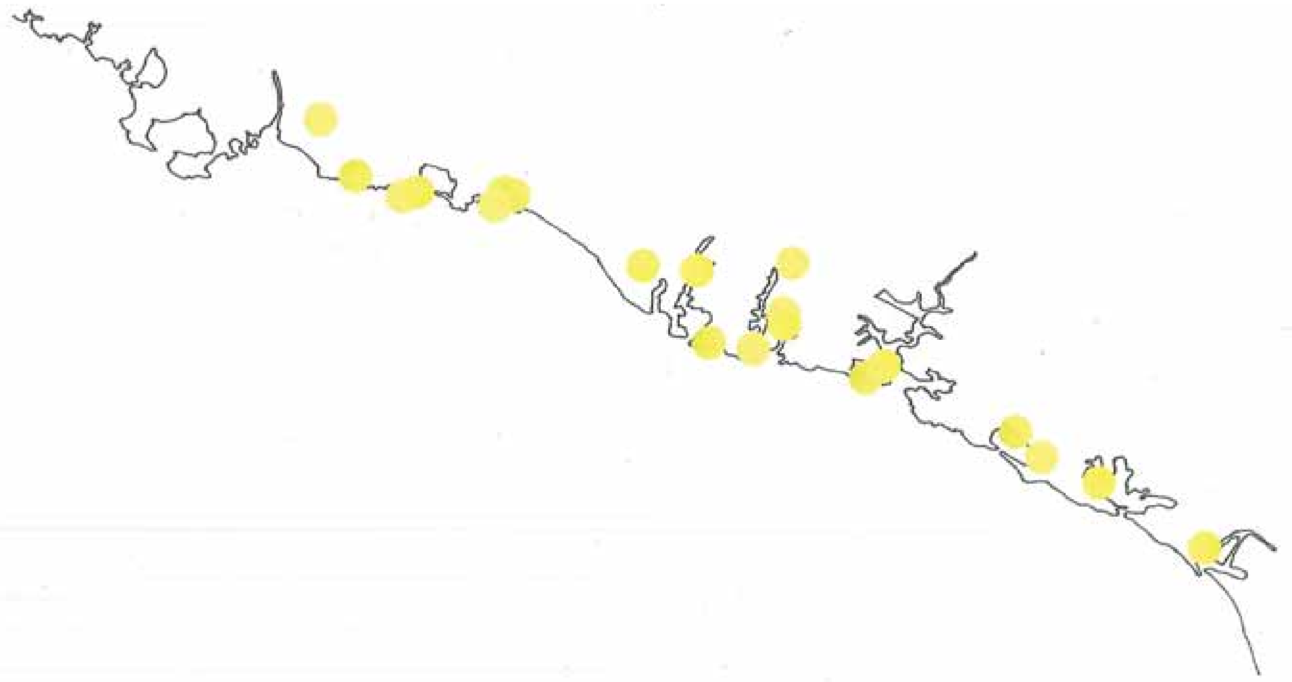
Rose-crowned Fruit-doves breed between October and late February in New South Wales (Higgins & Davies, 1996:991), so that the species may be overwintering in these regions prior to moving north to its breeding grounds. Although based on low numbers, there is some indication that Rose-crowned Fruit-doves occur in the Sydney Region mostly in June/July, and in the Illawarra District between July and especially September.

Table 4.5.7: Observations by month of Rose-crowned Fruit-doves *Ptilinopus regina* by region

Month	Region			Total
	Central Coast	Sydney	Illawarra	
1	-	-	-	-
2	1	1	-	2
3	-	-	-	-
4	-	-	-	-
5	-	1	1	2
6	-	2	1	3
7	-	3	2	5
8	-	1	3	4
9	-	1	7	8
10	-	1	1	2
11	1	2	1	4
12	-	-	-	-

Most observations of this species are very coastal, with individuals recorded mostly within 10km of the coast in the Central Coast/Illawarra regions, ranging up to about 20km in the Sydney region(Figure 4.5.5).

Figure 4.5.5: Records of Rose-crowned Fruit-dove *Ptilinopus regina* around Sydney



viii. Wompoo Fruit-dove *Ptilinopus magnificus*

Wompoo Fruit-doves occur throughout New Guinea and as three distinct populations/subspecies from Cape York down the east coast to just south of Wollongong(Higgins & Davies, 1996). Temminck(1822:126) described this species as native to the east coast of New Holland, facing the Five Islands and close to Red Point. It was a moderately common breeding resident in the 1840s on the Illawarra, and once ranged south at least to Cambewarra Mountain(Chafer et al, 1999).

The NSW population has been estimated at more than 7,000 individuals(Higgins & Davies, 1996:975). Although its overall conservation status is regarded as of 'least concern' in the IUCN Red List of Threatened Species, the Wompoo Fruit-dove is classified as a threatened species in New South Wales by the NSW Department of Environment and Climate Change (2007b). Wompoo Fruit-doves were once shot for food or recreation, and Frith regarded the species as uncommon or locally extinct over much of NSW and South Queensland. Nevertheless, field observations between the Central Coast and Illawarra District of New South Wales have markedly increased since the mid-1980s(Table 4.5.8).

Table 4.5.8: Observations of Wompoo Fruit-doves *Ptilinopus magnificus*, by region

Region	Date	Observation	Location
Hunter	23.8.1989	1 bird	Corlette, Port Stephens
	Oct 1989	1 bird	Blackbutt Reserve, Newcastle
	16.10.1989	I bird	New Lambton Heights
Central Coast	13.11.1996	I adult	Berkeley Vale

Region	Date	Observation	Location
Sydney	1865	1 bird	Dobroyde Gardens, Haberfield
	Aug. 1942	1 bird	Wahroonga
	11.8/9.9./15.10.1985	1 bird	Collaroy Plateau
	6.11.1996	I bird	East Chatswood
	8.11.1996	1 bird	Kurrajong
	29.4-15.7.1997	2 birds	Kurrajong Heights
	15-23.10.2000	1 male	St Ives
	29-31.10.2000	I male	Castlecrag
Illawarra	1804		Red Point
	1890		Cambewarra Mountain
	1920		Mt Keira
	1977		Rhododendron Garden Mt Ousley
	1982		Macquarie Pass
	1982/1986		Farmborough Heights
	1994		Mt Kembla

Sources:

Chafer, Brandis & Wright(1999)

Hoskin(1991)

Morris(2002a:35)

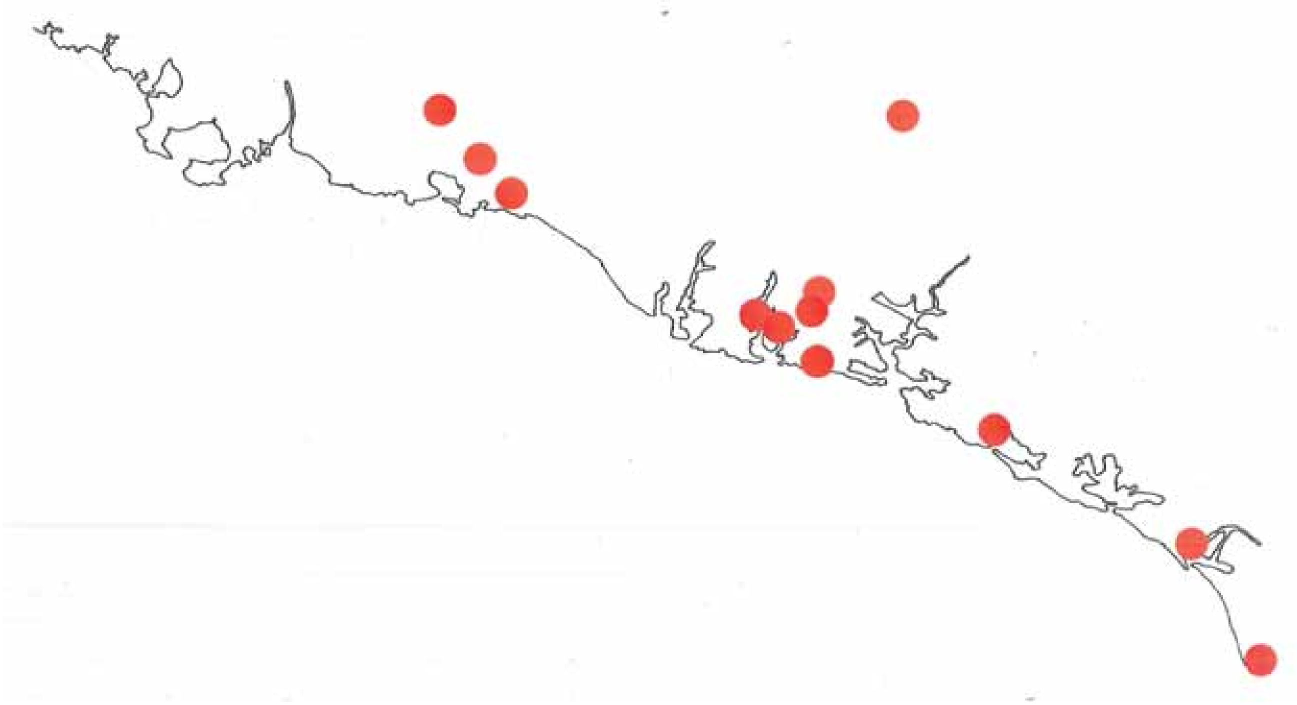
Morris & Burton(1992:56)

Morris & Burton(1999:111)

Temminck(1822)

Apart from the bird sighted at Kurrajong Heights between April/July 1997, all records for the Sydney Region were between August/November, and especially October/November. This appears to relate to breeding times, which are believed to be between October and late January in New South Wales(Higgins & Davies, 1996:978). The observed birds were presumably moving to their breeding grounds.

Figure 4.5.6: Records of Wompoo Fruit-dove *Ptilinopus magnificus* around Sydney



As can be seen from Figure 4.5.6, most Wompoo Fruit-doves have been recorded within 20km of the coast between the Central Coast and Illawarra.

ix. Noisy Pitta *Pitta versicolor*

This species occurs widely along the east coast of Australia, northwards to islands in the Torres Straits with some records from New Guinea; southwards the main populations occur to near Taree on the mid-north coast(Higgins, Peter & Steele, 2001). Biometric studies suggest a discreet Noisy Pitta population south of Gympie (Woodall, 1993). Recent assessments of the regional status of Noisy Pittas in New South Wales are shown in Table 4.5.9.

Table 4.5.9: Assessments of status of Noisy Pittas *Pitta versicolor* in New South Wales

Region	Assessment
New South Wales	Uncommon between the Northern Rivers and Lower Hunter, with three records further south(Morris et al, 1981:43)
Gosford/Wyong/Newcastle (County of Northumberland)	Not listed(Morris, 1975)
Sydney (County of Cumberland)	Four records for the region, one in 1976 and three in the 1980s(Hoskin, 1991:120)
Wollongong (County of Camden)	Two Wollongong records from 1877 and 1883, considered 'probably absent' today(Gibson, 1977:63)
Illawarra, Shoalhaven and adjacent tablelands	Rare;summer migrant. Observed five times in recent decades, twice in the mid/late 1980s and three times during the 1990s(Chafer et al, 1999)

Noisy Pittas were scarcely recorded between the Central Coast and Illawarra until the mid-1970s, with a resurgence of the species towards the southern limits of its range.

Figure 4.5.7: Records of Noisy Pitta *Pitta versicolor* around Sydney

In NSW, Holmes believed that Noisy Pittas occur in coastal lowlands on the North coast only in winter(Lindsey, 1979), an observation supported by Morris(1992a:3/4). Cumulated observations over the last three decades suggest that Noisy Pittas migrate south in New South Wales, particularly in April/June, overwintering as far south as Akole(just south of Narooma)(Morris, 2004:210), and migrating northwards to breed especially in September/October. For the most part, they have been recorded to 12-15km inland from the coast(Figure 4.5.7). These movements appear related to the egg-laying period between October and January(Morris et al, 1981; Woodall, 1994).

x. Spectacled Monarch *Monarcha trivirgatus*

This species occurs widely on the islands to the north of Australia, and discontinuously along the east coast of Australia from Cape York to south of Sydney. The southernmost breeding population is believed to range between about Rockhampton, Queensland and near Gloucester in mid-northern NSW(Higgins, Peter & Cowling, 2006a).

The Spectacled Monarch is considered rare to very rare south of its breeding range, with indications of increasing frequencies of occurrence since the early 1980s(Table 4.5.10).

Table 4.5.10: Assessments of status of Spectacled Monarchs *Monarcha trivirgatus* in New South Wales

Region	Assessment
New South Wales	Moderately common between the Northern Rivers and Ourimbah, with records further south to Sydney, Dapto and Ulladulla(Morris et al , 1981:43)
Gosford/Wyong/Newcastle (County of Northumberland)	Rare visitor, recorded in 1935 and 1973(Morris, 1975)
Sydney (County of Cumberland)	Rare, with records in 1970 and (two) in 1980: 'Since then single birds have been seen in Royal National Park and other locations'(Hoskin, 1991:120)
(County of Camden)	Rare visitor, one record in 1975(Gibson, 1977:63)
Illawarra, Shoalhaven and adjacent tablelands	Rare, summer migrant, with records from seven locations between 1973 and 1996(Chafer et al, 1999)

Field observations, which split almost evenly between Sydney and the Illawarra, confirm the rarity of the Spectacled Monarch towards the southern limits of its range; it has been recorded south to the Shoalhaven River at Nowra(Russill & Russill, 1996). They also confirm the preponderance of records since the early 1980s, with few earlier observations.

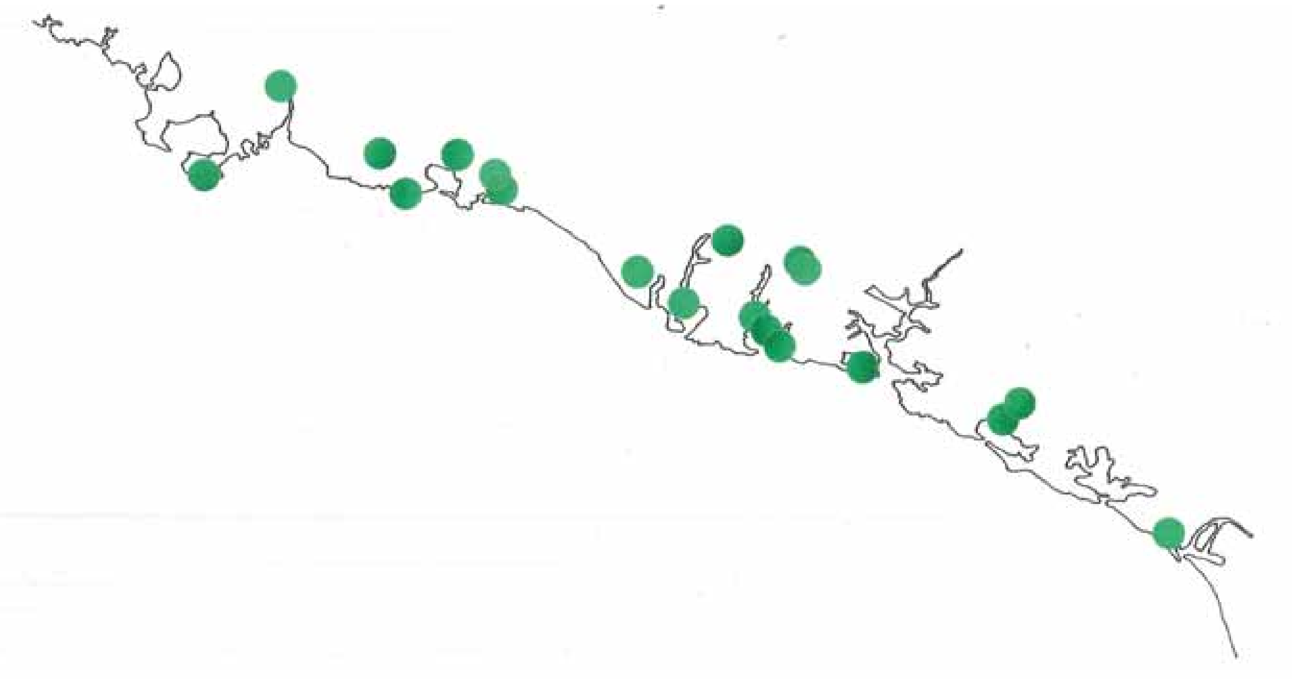
The monthly distribution of 26 observations from the Central Coast southwards(Table 4.5.11) suggests a northerly movement in about February and a well-defined southerly migration in October/November.

Table 4.5.11: Observations by month of Spectacled Monarchs *Monarcha trivirgatus*, south from NSW central coast

Month	1	2	3	4	5	6	7	8	9	10	11	12
Observations	1	3	1	0	0	0	0	0	2	10	8	1

These observations relate well to the known movements of this species, which migrates northwards from New South Wales in March/April(Morris et al, 1981) and returns to Australia in September/October(Higgins, Peter & Cowling, 2006a:57).

Figure 4.5.8: Records of Spectacled Monarch *Monarcha trivirgatus* around Sydney



Most observations of this species have been within 10km inland of the coast. Around Sydney, they extend up to 25km inland from the coast(Figure 4.5.8).

xi. Regent Bowerbird *Sericulus chrysocephalus*

Endemic to central eastern Australia, with apparently isolated populations in central Queensland. The main population occurs in a continuous band from Kroombit Tops, near Biloela in south-eastern Queensland to Thirroul in the Illawarra district; there was a record from Bega in January 1919(Edwards, 1919:303).

The range and status of this species has likely been much diminished since European settlement. Higgins et al(2006a:875) noted Regent Bowerbirds were formerly killed in large numbers for the millinery trade in London and for mounting as decorative novelties. They were killed by pigeon shooters and as a pest of orchards, and were 'popularly kept in captivity in early 20th century, with a glut of birds imported into England in 1903'. These authors documented contractions in range of this species as a result of these activities. Notwithstanding this history, the Regent Bowerbird has a conservation status of 'least concern' in the IUCN Red List of Threatened Species(BirdLife International, 2004c).

While published observations of Regent Bowerbirds between the Hunter and Illawarra Districts are limited, the species has shown little change in range or abundance over the last three decades(Table 4.5.12).

Table 4.5.12: Assessments of status of Regent Bowerbirds *Sericulus chrysocephalus* in New South Wales

Region	Assessment
New South Wales	Moderately common Northern Rivers and Tableland to Central Coast. South to Broken Bay and Cattai. Also recorded in Thirroul in 1977(Morris et al , 1981:43)
Gosford/Wyong/Newcastle (County of Northumberland)	Moderately common, nests in January(Morris, 1975)
Sydney (County of Cumberland)	'Prior to 1961 a rare straggler, since then has been observed on many occasions in the Baulkham Hills Shire … No known breeding records'(Hoskin, 1991:120)
County of Camden	Not listed by Gibson(1977:63)
Illawarra, Shoalhaven and adjacent tablelands	Accidental, with Thirroul and Menangle records noted(Chafer et al, 1999)

According to Higgins et al(2006a:875) movements of this species are not well known: 'Probably largely resident or sedentary but with some local winter movement, including altitudinal movement from higher elevations towards coasts'. Regent Bowerbirds have been recorded in almost every month in the region between the Central Coast and the Illawarra district, but there are too few observations to identify movement patterns in this region with confidence.

Observations for the Sydney region are limited to the north-west and south of the city, with no evidence of movements across the metropolis.

xii. Conclusions

This examination of mostly rainforest species illustrates the difficulties of establishing distribution patterns of the past. Extensive rainforest clearance in the early decades of settlement greatly reduced populations of the above species and hence their occurrence around Sydney. Since the early/mid 1970s populations of most of these species have started to recover sufficiently to make evident their annual patterns of movement in the Sydney region. Some species, such as the Brown Cuckoo-dove, Topknot Pigeon and Emerald Dove appear to be part-sedentary around Sydney, with populations supplemented over winter at least in respect of the first two species. Some individuals of the two latter species move northwards in spring to breed. The situation is less clear with the Emerald Dove, for which there are indications of movement between March and July depending on region.

The fruit-doves appear, although the evidence is sketchy, to move south after breeding, with some overwintering in southern NSW and, more especially with the Rose-crowned and Wompoo Fruit-doves, move north in September/November to breed. The Noisy Pitta shows a similar pattern of movement.

The Spectacled Monarch, on the other hand, is a summer visitor to southern New South Wales, arriving from the north in September/October and leaving in March/April. It is insectivorous, unlike the frugivorous pigeons.

The situation is unclear for the Regent Bowerbird, which appears to have sedentary, highly localised populations in central New South Wales. There is not yet enough evidence to show whether this species exhibits annual latitudinal movements.

Most, but not all, of the species studied have been recorded along a quite narrow coastal corridor – up to 20-25km wide – during their migrations. This may in part reflect the concentration of observers(and population more generally) in coastal areas.

In respect of Pyrmont peninsula, it seems probable that several rainforest species would once have overwintered in small numbers on the peninsula, while a few might have found enough suitable habitat to breed on the peninsula. A third group of species could have used suitable habitat on the peninsula as a resting place during their migrations; clearly, Pyrmont peninsula was well placed in the flyways of most of these species. This insight should be recognised in any revegetation plans for the peninsula.

These accounts of the changing fortunes of some NSW rainforest avifauna have parallels across other bird species found around Sydney, so great has been the impact of Europeans. This makes any efforts to describe the avifauna of Pyrmont peninsula in 1788 particularly difficult. Nonetheless, it is through such endeavour that priorities for future actions will emerge, an endeavour which can only improve with more knowledge.

C) Table birds

The early settlers had no compunction about using native birds as food: '[They] were interested in the parrots which abounded in the bush, mostly shooting them for sport or for the pot. Parrots are excellent eating, and many a bushman has enjoyed parrot stew'(Harman, 1981:2). Birds contributed significantly to the diet for well over a century after European settlement, as the comments below make clear, and still do to a lesser extent today. Some of the table birds which would have occurred on Pyrmont peninsula in 1788 are listed in Table 4.5.13, with short accounts of these delicacies. The cumulative effect of these predations on bird populations and distribution was substantial.

Table 4.5.13: Table birds once found on Pyrmont peninsula

Species	Comments
Black Duck *Anas superciliosus*	'Its flesh is excellent, and no Duck is more sought after for the table or for the splendid sport it affords in the field'(North, 1913/14:74)
Buff-banded Rail *Gallirallus philippensis*	'Its flesh forms an excellent article for the table, and the bird itself affords considerable amusement to the sportsman …'(Gould, 1972:2, 335).
Painted Button-quail *Turnix varia*	' … it is a bird which is not to be despised when the game-bag is emptied at the end of a day's sport, for it forms an acceptable variety to its contents'(Gould, 1972:2, 179)
Common Bronzewing *Phaps chalcoptera*	'In consequence of the excellence of its flesh, great numbers of this bird are shot for the table …[it] affords excellent shooting, equal to partridge shooting in England'(Diggles, 1866/70)
Wonga Pigeon *Leucosarcia melanoleuca*	'Its flesh being remarkably white and extremely delicate, it is one of the best birds for the table inhabiting Australia, or indeed any other country'(Gould, 1848, lxx)
Ground Parrot *Pezoporus wallicus*	'Its flesh is excellent, being delicate in flavour, and equalling, if not surpassing, that of the quail and snipe'(Gould, 1972, 2, 87)

D) Cage Birds

Harman(1981:1) surmised that Australian cockatoos were probably taken by Malay fishermen as pets long before Europeans settled the continent: 'At any rate, the Sulphur-crested Cockatoo must have made its appearance in Europe at a very early date. This is proved by a portrait painted by [Verelst, c.1644-1721] … the work depicts a small girl with her pet bird, which is unmistakably a Sulphur-crested Cockatoo'(p.1).

Several bird species which would have occurred on Pyrmont peninsula in 1788 were valued as cage-birds(Table 4.5.14).

Table 4.5.14: Cage-birds once found on Pyrmont peninsula

Species	Comments
Rainbow Lorikeet *Trichoglossus haematodus*	'A large export trade is done in the live birds, principally with Europe and England, and these are eagerly sought for on arrival, some of the rarer species commanding high prices' (North, 1912: 40)
Australian King Parrot *Alisterus scapularis*	' … it is highly prized as a cage-bird'(Gould, 1972:2, 36)
Crimson Rosella *Platycercus elegans*	' … it is one of the commonest of the living Parrakeets sent from Australia to this country'(Gould, 1972:2, 45)
Diamond Firetail *Stagonopleura guttata*	'A large export trade in Finches is done every year with the Continent and England; in one shipment I saw, in April 1902, over five thousand Finches that left Sydney for Antwerp'(North, 1906/09:268)

Figure 4.5.9: Brown, P., 1776, Nouvelles illustrations de zoologie, London, B. White, planche VII: Blue-bellied Parrot[Rainbow Lorikeet], opp. p.13(MRB/Q591/14).

A native species which has successfully adjusted to urban living; widespread on Pyrmont peninsula, where it provides a noisy context to the daily activities of people.

E) Bird parts for decoration

North(1913/14:22) noted that great numbers of Intermediate and Great Egrets (*Ardea intermedia* and *A. alba* respectively) were "slaughtered" during the breeding season for their plumes, for the purpose of adornment. While the populations of these species around Pyrmont peninsula would have been small, they may nevertheless have been hunted for this purpose.

The following account on Lyre Bird tails, although not directly relevant to Pyrmont peninsula, does relate to a bird living across Port Jackson from the peninsula:

> *'Not long since for example two enterprising brothers employed a number of men to shoot the luckless male birds, in which, after some practice, they were unfortunately so successful, that five hundred dozen of the beautiful tails were reported to have reached Sydney in the course of a few weeks. It is not difficult to understand how, at this rate, the price of tails which according to Bennett, was as high as thirty shillings a pair fifty years ago, should have fallen to one-third the price, at which figure I could have bought a hundred pairs in Sydney, had I been so minded.'*
>
> (Frederick Aflalo, 1896, as reported by Serventy(1966:101))

A similar article appeared four years later in The Sydney Daily Telegraph
of Wednesday 29 August 1900(2nd edition), p5:

> THE DESTRUCTION OF LYRE BIRDS
>
> "Lovely lyre-bird tails; 4s each. Have one mister?"
>
> The speaker was one of two men who entered "The Daily Telegraph" office yesterday, carrying a number of lyre-bird tails; or, rather, portions of tails.
>
> "Where did these come from?" was asked.
>
> "From the Paterson, up north."
>
> "Plenty of them there?"
>
> "Thousands."
>
> "But are they not protected?"
>
> "Part of the year," said the man who earns his living by shooting them.
>
> "Do you shoot many?"
>
> "Well, about 250 this season; last season a lot more. You see, a lyre-bird is awfully difficult to get at; and I have been tramping for weeks over terrible country. Get exterminated? Well, perhaps so, in time, but not yet. There are thousands of square miles where nobody has been after them yet. I am not saying they ought not to be protected, though. In Victoria you're not allowed to shoot them at all, and that may be right."
>
> "Much sale for these tails?"
>
> "Yes, pretty good; sold a dozen in one place just now. You don't get them every day, and perhaps you won't get them at all soon."
>
> Why should anyone be allowed to shoot these beautiful birds? is a question that everyone will ask.

North(1901:17) 'ascertained that an incredible number of the beautifully plumaged males of the Rifle-bird and Regent Bower-bird were destroyed throughout the year [in the head-waters of the North-Coast rivers], a large export trade being done in the skins of these species, chiefly for the purposes of adornment and decoration of ladies' hats and dresses'.

F) Persecution of birds

Sometimes, birds compete with humans for the same resource(Table 4.5.15). This was clearly true of the Cormorants, while Wedge-tailed Eagles have long been persecuted for allegedly taking young livestock. While the Emus were killed for no good reason, the motivation for destroying large numbers of Black Swans is unclear.

Table 4.5.15: Persecution of birds once found on Pyrmont peninsula

Species	Comments
Emu *Dromaius novaehollandiae*	'Between the years 1945 and 1960, bounty was paid on 284,724 birds. Since most of these were killed in pastoral areas where the birds do little harm and some good, this was largely a waste of money'(Serventy, 1966:109)
'Black Swan *Cygnus atratus*	'One most destructive mode by which vast numbers are annually destroyed is that of chasing the birds in a boat at the time they shed their primary quill-feathers … I have heard of the boats of a whaler entering an estuary and returning to the ship, nearly filled with Black Swans destroyed in this manner' (Gould, 1972:2,34)
Cormorants *Phalacrocorax spp*	'In the Report for the year ending 31st December 1890 of the Fisheries Board of NSW, it is stated: "Under the Fisheries Regulations the extinction of Cormorants or Shags – birds very destructive to fish – was promoted by means of a reward for each bird destroyed'(North, 1912;324) 'We believe that a premium for the destruction of these birds would be really productive of good; and that a reward of 10s. for every score of cormorant heads produced would probably quickly rid us of a very serious pest'(Royal Commission into NSW Fisheries, 1880:86).
Wedge-tailed Eagle *Aquila audax*	In 1899, 7865 "Eagle-hawks" were killed according to the Official Report of the Stock and Brands Branch of the NSW Department of Agriculture(North, 1912:201).

G) Conclusions

The impact of the early settlers on the native birds of Port Jackson would have been considerable and sustained. Major changes in the region's avifauna would have taken place well before systematic attempts were made to describe that avifauna. Retrospectively, reliance must be placed on piecing together the brief comments of observers of the natural history of Port Jackson early in the establishment of Sydney.

4.5.4 Key observers

While the taxonomists performed the fundamental task of describing the birds of Port Jackson, they contributed little to our understanding of the patterns of distribution and movement of these birds in response to environmental factors (e.g. the seasons, drought, fire, human activity). As we have just seen, human activity had a rapid and major impact on bird distribution and movement around Port Jackson and beyond. A second set of individuals – ornithologists – have elucidated these complex patterns over time. It is largely through the efforts of a few committed individuals that the information in the two appendices was generated.

Early arrivals, like Watkin Tench[1788](1996) provided some broad insights into the birdlife around Port Jackson at settlement: 'Hawks are very numerous, so are quails. A single Snipe has been shot. Ducks, geese and other aquatic birds are often seen in large flocks'(p.241).

While the first three decades of European settlement in Sydney were described ornithologically by people like White, Raper, Lewin, and Caley (Figure 4.5.10), their documentation was, by today's standards, far from complete.

Figure 4.5.10: Peak activity periods of key contributors to Sydney ornithology

White	-	-																			
Raper	-	-																			
Caley			--																		
Lewin			--	--																	
Bennett						--	--	--													
Gould							--	--	-												
Ramsay									--	--	--	-									
North												--	--	-							
Hindwood															-	--	--	--	--		
McGill																	--	--	--	--	
Hoskin																	--	--	--	--	--
Dixon																				-	
Morris																				-	--	--
	1780	-90	1800	-10	-20	-30	-40	-50	-60	-70	-80	-90	1900	-10	-20	-30	-40	-50	-60	-70	-80	1990

The next century of ornithology in Sydney was dominated by four individuals – George Bennett, John Gould, Edward Pierce Ramsay, and Alfred John North. Working mostly between the 1830s and mid-1910s, these individuals described new species, bird nests and eggs, and documented patterns of distribution and movement around Sydney and, indeed, Australia. They together provided our first systematic understandings of the status of birds in the Sydney Region, and the changes in this status over some 70 years.

A revival of interest in the birds of Sydney was initiated by Keith Hindwood from the mid-1920s.

Short biographies of these key contributors to our understanding of Sydney's avifauna follow.

A) John White(1756?-1832)(Reinits, 1967)

White was born about 1756 in Sussex, England. He entered the navy as third surgeon's mate in June 1778, received his diploma of the Company of Surgeons in August 1781 and, in June 1786, became surgeon on the Irrestible. Four months later, he was appointed Chief Surgeon on the expedition to establish a convict settlement at Botany Bay.

Within the first year of settlement White had accompanied Governor Phillip on two journeys of exploration. He kept a journal of both the voyage to Australia and his early explorations, which he sent to London in November 1788 for publication as the Journal of a Voyage to New South Wales in 1790. The text contained 65 engravings 'illustrating the natural history and products of the colony, drawn in England from specimens sent by White, with descriptions by English specialists'(Reinits, 1967).

White left Sydney on the Daedalus in December 1794, reaching London in July 1795. He did not return to New South Wales, serving the navy in various roles until he was superannuated in January 1820 at age 63. He lived in retirement in Brighton, dying at Worthing in February 1832 aged 75.

B) George Raper(1769-1797) (Hindwood, 1967)

Raper entered the British navy in 1783, joining the Sirius in December 1783; this latter became part of the First Fleet. He became a midshipman in September 1787, a few months before reaching Botany Bay. Raper's stay in Sydney was interspersed with voyages to the Cape of Good Hope, to get food for the colony, and then Norfolk Island, where the Sirius was wrecked and the crew marooned for eleven months. When Raper left Sydney for England in March 1791, he had spent only 18 months in the colony itself.

Raper appears to have been a self-taught artist. He produced a diverse set of paintings of scenes, native implements, birds, flowers, fishes etc not only of Port Jackson but also Lord Howe and Norfolk islands. Of particular interest here are his 'Birds of Port Jackson' series, as they clearly relate subject matter to locality. Hindwood(1964) described a series of 72 Raper paintings lodged with the British Museum(Natural History), of which 21 portrayed bird species from Port Jackson.

C) George Caley(1770-1829) (Else-Mitchell, 2007)

Caley, naturalist and explorer, was born in 1770 at Craven, Yorkshire. He initially worked with his father, a horse dealer, but became associated with the Manchester School of Botanists. In 1795 he approached Sir Joseph Banks who employed him at Kew gardens, before sending him in 1798 to New South Wales as a collector. Caley arrived in Sydney in 1800 and was allotted a house at Parramatta, where he kept his specimens and maintained a botanical garden until his appointment was terminated by Banks in 1808(whereupon Caley returned to England). Caley also studied birds, sending specimens to Banks. He travelled widely, both around Sydney and beyond, and provided Vigors and Horsfield with useful information on the status of birds around Sydney at that time.

D) John Lewin(1770-1819) (Mander-Jones, 1967: McEvey, 1978)

Lewin, naturalist and artist, sailed to Sydney on the Minerva, arriving on 11 January 1800. The Lewins moved to Parramatta about September 1800, from where Lewin participated in various expeditions to enlarge his collections.

Lewin's bird sketches, with short commentaries, were first published in 1808 as Birds of New Holland. The title, commentaries, and number of plates varied over subsequent editions published in 1813, 1822, 1838 and 1875. Regrettably, Lewin's original commentaries were shortened by his brother, Thomas, who edited the 1808 edition. It is significant that the 1813 edition 'was the first natural history book known to have been published in Australia … '(McEvey, 1978:xii). Some of the plates in the Birds are among the earliest known to have been engraved in New South Wales(Mander-Jones, 1967: 112).

Figure 4.5.11: Lewin, J.W., 1838, A natural history of the birds of New South Wales, London, Bohn, plate 24: Black-crowned Honey-sucker[White-naped Honeyeater] (ML F598.2/L)

John Lewin brought an exquisite quality to ornithological illustration just twenty years after European settlement, as is so evident in this illustration of a White-naped Honeyeater.

The Lewins moved to Sydney in 1808, where he received patronage from Governor Macquarie. He died on 27 August 1819, aged 49, his wife returning to England with their son.

E) George Bennett(1804-1893)(Chisholm, 1966: Strahan, 1979)

Born in Plymouth, England, Bennett began his travels from age 15 years. He returned to England in 1821 to study medicine, becoming a member of the Royal College of Surgeons in 1828.

Bennett visited Sydney in 1829, in which year Governor Darling appointed William Holmes in charge of the Colonial Museum. Holmes died in a gunshot accident in 1831, leaving vacant the position of Colonial Zoologist. Bennettt sought the position unsuccessfully in early 1833, whereupon he resumed his travels. These led to publication of Wanderings in New South Wales, Batavia, Pedir Coast, Singapore and China; being the journal of a naturalist in those countries during 1832, 1833 and 1834, 'a work of merit for its good writing and generally sound observation'.

Bennett returned to Sydney in 1835, this time to settle. He began to establish a medical practice, but the need for a curator(director) at what became The Australian Museum in 1836 led him to successfully seek appointment as the first Secretary and Curator of the Museum in 1835. At this time, the Museum had no permanent abode, being variously located in an old post office in Bent Street, in the Legislative Council building in Macquarie Street, and, from mid-1836, at a house in Macquarie Place.

Bennett collated a catalogue of the Museum's collection, which was published in 1837 as A Catalogue of the Specimens of Natural History and Miscellaneous Curiosities deposited in the Australian Museum, Sydney. The catalogue, inter alia, provides a useful inventory of birds collected around Port Jackson.

Bennett resigned from the position of Curator and Secretary in 1841, continuing his association with the Museum as Chairman of its Board in 1863, 1866, and 1873. Meanwhile he resumed private medical practice and engaged in further travels leading, in 1860, to publication of Gatherings of a naturalist in Australasia: being observations principally on the animal and vegetable products of New South Wales, New Zealand, and some of the Austral Islands.

Some regard Bennett as 'the greatest of the physician-naturalists of Australia', an accolade emphasised by the numbers of plants and animals which bear his name.

F) John Gould(1804-1881)

A more extensive biography of Gould appears elsewhere(p. 348). The signal benefit of John Gould's visit to Australia while preparing his account of The Birds of Australia was that he could supplement his taxonomic descriptions with field notes. While Vigors & Horsfield had done this using accounts provided by George Caley, Gould achieved this integration for all Australian birds.

G) Edward Pierson Ramsay(1842-1916)(Chisholm, 1976)

Ramsay was the first Australia-born ornithologist to contribute to our understanding of the birds of Sydney. He was born on 3 December 1842 at Dobroyd(Ashfield), New South Wales, went to the University of Sydney to study medicine in 1863. He left in 1865 to study birds and, despite an enduring association with The Australian Museum since 1860, it was not until September 1874 that he became a curator there. He added some 17,600 bird skins to the Museum's collection. Between 1876 and 1894 his Catalogue of the Australian Birds in The Australian Museum at Sydney was published in four parts. He widely contributed to the development of the natural sciences in New South Wales during the 1870s and 1880s, his work being recognised through various awards.

Ramsay was also involved with the Fisheries of New South Wales, being a member of a Royal Commission established in January 1880 to inquire into the state and prospects of NSW fisheries, Subsequently, in 1882, Ramsay was appointed to the NSW Fisheries Board(Thompson, 1893:38).

Ramsay resigned from The Australian Museum due to ill-health end-1894, becoming consulting ornithologist to the museum until 1909. He died from stomach cancer on 16 December 1916.

H) Alfred John North(1855-1917)(Mathews, 1918;Cahill,1998;Anon, 2007)

North was initially apprenticed to the jewellery trade but, by 1878, was in correspondence with Dr. E.P. Ramsay of the Australian Museum. He was privately employed by Ramsay in September 1886 to curate the latter's egg collection, held at Dobroyde(Ashfield). He joined the Australian Museum in December 1886, and became Ornithologist in August 1891, a position he retained until his death.

North published ornithological articles over 28 years, from when he joined The Australian Museum, while the last part of his Nests and Eggs of Birds found breeding in Australia and Tasmania was published in December 1914. Several genera, species, and subspecies of birds were named after him. His writings appeared, inter alia, in The Ibis, Proceedings of the Linnean Society of New South Wales, The Victorian Naturalist, Records of the Australian Museum, Transactions of the Royal Society of South Australia.

His text The Birds of Sydney and the County of Cumberland, published in 1888, is a simple listing of 228 bird species for which Sydney was considered a part of their natural range and another 10 species which North regarded as 'stragglers'(vagrants in current terminology). The list was 'compiled mostly from specimens that have come under my notice during the last two years, many of which have been sent as donations to the Australian Museum' (p.1773).

Figure 4.5.12: Atkinson, Louisa, 1855/72, [Sketchbook comprising mainly natural history drawings], folio 34: *Tinnunculus* (PXA 4499/34)

According to Joan Kerr(1992:28), Louisa Atkinson was a watercolour painter, illustrator, writer, naturalist and taxidermist: 'more famous as a botanist and writer than as a visual artist'. Taught by her mother to draw plants, flowers and animals: 'Especially fine are the animal and bird pictures with the bushland background sketched lightly with pen strokes while the animals are carefully drawn and fully coloured'. This quality of naturalness is delightfully captured in this painting of two, probably juvenile, Australian or Nankeen Kestrels *Falco cenchroides*.

A decade later, North(1898) published an annotated list of 261 species in The Birds of the County of Cumberland. He omitted several species which no longer occurred in the County, but included others which had been recently observed. North's notes are the first systematic account of every species then known for the region.

North's major work, Nests and Eggs of Birds found Breeding in Australia and Tasmania, was published in parts between June 1901 and December 1914. The title is misleading, in that for each relevant species North gave the most detailed account yet of its status in 'the neighbourhood of Sydney'.

I) Keith Hindwood(1904-1971)(Anon, 1971: McGill, 1980: Hoskin, 1996)

Keith Hindwood was a businessman by occupation, establishing a wholesale stationery, office supplies and printing business in 1928 which he ran until retirement in 1970.

From 1930, Hindwood was an Honorary Ornithologist, later Research Associate, at The Australian Museum. He was President and Fellow of both the Royal Zoological Society of New South Wales and the Royal Australasian Ornithologists' Union(RAOU). He was awarded the Australian Natural History medallion in 1959, the highest honour in this field.

He was a prolific writer, publishing 185 articles from 1924 onwards in The Emu, the official publication of the RAOU; his overall contribution amounted to some 600 pages. He also submitted 52 photographs of natural history subjects to the Sydney Mail and, as 'Oriole', wrote a column in the Land newspaper in 1931/32.

Hindwood's particular interest was in historical ornithology; he was also a member of the Royal Australian Historical Society. He did much to establish our knowledge of the pioneer naturalists, early colonial artists and their works.

Between 1940 and 1963, Hindwood authored or contributed to a series of books on Australian birds. Of particular interest here, was his co-authorship of The Birds of Sydney with Arnold McGill in 1958.

J) Arnold McGill(1905-1988)(Hoskin, 1988)

McGill was born at Armatree, near the Warrumbungles, in 1905. Involved with the grocery business for his working life, he was also an accomplished cartographer. His abiding interest from when he was eight years old was in birds – seabirds and waders in particular.

McGill joined the Royal Australasian Ornithologists' Union in 1941, becoming NSW Branch Secretary(1944/60), Assistant Editor The Emu(1948/69), Vice President(1955/58) and President(1958/59). McGill published frequently in The Emu, especially between 1942 and 1966, and, with the formation of the NSW Field Ornithologists' Club(FOC) in 1966, in their journal. He became the second Patron of the FOC in 1977, later to become a Life Member. McGill received the Order of Australia Medal in 1984.

McGill also published a series of monographs between 1958 and 1970. Notable among these in the present context was The Birds of Sydney, which he co-authored with Keith Hindwood in 1958. McGill also worked with Hindwood on the 1959 revision of What bird is that? and contributed 42 items to the Reader's Digest Complete Book of Australian Birds. He co-authored, with Alan Morris and Glenn Holmes, the Handlist of Birds in New South Wales in 1981, a precursor of which he had prepared for the Fauna Protection Panel in 1960. Over two decades, McGill published indexes of The Emu for the period 1901 to 1987, which involved careful searching through more than 18,000 pages of the publication.

K) Ern Hoskin(1914)(Huxley, 2000: Wren, 2002)

Born in 1914, Hoskin was a signwriter by profession. He was also a skilled ballroom dancer, writing some manuals of dance instruction, and donating a box of his papers on ballroom dancing to the National Library of Australia.

Hoskin was passionate about ornithology, a field to which he contributed in many ways over some 80 years. Among his several publications, Hoskin is best-known for The Birds of Sydney(1991). It was an update of the 1958 text by Keith Hindwood and Arnold McGill, and incorporated records from the extensive Keith Hindwood Bird Recording Service. This latter was started by Hindwood in 1928, and was maintained for many years by Hoskin. It provides a unique and extensive insight into the birds of the Sydney region over many decades. Other publications by Hoskin include Birds observed in Warriewood Swamp, published in 1933 and again in 1952, The Waders of Sydney, co-authored with Keith Hindwood in 1955, Birds of Centennial Park, published in 1999. Hoskin also provided historical records of the Bicentennial Park, Homebush Bay in about 2000.

Hoskin will be recalled by many for his educational efforts, most particularly his contributions to Centennial Park over more than fifty years. He led regular bird walks in the park, probably attended by thousands of people over time. Hoskin also used his signwriting and artistic skills to hand-paint a bird identification display panel, titled 'Common Water Birds of Centennial Park', which was installed almost 35 years ago and was refurbished and unveiled by the artist in March 2002.

A particular skill Hoskin brought to his ornithology was an ability to mimic some 50 different bird calls, 'calling up' birds for others to see more clearly. Once a Spotted Pardalote landed on his nose, in its quest to find the origin of its call!

This rich and diverse ornithological life culminated with the award of the Medal of the Order of Australia in the 1999 Queen's Birthday Honours list. Hoskin had been nominated for the award by the NSW Field Ornithologists Club, supported by the Centennial Parklands Trust, 'for service to ornithology, particularly in the Sydney Region'.

Figure 4.5.13: Anon, 1791/92, Drawings of birds chiefly from Australia, folio 79: A young Mosquito Hawk[Owlet Nightjar](ML PXD 226/79; Digital Order No. a805078u).

First described by George Shaw in John White's(1790) Journal of a voyage to New South Wales, this very fine drawing is from a collection dated a year or two later(Anon, 1791/92). At first called the Crested Goat-sucker, erroneously so, this delightful night-bird is now known as the Owlet Nightjar *Aegotheles cristata*. The drawing is of a juvenile bird, possibly in dark-grey morph plumage. The species would have been widespread in the dry woodlands of Pyrmont peninsula in 1788.

L) Father Thomas Sidney Dixon(1916-1992)(Dixon, 1988)

Dixon was born in 1916 at Mascot, of Liverpool-Irish parents who migrated to Sydney in 1914. In 1934 he entered the novitiate of the Missionaries of the Sacred Heart, continuing his studies until 1941 when he was ordained a priest.

He worked as a missionary and educationist in northern Australia until 1956, after which he held several short/medium-term appointments in different States. He resigned from the traditional ministry in 1969 to marry. He took up a teaching position at St Ignatius' College Riverview in 1973, which he held until retirement in 1981.

While at Riverview, Dixon was encouraged to offer ornithological studies to students, and this culminated after six years of observations in publication of The Birds of Riverview. Tom Dixon died in August 1992.

M) Alan Morris (born 1942) (McGill, 1983; Karplus, 2006)

Morris 'became engrossed in bird watching' in the late 1960s. He joined the NSW National Parks and Wildlife Service as a foundation staff member about 1967, becoming District Manager at Coonabarabran(1975/82), Chief Ranger of Sydney Harbour and Botany Bay National Parks, Acting Superintendent of Hawkesbury District, Chief Ranger and then District Manager of the Central Coast district. Morris left the NPWS around 2000 to become an ornithological consultant. He was appointed to the Tuggerah Lake Reserve Trust in 2002, of which he is now Secretary.

From 1972, Morris edited the Journal of the NSW Field Ornithologists' Club, a post he held until 1986 and again between 1989 and 1993. In 1985/86 he was President of the Club, and Vice-President in 1987/88. He has edited the Club's Annual Report since 1989. Morris has also been involved with other ornithological organisations, notably Birds Australia and the Bird Interest Group Network(BIGNet). He founded the Central Coast Group of Birding NSW. He has been active in the Annual Twitchathons, the national Bird Atlas, and Birdline NSW.

Morris has published extensively over the last 30 years or so, particularly in Australian Birds but also in such journals as Wingspan and the National Parks Journal. Following an early interest in beach-washed seabirds, Morris provided annotated checklists ranging from individual national parks(e.g. Sydney Harbour and Botany Bay National Parks), through regions(e.g. the County of Northumberland), to New South Wales itself(Handlist of Birds in New South Wales). He has long been interested in sightings of rare species, and initiated the NSW Ornithological Records Appraisal Committee about 1993, with which he was associated until 2000. Another major interest is in endangered species, such as the Little Tern, Swift Parrot, and Regent Honeyeater.

Morris has been a strong advocate for wildlife generally, birds in particular, in both local and national media over many years.

Figure 4.5.14: Bougainville, H.Y.P.P., 1837, Journal de la navigation autour du globe de la frégate La Thétis et de la corvette L'Espérance pendant les années 1824, 1825 et 1826, Paris, Arthus Bertrand, plate 39: Le Callocéphale austral, male(MRB/F980/B Atlas)

This striking male Gang-gang Cockatoo *Callocephalon fimbriatum* appears in the Atlas accompanying de Bougainville's account of his circumnavigation of the globe as commander of the French ship La Thétis. The skins of 320 birds were among the items unloaded from the ship on her return to France(Rivière, 1999). The status of the Gang-gang on Pyrmont peninsula in 1788 is unclear, but it is likely to have been a periodic visitor.

4.5.5 Avifauna of Pyrmont peninsula in 1788

A) Introduction

Two approaches were used to determine this avifauna:

- the collation of contemporary avifaunal listings for the Port Jackson region, mainly but not exclusively based on existing parks and reserves along the foreshore of Sydney harbour
- use of historical accounts on the avifauna of the Port Jackson region

The latter approach is preferable where the current distribution of a species is likely to be materially different from that in 1788. It is, however, limited by the extent of early documentation.

B) Contemporary avifaunal surveys

The results of several contemporary surveys of the avifaunas of bushland relicts adjoining Port Jackson are given in Table 4.5.16. 249 species are listed for the Port Jackson region, almost 61% of the native bird species recorded by Morris(1987) for the County of Cumberland(the administrative division within which Sydney resides) since 1900.

Of these 249 species, 31(12%) have been excluded from consideration as once occurring on Pyrmont peninsula, because:

- 11 species have extended their ranges to include Port Jackson since European settlement, or are considered aviary escapees(e.g. Cattle Egret, Marsh Sandpiper, Bar-shouldered Dove, Crested Pigeon, five parrots, White-plumed Honeyeater, Figbird)
- 7 species are essentially coastal or maritime birds, unlikely to have ventured inland to Pyrmont peninsula(viz. Fairy Prion, Eastern Reef Heron, Wandering Tattler, Pied and Sooty Oystercatchers, Pomarine and Long-tailed Jaegers)
- 8 species were unlikely to have had enough suitable habitat on Pyrmont peninsula or were likely vagrants to the bushland areas surveyed(viz. Baillon's Crake, Purple Swamphen, Wood Sandpiper, White-winged Black Tern, Pied Butcherbird, Double-barred Finch, Chestnut-breasted Mannikin, White-backed Swallow)
- 5 species were unlikely to have enough moist forest habitat to exist on Pyrmont peninsula(viz. Superb Lyrebird, Rock Warbler, Large-billed Scrubwren, Bell Miner, Russet-tailed Thrush)

It is proper to reflect also on the differences between the species recorded in these contemporary surveys and those listed based on historical accounts (see p. 279). Thirty-three species listed on the latter(Appendix D) were not observed during the recent surveys. Likely reasons are as follows:

- The ranges of 14 species have contracted over the last two centuries(viz. Emu, Great-crested Grebe, Black-necked Stork, Brahminy Kite, Square-tailed Kite, Red Goshawk, Brolga, Red-tailed Black Cockatoo, Orange-bellied Parrot, Turquoise Parrot, Ground Parrot, Blue-faced Honeyeater, [Red-backed Fairy Wren], Southern Emu Wren)
- There would be limited habitat for eleven species on the northern coastline of Port Jackson, namely the Little Bittern, Black Bittern, Black-tailed Godwit, Red Knot, Sanderling, Red-necked Stint, Double-

banded Plover, Lesser Sand Plover, Whiskered Tern, Clamorous Reed Warbler, Tawny Grassbird. At settlement, the southern side of Port Jackson had substantially larger mudflats and their associated plant communities – salt marsh, mangroves, salt/fresh water wetlands – the preferred habitats of these species(see p. 138 - 141).

- Eight species could have been missed during the recent surveys, either because of their transient nature around Port Jackson(e.g. Rose-crowned Fruit-dove, Wompoo Fruit-dove) or because of their likely scarcity today in the relevant reserves(e.g. Stubble Quail, Masked Owl, Australian Owlet-nightjar, Chestnut-rumped Hylacola, Spotted Quail Thrush, Crescent Honeyeater).

Table 4.5.16: <u>Contemporary avifaunas of bushland relicts adjoining Port Jackson</u>

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Brown Quail	+		+						+		+	+
King Quail			+									
Australian Wood Duck	+	+	+					+		+		
Freckled Duck	+											
Musk Duck	+											
Black Swan	+		+									
Hardhead	+	+	+									
Pacific Black Duck	+	+	+					+		+	+	
Australasian Shoveler	+											
Pink-eared Duck	+											
Grey Teal	+	+										
Chestnut Teal	+											
Hoary-headed Grebe	+											
Australasian Grebe	+	+	+									
Little Penguin						+		+		+	+	+
Southern Giant-Petrel												+
Fairy Prion										+		
Wedge-tailed Shearwater												+
Wandering Albatross						+						+
Black-browed Albatross						+						+
Shy Albatross						+						
Grey-headed Albatross												+
White-tailed Tropicbird						+						+
Australasian Gannet						+		+			+	+
Darter	+	+	+					+	+			

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Great Cormorant	+	+	+			+		+			+	+
Little Black Cormorant	+	+	+	+	+	+	+	+	+	+	+	+
Pied Cormorant	+	+	+	+		+	+	+		+		+
Little Pied Cormorant	+	+	+	+	+			+	+		+	+
Australian Pelican	+	+	+	+				+	+	+	+	+
White-necked Heron	+		+								+	+
White-faced Heron	+	+	+	+	+	+				+	+	+
Eastern Reef Heron											+	+
Cattle Egret	+					+						+
Little Egret	+		+									
Great Egret	+	+	+									
Intermediate Egret	+											
Nankeen Night Heron	+	+	+			+						+
Striated Heron	+	+	+			+						
Australasian Bittern	+		+									
Straw-necked Ibis		+	+									
Australian White Ibis	+	+	+		+	+			+	+		+
Royal Spoonbill	+	+	+									+
Yellow-billed Spoonbill	+	+										
Black-shouldered Kite	+	+	+			+			+	+	+	+
Pacific Baza			+									
Whistling Kite	+					+				+		+
Collared Sparrowhawk			+									
Brown Goshawk	+	+	+			+		+	+		+	+
Grey Goshawk			+									
Osprey	+					+						+

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
White-bellied Sea-eagle	+	+	+	+		+			+		+	+
Little Eagle			+			+					+	+
Swamp Harrier											+	
Wedge-tailed Eagle			+									
Marsh Harrier	+											
Brown Falcon	+		+			+						+
Nankeen Kestrel	+		+			+		+	+	+	+	+
Peregrine Falcon	+	+	+			+		+			+	+
Australian Hobby	+	+	+			+						+
Buff-banded Rail			+							+		
Lewin's Rail						+					+	+
Spotless Crake						+						
Australian Spotted Crake	+											
Baillon's Crake	+											
Dusky Moorhen	+	+	+									
Purple Swamphen	+		+									
Eurasian Coot	+	+	+									
Bush Stone-Curlew						+						
Painted Button-Quail			+			+			+			+
Latham's Snipe	+	+										+
Bar-tailed Godwit						+						
Eastern Curlew	+		+									
Whimbrel	+											+
Common Greenshank	+	+										
Marsh Sandpiper	+											
Wood Sandpiper	+											

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Common Sandpiper	+		+									
Grey-tailed Tattler	+	+										
Wandering Tattler						+			+			+
Ruddy Turnstone	+											
Sharp-tailed Sandpiper		+										
Curlew Sandpiper		+										
Pied Oystercatcher						+						
Sooty Oystercatcher						+		+				+
Black-winged Stilt	+	+	+			+						
Red-necked Avocet	+											
Pacific Golden Plover	+	+										
Red-capped Plover	+											
Red-kneed Dotterel	+											
Black-fronted Dotterel	+	+	+									
Masked Lapwing	+	+	+	+	+	+	+	+	+	+	+	+
Arctic Jaeger						+						+
Pomarine Jaeger						+						+
Long-tailed Jaeger						+						
Silver Gull		+	+	+	+	+	+	+	+	+	+	+
Pacific Gull						+						+
White-winged Black Tern	+											
Caspian Tern											+	+
Crested Tern	+	+	+			+		+			+	+
White-fronted Tern						+					+	+
Common Tern	+	+				+			+		+	+
Little Tern	+											

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Sooty Tern						+						+
Peaceful Dove			+									
Brown Cuckoo-Dove			+								+	
Bar-shouldered Dove			+			+					+	+
Topknot Pigeon		+	+			+						+
Emerald Dove			+									
Common Bronzewing			+			+						
Brush Bronzewing			+			+						
Wonga Pigeon			+			+						+
Crested Pigeon		+	+	+	+	+		+	+	+	+	+
White-headed Pigeon			+			+			+			+
Superb Fruit-Dove						+			+			+
Glossy Black Cockatoo			+									
Yellow-tailed Black Cockatoo		+	+			+		+	+	+	+	
Gang-gang Cockatoo			+									
Galah		+	+		+	+				+	+	+
Long-billed Corella		+	+									
Little Corella		+	+			+				+		+
Sulphur-crested Cockatoo		+	+		+	+	+	+	+	+	+	+
Rainbow Lorikeet		+	+	+	+	+	+	+	+	+	+	+
Scaly-breasted Lorikeet			+								+	+
Little Lorikeet			+			+						
Musk Lorikeet		+	+									
Swift Parrot			+			+						+
Australian King-Parrot			+			+			+	+	+	+
Crimson Rosella			+		+	+	+	+	+	+	+	+

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Eastern Rosella		+	+			+	+	+	+	+	+	+
Western Ringneck			+			+				+	+	+
Red-rumped Parrot		+				+						+
Pallid Cuckoo			+			+				+		+
Fan-tailed Cuckoo			+			+		+	+	+	+	+
Brush Cuckoo			+			+						+
Horsfield's Bronze-Cuckoo			+			+			+		+	+
Shining Bronze-Cuckoo			+			+					+	+
Golden Bronze-Cuckoo			+									
Common Koel		+	+	+	+	+		+	+	+	+	+
Channel-billed Cuckoo		+	+			+		+		+		+
Pheasant Coucal			+								+	+
Powerful Owl			+			+		+			+	
Barking Owl			+					+			+	
Southern Boobook			+			+	+	+			+	+
Sooty Owl			+			+						
Barn Owl			+					+			+	+
Tawny Frogmouth		+	+		+	+	+	+	+	+	+	+
White-throated Nightjar												+
Fork-tailed Swift			+			+						+
White-throated Needletail		+	+			+			+		+	
Azure Kingfisher			+			+						
Laughing Kookaburra		+	+	+	+	+		+	+	+	+	+
Sacred Kingfisher		+	+			+			+	+	+	+
Rainbow Bee-eater			+									
Dollarbird		+	+			+		+	+	+	+	+

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Noisy Pitta						+						
Superb Lyrebird			+			+						
White-throated Treecreeper			+									
Brown Treecreeper			+									
Superb Fairy-Wren		+	+		+	+	+	+	+	+	+	+
Variegated Fairy-Wren			+			+			+	+	+	+
Spotted Pardalote		+	+		+	+		+	+	+	+	+
Striated Pardalote			+			+						
Eastern Bristlebird						+						
Rock Warbler			+			+			+		+	+
White-browed Scrubwren		+	+	+		+	+	+	+	+	+	+
Large-billed Scrubwren			+									
Brown Gerygone			+			+				+	+	+
White-throated Gerygone			+			+						+
Brown Thornbill			+			+		+	+		+	+
Buff-rumped Thornbill			+									
Yellow-rumped Thornbill			+			+		+				+
Striated Thornbill			+			+			+		+	+
Yellow Thornbill		+	+			+			+	+	+	+
Little Wattlebird		+	+	+		+		+	+	+	+	+
Red Wattlebird		+	+	+	+	+		+	+	+	+	+
Little Friarbird						+						+
Noisy Friarbird			+							+		+
Spiny-cheeked Honeyeater												+
Regent Honeyeater			+			+			+			

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Bell Miner			+							+		
Noisy Miner		+	+	+	+	+	+	+	+	+	+	+
Lewin's Honeyeater			+			+						+
Yellow-faced Honeyeater			+			+		+	+		+	+
White-eared Honeyeater			+								+	
Yellow-tufted Honeyeater			+			+			+			
Fuscous Honeyeater			+									
White-plumed Honeyeater			+			+						+
Black-chinned Honeyeater			+									
Brown-headed Honeyeater			+									
White-naped Honeyeater			+			+						+
New Holland Honeyeater		+	+			+		+	+	+	+	+
White-cheeked Honeyeater		+	+			+			+		+	+
Tawny-crowned Honeyeater			+									
Eastern Spinebill			+			+		+	+	+	+	+
Scarlet Honeyeater			+			+						+
Brown Honeyeater			+									
White-fronted Chat			+									
Jacky Winter			+			+						+
Scarlet Robin			+									
Rose Robin			+			+						+
Eastern Yellow Robin			+		+	+			+	+	+	+
Eastern Whipbird			+			+	+		+	+	+	+
Varied Sittella			+			+						+
Crested Shrike-Tit			+			+						+
Golden Whistler			+			+		+	+			+

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Rufous Whistler			+			+		+	+		+	+
Grey Shrike-Thrush			+						+		+	+
Black-faced Monarch		+	+			+						+
Spectacled Monarch			+			+						+
Leaden Flycatcher			+			+						+
Satin Flycatcher			+			+						+
Restless Flycatcher			+									
Willie Wagtail		+	+			+		+	+	+	+	+
Rufous Fantail			+			+				+		+
Grey Fantail		+	+			+		+	+	+	+	+
Black-faced Cuckoo-Shrike		+	+		+	+		+	+	+	+	+
White-bellied Cuckoo-Shrike			+									
Cicadabird			+									
White-winged Triller			+									
Olive-backed Oriole			+			+			+	+		+
Figbird		+	+		+	+					+	+
White-browed Woodswallow			+									
Dusky Woodswallow			+									
Grey Butcherbird		+	+	+	+	+	+	+	+	+	+	+
Pied Butcherbird			+			+		+				
Magpie-Lark		+	+	+	+	+		+		+	+	+
Australian Magpie		+	+	+	+	+	+	+	+	+	+	+
Pied Currawong		+	+	+	+	+	+	+	+	+	+	+
Spangled Drongo			+			+		+	+		+	+
Australian Raven		+	+	+	+	+	+	+	+	+	+	+

Common Name	Homebush Bay	Canada Bay	Lane Cove	Kelly's Bush	North Sydney	Mosman	Middle Head	Nielsen Park	Dobroyd Head	Manly Reserves	North Head	Sydney Harbour
Little Raven			+									
Green Catbird			+									
Satin Bowerbird			+									
Richard's Pipit			+									+
Double-barred Finch			+									
Red-browed Finch		+	+			+		+	+	+	+	+
Beautiful Firetail			+									
Diamond Firetail										+		
Chestnut-breasted Mannikin			+									
Mistletoebird		+	+			+		+			+	+
Welcome Swallow		+	+	+	+	+		+	+	+	+	+
White-backed Swallow			+									
Tree Martin			+			+						+
Fairy Martin		+	+						+			
Little Grassbird			+									
Golden-headed Cisticola			+							+	+	+
Silvereye		+	+		+	+			+		+	+
Russet-tailed Thrush						+						

Sources of information:

Location	Source
Canada Bay	Hobcroft(200?)
Lane Cove	Department of Environment and Conservation(NSW) (2004)
Kelly's Bush/Woolwich Dock	Skelton et al(2003b)
North Sydney Remnant Bush	Biosphere Environmental Consultants(2001)
Mosman Bushland	Oculus Environmental Planning(2001)
Middle Head/George's Heights	Australian Museum Business Services(1995) Conacher Travers(2001)
Nielsen Park	Newton(2006), Hilliard et al.,(n.d.)
Dobroyd Head	Skelton(2004)
Manly Reserves	Skelton et al(2004)
North Head	Skelton et al(2003a)

C) Historical avifaunal information

i. Introduction

The birds around Sydney interested the colonists from the outset. Their novelty and, to some, discordant calls, attracted attention. In consequence, there is a series of accounts of the birds of Sydney since before settlement.

In this section, historical accounts are used to re-create the likely avifauna of Pyrmont peninsula at European settlement. These accounts span a period of 220 years, from First Fleet artists like George Raper to contemporary ornithologists. The earliest accounts were in the form of illustrations, later annotated by various observers. While these accounts initially dealt with bird species in the immediate vicinity of Sydney town, collecting very soon extended further afield as exploration of the colony's hinterland began. Thus John White journeyed inland to Prospect Hill some three months after arrival, while John Lewin and George Caley worked out of Parramatta from the early 1800s. By John Gould's visit to Australia some three decades later, a continental perspective on bird distribution was emerging, an approach sustained by the likes of E.P. Ramsay and Alfred North. Then there was a trend towards regional or localised accounts, with annotated lists of the birds of Sydney and the County of Cumberland first by North and then by Hindwood and McGill and, most recently, by Hoskin. Dixon was highly localised in his Birds of Riverview. Morris has tended towards a regional approach although some of his accounts are localised.

To the extent that the interest here is in establishing what the avifauna of Pyrmont peninsula was in 1788, care has been taken to use material specified to the neighbourhood of Sydney or Port Jackson. In consequence, George Raper's 'Birds of Port Jackson' series of paintings was included in preparing the appendices to this section, whereas Thomas Watling's paintings were mostly excluded, as sources of the specimens used were generally not given.

In generating the appendices, the monograph literature was widely consulted; the periodical literature was more selectively used - a limitation imposed by time constraints.

The historical accounts available vary widely between species. For some species, rich literatures are available, whereas other species have little supporting documentation. For these latter species, efforts were made to ascertain whether their preferred habitats would have occurred on Pyrmont peninsula in 1788.

There is every indication that the avifauna which occupied Pyrmont peninsula in 1788 was rapidly and systemically changed in the process of colonisation. Dramatic changes in populations and distributions of some species occurred well before the first comprehensive accounts of the birds of Sydney. Reliance must again be placed on the habitat preferences of such species in determining their likelihood of occurrence on Pyrmont peninsula in 1788. Not surprisingly, the avifauna of the peninsula today bears little resemblance to its 1788 forbear, and it is conceptually difficult to travel 220 years back in time to visualise that earlier avifauna.

The outcome of the above processes has been the development of two listings of bird species for Pyrmont peninsula in 1788, one of species believed to have been within their natural ranges at that time and the other for species which would likely have been vagrants to the peninsula at that time. Each species listed has an account which marshals the evidence to support its inclusion.

Appendix D lists 220 species for which Pyrmont peninsula would likely have once been part of their natural range; that is, about 28% of the total Australian avifauna and over half the current Sydney listing(Morris, 1987). Appendix E lists 68 species which could have occurred irregularly(as vagrants) on or about the peninsula.

ii. Superb Lyrebird *Menura novaehollandiae*

The status of the Superb Lyrebird around Port Jackson in 1788 warrants brief mention. Hoskin(1991: 121) described its distribution in the late 20th century as 'throughout the moist Sandstone gullies, particularly in Royal National Park, Ku-ring-gai Chase National Park, the Hornsby Shire, southern parts of the County[of Cumberland], Warringah Shire, Davidson Park, and many other areas'.

Recent surveys found Superb Lyrebirds in Lane Cove National Park(NSW Department of Environment and Conservation, 2004) and Mosman bushland (Oculus Environmental Planning, 2001), on the north shore of Port Jackson. Some 80 years previously, Le Souef & Macpherson(1920:85) recorded a pair nesting on Middle Harbour 'within two miles of the General Post-Office'.

In light of these observations, it is surprising that the Superb Lyrebird was not collected until 1797. As Chisholm(1960:2) commented: 'The odd thing … is that no specimen of the bird was obtained during the first ten years of settlement, for doubtless the species was represented then(and it still is), in rough gullies immediately north of Port Jackson'.

Had the lyrebird occurred on Pyrmont peninsula in 1788, it should have been detected early in settlement. It seems likely, then, that Port Jackson provided an effective southern boundary for the North Shore lyrebirds.

4.5.6 Conclusions

Pyrmont peninsula once supported a rich and diverse avifauna, reflecting the variety of habitats available on the peninsula itself and in the adjoining bays.

It is also evident that this avifauna experienced huge change after 1788. While the almost decimation of native bird species diversity over the last 220 years is due primarily to loss of habitat on the peninsula, it has been much reinforced by wider changes beyond the peninsula. The loss of rainforest habitat described earlier(pp. 233/234) is one of several kinds of impact visited upon bird populations early in settlement.

These adversities were well-recognised by more astute observers of the time. Bennett(1834:278), for example, noted: 'It is much to be regretted that human beings are so eager to destroy, even to extermination, the races of animals useful or dangerous, which may be found in a new country. In the settled parts of the Colony, the harmless kangaroos and emus are rarely seen, when they might easily be domesticated about the habitations. The same remark applies to the lyre pheasant[Superb Lyrebird]. Why are they not domesticated, before, by extermination, they are lost to us for ever?'

In similar vein, John Gould(1972:xxii-xxiv) wrote: 'Australians should at once bestir themselves to render protection to these and many other native birds, otherwise very many of them … will soon become extinct'.

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4.5.8 Appendices

Bird species likely to have been present on Pyrmont in 1788 can be classified as having been in their 'natural range' or as 'vagrants'. These two terms are now defined.

'Natural range' has been defined as:

> *'… roughly the spatial limits within which the … species occurs. It is not identical to the precise localities or territory where a … species or subspecies permanently occurs. Such actual localities or territories for many … species may be patchy or disjointed(i.e … species might not occur evenly spread) within their natural range. If the reason for disjunction proves to be natural i.e. caused by ecological factors, the isolated localities should not be interpreted as continuous natural range, for example for an alpine species the range may be the Alps and the Pyrenees, but not the lower area between. The natural range includes however areas that are not permanently used: for example for migratory species "range" means all the areas of land or water that a migratory species inhabits, stays in temporarily, crosses or overflies at any time on its normal migration. Vagrant or occasional occurrences(in the meaning of accidental, erratic, unpredictable) would not be part of the natural range.*
>
> *Natural range as defined here is not static but dynamic: it can decrease and expand. Natural range can also be in an unfavourable condition for a … species ie. it might be insufficient to allow for the long-term existence of that … species'*
>
> Habitats Committee, 2005

To background this definition a little, it was developed for the European Union's Habitats Directive, which is considered among the most significant initiatives of the EU to halt the loss of biodiversity in Europe by 2010, a goal that was established by the Union in 2001.

The dynamic nature of 'natural range' may be due to natural reasons, such as climate change, changes in habitat, development of new survival strategies by species, or it may be caused by humans, through land clearance, changes to water courses, direct extermination, etc.

The second concept is that of vagrancy. Vagrants have been described as:

> *'Individuals of a species which, by natural means, move from one geographical region to another outside their usual range, or away from usual migratory routes, and which do not establish a self-maintaining, self-regenerating population in the new region'.*
>
> Lincoln, R.J. *et al*, 1986

Observations of vagrant species should not be discounted, for: 'there are numerous examples of rare bird records which, according to the knowledge of that time, were considered insignificant deviations from the norm but which later proved to be the signs of a newly recognised phenomenon. Only long-term documentation at a high standard can reveal such patterns which may be of special interest in the light of rapid environmental changes'(Association of European Rarities Committees, 1991).

When defining the birds utilising a particular region, say Pyrmont peninsula, most species can be readily defined as either within their 'natural range' or as 'vagrants' to the peninsula. There are some species, however, which fall between these two neat classifications. They may be species whose movements, for various reasons, are difficult for humans to understand or document. Patterns of observations may be misunderstood – at least for a time – as those of vagrants when they should be seen as being in the natural range of a species. Alternatively, species which are truly vagrant may over time discover opportunities for exploitation which cause a transition so that vagrant patterns become part of a natural range. Indeed, over time, all of these events could occur in one and the same species.

Changing human understandings of the relationship between natural range and vagrancy often occur slowly, as the species in question gradually alters its status or the body of knowledge on that species improves. So the lists of bird species utilising Pyrmont peninsula in Appendices D and E should be seen as established at a particular point in time, and open to ongoing revision.

One more feature of birds, their capacity to migrate sometimes over huge distances, deserves mention. Of approximately 1.5 million scientifically described animal species, at least 5000 are believed to cyclically migrate(ie. travel at least 100km). Some 40% of these are birds. These migrants are ecologically important. Many are essential keystone species in food webs and ecosystems, as predators, prey, or both. Yet understandings of their requirements for survival are of a different order of complexity to those for resident species. Knowledge of patches of habitat critical to their overall patterns of movement is essential if we are to avoid unintentionally destroying their capacity to maintain patterns of migration and thus to survive.

Ecological sustainability requires levels of understanding wildlife requirements not common among human societies. Even those who specialise in these matters perforce often have only the most rudimentary understandings of the complex systems which they study. Such considerations call for conservative approaches to the management of wildlife in urban environments, approaches which require often surpriseful initiatives within the envelope of what is feasible.

Appendix D lists those species for which Pyrmont in 1788 would likely have been a part of their natural range. It should be appreciated that many of the listed species would have had territories which extended more or less beyond Pyrmont peninsula itself. Individuals of these species would have been observed periodically on the peninsula, whereas other species would have been resident on the peninsula and present at all times. The latter would have varied considerably in numbers, so that some species – although present all the time – might have been seen by observers only periodically while others would have been readily seen at all times. With a knowledge of home range sizes and finer resolution of the peninsula's vegetation at European settlement, some idea of populations for each species could be estimated; this is not done here.

Appendix E lists species likely to have been vagrant to Pyrmont peninsula at the time of European settlement. The notion of vagrancy is somewhat elastic, and so the list is confined to those species for which there are reasonable grounds for thinking they could have occurred on or about the peninsula from time to time. These species would be mostly either maritime species seeking refuge from inclement weather or inland species coming to the coast in times of drought. Their use of natural resources on or about the peninsula would have been incidental.

There is a blurred line between the above two categories and some might be inclined to classify certain species differently. It is equally clear that classifications for some species have changed over time, perhaps due to events remote from the peninsula, or to changing habitat exploitation by a particular species. So the classification of some species into one or the other category can be difficult to ascertain at a time so far removed from the present.

The nomenclature and order of species in both appendices follow Pizzey & Knight(2003).

Appendix D: Species likely to have occurred on Pyrmont peninsula in 1788 as part of their normal range

Scientific Name	Comments
Emu *Dromaius novaehollandiae*	Rock carvings attest the importance of emus around Sydney to aboriginals (Hoskin, 1991:7). Recorded by Tench(1788:72/73). 'This bird is not uncommon in New Holland, as several of them have been seen about Botany Bay, and other parts. The one from which the plate was taken, was shot within two miles of the settlement at Sydney Cove …'(Phillip, 1790:222).. '[The Emu] has been frequently seen by our settlers both at Botany Bay and Port Jackson'(White, 1790, x). Illustrated as "Emu of Port Jackson" by George Raper in 1791(Hindwood, 1964:46). 'There have been several large birds[Emus] seen since we arrived in this part'(Hunter, 1793:48). '… the Emu was formerly abundant about Botany Bay and Port Jackson Harbour …'(Gould, 1865b:202). It would have once frequented Pyrmont peninsula.
Stubble Quail *Coturnix pectoralis*	Recorded by North(1913/14:172) from several localities south of Sydney, from Randwick to Botany Headlands. Although mostly associated with swampy areas, grassy paddocks and crops, also occurs in saltmarsh(especially at edges where mixed with grasses) and heath (Marchant & Higgins, 1993). Small numbers of this species could have once occurred in such habitats on Pyrmont peninsula, especially around the mouths of Cockle and Blackwattle Creeks..
Brown Quail *Coturnix ypsilophora*	Named by Latham in 1801 from specimen collected at Sydney(Mathews, 1910/27:4). Collected at Port Jackson(Bennett, 1837:44). Mathews(1910/12: 69) illustrated a female bird collected at Long Bay. Once considered very common at such localities as Randwick, Long Bay, Botany and Maroubra Rifle Range (North, 1913/14:176). Habitats include heath and coastal scrub(Marchant & Higgins, 1993:405). Would have once occurred in suitable locations on Pyrmont peninsula.
King Quail *Coturnix chinensis*	'The Little Swamp-Quail is found tolerably abundant in the marshy parts about Botany Bay and South head'(Ramsay, 1868:279). 'This handsome little bird is very partial to open heath lands and swampy localities … It was at one time very abundant in the neighbourhood of Sydney, frequenting the low-lying lands between Randwick and Botany (North, 1913/14:183). Habitats include heath with >80% foliage cover, thickets in low woodland, drainage channels in heath, swampy heathland (Marchant & Higgins, 1993:415). Would have once occurred in suitable habitat on Pyrmont peninsula.
Musk Duck *Biziura lobata*	North(1898:104) considered this species 'Common in the bays and inlets of the coast. It may be frequently observed in the Parramatta River and Hen and Chickens Bay during the summer months'. Would have once occurred in waters around Pyrmont peninsula.

Scientific Name	Comments
Australian Wood Duck *Chenonetta jubata*	'During the early days of the colony of New South Wales, it was very common on the rivers near Sydney, particularly on the Hawkesbury …'(Gould, 1865b:354/355). 'In the early days of settlement of New South Wales, large flocks used to frequent the neighbourhood of Sydney, but owing to the progress of civilization many of the feeding grounds have been cleared and drained …'(North, 1913/14:63). Although favouring open, freshwater habitats, also found in coastal inlets, saltmarsh and lower reaches of rivers(Pizzey & Knight, 2003:26). Could have once occurred in such habitat around Pyrmont peninsula.
Hardhead *Aythya australis*	According to Marchant & Higgins(1990:1352), this species occasionally occurs in sheltered estuarine and inshore waters: 'Occasional records from coastal lagoons, salt lakes and pans, mangrove swamps, and sheltered inshore waters'. Moderately common at Homebush Bay, sometimes roosting in salt marsh(Morris et al, 1990:52). Recorded from Homebush Bay, Canada Bay and Lane Cove River Valley in contemporary surveys. Would likely have once occurred in waters off Pyrmont peninsula.
Pacific Black Duck *Anas superciliosus*	Listed by North(1898:103) for the Port Hacking but not the Parramatta River. According to North(1913/14:174): 'In the neighbourhood of Sydney it is sparingly distributed …'. Seen at Riverview, where it frequented both fresh and saline waters(Dixon, 1980:37/38). Would have once occurred in both Blackwattle and Cockle Bays.
Australasian Shoveler *Anas rhynchotis*	' … was shot at Botany Bay, in May(Latham, 1801:360). Although favouring freshwater habitats, this species 'may occur in high numbers on … estuaries and sheltered inshore waters, especially when salinity reduced by freshwater'(Marchant & Higgins, 1990:1341). Considered scarce at Homebush Bay, roosting in saltmarshes(Morris et al, 1990:52). Recorded in contemporary surveys at Homebush Bay. Would have once occurred periodically in waters off Pyrmont peninsula.
Black Swan *Cygnus atratus*	Observed by White on 15 April 1788, probably at Dee Why lagoon (Chisholm, 1962:121). '… by no means uncommon [around Port Jackson], being found on most of the lakes'(Phillip, 1790:116). '[Seen] occasionally passing … over Sydney, where, some years since, they were so abundant, that I recollect a drove of Black Swans being driven up George Street like a flock of geese'(Bennett, 1860:238). Considered common in most of the estuaries along the coast by North (1898:103). 'Although unquestionably decreased in numbers since the early days of settlement, it still inhabits the neighbourhood of Sydney …'(North, 1913/14:53). According to Hindwood & McGill (1958:48) it was 'Common: Frequents sheltered estuaries …'. Would have once frequented the waters around Pyrmont peninsula.
Grey Teal *Anas gracilis*	'In New South Wales it is without exception the most common species of the family Anatidae, and is met with throughout the year. It frequents … rivers, swamps and lagoons, both near the coast and inland'(North, 1913/14:80). According to Hoskin(1991:40) frequents tidal estuaries, sometimes in large numbers. Reported from Riverview in fresh, brackish and salt water(Dixon, 1980:39). Would have occurred in Cockle and Blackwattle Bays.

Scientific Name	Comments
Chestnut Teal *Anas castanea*	'Essentially it is a coastal species, frequenting salt-water lakes and arms of the sea …'(North, 1913/14:77). 'Most common in the saltwater bays, rivers and estuaries of the city'(Hoskin, 1991:41). Occurred widely in both fresh and brackish waters at Riverview(Dixon, 1980:40/41). Would have occurred in both Cockle and Blackwattle Bays.
Great Crested Grebe *Podiceps cristatus*	Listed for Sydney by North(1888:1779), considered rare by North(1898:116) and very rare by Hindwood & McGill(1958:19). Habitats include estuaries and inlets with fringing *Juncus maritimus*, mangroves or saltmarsh(Marchant & Higgins, 1990:116). Hoskin(1991:7) provided evidence of increasing populations in recent decades. Could have been persecuted by early settlers, prior to which it may have occurred in waters around Pyrmont peninsula.
Hoary-headed Grebe *Poliocephalus poliocephalus*	Found at head of Iron Cove; also seen in saltwater inlets and estuaries of river at Riverview (Dixon, 1980:16). According to Hoskin(1991:17): 'Frequents both freshwater and saltwater inlets, with a preference for tidal backwaters and estuaries'.Would have been present in both Cockle and Blackwattle Bays
Australasian Grebe *Tachybaptus novaehollandiae*	McGill recorded this species as 'often common on days around the Harbour'(in Dixon, 1980:15), but prefers freshwater(Hoskin, 1991:8). Probably once present in small numbers in Cockle and Blackwattle Bays.
Little Penguin *Eudyptula minor*	An illustration of a "New Holland Penguin" in the online First Fleet Collection of the British Museum(Natural History), believed painted between 1788 and 1797, is annotated: ' … the only one yet seen in Port Jackson'. Not listed by North(1898). According to North(1913/14:392): 'Occasionally small flocks may be seen inside Sydney Heads and at the entrance to Middle Harbour'. Since the early 1980s, this species has been seen at such locations as Milson's Point, McMahon's Point, Circular Quay, Balls Head, Lavender Bay, Greenwich Wharf, and Longueville. It would have once occurred in waters around Pyrmont peninsula.
Australasian Gannet *Morus serrator*	According to North(1912;339/340): 'Occasionally it may be seen just inside Sydney Heads, and there are specimens in the Australian Museum Collection captured at Rose Bay and Watson Bay … On several occasions I have seen it venture much higher up the harbour, and once saw one at the entrance of Lane Cove River'. Would have once visited waters off Pyrmont peninsula.
Darter *Anhinga melanogaster*	Sometimes met with in the Parramatta River(North, 1898:109). 'The [Darter] is found, although it is by no means common, in the neighbourhood of Sydney …'(North, 1912:337). Seen occasionally at Riverview (Dixon, 1980:19). Found in saltwater rivers and bays (Hoskin, 1991). Would have once occurred in Blackwattle and Cockle Bays.
Great Cormorant *Phalacrocorax carbo*	Common in coastal bays and inlets (North, 1898). Would have once frequented Blackwattle and Cockle Bays.

Scientific Name	Comments
Little Black Cormorant *Phalacrocorax sulcirostris*	'It may be seen frequently on … banks and piles in the Parramatta, George and Cook Rivers …'(North, 1912:327). Would have once frequented Blackwattle and Cockle Bays.
Pied Cormorant *Phalacrocorax varius*	'To the estuaries, bays and inlets of Eastern New South Wales it may appear in large numbers, principally during the winter and early spring months, and then be absent again for years. It visited the neighbourhood of Sydney in large flocks from July to October, 1892, and many specimens were obtained at … the Hawkesbury, Parramatta and Cooks Rivers(North, 1912:331). Recorded on the Parramatta River at Riverview(Dixon, 1980:19). Would have once visited Blackwattle and Cockle Bays.
Little Pied Cormorant *Phalacrocorax melanoleucos*	Frequents bays, inlets and rivers; common in Sydney Harbour (North, 1898:101). 'Near Sydney … [it] is usually abundant on … the Parramatta and Cook Rivers'(North, 1912:323). Would have once occurred in Blackwattle and Cockle Bays.
Black-necked Stork *Ephippiorhynchus asiaticus*	'Mr Lambert informs me, that only two have yet been met with, but are now and then seen on the muddy banks of the harbour of Port Jackson, searching for fish, when the tide is out, on which, no doubt, they principally live' (Latham, 1801:295). One shot on the North Shore, near Sydney, in 1839(Bennett, 1860:195/196); 'Mr Edward Hill informed me that he formerly shot Jabirus, in the early days of the colony, in the swamps about Windsor …'(p.201).). ' … when the country was first colonized it was found as near to Sydney as Botany Bay …'(Gould, 1865b:293). According to Calaby(1989): '[It] is rare in the Sydney district and perhaps always was'. Numbers and range of this species drastically reduced from pre-European times; at one time probably reached further south than Wollongong(Dorfman, 1998). Favoured habitats include coastal wetlands, mangroves and tidal mudflats(Pizzey & Knight, 2003). Would have once occurred in the bays adjoining Pyrmont peninsula.
Australian Pelican *Pelecanus conspicillatus*	Illustrated as the "Pellican of Port Jackson" by George Raper in 1790 (Hindwood, 1964:44). 'Sometimes seen on the Parramatta River, Hen and Chickens Bay, and at Newington'(North, 1898:100). 'Favourite feeding grounds are the mudflats at … the upper parts of the Parramatta River …'(North, 1912:359). Also occurred at Riverview(Dixon, 1980:17/18). 74 observed in Homebush Bay in November 1986(Anon, 1986:2). Would have once frequented waters around Pyrmont peninsula.
White-faced Heron *Egretta novaehollandiae*	Phillip figured this species in his 'Voyage to Botany Bay', in 1789, from a specimen obtained at Port Jackson. ' … met with at Port Jackson'(Latham, 1801:305). Commonly found in estuaries(North, 1898: Hoskin, 1991:34). 'It frequents the timbered margins of rivers and creeks, mangrove flats and estuarine areas …'(North, 1913/14:24). Observed at Riverview(Dixon, 1980:28/29). Would have once been resident in Blackwattle and Cockle Bays.

Scientific Name	Comments
Great Egret *Ardea alba*	According to North(1913/14:22): 'It chiefly frequents the margins of rivers … also the estuaries of rivers in the coastal districts'. Present especially on the mudflats at Riverview(Dixon, 1980:30). Observed in recent times in Morrison's Bay, Parramatta River(Morris, 1983:3). A bird of tidal inlets (Hoskin, 1991). Would have once been present in Cockle and Blackwattle Bays.
Little Egret *Egretta garzetta*	Seen in saltmarsh at Homebush Bay(Morris et al, 1990:51). Now a regular visitor(Hoskin, 1991:35). A bird found on tidal mudflats, salt marshes and mangroves(Pizzey & Knight, 2003:112). Persecuted after European settlement. Would once have been a visitor to Cockle and Blackwattle Bays.
Intermediate Egret *Ardea intermedia*	' … occasionally still found on the Parramatta River near Sydney …'(Ramsay, 1877:341). 'I have known it to be obtained in the neighbourhood of Sydney on only one occasion … on the 26 March 1902, at Long Bay …'(North, 1913/14:19/20). Persecuted during early settlement, but a steady increase in numbers in Sydney Region since 1949 (Hoskin, 1991:35). Habitat includes tidal mudflats(Pizzey & Knight, 2003:114). Would have periodically frequented Pyrmont peninsula at European settlement.
Nankeen Night Heron *Nycticorax caledonicus*	According to North (1898) frequented chiefly Melaleuca swamps. 'As in the early days of settlement, it is still an inhabitant of the neighbourhood of Sydney, specimens being more often obtained at Randwick, Botany, Cook River, Lane Cove and Parramatta Rivers … For forty or fifty years a breeding colony of these birds used to frequent the densely foliaged pine trees in the grounds of Elizabeth Bay House, Sydney Harbour … these birds would feed on the mudflats of Rushcutter and Watson Bays'(North, 1913/14:34). Nest in large pines at Elizabeth Bay(Le Souef & Macpherson, 1920:83). Resident at Riverview(Dixon, 1980:31). Occurred in mangroves at Homebush Bay (Hoskin, 1991). Would have once occurred in Blackwattle and Cockle Bays.
Little Bittern *Ixobrychus minutus*	'This is found in the marshes and other moist ground about Port Jackson, in December'(Latham, 1801: 301). Collected at Botany Bay(Bennett, 1837:45). 'During my sojourn in the country I ascertained that the few individuals known had been procured between Sydney and Botany Bay'(Gould, 1865b:319). 'The species was once tolerably numerous near Sydney; and there are still specimens in the Dobroyde collection which were shot at Botany Bay and near Newtown'(Ramsay, 1877:343). 'Rare. Frequents the rank herbage growing in swampy ground, near the mouth of Cook's River …'(North, 1898:102). Seen at Randwick, Rose Bay and Dobroyd[Ashfield] (North, 1913/14:41). Mathews(1913/14:475) described and figured a bird collected at Long Bay in 1908. Would have occurred in suitable habitat adjoining Cockle and Blackwattle Bays.

Scientific Name	Comments
Striated Heron *Butorides striatus*	Frequented mangroves in Parramatta River and Hen and Chickens Bay(North, 1898). 'At Dobroyde[Ashfield] and Five Dock, in former years, I occasionally flushed it while it was sheltering during the day in some densely foliaged mangrove …'(North, 1913/14:38). Resident in mangroves at Riverview(Dixon, 1980:32). Recent records from Rozelle Bay(Morris et al., 2004a:18) and near Elizabeth Macarthur Bay(pers.ob.). Would have once been resident in Cockle and Blackwattle Bays.
Australasian Bittern *Botaurus poiciloptilus*	'They are still found to be not rare within a few miles of Sydney …'(Ramsay, 1877:343). Mathews(1913/14:488) described and figured a bird collected at Botany Bay in 1900. 'In New South Wales the Bittern still haunts the neighbourhood of Sydney, being more frequently met with in the rush enclosed swamps in the neighbourhood of Botany and Cook River, and also in the upper parts of Narrabeen Lake'(North, 1913/14:46). Would have occurred in reedy areas of creeks feeding into Cockle and Blackwattle Bays.
Black Bittern *Ixobrychus flavicollis*	According to North(1913/14:43): 'Mangrove flats, the timbered margins of rivers and creeks … are its favourite haunts'. Small numbers of this species could have occurred in the vegetated margins at the heads of Cockle and Blackwattle Bays and in the lower reaches of creeks feeding same.
Royal Spoonbill *Platalea regia*	Not listed by North(1898) or North(1913/14). Observed around 'the mangrove-lined shores of Majors, Yaralla and Horseshoe Bay on the Parramatta River'(Morris, 1983:3). Regarded by Hoskin (1991:38) as moderately common and of irregular occurrence; present in saltwater estuaries and bays. Would have occurred in the bays adjoining Pyrmont peninsula.
Yellow-billed Spoonbill *Platalea flavipes*	Considered rare by North(1898). 'New South Wales is the stronghold of this species, over which it is generally distributed in favourable situations, except in the coastal districts, where it is of rare occurrence'(North, 1913/14:14): North had a single record, of a bird taken at Botany. Hindwood & McGill (1958:45), however, noted: 'When conditions are suitable flocks of up to 20 or more birds have been observed', mostly in the Hawkesbury District. Rarely seen at Riverview(Dixon, 1980:35). Although this species prefers freshwater habitats, Pizzey & Knight(2003:122) noted: 'Seldom on tidal areas but occasionally saline wetlands'. This species was probably persecuted early in European settlement, and may once have been commoner around Sydney than these observations suggest. Could have occurred irregularly in suitable habitats adjoining Pyrmont peninsula.
Black-shouldered Kite *Elanus axillaris*	Considered 'not plentiful' by North(1898), 'Nowhere is it so abundantly distributed as the south-eastern parts of Queensland, and the coastal districts of New South Wales … It is seldom seen now anywhere near Sydney, although there are specimens procured at Petersham …'(North, 1912:249). Dixon(1980:42/43) considered it nomadic/part-sedentary at Riverview. Would have occurred on Pyrmont peninsula.

Scientific Name	Comments
Brahminy Kite *Haliastur indus*	Hoskin(1991) noted its presence in early paintings, about 1790, and it being sufficiently known to local aboriginals to have a name. Debus(1992:72/73) commented: 'I see no reason to doubt that the adult Brahminy Kite in the Watling drawings … came from the Sydney district around 1790, the corollary of which is that the species' range has contracted northwards in New South Wales since European settlement'. A bird of tidal mudflats, estuaries & mangroves, large rivers and harbours(Pizzey & Knight, 2003) it likely occurred around Pyrmont peninsula in 1788.
Whistling Kite *Haliastur sphenurus*	According to Caley: 'It frequents the upper parts of the harbour(Port Jackson), particularly about the Flats, a few miles below Parramatta …'(Vigors & Horsfield, 1827:188). 'It is incessantly hovering over the harbours, and sides of rivers and lagoons … and when I visited the colony in 1839, it was nowhere more common or more generally to be seen than over the harbour of Port Jackson'(Gould, 1865a:21). North(1912:228) noted that: 'Occasionally it occurs in the County of Cumberland … It usually frequents the timber on the margins of rivers, creeks or marshes, or growing on the plains, or open forest lands'. Would have occurred around Pyrmont peninsula.
Red Goshawk *Erythrotriorchis radiatus*	Vigors & Horsfield(1827:187/8) quoted the following note of Caley: 'It frequents the upper parts of the Harbour(Port Jackson), particularly about the flats a few miles below Paramatta[sic]'. Not listed by North(1898). Hoskin(1991:46) noted it was 'included in a series of paintings made during the first years of settlement, about 1790 …' Debus(1991) reviewed the likely status of this species at European settlement, and concluded it was 'a formerly more numerous bird south to Sydney in the 1800s and early 1900s'(p.85). It has a large home range, of 100-200km^2 (Anon, 1991), and occurs in open forests and woodlands, especially near rivers (Pizzey & Knight, 2003). Pyrmont peninsula could have once been part of a larger home range.
Collared Sparrowhawk *Accipiter cirrhocephalus*	The 'Hawke of Port Jackson', illustrated by George Raper in 1789, is believed to be this species(Hindwood, 1964:45). North(1912:195) commented: 'Specimens are sometimes obtained in the neighbourhood of Sydney, but not so often as [the Brown Goshawk] … It frequents open forest and heath lands …'. He noted specimens, inter alia, from Elizabeth Bay, and Randwick. Would have occurred on Pyrmont peninsula, especially in more heavily-timbered parts.
Brown Goshawk *Accipiter fasciatus*	Regarded as the commonest bird of prey in the County (North, 1898). Would have once frequented Pyrmont peninsula.

Scientific Name	Comments
Grey Goshawk *Accipiter novaehollandiae*	The white morph was illustrated as 'White-Hawke of Port Jackson' by Raper in 1789(Hindwood, 1964:45). It was shot in February 1809 by Caley 'near Duck River, which is a branch of Port Jackson Harbour, about two miles from Parramatta on the road to Sydney. I have seen this species very sparingly …'(Vigors & Horsfield, 1827:180). Considered rare by North(1898). North(1912:184) observed: 'At one time it was common around Sydney', and noted specimens had been collected from Sydney, Woolloomooloo, Hunter's Hill, Hornsby, and Ashfield. Recorded once at Riverview(Dixon, 1980:44). Would have occurred in the more heavily timbered areas of Pyrmont peninsula.
Osprey *Pandion haliaetus*	Considered rare by North(1898) and very rare by Hoskin(1991). One observed on Lane Cove River on 7 April 2000(Morris & Gladwin, 2000:9). Favours coasts, estuaries, bays and inlets(Pizzey & Knight, 2003). It would have frequented Port Jackson(and Pyrmont peninsula) before European settlement.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	According to Gould(1865a:14): 'Among the numerous places in which I observed it in 1839 was the Cove of Sydney, where one or two were daily seen performing their aerial gyrations above the shipping and over the tops of the houses …'. 'Frequents the inlets and bays of the coast. Sometimes seen in Sydney harbour'(North, 1898). North(1912:216) commented:'… the White-bellied Sea-Eagle still occurs in Port Jackson, although it is not nearly so frequently seen as it was ten years ago'. He noted sightings at Middle Harbour, Ashfield, Roseville, and Lane Cove. A pair 'live above Middle Harbour'(Le Souef & Macpherson, 1920:84). Mostly single birds seen at Riverview(Dixon, 1980:46). Would have once frequented Pyrmont peninsula.
Little Eagle *Hieraaetus morphnoides*	North(1912:212) noted: ' … the Little Eagle is by no means common anywhere …'. Preferred habitats include dry sclerophyll forest(Morris et al, 1981:21). According to Hoskin(1991:47) 'Once a rare bird in the County but has been making frequent visits during the last 30 years over a wider area'. 'Less common near coast'(Marchant & Higgins, 1993:182). Probably persecuted by early settlers. Would have periodically visited Pyrmont peninsula.
Wedge-tailed Eagle *Aquila audax*	North(1912:202) commented: 'although noted by several writers, more particularly during the early history of the State, as frequenting the neighbourhood of Sydney, it is very seldom, or never, that it occurs now …'. Persecuted by early settlers. Would have visited Pyrmont peninsula periodically.
Swamp Harrier *Circus approximans*	North(1898:98) reported this species from similar locations to the former species, 'but is not so freely distributed'. According to Marchant & Higgins(1993:107), this species occurs in mangrove swamps and saltmarsh, over heath and in woodlands of *Banksia* and eucalypts. Pyrmont peninsula would have provided limited habitat for this species, and it probably visited periodically as part of a larger range.

Scientific Name	Comments
Brown Falcon *Falco berigora*	Considered common by North(1898). 'It chiefly frequents forest and heath lands …'(North, 1912:281). Two frequented Taronga Park(Le Souef & Macpherson, 1920:84). Hoskin(1991:49) regarded it as widely distributed in open forest country. Would have once occurred on Pyrmont peninsula.
Nankeen Kestrel *Falco cenchroides*	Vigors & Horsfield(1827:182) used specimens collected by Caley near Sydney early in settlement to describe this species. 'As in Caley's time it still haunts the neighbourhood of Sydney, but is not plentiful, and may be more frequently observed on the heath lands about Randwick, La Perouse and Long Bay, principally during the summer and autumn months …'(North, 1912:286). Often over the city in autumn(Le Souef & Macpherson, 1920:84). Would have once occurred on Pyrmont peninsula.
Peregrine Falcon *Falco peregrinus*	Ramsay(1876:49) collected it at Pennant Hills. Seldom seen according to North(1898). North(1912:259) observed: 'It is certainly now rare near the metropolis …'. He recorded specimens from Ashfield and Glenfield. It would have been present in Port Jackson at the time of European settlement.
Australian Hobby *Falco longipennis*	'This species chiefly frequents open forest and heath lands … It is generally distributed over the County of Cumberland, but is by no means common'(North, 1912:273); he recorded it from Randwick, Ashfield, Middle Harbour and Sydney Domain. Would have once occurred on Pyrmont peninsula.
Buff-banded Rail *Gallirallus philippensis*	Illustrated as a 'Bird of Port Jackson' by George Raper in 1789(Hindwood, 1964:44). King(1827:420) noted a specimen in the Linnean Society's Collection 'taken in the neighbourhood of Port Jackson'. Collected at Port Jackson(Bennett, 1837:49). North(1913/14:204) considered this species common in the vicinity of Sydney, with observations from Centennial Park, Botany, La Perouse, Botanic Gardens, Elizabeth Bay and in 'large gardens on the south side of the harbour'. Preferred habitats include saltmarsh, tidal mudflats, heathland, woodlands and forests(Marchant & Higgins, 1993:496). Would have occurred in suitable habitat on Pyrmont peninsula.
Lewin's Rail *Rallus pectoralis*	Although the swampy parts of Randwick, Long Bay, Little Bay and La Perouse were once favoured by this species, it also occurred to a lesser extent in the reed-bordered parts of Cook and George Rivers(North, 1913/14:201). Could have once occurred in such habitat on the peninsula.
Spotless Crake *Porzana tabuensis*	Named by Mathews(1910/27:15) in 1914 from specimen collected at Botany Swamps. North(1913/14:216/217) collected this species widely around Sydney, including Randwick, Botany, Long Bay, around Narrabeen, Manly Lagoon, and Tempe. Preferred habitats include saltmarsh, tidal creeks, heathy flats, coastal scrub(Marchant & Higgins, 1993:559). Would have occurred in suitable localities on the peninsula, particularly at the heads of the bays.

Scientific Name	Comments
Australian Spotted Crake *Porzana fluminea*	Widely collected near Sydney by North(1913/14:211/212); localities included Botany, Long Bay, La Perouse, Newtown, Narrabeen, and Macquarie Fields. Preferred habitats include estuaries, tidal creeks, saltmarshes, mangroves and dense shrub thickets(Marchant & Higgins, 1993:552). Flushed from Mason Park saltmarsh in 1991(Olympic Co-ordination Authority, 1996:57). Observed at Homebush Bay on 5 November 2001(Morris & Gladwin, 2001:10). Would have occurred in suitable vegetation at heads of bays.
Eurasian Coot *Fulica atra*	Frequents mangrove-fringed backwaters and estuaries(Hoskin, 1991:57). Would have occurred in both Blackwattle and Cockle Bays.
Bush Stone-Curlew *Burhinus grallarius*	Collected at Cook's River, Botany Bay(Bennett, 1837:46). Observed in the Mosman area in October 1877(Oculus, 2001). Once 'generally distributed over the county'(North, 1898:109), North(1913/14:189) observed it particularly in open forest between Toongabbie and Penrith, and at Blacktown. He also recorded it from Roseville and the Botanic Gardens. Habitats include saline sedge marshes, salt marsh and mangrove flats(Hoskin, 1991:59, NPWS, 2003). Would have once occurred on Pyrmont peninsula.
Painted Button-Quail *Turnix varia*	Collected at Port Jackson(Bennett, 1837:44). ' … many specimens [are] obtained immediately around Sydney, but principally at Middle Harbour, Randwick, Botany, and farther out at Campbelltown'(North, 1913/14:189). '… it is still the most common species found close to Sydney'(p.190); other locations include Roseville, Coogee Beach and Waterloo. ' … often to be found in the Sydney parks'(Le Souef & Macpherson, 1920:82). Seen occasionally at Riverview(Dixon, 1980:49). Found, inter alia, in heathlands. Would have once occurred on Pyrmont peninsula.
Latham's Snipe *Gallinago hardwickii*	Collected at Port Jackson(Bennett, 1837:48). Found roosting on the edge of saltmarsh at Homebush Bay and Newington(Morris et al, 1990:55). Would have occurred at heads of the bays.
Bar-tailed Godwit *Limosa lapponica*	Seen on flats of the Parramatta River(North, 1898). Observed at several locations on the Parramatta River in recent times(Morris, 1983:3). Would have occurred in suitable locations around Pyrmont peninsula.
Black-tailed Godwit *Limosa limosa*	A scarce summer visitor to saltmarsh at Homebush Bay and the intertidal zone at Kissing Point(Morris et al., 1990:55). 'Frequents tidal flats …' (Hindwood & McGill, 1958:39). Would have once occurred in such habitats on Pyrmont peninsula.
Eastern Curlew *Numenius madagascariensis*	Considered very common in spring/early summer by North (1898): 'Frequents … flats at the mouths of rivers. Plentiful at Botany Bay'. Frequents estuaries and mudflats(Hoskin, 1991). Would have once occurred in the bays adjoining Pyrmont peninsula.
Whimbrel *Numenius phaeopus*	A bird of saltwater estuaries(Hoskin, 1991:68). Probably occurred in the bays adjoining Pyrmont peninsula.

Scientific Name	Comments
Common Greenshank *Tringa nebularia*	Considered uncommon by North(1898:111). Found, inter alia, in estuaries, mudflats, and mangroves (Hoskin, 1991:71). Probably once occurred in such habitats adjoining Pyrmont peninsula.
Common Sandpiper *Actitis hypoleucos*	Hoskin(1991:71) recorded it from 'Backwaters of the Parramatta and Lane Cove Rivers'. Would have once occurred in such locations around Pyrmont peninsula.
Grey-tailed Tattler *Heteroscelus brevipes*	Listed by Hoskin(1991:69) as a bird of 'the coastal rock shelves, estuarine bays and mangroves …'. Could have occurred in such habitats around Pyrmont peninsula
Ruddy Turnstone *Arenaria interpres*	Recorded in small numbers in Hen and Chicken Bay(Abbotsford), with many records for Homebush and Wentworth Bays(Olympic Coordination Authority, 1996:60). Would have once occurred in the bays adjoining Pyrmont peninsula.
Red Knot *Calidris canutus*	Mathews(1913/14:271) figured and described a specimen collected at Botany Bay. Habitats include tidal mudflats, sand flats, salt marshes(Pizzey & Knight, 2003:180). Could have occurred in these habitats on Pyrmont peninsula.
Sanderling *Calidris alba*	'This species is found in New South Wales, but not plentifully … The English call it at Port Jackson, Sea or Shore Lark, from its being met with in that situation'(Latham, 1801:315). Could have once occurred in the bays adjoining Pyrmont peninsula.
Red-necked Stint *Calidris ruficollis*	One habitat noted by Hoskin(1991:76/77) was the muddy margins of estuaries, where it might once have occurred around Pyrmont peninsula.
Sharp-tailed Sandpiper *Calidris acuminata*	Considered common on the shores of Homebush Bay by North (1898). Found, inter alia, in estuaries where it can be a common bird(Hoskin, 1991:75). Recorded for Canada Bay. Would have once occurred in the bays adjoining Pyrmont peninsula.
Curlew Sandpiper *Calidris ferruginea*	Recorded from Canada, Kissing Point, and Homebush Bays in recent times (e.g. Morris, 1983:3), where it frequents estuarine mudflats. Could have once occurred in similar habitats around Pyrmont peninsula.
Black-winged Stilt *Himantopus himantopus*	Recorded from saltwater estuaries by Hoskin(1991:66), also from Homebush and Canada Bays and Lane Cove River estuary. Would once have occurred in the bays adjoining Pyrmont peninsula.

Scientific Name	Comments
Red-necked Avocet *Recurvirostra novaehollandiae*	Although mostly an inland species, it regularly visits coastal habitats such as estuaries and tidal mudflats(Pizzey & Knight, 2003:200). Considered rare in Sydney(North, 1898:111). Rarely observed at Homebush Bay(Hindwood & McGill, 1958:66, Olympic Co-ordination Authority, 1996:60). Hoskin (1991:66) reported a single bird at Homebush in 1987. Eight at Concord (Morris et al., 2004b:14). Small numbers now periodically observed at Homebush Bay(e.g. Morris et al, 2006:13). Could have once visited the mudflats around Pyrmont peninsula.
Pacific Golden Plover *Pluvialis fulva*	Collected at Port Jackson(Bennett, 1837:48). Considered common on the low flats at the mouth of the Cook's River by North(1898). Mathews(1913/14;79) figured and described a bird collected at Botany Bay. Recorded in recent times from Canada, Kissing Point, and Homebush Bays on the Parramatta River(e.g. Morris, 1983:3). Would have once frequented the bays around Pyrmont peninsula.
Red-capped Plover *Charadrius ruficapillus*	'This bird … is very common on the sands in the different parts of the harbour'(Hindwood, 1965:89). Found on estuarine flats(Hoskin, 1991) and recorded at Homebush Bay. Would have once occurred on the mud flats adjoining Pyrmont peninsula.
Double-banded Plover *Charadrius bicinctus*	North(1898:110) considered this species:'Common about Como, Botany Swamps, and the flats at the mouth of Cook's River. Found on mudflats of estuaries and bays(Hoskin, 1991:63). Could have occurred on same around Pyrmont peninsula.
Lesser Sand Plover *Charadrius mongolus*	Recorded from tidal mudflats, saltmarsh and estuaries(Pizzey & Knight, 2003:208). Possible regular visitor to these habitats in Cockle and Blackwattle Bays.
Black-fronted Dotterel *Elseyornis melanops*	Collected at Cook's River(North, 1913/14:280). Occurred at Centennial Park(Le Souef & Macpherson, 1920). Recorded at Homebush Bay(Olympic Co-ordination Authority, 1996; Morris et al, 1990:54). Found less commonly on saltmarsh and mudflats(Pizzey & Knight, 2003:212). Would have occurred periodically in Cockle and Blackwattle Bays.
Masked Lapwing *Vanellus miles*	'Is sometimes met with in the flats going to Parramatta, but is not a common bird'(Latham, 1801:314). Collected at Port Jackson(Bennett, 1837:50). According to North(1898): 'Frequents the … low-lying lands of the Parramatta River. Considered frequent at Riverview(Dixon, 1980:53/55) and recorded from most residual patches of natural vegetation adjoining Port Jackson. Would have been a breeding resident of the peninsula, as today.
Arctic Jaeger *Stercorarius parasiticus*	' … Arctic Skuas were seen chasing Crested Terns and Silver Gulls in Sydney Harbour'(Milledge, 1977:7). Morris(1986a:73) regarded this species as a common migrant of coast and harbour. In recent times, at least seven individuals were observed on Sydney Harbour on 20 January 1999(Morris & Gladwin, 1999a:13). It may well have occurred periodically over waters around Pyrmont peninsula, although this may be close to the inland limits of its movement.

Scientific Name	Comments
Pacific Gull *Larus pacificus*	Collected at Port Jackson(Bennett, 1837:51). According to North(1898:113): 'Common in all the bays and inlets, and along the coast. It may be frequently observed about Sydney Harbour, and on the Parramatta River'. North(1913/14:353) noted: 'Like the Silver Gull, it haunts the bays and estuaries of rivers, generally singly or in pairs, not in flocks …'. These comments presumably reflect its status around Pyrmont peninsula in 1788.
Silver Gull *Larus novaehollandiae*	'The Port Jackson or Small Gull[*Larus novaehollandiae*] is very numerous in the harbours and bays of the Australian Coast … great numbers of them feed on the mud-banks in the harbour at low water … I have often observed them in large flocks, in the dusk of evening in the month of December, returning to their roosting-places about the vicinity of the Heads of Port Jackson or other localities … they formed a dense mass during their passage down the harbour, keeping at a high elevation'(Bennett, 1860:242). '[It] is very common about Sydney at times, especially in dull weather, frequenting the paddocks, at no great distance from the city, in great numbers'(Diggles, 1866/70). In 1895, 'during the breeding months considerable numbers of sea gulls frequent the creeks and bays of the [Lane Cove] river' at Riverview(Dixon, 1980:12). North (1898:113) considered them 'Common about Sydney Harbour and the Parramatta River'. Would have occurred frequently around Pyrmont peninsula.
Whiskered Tern *Chlidonias hybrida*	'It is seldom seen on the coast near Sydney, but occasionally occurs on the flats at the mouth of Cook River, where it enters Botany Bay(North, 1913/14:302). Morris et al(1990:56) considered it an irregular visitor to saltmarsh at Homebush Bay. Hoskin(1991:84) described it as 'An uncommon … visitor to … tidal rivers and backwaters'. Probably a periodic visitor to the waters around Pyrmont peninsula.
Caspian Tern *Sterna caspia*	'Like many other species once common in the neighbourhood of Sydney, the Caspian Tern no longer frequents Port Jackson, neither has a specimen obtained in the neighbourhood of the metropolis come officially under my notice during a period of twenty-seven years'(North, 1913/14:309). 'An uncommon visitor, frequenting bays and estuaries and fresh-water swamps at irregular intervals'(Hoskin, 1991:86). Would have once occurred around Pyrmont peninsula.
Crested Tern *Sterna bergii*	'Common in all the bays and inlets …'(North, 1898). Recorded from both fresh and saltwater habitats at Riverview(Dixon, 1980:60). Recorded at Mortlake Point(Morris, 1983:3). Would have once occurred around Pyrmont peninsula.
Common Tern *Sterna hirundo*	Not recorded by North(1898). Dixon(1980:59) once recorded this species flying up the river at Riverview. Morris(1983:3) recorded it at Mortlake Point and Kissing Point Bay on the Parramatta River. Over 30 individuals recorded off McMahon's Point on 4 March 2002(Morris & Gladwin, 2002c:15). Likely to have visited the waters around Pyrmont Peninsula at European settlement.

Scientific Name	Comments
Little Tern *Sterna albifrons*	Morris et al.(1990:56) found this species present in small numbers in the bays and roosting on the rocky shores of the Parramatta River: 'Previously rested at Homebush Bay on a sandspit'. Could have once been present around Pyrmont peninsula.
Brown Cuckoo-Dove *Macropygia amboinensis*	According to Temminck(1822:129), this species occurred inland, towards Port Jackson. 'Like many other species inhabiting the neighbourhood of Sydney … it is no longer found near the metropolis, although for many years after it could be obtained at Randwick and Botany'(North, 1913/14:113). Considered uncommon by Hoskin(1991:95). Could have used rainforest/ wet sclerophyll patches on the peninsula.
Topknot Pigeon *Lopholaimus antarcticus*	Considered common in palm scrubs in the County during the winter months by North(1898:105). Small numbers probably visited the fruiting trees which once occurred on Pyrmont peninsula
Emerald Dove *Chalcophaps indica*	'I have never seen or heard of its recent occurrence near the metropolis, although formerly this Pigeon could be obtained at Randwick and Long Bay' (North, 1913/14:124). Occasionally seen at Riverview(Dixon, 1980:12). It could have occurred in the more heavily-timbered areas of the peninsula at its base.
Common Bronzewing *Phaps chalcoptera*	White(1790:146) noted that several specimens of this species had been sent from Port Jackson. Named by Latham in 1790 from specimen collected at Sydney(Mathews, 1910/27:10). '… nowhere more frequent than in the neighbourhood of Sydney Cove and Botany Bay; most especially in sandy and desert tracts; it is only seen from September to February, and at that time very numerous …'(Latham, 1801:267). Once abundant around Randwick and Botany(North, 1898:106). Recorded from forest country generally(Hoskin, 1991:96). Would have once occurred on Pyrmont peninsula.
Brush Bronzewing *Phaps elegans*	Illustrated as a 'Pigeon of Port Jackson' by George Raper in 1789(Hindwood, 1964:44). Used to be common at Randwick and Botany, and nested at Bondi(North, 1898:106). ' … it is by no means uncommon in the scrublands in the vicinity of Sydney, particularly between Manly and Newport; also at Middle Harbour'. Named by Mathews(1910/27:11) in 1912 from specimen collected at Long Bay. Found in scrubby country and heathlands, especially on sandstone(Hoskin, 1991:97). Would have once occurred on Pyrmont peninsula.
Wonga Pigeon *Leucosarcia melanoleuca*	' … seen at Port Jackson … in December'(Latham, 1801:269). Observed at Riverview in 1895(Plummer, 1895:111). This species favours moist, heavily timbered sandstone gullies (Hoskin, 1991:97). Would have once occurred in suitable habitat on Pyrmont peninsula.
White-headed Pigeon *Columba leucomela*	Probably commoner at European settlement than either North (1898:105) and Hoskin(1991:94) have reported since. Small numbers may have once visited stands of rainforest trees on the peninsula.

Scientific Name	Comments
Superb Fruit-Dove *Ptilinopus superbus*	North(1898:105) considered it a rare species which frequented chiefly Port Hacking and Royal National Park. The Australian Museum has specimens collected on the North Shore. Hoskin(1991:93) documented its recurrence in 1953. Probably visited suitable locations around Sydney at European settlement, including on Pyrmont peninsula.
Rose-crowned Fruit-Dove *Ptilinopus regina*	Reported as rare and found only in the coastal brushes, and in the scrubs on the banks of George's River(North, 1898:104). Hoskin (1991:93) recorded it was collected on the North Shore about 1865. Probably occurred at suitable times of the year on fruiting trees on Pyrmont peninsula.
Wompoo Fruit-Dove *Ptilinopus magnificus*	Considered rare by North(1898:105) and 'sometimes met with in the scrub at Port Hacking'. Hoskin(1991:93) regarded it as 'very rare in the County even in early years'. May have occurred on Pyrmont peninsula when rainforest trees were in fruit.
Glossy Black Cockatoo *Calyptorhynchus lathami*	Illustrated as a 'Cockatoo of Port Jackson' by Raper in 1789 (Hindwood, 1964:45). The birds seen by White(1790) and Phillip(1790) are believed to have been this species rather than *C. banksii*. Temminck described this species from a specimen collected at Botany Bay in 1807 and two specimens collected at Port Jackson in 1821(Mathews, 1910/27:80). North(1898:95) regarded this species as rare, usually met with at Port Hacking and Royal National Park, but also once frequented Botany. North(1912:70) noted: '[Mr J.A. Thorpe] informed me that this species used to frequent the neighbourhood of Botany and Kurnell'. Mathews(1916/17:127) believed that 'in the days of settlement at Port Jackson this species was the commonest bird, but being smaller in size, the rarer and larger bird[*C. banksii*] was more sought after and written about'. '… often seen around Sydney at the beginning of settlement but now rarely observed there' (Calaby, 1989:116). Still present in Kuring-gai Chase National Park(Department of Environment and Conservation, 2006:36). Would have once occurred on Pyrmont peninsula.

Scientific Name	Comments
Red-tailed Black Cockatoo *Calyptorhynchus banksii*	Latham, in the Supplement to his General Synopsis of Birds(pp.63/64), published in 1787, illustrated a female Red-tailed Black-Cockatoo with the comment: 'Inhabits New Holland. In the collection of Sir Joseph Banks, who brought it with him from thence to England, on his return from his voyage round the World'. In a footnote to Banks's Endeavour journal, Beaglehole (1963, 1:416) noted: 'It is curious that amongst the numerous natural history paintings of New Zealand and Australian plants and animals … there is only one sketch of a land bird, the Banksian Cockatoo[Red-tailed Black-Cockatoo] – which was made at Endeavour River[North Queensland]'. Elsewhere[2:118), Beaglehole commented, again in a footnote, that 'large noisy flocks of the Red-tailed Black Cockatoo … are common in the open forest of the upper Endeavour'. Banks and Solander shot 'some most beautiful birds' here, presumably the source of the specimen illustrated by Latham. This species did not figure in Raper's paintings of Port Jackson birds (Hindwood, 1964), the three illustrations being by 'The Port Jackson Painter'(several artists, including Watling). Raper left Sydney on 27 March 1791. Although he spent cumulatively less than 18 months in Sydney, it is surprising that he did not illustrate this striking bird. It is not clear that the birds collected for illustration by 'The Port Jackson Painter' were all from Port Jackson. One interpretation of the foregoing is that Red-tailed Black-Cockatoos only became known after Raper left Port Jackson, and were illustrated by 'The Port Jackson Painter' sometime in the early/mid 1790s. By this time, specimens could have been collected from towards the Hunter River. This interpretation accords with Ford(1980:106) and Morris(1992b:87), who both doubt whether the species ever occurred around Sydney. On the other hand, Temminck(1822:113) described a specimen collected in the neighbourhood of Port Jackson. Caley reported seeing this species frequently at North Rocks, 'a few miles northward of Paramatta[sic]'(Vigors & Horsfield, 1827:271). Noted as seen about Sydney and Port Jackson (Bougainville, 1837). Gould(1865b:14) noted that this species ' … is not infrequently seen in the immediate neighbourhood of Sydney …'. Listed by North in 1888(p.1777) but not in 1898. Hoskin(1991:98) noted that this species was 'not uncommon during the early days of settlement, 1788-94, no records since'. Hoskin's comment was presumably based on the drawings of the First Fleet artists noted above. According to Forshaw(2002:90), this species: 'Formerly ranged south in coastal New South Wales to the Hunter River Valley, and possibly near to Sydney'. This species may have once sometimes visited Pyrmont peninsula.
Yellow-tailed Black Cockatoo *Calyptorhynchus funereus*	Illustrated as a 'Bird of Port Jackson' by Raper in 1789(Hindwood, 1964:46). Noted as seen about Sydney and Port Jackson(Bougainville, 1837). 'Frequently seen in the heavily-timbered mountain ranges near the Hawkesbury River, also at National Park and Bulli. In the summer months I have observed it flying over Ashfield'(North, 1898). 'It is the only species inhabiting the neighbourhood of Sydney, and it may be found all the year about the upper parts of Middle Harbour'(North, 1912:58). Would have once visited Pyrmont peninsula.

Scientific Name	Comments
Sulphur-crested Cockatoo *Cacatua galerita*	Illustrated as a ' … Cockatoo of Port Jackson' by George Raper in 1789(Hindwood, 1964:46). North(1898) considered it uncommon: 'found only in the heavily-timbered ranges about Port Hacking, National Park, Bulli, and near George's River'. North(1912:77) noted: 'Although found near Sydney in the early days of settlement, it is now seldom seen east of the Nepean River …'(North, 1912:77). This species would have been persecuted at European settlement. Would have occurred on Pyrmont peninsula.
Rainbow Lorikeet *Trichoglossus haematodus*	According to Mathews(1916/17) this was the first parrot definitely described from Australia as it appears in the Nouvelles Illustrations de Zoologie by Peter Brown in 1776. 'Inhabits Botany Bay in New Holland'(Latham, 1781:213). 'This bird is a very common species … in great plenty both at Botany Bay and Port Jackson'(White, 1790:140). Collected at Port Jackson(Bennett, 1837:33). North(1898) described this species as 'Very abundant in some seasons in all parts of the county'. According to North (1912:41): 'In New South Wales, when there is an abundance of Eucalypts in blossom, these birds are in some seasons extremely plentiful, but they are far less numerous of late in the neighbourhood of Sydney than they were ten or fifteen years ago'. This species would have frequented Pyrmont peninsula in 1788.
Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus*	North(1898:94) noted: 'Formerly common, but now rare' in Sydney. North(1912:45) wrote that the Hawkesbury river: 'may be regarded as the extent of its normal range. That it does occasionally occur in the northern parts of the County of Cumberland there is no question, but I have never seen a specimen obtained in the neighbourhood of Sydney for many years past, nor have I ever observed at any time a skin in any collection formed south of the metropolis'. Hindwood & McGill(1958:57) observed: 'Similar in habits and distribution to the Rainbow Lorikeet, though not so often observed as that species. The Sydney district appears to be about the southern limit of distribution'. According to Hoskin(1991: 102): 'Often seen in the company of the Rainbow Lorikeet, Musk and Little Lorikeets … Follows the flowering Eucalypts, Banksias and other native plants'. Forshaw(2002:234) recorded its distribution south to the Illawarra district. He commented in respect of Sydney: 'I believe that since about the 1960s numbers have increased in the metropolitan area, especially south of the Harbour, where prior to that time the birds were seen only rarely'(p.235). Higgins(1999:213) recorded it, albeit rarely, south to South Durras. This species would have occurred on Pyrmont peninsula at European settlement.
Little Lorikeet *Glossopsitta pusilla*	'it is found in great numbers all over the country about Sydney Cove'(Latham, 1801:88). Considered 'Common during the winter months about Seven Hills and Blacktown, feeding on the blossom of *Eucalyptus obliqua*'(North(1898). 'Near Sydney it is extremely abundant in some seasons, from April to the end of June, in the neighbourhood of Toongabbie, Seven Hills and Blacktown(North, 1912:53). Hoskin(1991:103) considered its occurrence as determined by flowering Eucalypts and Angophoras. Likely to have once occurred on the peninsula.

Scientific Name	Comments
Musk Lorikeet *Glossopsitta concinna*	Described by Latham in 1790 from specimen collected at Botany Bay (Mathews, 1910/27:78). Collected at Port Jackson(Bennett, 1837:33). Described by North(1898) as: 'Exceedingly abundant in some seasons from January to April'. According to North(1912:49): 'In summer and autumn months it is usually without exception the commonest species of any member of the order Psittaci occurring near Sydney, although I have never myself found it, or heard of its breeding in the vicinity. Its appearance is greatly governed by the food supply and in some seasons it is far more abundant than others, and it is more common in the western suburbs of Sydney, than it is close to the coast'. Probably nomadic to Pyrmont peninsula at suitable times.
Swift Parrot *Lathamus discolor*	Illustrated as a 'Parroquet … of Port Jackson' by Raper in 1789 (Hindwood, 1964:45). Considered by North(1898): 'in former years a regular visitor to the City when the flowering Eucalypti was in blossom'. It would have visited Pyrmont peninsula at such times.
Australian King-Parrot *Alisterus scapularis*	Illustrated as a 'Parrot … of Port Jackson' by Raper in 1790 (Hindwood, 1964:45). Procured at Botany Bay in May 1788(White, 1790:112). Collected at Port Jackson(Bennett, 1837:31). North(1898) considered this species: 'Comparatively rare. Found only in the mountain ranges near the southern boundary of the county'. Hoskin (1991:103) described it as 'well distributed throughout the County'. Persecuted by the early settlers, this species would have once occurred on Pyrmont peninsula.
Eastern Rosella *Platycercus eximius*	Collected at Port Jackson(Bennett, 1837:32). North(1912:127) noted that: 'It frequents alike the brushes of the coast as well as the mountain ranges and open forest lands …'. Small numbers of this parrot would have once occurred on Pyrmont peninsula.
Crimson Rosella *Platycercus elegans*	Illustrated as a 'Parroquet … of Port Jackson' by Raper in 1789(Hindwood, 1964:45). Described from around Sydney by White(1790:174). According to Governor Phillip: 'This beautiful bird is not infrequent about Port Jackson …'(Mathews, 1916/17:307). Observed by Bougainville along Lady Macquarie's Road in July 1825(Rivière, 1999:76). Collected at Port Jackson(Bennett, 1837:31). Considered uncommon by North(1898): 'Found chiefly in the south coastal parts of the county, about Port Hacking and the National Park'. He further observed that: 'Both this and the [King Parrot] used to be obtained, in the early days of the colony, near Sydney'. Hoskin(1991:106) considered this species 'Widely distributed throughout the Sandstone, the North Shore and southern areas'. Would have once been resident on the peninsula.

Scientific Name	Comments
Orange-bellied Parrot *Neophema chrysogaster*	Male and female birds collected at Long Bay(Ramsay, 1891:82). According to a correspondent with North(1912:160) in about 1889, Orange-bellied Parrots 'were numerous around Penshurst and Bankstown, where they afforded some shooting for the sportsmen of the day. They were often to be found in the possession of bird-keepers, but are practically unknown now'. North noted: 'The late Mr J.A. Thorpe obtained a male and female at Middle Head, Sydney Harbour, where he found them breeding in a low hollow stump, also a specimen at Long Bay'. North also recorded this species from Penshurst, Blacktown and Riverstone. Particularly associated with coastal saltmarsh and heath habitats; likely occurred in suitable locations along the Parramatta River, including around Pyrmont peninsula.
Turquoise Parrot *Neophema pulchella*	Collected at Cook's River(Bennett, 1837:34). Ramsay(1891:80) detailed specimens from Rope's Creek(Erskine Park) and Sydney. 'Very common in former years but now seldom met with. Occasionally seen at Middle Harbour and Hornsby. There are numerous specimens in the Australian Museum obtained many years ago at North Shore, Dobroyde, and Macquarie Fields' (North, 1898). Morris(1980:58) detailed contemporary sightings of this species on the Cumberland Plain, and at Cowan and Holdsworthy. According to Hoskin(1991:109), this species decreased from about 1875, almost to the point of extinction; now well distributed over some parts of the County in fluctuating numbers. Turquoise Parrots still occur in Kuring-gai Chase National Park(NSW Department of Environment and Conservation, 2006:37). Could have once occurred on Pyrmont peninsula.
Ground Parrot *Pezoporus wallicus*	'This is a most elegant and beautiful species, inhabiting New South Wales, and other parts of New Holand … it is found in tolerable plenty'(Latham, 1801:87). 'According to Caley: 'What is called the Ground Parrot at Sydney inhabits the scrubs in that neighbourhood"(Vigors & Horsfield, 1827:286). 'Collected at Botany Bay(Bennett, 1837:34). According to North(1898:96) 'Occasionally met with in the Botany Water Reserve, Long Bay, Manly and Middle Harbour'. North(1912:73) noted: 'It is … chiefly an inhabitant of the coastal districts, over which, in favourable situations, it is somewhat sparingly distributed. Swamplands, more or less covered with rushes or grass tussocks, are its usual haunts, or low scrub-clothed wastes, heathlands, and less frequently it is found in open forest-lands'. Observed, inter alia, at Kensington and Middle Harbour. 'This extraordinary Parrot was not uncommon round Sydney when the first settlement was made …'(Mathews, 1916/17:487). Recorded in Royal National Park in the 1960s(NSW National Parks and Wildlife Service, 2000:21). Would have once occurred on Pyrmont peninsula.
Pallid Cuckoo *Cuculus pallidus*	Several specimens collected at Cook's River, Botany Bay(Bennett, 1837:29). Young being fed by Superb Fairy-wrens in garden of Government House, Sydney(Bennett, 1860:209). According to North(1898): 'Common all over the county in the spring and summer months, less numerous in the autumn, and very seldom seen in the winter. Frequents chiefly open forest lands …'. They arrive in numbers in September, but only on passage, staying for about a fortnight(Le Souef & Macpherson, 1920: 85). Would have occurred on Pyrmont peninsula.

Scientific Name	Comments
Fan-tailed Cuckoo *Cacomantis flabelliformis*	According to Ramsay(1865b:464), this species preferred 'the lonely and more closely wooded parts, and the sandy scrub-lands studded with aged Banksiae(*B. serrata*) and widely branching Eucalypti, where the undergrowth consists of low, thick, scrambling Lambertiae(*L. formosa*), Acacias, and dwarf Banksias & c.'… June comes, and they leave their lonely haunts for the more open wooded parts'. 'In the neighbourhood of Sydney it is a resident species … It frequents open forest lands …'(North, 1912:8). A resident of Sydney, 'not infrequent'(Le Souef & Macpherson, 1920:85). 'A widely distributed resident occurring throughout the year but nomadic in the autumn and winter'(Hoskin, 1991:110). A resident species at Riverview (Dixon, 1980:76/77), which would have once been its status on Pyrmont peninsula.
Brush Cuckoo *Cacomantis variolosus*	North(1912:13) described this species as '… a permanent resident in the neighbourhood of Sydney, and may be found about Greenwich, Narrabeen, Roseville and Middle Harbour …'. Both Hindwood & McGill(1958:110) and Hoskin(1991:110) considered it a summer migrant, widely distributed in forest country(Hosking, 1991). Would have once occurred on Pyrmont peninsula.
Horsfield's Bronze-Cuckoo *Chrysococcyx basalis*	Considered common by North(1898). According to North(1912:23), this species '… evinces a decided preference for the coastal districts …[it] is a permanent resident throughout the year in the neighbourhood of Sydney'. A summer visitor in small numbers to Riverview(Dixon, 1980:78). 'Usually seen in open country, heaths, or the edges of forests'(Hoskin, 1991:111). Would have once frequented Pyrmont peninsula.
Shining Bronze-Cuckoo *Chrysococcyx lucidus lucidus*	'I have … seen it in the Botanic Garden at Sydney in the month of March' (Gould, 1865a:623). A winter visitor from New Zealand. North(1912:22) had specimens from Mosman and Darling Point. Probably a winter visitor to Pyrmont peninsula in 1788.
Golden Bronze-Cuckoo *Chrysococcyx lucidus plagosus*	Collected at Port Jackson(Bennett, 1837:29). Considered common by North(1898). North(1912:19/20) recorded it, inter alia, from the Australian Museum grounds, Ashfield, Roseville and Randwick. ' … often to be seen in the city parks'(Le Souef & Macpherson, 1920:85). Hoskin(1991:112) described it as a forest frequenting species, 'well distributed throughout the County, apparently nomadic in the winter months when it can be seen in a variety of habitats'. Would once have occurred on Pyrmont peninsula.
Common Koel *Eudynamys scolopacea*	According to Bennett(1860:210): '… has often been shot in the vicinity of Sydney … In February 1859, a fine female of this bird was killed in a garden at New Town, near Sydney'. 'Rare. Occasionally obtained at Port Hacking, Randwick, and in the scrub near George's River'(North, 1898). North(1912:29) noted: '… specimens occasionally being obtained as far south as the County of Cumberland. According to Hoskin(1991:112): 'A regular breeding migrant … A bird of the forests in the Sandstone … particularly on the north side of the harbour' Would have been a visitor to Pyrmont peninsula at European settlement.

Scientific Name	Comments
Channel-billed Cuckoo *Scythrops novaehollandiae*	Illustrated as a 'Bird of Port Jackson' by Raper in 1788(Hindwood, 1964:53). Observed by White(1790:98) on the North Shore. 'This bird was killed at Port Jackson …'(Phillip, 1790:208). ' … it is not very common, and first appears about Port Jackson in October … they depart elsewhere in January'(Latham, 1801:97). Collected at Port Jackson(Bennett, 1837:28). 'A few years since, a fine female was shot in the Botanic Garden at Sydney'(Bennett, 1860:206). Considered a straggler to the County of Cumberland by North(1888:1780). Not listed by North(1898). North(1912:32) recorded the collection of specimens at Elizabeth Bay and near Parramatta. According to Chisholm(1962:253): 'this species was once fairly common about Sydney but is now mainly restricted to areas farther north'. Considered as 'a once rare migrant' by Hoskin(1991:113). Would have occurred on Pyrmont peninsula.
Pheasant Coucal *Centropus phasianinus*	King(1827:417) noted '[a] specimen of this bird in the Linnean Society's collection, that was taken in the neighbourhood of Port Jackson'. Considered rare by North(1898): 'Occasionally met with in the Hawkesbury River district, Greenvale, and near Liverpool'. North(1912:36) recorded this species from Narrabeen, Como, and Port Hacking. Hoskin(1991:114) recorded it from suitable habitat along the coast and in Royal and Kuring-gai National Parks. Morris(1986a:76) reported one bird from North Head, which he considered accidental. Stephens(1978:171) listed the species as an uncommon resident of Kuring-gai Chase National Park and as a rare visitor to Lane Cove Valley. Recent observations include Bayview(May 1966), Hornsby Heights (September 1966), Royal National Park in August 2005 (Morris et al., 2005a:13), and Warriewood in November 2005(Morris et al., 2005b:11) provided a good summary of the Pheasant Coucal's status in the Sydney/Illawarra region. It may have been an uncommon resident on Pyrmont peninsula, if suitable habitat existed, or a rare visitor.
Powerful Owl *Ninox strenua*	Collected at Macquarie Fields(Ramsay, 1890:24). 'Rare. Met with usually in the thick scrubs of the Hawkesbury district and about George's River'(North, 1898). Seen once at Riverview (Dixon, 1980:83). Could have been an occasional visitor to the peninsula.
Barking Owl *Ninox connivens*	Considered rare by North(1898). According to North(1912:304): 'Near Sydney it is a rare species, although the drawing which now constitutes the type was made from a specimen procured there in the early days of the settlement of Australia'. Stephens (1978:171) listed this species as a rare visitor to Kuring-gai Chase National Park and uncommon breeding resident in Lane Cove River Valley. 'Previously only known from very early County lists …'(Hoskin, 1991:115). May have occurred on Pyrmont peninsula.

Scientific Name	Comments
Southern Boobook *Ninox novaeseelandiae*	Collected on the North Shore, Port Jackson(Bennett, 1837:11). Considered common by North(1898). 'As in Watling's days, it is still to be found in the heart of the City and the surrounding suburbs …'(North, 1912:297). North included records from Randwick, Sydney Town Hall, Australian Museum grounds and North Shore. Pair occurred in the Quarantine grounds[North Head](Le Souef & Macpherson, 1920:84). Recorded at Riverview(Dixon, 1980:12). 'Widely distributed throughout the County'(Hoskin(1991:114). Would once have frequented Pyrmont peninsula.
Barn Owl *Tyto alba*	Collected from Concord and the Parramatta River(Ramsay, 1890:11). According to North(1898): 'Generally distributed over most parts of the county. It frequents the neighbourhood of Randwick and La Perouse, Kogarah, Manly and Hunter's Hill'. 'In New South Wales it inhabits alike the brushes of the coastal districts, the contiguous mountain ranges, and open forest lands … '; several specimens were collected close to Sydney(North, 1912:311). A pair observed at Taronga Park(Le Souef & Macpherson, 1920:84). Recorded at Riverview(Dixon, 1980:12). Hoskin(1991:115) noted that most records of this species were from shale areas. Would have once occurred on Pyrmont peninsula.
Masked Owl *Tyto novaehollandiae*	Considered 'not common' by North(1898). 'In New South Wales the Masked Owl is more often met with in the heavily timbered districts and open forest lands near the coast'(North, 1912:316). North had specimens, inter alia, from Roseville and Concord. Hoskin(1991:115) noted most records were from Sandstone areas. Would have occurred sometimes on the peninsula.
Tawny Frogmouth *Podargus strigoides*	Considered 'not plentiful' by North(1898): 'Generally distributed all over the county, except close to the coast'. North(1906/9:338) recorded it, inter alia, from Roseville and Chatswood. 'One or two pairs … live in the parks adjacent to the city'(Le Souef & Macpherson, 1920:84). Periodically recorded in low numbers at Riverview(Dixon, 1980:84/85). Would have once occurred on Pyrmont peninsula.
Australian Owlet-Nightjar *Aegotheles cristatus*	' … it appears about our settlement at Port Jackson in March'(Latham, 1801:261). 'Sparingly distributed throughout the County'(North, 1898). 'In the neighbourhood of Sydney this species is not uncommon '(North, 1906/9:343). North recorded it from Hunter's Hill, Middle Head, Ashfield, Newington. 'Many records from Sandstone areas'(Hoskin, 1991:117). Would have once occurred on Pyrmont peninsula.
White-throated Nightjar *Eurostopodus mystacalis*	Collected at Port Jackson(Bennett, 1837:35). North(1898) noted that in some seasons this species was unusually plentiful around the Lane Cove River. According to North(1906/9:331): 'In … New South Wales it is not uncommon in the coastal brushes and open forest lands … During March, 1893, it was particularly numerous around Sydney, and many were observed hawking around the fig-trees in the Domain'. According to Hoskin(1991:117): 'Widely distributed in the County but most records are from Sandstone areas'. Would have been a summer visitor to Pyrmont peninsula.

Scientific Name	Comments
Fork-tailed Swift *Apus pacificus*	Collected at Port Jackson(Bennett, 1837:36). North(1898) considered this species: 'Plentiful in some seasons about Ashfield, Marrickville and Randwick'. A summer visitor over Pyrmont peninsula.
White-throated Needletail *Hirundapus caudacutus*	According to Hoskin(1991:117): 'Likely to be seen anywhere over the County during the hot summer months, sometimes in large numbers …'. A summer visitor over Pyrmont peninsula.
Azure Kingfisher *Alcedo azurea*	According to Caley: 'It inhabits the harbour of Port Jackson, particularly the upper parts of the branches or creeks(Vigors & Horsfield, 1827:208). Ramsay(1894:19) collected three female birds from Middle Harbour in 1878. North(1898) noted: 'Occasionally seen in the mangroves growing in the Parramatta River'. Dixon(1980:90) believed that this species would have been present at Riverview in earlier times. Would have once occurred around Pyrmont peninsula.
Laughing Kookaburra *Dacelo novaeguineae*	Illustrated as a 'Bird … of Port Jackson' by Raper in 1789(Hindwood, 1964:45). Occurs at Port Jackson 'where … it is not infrequently met with'(Phillip, 1790:211). Collected at Cook's River, Botany Bay(Bennett, 1837:15). They prefer the natural lands along Port Jackson but will occur in suburbs with large gardens about(Le Souef & Macpherson, 1920:85). Hoskin(1991:118) considered this species 'a widespread breeding resident seen in most habitats'. Would have occurred on Pyrmont peninsula in 1788.
Sacred Kingfisher *Todiramphus sanctus*	In August 1788, White(1790:193/194) 'shot a Sacred Kings-Fisher on Port Jackson close to the hospital'. Raper illustrated this species from Port Jackson in 1790(Hindwood, 1964:44). 'Common all over the county …'(North, 1898). 'In the neighbourhood of Sydney it is more commonly met with during the latter end of August or beginning of September, until the middle of March, but I have observed odd birds or pairs throughout the autumn and winter months. Near the coast it chiefly frequents open forest lands, and the taller trees of the brushes and scrubs …'(North, 1906/9:373). Their call 'is heard in the spring, and many take up their summer residence in the parks round the city'(Le Souef & Macpherson, 1920:85). Mostly a summer visitor at Riverview(Dixon, 1980:91/92). 'Inhabits forest country generally'(Hoskin, 1991:119). Would have once occurred on Pyrmont peninsula.
Dollarbird *Eurystomus orientalis*	'Inhabits Port Jackson'(Latham, 1801:372). Collected at Cook's River, Botany Bay(Bennett, 1837:26). '… it is a regular visitor to the neighbourhood of Sydney, and is generally met with in scattered pairs here and there, but is nowhere common'(North, 1906/9:347). 'A regular migrant … Widely distributed thoughout the County with most records from the Sandstone'(Hoskin, 1991:120). Would have once occurred on Pyrmont peninsula.

Scientific Name	Comments
Noisy Pitta *Pitta versicolor*	Not listed by North(1898), while Hoskin(1991:120) surmised that the birds periodically recorded in Sydney could have been lost while migrating. Contemporary sightings suggest a southern migration in April/May and a northern migration in late-July/September(see). Pyrmont peninsula would likely have been on this migratory route.
White-throated Treecreeper *Cormobates leucophaeus*	Common(North, 1898). 'A breeding resident. A forest frequenting bird seen more often in the Sandstone …'(Hoskin, 1991:148). Would have once occurred on Pyrmont peninsula.
Superb Fairy-Wren *Malurus cyaneus*	Specimens collected at Port Jackson(Bennett, 1837:18). 'Several broods are reared annually in the Botanic Garden at Sydney …'(Gould, 1865a:319). 'Common everywhere'(North, 1898). Described by North in 1904 from specimen collected at Meadow Bank, near Ryde(Mathews, 1924:159). Numerous throughout the suburbs, even occurring in Darlinghurst Gaol and Double Bay'(Le Souef & Macpherson, 1920:89). Resident at Riverview (Dixon, 1980:124/126). 'Not as common as in earlier years in suburban gardens, but still to be seen in most areas in the County …'(Hoskin, 1991:138). Would once have been a widespread resident on Pyrmont peninsula.
Variegated Fairy-Wren *Malurus lamberti*	'The neighbourhood of Botany Bay is one of its most favourite haunts, and it is occasionally seen near Sydney, and even in the small gardens within the town'(Gould, 1865a:327). 'As at the time of Gould's visit to Australia, the stunted vegetation and heathlands about Botany Bay and Middle Harbour are still its favourite haunts near Sydney, but, unlike [the Superb Fairy-Wren], it no longer inhabits the gardens and parks of the city'(North, 1901/4:218/9). 'a few pairs [occur] in the parks around the harbour …'(Le Souef & Macpherson, 1920:89). ' … still fairly well distributed throughout Sydney's heathlands …' (Chisholm, 1962:187). Seen at Riverview once in early 1977 (Dixon, 1980:127). A bird of 'the sandstone heathlands, creeksides, and thick undergrowth of the forest country'(Hoskin, 1991:158). Would once have been a widespread resident on Pyrmont peninsula.

Scientific Name	Comments
Red-backed Fairy-Wren *Malurus melanocephalus*	The status of this species around Sydney at European settlement is unclear. Hindwood & McGill(1958:82) observed: 'Known only from paintings done during the first years of settlement and dating from about the year 1790. Presumably the drawings were done from a specimen, or specimens, collected in the Sydney area ...'. The 'First Fleet Collection' on the British Museum(Natural History) website has three images of the wren, one titled "Birds of Port Jackson" by George Raper, dated 1790, and the other two by 'The Port Jackson Painter'(Watling Drawings Nos 264 and 265). Of the former, Hindwood(1964:44) wrote: 'The Red-backed Wren is figured in several contemporary collections of drawings; it must, therefore, have been found near Sydney during the early years of settlement, though it has not since been observed in the Sydney district'. Lewin(1808:18) also illustrated Red-backed Wrens, noting that they inhabited 'the banks of Patterson river'. According to North(1901/4:230) this account would have been based on 'when [Lewin] accompanied Colonel Paterson, the Lieutenant-Governor of the then recently-formed colony of New South Wales, in his exploration of the Hunter River in the barque "Lady Nelson" in June and July, 1801'. Lewin's observation of the wrens thus came well after the "First Fleet" drawings were done, indicating that these latter were indeed based on populations nearer to Sydney than those at Patterson river. The attractive plumage of this species could have led to its widespread trapping as a cage bird and, in all likelihood, local extinction. According to the National Photographic Index of Australian Wildlife(1982:54) the preferred habitat of Red-backed Fairy-Wrens is 'tussock and thick grass along the banks of creeks, swamps and tidal flats', so limited habitat suitable to this species would have existed on Pyrmont peninsula at European settlement.
Southern Emu-Wren *Stipiturus malachurus*	Illustrated as a bird '... of Port Jackson' by Raper(Hindwood, 1964:46). According to Davies(1798:240): 'All the information which I have been able to procure respecting it, from Governor Phillip, Colonel Nepean, and other Gentlemen, who resided some years in New South Wales, is that it is found about Sydney and Botany-Bay, in marshy places, abounding with long grass and fine rushes ...'. Lesson considered the Emu-Wren as one of the commonest birds around Sydney in the early 1820s(Hindwood, 1931:106). Specimens collected at Port Jackson(Bennett, 1837:18). 'The delicate little Emeu Wren(*Malurus malachurus*), although formerly seen in great numbers in the vicinity of Sydney, is now very rare ... Some years since, it congregated in great numbers in the Sydney Domain, near the Botanic Garden, but for some time not one has been seen in that locality'(Bennett, 1860:213). North(1901/4:243) noted that this species 'was originally obtained near Sydney, and is still numerous in the neighbourhood of the city'. North(1898) found this wren 'Common near the coast. Frequents swampy localities overgrown with clumps of long rushes, and heath-covered sandy wastes'. Bell(1983:2) noted K.A. Hindwood recorded this species in Centennial Park 'well into this century'. Hoskin(1991:139) found it 'Inhabits damp heath, peat bogs, saline marsh or water tables all in Sandstone areas'. Would have once occurred on Pyrmont peninsula.

Scientific Name	Comments
Spotted Pardalote *Pardalotus punctatus*	Collected at Port Jackson(Bennett, 1837:19). 'Very common in all parts of the county. 'It may be found in the neighbourhood of Sydney throughout the whole year …'(Ramsay, 1868:273). 'Frequents chiefly heavily-timbered ranges, and open forest lands'(North, 1898). 'Nowhere is it more common than in the neighbourhood of Sydney, breeding freely in the suburbs …'(North, 1906/9:226). ' … one of the most numerous of the wild birds where there are any eucalyptus and angophora trees about'(Le Souef & Macpherson, 1920:90). Hoskin(1991:165) found it a common species. Resident breeding species at Riverview(Dixon, 1980:149/150). Would have been widely distributed on Pyrmont peninsula in 1788.
Yellow-tipped Pardalote *Pardalotus striatus striatus*	Collected at Port Jackson(Bennett, 1837:19). Ramsay(1865:298) noted the presence of this species in Sydney. 'Although this species is widely distributed over Eastern New South Wales and may be obtained in the suburbs of Sydney, it is the rarest of the striped crowned species of the genus *Pardalotus* inhabiting the State'(North, 1906/9:222). A winter visitor from Tasmania, at times in large numbers(Hoskin, 1991:166). Widespread in a variety of forests and woodlands, often with shrubby understorey, and usually dominated by eucalypts(including bloodwoods). Often inhabit open, dry sclerophyll forests and woodlands'. Would have occurred at times on Pyrmont peninsula.
Eastern Striated Pardalote *Pardalotus striatus ornatus*	Collected at Port Jackson(Bennett, 1837:19). North(1898) found this species common in open forest lands and widely distributed through the more southern areas of the county. 'It is common in the coastal districts …'(North, 1906/9:221). According to Hoskin(1991:165): 'Formerly more common and widespread in the County, particularly in the shale country and less common in the Sandstone areas'. Would have occurred on Pyrmont peninsula.
Eastern Bristlebird *Dasyornis brachypterus*	'Not common. Found only in the dry scrubby undergrowth near the coast. Occasionally obtained at Greenvale, near Manly, Randwick and Port Hacking'(North, 1898). North(1901/4:244) reported it also from between Bondi and La Perouse. According to Hoskin(1991:139): 'This unobtrusive species formerly occurred in coastal Sandstone in dense low scrub, damp heaths, and thick creekside vegetation'. Could once have occurred in suitable habitat on Pyrmont peninsula.
White-browed Scrubwren *Sericornis frontalis*	' … found in many little gullies and secluded pockets of thick vegetation in the parks around the harbour'(Le Souef & Macpherson, 1920:89). 'A breeding resident found throughout the Sandstone areas particularly along creeks and in thick undergrowth'(Hoskin, 1991:141). Would have once occurred in such locations on Pyrmont peninsula.

Scientific Name	Comments
Chestnut-rumped Heathwren *Hylacola pyrrhopygia*	North(1898) recorded this species from the North Shore, Randwick and La Perouse. North(1901/4:263) noted: '… nowhere is it more abundant than in the stunted scrub-covered lands lying between the Hawkesbury River and Botany Bay … Near Sydney I have only observed it in the scrubby undergrowth or thick bush growing in the shallow sandy soil which more or less covers the outcrops of Hawkesbury sandstone. He also commented: 'In August or September they leave these open parts and may be met with in pairs in the more dense and higher scrub, or frequenting rocky boulders on the margin of it'(p.264). Hindwood & McGill(1958:79) considered it 'largely confined to heathlands and scrub-covered rocky ridges on the sandstone'. Would have once occurred on Pyrmont peninsula.
Brown Gerygone *Gerygone mouki*	North(1901/4:196) recorded this species from Roseville, Blacktown, and Elizabeth Bay. Found in rainforests or deep sheltered gullies in the sandstone; widely distributed through the County(Hoskin, 1991:144). Would have once occurred in the moister forests towards the base of Pyrmont peninsula.
White-throated Gerygone *Gerygone olivacea*	Described by Gould in 1838 from specimen collected at Sydney(Mathews, 1923:124). Common summer visitor(early/mid September to early/mid April): 'Frequents chiefly the <u>Eucalypti</u> and <u>Syncarpia</u>, and usually feeds in low saplings'(North, 1898). 'A few … stay in the city parks and suburbs where they breed'(Le Souef & Macpherson, 1920:86). 'A regular migrant seen throughout the County, with a preference for second-growth timber'(Hoskin, 1991:144). Would have once occurred in the forested parts of Pyrmont peninsula.
Brown Thornbill *Acanthiza pusilla*	'Described by White(1790:257) from specimen collected at Sydney. Among the numerous small insectivorous birds frequenting the gardens about Sydney, the Little Brown Acanthiza, or Dwarf Warbler(*Acanthiza pusilla*), is common'(Bennett, 1860:213). 'Common in the low scrubby undergrowth near the coast'(North, 1898). 'Inhabits melaleucas and is very local'(Le Souef & Macpherson, 1920: 89). 'A breeding resident, widely distributed. Seen in thick low growth in Sandstone areas …'(Hoskin, 1991:145). Would once have been widespread on Pyrmont peninsula.
Buff-rumped Thornbill *Acanthiza reguloides*	'Some specimens in the collection were brought home by Mr. Brown from Port Jackson, where he obtained them in August 1803'(Vigors & Horsfield, 1827:226). Collected at Port Jackson(Bennett, 1837:17). '… between the Hawkesbury River and Port Jackson, this species is very common'(North, 1901/4:285). Prefers quite open, lightly timbered habitats(North, 1898: Hoskin, 1991:145). Could have occurred on Pyrmont peninsula in suitable habitat.
Striated Thornbill *Acanthiza lineata*	' … numerous in the eucalyptus and acacias areas'; common about Double Bay(Le Souef & Macpherson, 1920:89). Observed in small numbers at Riverview(Dixon, 1980:130). 'A resident species in the eucalyptus forest of the County. Widely distributed throughout natural forests in the Sandstone and Shale'(Hoskin, 1991:146). Would once have occurred on Pyrmont peninsula.

Scientific Name	Comments
Yellow Thornbill *Acanthiza nana*	North(1898) and Hoskin(1991:146) both found this species widely distributed throughout the county. Would once have been resident on Pyrmont peninsula.
Weebill *Smicrornis brevirostris*	'not uncommon among the eucalypts and angophora trees'(Le Souef & Macpherson, 1920:86). Occasionally occurred in small parties at Riverview(Dixon, 1980: 132). May have had a similar status on Pyrmont peninsula.
Little Wattlebird *Anthochaera chrysoptera*	' … is a numerous species [in New South Wales], seldom seen but near the seashore … '(Latham, 1801:166). According to Caley: ' … it is common in the neighbourhood of Sydney. It is what I should call an inhabitant of the coast'(Vigors & Horsfield, 1827:322). Collected at Port Jackson(Bennett, 1837:37). 'Among the places in which it is most numerous on the continent, are … Sydney … The Botanic Garden of the latter place, although in the midst of a populous city, is visited by great numbers of this bird …'(Gould, 1865a:541). 'In New South Wales it is common in the coastal districts … Although it frequents, and sometimes breeds in the neighbourhood of Sydney it is far less numerous than *Anthochaera carunculata*'(North, 1906/9:166). Locations given by North included the Botanic Gardens, Middle Harbour, Belmore. 'Common in sandstone heathlands, coastal scrubs, and areas where the Heath-leaved Banksia *Banksia ericifolia* and the Coast Banksia *Banksia integrifolia* grow'(Hoskin, 1991: 149). Would once have occurred on Pyrmont peninsula.
Red Wattlebird *Anthochaera carunculata*	A specimen of this species was collected by White on 17 April 1788 on the north shore of Port Jackson. 'it was received from Port Jackson'(Phillip, 1790:213). ' … inhabit New Holland, especially the sea-shores, and are pretty numerous … they are very fond of sucking the honey from the different kinds of *Banksia*'(Latham, 1801:151). Surprisingly, Caley observed 'to my knowledge it never occurred about Sydney, although is said by Mr. White to be an inhabitant of the colony'(Vigors & Horsfield, 1827:321). Collected at Port Jackson(Bennett, 1837:37). 'The *Anthochaera carunculata*, or Wattle-bird, is common about Sydney and Parramatta during the months of July and August'(Bennett, 1860:233). According to North(1898): 'Exceedingly abundant throughout the county from April until the end of August. "Gill-bird" shooting, either for sport or profit, is greatly indulged in during the winter months at Manly, Narrabeen, Hornsby and Port Hacking. Retires to the Blue Mountains to breed'. Now a widespread breeding resident(Hoskin, 1991:149). Would have once occurred widely on Pyrmont peninsula.
Noisy Friarbird *Philemon corniculatus*	Illustrated as a 'Bird of Port Jackson' by Raper in 1789(Hindwood, 1964:44). 'This is found about Port Jackson … in January'(Latham, 1801:155). Collected at Port Jackson(Bennett, 1837:36). 'As regards the neighbourhood of Sydney, it may be considered as nomadic in habits, some seasons appearing in large flocks, at other times in isolated pairs, and more often is entirely absent'(North, 1906/9:169). Periodically present at Riverview (Dixon, 1980:137). 'Seen in most parts of the County in forest areas. Breeds mainly in the sandstone forests'(Hoskin, 1991:150). Would have occurred on Pyrmont peninsula at European settlement.

Scientific Name	Comments
Regent Honeyeater *Xanthomyza phrygia*	Collected at Port Jackson(Bennett, 1837:38). According to North(1898): 'Large flocks of these birds may be seen during August and September at Port Hacking and between Manly and Narrabeen. A few pairs visit Dobroyde [Ashfield] and Canterbury nearly every season'. Considered nomadic, responding to the flowering of, among others, *Eucalyptus* and *Banksia* spp. Likely to have been an irregular visitor to Pyrmont peninsula.
Blue-faced Honeyeater *Entomyzon cyanotis*	Painted by Raper in 1789, in his 'Bird and Flower of Port Jackson' series. 'This attractive and beautiful Honey-eater … is strictly indigenous to New South Wales, where it is abundant and very generally dispersed …'(Gould, 1865a:560). According to North(1906/09:177): 'This is an instance of a species at one time found near Sydney, being driven away from its former haunts …'. Hindwood & McGill(1958:152) noted: 'Rarely observed. Recorded during the early years of settlement …'. According to Hindwood(1964:45): 'This species, now considered an extremely rare bird in the Sydney district, is figured in several sets of early natural history drawings'. Stephens(1978:172) listed it as a rare visitor to Kuring-gai Chase National Park, with no recent records. Would have visited Pyrmont peninsula.
Noisy Miner *Manorina melanocephala*	Mathews & Iredale(1920) commented on ' … specimens in the possession of Captain King, which were brought from Port Jackson, in New South Wales. Collected at Port Jackson(Bennett, 1837:37). North(1898:86) recorded this species from open forest around Seven Hills to Penrith, 'being more freely distributed near the western boundary of the County'. According to North(1906/9:201): ' … I have only seen it during one season in the suburbs of Sydney. This was at Roseville, … during the drought of 1902'. Hindwood & McGill(1958:93) considered it 'rarely seen in true sandstone forests'. Hoskin(1991:152) described this species as: 'A common resident species which lives in rather loose colonies, more numerous than in earlier years'. Would have sometimes visited Pyrmont peninsula about European settlement.
Lewin's Honeyeater *Meliphaga lewinii*	'Near Sydney it is more often met with … on the sides and creeks overgrown with vine-covered Lilly-Pilly, Coachwood, and Blackwattle trees'(North, 1906/9:106). 'Found in the rainforests and damp, heavily timbered gullies of the Sandstone, particularly where Coachwoods and Lilly-pillies abound … Inclined to be nomadic during autumn and winter' (Hoskin, 1991:152/153). This species was recorded patchily on the north shore of Port Jackson in contemporary surveys – in Lane Cove, Mosman bushland and at several locations in Sydney Harbour National Park. South of the harbour, there are undated specimens in the Australian Museum collection from Port Hacking, Botany Bay and Liverpool(Boles, pers.com.). Would have occurred in moist forest patches on Pyrmont peninsula at European settlement.
Yellow-faced Honeyeater *Lichenostomus chrysops*	White(1790:161) collected this species at Sydney on 30 May 1788. '… abundant in the gardens of Sydney …'(Gould, 1865a:521). 'Very common in the neighbourhood of Sydney'(North, 1898). 'Widespread throughout the County in forest country, particularly near creeks and streams'(Hoskin, 1991:153). Would have once been common on Pyrmont peninsula.

Scientific Name	Comments
White-eared Honeyeater *Lichenostomus leucotis*	According to Lewin(1822:20) this species was found in: 'The neighbourhood of Sydney and Parramatta; frequenting thick brushy woods'. 'Frequents the scrubs about Homebush Bay, Enfield and National Park'(North, 1898). 'In the neighbourhood of Sydney, although widely distributed, the White-eared Honeyeater is the rarest species of the genus. It frequents the tea-tree and needle-bush scrubs about Parramatta River and Cook's River, and the large open tracts with a stunted vegetation about Middle Harbour'(North, 1906/9:146). Hoskin(1991:154) reported 'Dry sandstone ridges and heaths are the habitat of this species … Often seen in forest country in autumn and winter'. This species could well once have occurred on Pyrmont peninsula, as a breeding species or visitor.
Yellow-tufted Honeyeater *Lichenostomus melanops*	Described by Vieillot in 1818 from specimen collected at Botany Bay (Mathews, 1924:196). According to Caley: 'The birds frequented the trees in the brush along the upper part of Duck River, in great abundance …'(Vigors & Horsfield, 1827:314). Collected at Port Jackson(Bennett, 1837:39). According to Ramsay(1864:243) this species is ' … very common about Sydney … It gives preference to the more open underwood of young *Eucalyptus* and Wattle trees(*Acacia decurrens*), which are plentiful near Dobroyde, Enfield, and Paramatta[sic], rather than to the dense scrubland nearer the coast'. 'Exceedingly common about the western suburbs of Sydney … and generally distributed throughout the county'(North, 1898). '[It] is the commonest species of the genus found in the neighbourhood of Sydney, and more especially in the western suburbs'(North, 1906/9:140). North observed this species at, inter alia, Ashfield, Canterbury, Roseville, and Middle Harbour. ' … numerous in Sydney wherever there are eucalyptus trees … common in some of the outlying suburbs'(Le Souef & Macpherson, 1920:90). Hoskin(1991:154) recorded it from sandstone … with a preference for localities where the Grey Gum *Eucalyptus punctata* grows'. Probably occurred on Pyrmont peninsula.
Fuscous Honeyeater *Lichenostomus fuscus*	'It is a common species in the neighbourhood of Sydney, where it is resident throughout the year … Near the coast it may be found frequenting the same situations as [the Yellow-tufted Honeyeater], but it gives preference more to open forest lands'(North, 1906/9:114). Hoskin(1991:154) described this species as inclined to be nomadic in autumn and winter 'when it has been seen on sandstone heaths, suburban parklands and coastal areas, attracted by flowering trees'. Would have once occurred at such times on Pyrmont peninsula.
Brown-headed Honeyeater *Melithreptus brevirostris*	Collected at Port Jackson(Bennett, 1837:39). 'In the neighbourhood of Sydney, it is fairly common in some localities, especially in the winter months … [it] is particularly plentiful in Middle Harbour …'(North, 1906/9:191). ' … rather numerous in Taronga Park'(Le Souef & Macpherson, 1920:90). 'A bird of the open forests and heaths interspersed with eucalypts … Wandering parties of a dozen or more may be seen in heathlands during the cooler months'(Hoskin, 1991:156). Would have occurred on Pyrmont peninsula.

Scientific Name	Comments
White-naped Honeyeater *Melithreptus lunatus*	Illustrated as a bird ' … of Port Jackson' by Raper in 1789(Hindwood, 1964:46). According to Caley: 'I shot it at Iron Cove … on the Paramatta Road'(Vigors & Horsfield, 1827:315). These authors also noted: 'Specimens of the species now in the collection were brought by Mr. Brown from Port Jackson'. Collected at Botany Bay(Bennett, 1837:40). 'Very common in all parts of the county, frequenting the flowering Eucalypti'(North, 1898). ' … often seen among the eucalypts in the parks …'(Le Souef & Macpherson, 1920:90). Would have once been common on the peninsula.
New Holland Honeyeater *Phylidonyris novaehollandiae*	Collected beside Port Jackson harbour by White(1790:186) on 13 July 1788. Collected at Port Jackson(Bennett, 1837:38). 'Nowhere have I seen it so abundant as in the neighbourhood of Sydney, particularly at Long Bay, La Perouse, and around the shores of Botany Bay; also about Middle Harbour, and from Manly to Narrabeen'; specific locations included Hyde Park and the Botanic Gardens(North, 1906/9:60). According to Hoskin(1991:160): 'One of the most common honeyeaters in the Sandstone areas, seen in heathlands, low coastal scrubs and forest county especially where there is thick undergrowth'. Would have once been widespread on Pyrmont peninsula.
White-cheeked Honeyeater *Phylidonyris nigra*	Collected by White(1790:297) around Port Jackson. Collected at Botany Bay(Bennett, 1837:39). ' … common at Botany Bay, and on most parts of the sea-coast between that place and the river Clarence …'(Gould, 1865a:490). 'At Roseville, Middle Harbour, Thornleigh and Hornsby it frequents the forest lands with a thick scrubby undergrowth of stunted Banksias and Eucalypti' (North, 1906/9:65). 'a common species in Sydney heathlands'(Chisholm, 1962:203). Present in small numbers at Riverview(Dixon, 1980:145). 'Inhabits thick vegetation bordering creeks, swampy situations with a rank growth of Sword-grass *Gahnia* and ferns and the more vigorous heathlands of the Sandstone. Frequents forest country when the trees are in blossom'(Hoskin, 1991:160). Would have once occurred locally on the peninsula.
Crescent Honeyeater *Philidonyris pyrrhoptera*	Collected at Botany Bay(Bennett, 1837:39). Considered rare in the Sydney region by North(1898:83): 'Sometimes obtained in the scrubby undergrowth at Botany and Port Hacking, and on one occasion at Rose Bay'. Hindwood & McGill(1958:92) noted it moved out of heavy forest country 'into nearby sandstone heaths to feed on the flowering banksias'. Stephens(1978:174) listed it as a rare visitor to Kuring-gai Chase, with 1-2 sightings and possibly an accidental occurrence or vagrant; no recent records. Described by Higgins et al.(2001) as an autumn/winter visitor to coast round Sydney, mostly April-August. Probably once an uncommon autumn/winter visitor to the heaths on Pyrmont peninsula.

Scientific Name	Comments
Tawny-crowned Honeyeater *Phylidonyris melanops*	'One of the specimens of this species in the collection was brought by Mr. Brown from Port Jackson, where he met with it in August 1803'(Vigors & Horsfield, 1827:318). 'Not uncommon on the heath lands of Randwick, Botany, National Park, and Middle Harbour'(North, 1898:83). 'It is principally an inhabitant of the coastal districts, open heath lands or sandy wastes with a stunted and scattered vegetation being its favorite haunts'(North, 1906/9:72). Prefers open, dry, low, sandstone heath (Hoskin, 1991:162). Would have once frequented suitable habitat on Pyrmont peninsula.
Eastern Spinebill *Acanthorhynchus tenuirostris*	'Mr. Caley observes that he has seen this bird both at Sydney and at Parramatta'(Vigors & Horsfield, 1827:317). Collected at Port Jackson (Bennett, 1837:38). ' … resident, numerous in our gardens, but more especially in the vicinity of the parks'(Le Souef & Macpherson, 1920: 90). 'A resident species and found throughout the County although less common than formerly. More prevalent on the Sandstone …'(Hoskin, 1991:163). Would have once occurred widely on Pyrmont peninsula.
Scarlet Honeyeater *Myzomela sanguinolenta*	'Inhabits New South Wales; seen only in the spring, and is a rare species'(Latham, 1801:168). Collected at Port Jackson(Bennett, 1837:38). Ramsay(1865:304) noted that this species arrived in Sydney in July/August, leaving in January, although their occurrence depended on season. 'Nowhere is it more abundant in certain seasons of the year than the coastal districts around Sydney. Although fairly regular in its appearance during early spring, it is distinctly nomadic and erratic in habits during the winter months'(North, 1906/9:92). North observed it at, inter alia, Middle Harbour, Bondi, Randwick, Hyde Park, Roseville, Chatswood, and Ashfield. Arrives in September and a few remain in the city parks, leaving in February(Le Souef & Macpherson, 1920:90). '… its movements and numbers [depend] largely on the blossoming of various trees and shrubs … sometimes seen in the Sandstone heathlands during the autumn and winter months …'(Hoskin, 1991:164). Would have once been a nomadic visitor to Pyrmont peninsula
Brown Honeyeater *Lichmera indistincta*	'In the neighbourhood of Sydney they frequent the orange groves …'(Ramsay, 1875:595). 'In the neighbourhood of Sydney, it may be regarded as a comparatively rare species … The birds are more often met with on the southern shores of Botany Bay and at the National Park'(North, 1906/9:80). ' … still present in small numbers in the mangroves and Coast Banksias *Banksia integrifolia* between Cronulla and Kurnell. Also present at times in Homebush Bay …'(Hoskin, 1991:158). Could have once occurred in similar habitats around Pyrmont peninsula.
White-fronted Chat *Epthianura albifrons*	'About Botany and the Paramatta River[sic] … they are plentiful'(Gould, 1865a:379). 'Near the coast, it chiefly frequents estuarine areas and marshy grounds dotted here and there with tufts of rushes, and sand wastes covered with low bracken fern or stunted vegetation'(North, 1901/4:344). 'Common on the flats of the Parramatta River …'(North, 1898). Recorded by Hoskin(1991:164) from Homebush Bay. Small numbers may have once occurred on the flats adjoining Pyrmont peninsula.

Scientific Name	Comments
Jacky Winter *Microeca fascinans*	' … at Port Jackson is called the smaller fascinating bird …'(Latham, 1801:197). 'The specimen in the Society's Collection was met with at Port Jackson by Mr. Brown'(Vigors & Horsfield, 1827:245). 'The commonest resident species in the county, over which it is generally distributed'(North, 1898). 'is much associated with Sydney'(Le Souef & Macpherson, 1920:86). Occasionally observed at Riverview(Dixon, 1980:109/110). Would have once occurred on Pyrmont peninsula.
Scarlet Robin *Petroica multicolor*	An illustration of this species, made between 1788 and 1797, is annotated 'They are more numerous of N[orfolk] Island than at Port Jackson'. Bougainville(1837) noted that an individual of this species was collected around Port Jackson; he commented also that, according to Caley, in March and April, it appears at the Western port, and comes to perch on the ships at anchor. In November it takes itself to the mountains. Described by Pease in 1848 from specimen collected at Sydney(Mathews, 1923:121). 'Tolerably common in open forest lands during the autumn and winter months … retires in the spring to the mountain ranges outside the county to breed'(North, 1898). Recorded in the autumn and winter months, inter alia, from heathland areas (Hoskin, 1991:128). Would have once been a winter visitor to Pyrmont peninsula.
Rose Robin *Petroica rosea*	'During the winter months it chiefly frequents the open forest lands, and returns again in the spring to its thickly-wooded retreats for the purpose of breeding. Near Sydney it … is so familiar that I have often observed it in the suburban gardens on the outskirts of Ashfield and Croydon …'(North, 1901/4:159/160). Recorded as a winter visitor to Riverview by Dixon (1980:105). Would have occurred on Pyrmont peninsula, in the mangroves and more forested areas, in autumn and winter.
Eastern Yellow Robin *Eopsaltria australis*	Described by Latham(1790 and 1801), Vieillot(1818), Swanson(1837) and Gould(1838), all from specimens collected at Sydney(Mathews, 1923:132). Collected at Port Jackson(Bennett, 1837:20). According to Bougainville (1837), this species was seen about Botany Bay. '… I also observed it in most of the gardens in the neighbourhood of Sydney …'(Gould, 1865a:293). 'In the neighbourhood of Sydney it is very common, and a few pairs breed every year in the Botanic Gardens and the Domain'(North, 1901/4:182). ' … numerous in the harbour parks, and will establish themselves in a garden if there is sufficient cover available'(Le Souef & Macpherson, 1920:86). According to Hoskin(1991:129) 'The most common of the robins in the County. Widely distributed breeding resident found in all types of forest country and coastal tea-tree scrubs'. A resident, breeding species at Riverview(Dixon, 1980:107/108). Would once have bred in moister habitats on Pyrmont peninsula.

Scientific Name	Comments
Eastern Whipbird *Psophodes olivaceus*	Illustrated as a bird ' … of Port Jackson' by Raper in 1789(Hindwood, 1964:46). 'Near Sydney it is tolerably common in the scrubby undergrowth of North Shore, Homebush, and Cook's River …'(North, 1901/4:336). North recorded this species, inter alia, from Middle Harbour, Roseville, Newington, Chatswood, Eastwood and the Parramatta River. ' … occurred in Ashton Park'(Le Souef & Macpherson, 1920:7). Contemporary surveys reported this species from most bushland relicts between Lane Cove and North Head(see p.276). Australian Museum collection specimens of interest here are from Ashfield and Newington – both within the Parramatta River catchment and supplementing North's observation(above) from Homebush. This species was likely associated with denser vegetation along the river and its tributaries and, as such, would have occurred at the heads of Cockle and Blackwattle Bays.
Spotted Quail-Thrush *Cinclosoma punctatum*	Collected from Port Jackson(Bennett, 1837:26). North(1901/4:324) considered this species fairly numerous in the coastal districts of New South Wales, recording it from Roseville, Middle Harbour and Royal National Park. 'A ground dwelling bird inhabiting sandstone ridges and rock outcrops in forest country … Not commonly observed in recent years' (Hindwood & McGill, 1958:75). Would have likely occurred in rocky areas of Pyrmont peninsula.
Varied Sittella *Daphoenositta chrysoptera*	An abundant species in all parts of the county'(North, 1898). 'Nowhere is it more common than in the neighbourhood of Sydney … Open forest lands studded with the larger kinds of Eucalypti and Angophorae are its favourite haunts …'(North, 1906/9:53). 'One can generally find them in the vicinity of the parks and larger gardens …'(Le Souef & Macpherson, 1920:88). It would once have occurred on Pyrmont peninsula.
Crested Shrike-Tit *Falcunculus frontatus*	Illustrated as a 'Bird … of Port Jackson' by Raper in 1789(Hindwood, 1964:46). Collected at Cook's River, Botany Bay(Bennett, 1837:12). 'It is a resident species and is particularly plentiful in the tall Eucalypti and sapling scrubs of the coastal districts, and nowhere is it more abundantly distributed than in the neighbourhood of Sydney'(North, 1906/9:36). ' … more numerous than one would suppose … They mainly keep to the eucalyptus trees'(Le Souef & Macpherson, 1920:86). Would have once occurred in the more forested parts of the peninsula.
Golden Whistler *Pachycephala pectoralis*	According to Latham(1782:182): 'Not infrequently seen at Port Jackson in the winter months'[North, 1906/9:22]. Described by Shaw & Nodder(1811), Vieillot(1817), Stephens(1826), Vigors & Horsfield(1827), all from specimens collected at Sydney(Mathews, 1923:128). ' … sparingly present in Ashton Park, keeping to the thicker gullies in the summer, but reaching out to the higher grounds and adjoining suburban gardens in the winter …'(Le Souef & Macpherson, 1920:86). 'A breeding resident of the well-timbered damp gullies in the Sandstone and rainforests. During the autumn, winter and early spring, it is nomadic, being seen in the Shale and most other habitats'. (Hoskin, 1991:130). It would once have seasonally exploited different parts of Pyrmont peninsula.

Scientific Name	Comments
Rufous Whistler *Pachycephala rufiventris*	Described by Latham in 1801 from specimen collected at Sydney(Mathews, 1923:129). According to North(1898), it was a common species, which frequented open forest lands and lightly timbered scrub'. Many stay in and around the city to breed, while others pass through on migration in September(Le Souef & Macpherson, 1920:86). 'A regular spring migrant of the forest country …'(Hoskin, 1991:131). Would have once been widespread on Pyrmont peninsula.
Grey-Shrike Thrush *Colluricincla harmonica*	Described as the 'Port Jackson Thrush', which 'inhabits the neighbourhood of Port Jackson'(White, 1790:157). 'Common … in open forest lands, mountain ranges and lightly-timbered scrub'(North, 1898). Would have once occurred widely on Pyrmont peninsula.
Black-faced Monarch *Monarcha melanopsis*	Vieillot formally described this species in 1818, with a specimen collected in the region of Port Jackson. Also collected from Port Jackson for the Australian Museum(Bennett, 1837:25). Specimen collected at Petersham, where it nested, and another seen in the vicinity of Sydney in 1860(Ramsay, 1865:302/3); Ramsay believed that very few Black-faced Monarchs bred around Sydney. 'Near Sydney it may be occasionally observed in open forest or lightly timbered lands from the beginning of February until the end of September. It is now common, however, and retires from the vicinity of the metropolis to breed in the more secluded mountain gullies of the county'(North, 1901/4:155). Could have once occurred in moister habitats on Pyrmont peninsula.
Spectacled Monarch *Monarcha trivirgatus*	Not listed by North(1898 & 1901/4). Hoskin(1991:132) described it as rare, being seen more often since about 1980. Records for Sydney are mostly clustered in October/November, suggesting it may be on migration at this time(see p. 248). Would have visited Pyrmont peninsula at such times.
Leaden Flycatcher *Myiagra rubecula*	Lewin(1822:21) recorded this species in 'The neighbourhood of Sydney'. ' … a rare visitor to Sydney'(Le Souef & Macpherson, 1920:87). A regular summer migrant(October/end March), nesting in forest country in the Sandstone or in mangroves of estuaries(Hoskin, 1991:132). Would have occurred on Pyrmont peninsula at such times.
Satin Flycatcher *Myiagra cyanoleuca*	Considered 'exceedingly rare' by North(1898:75), who recorded an adult male from 'scrubby undergrowth at North Shore'. Rarely observed by Hindwood & McGill (1958:71): 'The normal migration route of the Satin Flycatcher appears to follow the highlands of the Great Dividing Range west of the County'. Usually seen during migration, as breeds in ranges(Hoskin, 1991:132). Visitor to the foreshore trees at Riverview(Dixon, 1980:117). Would have been a seasonal visitor to Pyrmont peninsula.

Scientific Name	Comments
Restless Flycatcher *Myiagra inquieta*	Collected at Port Jackson(Bennett, 1837:25). '… a permanent resident … fairly numerous in the neighbourhood of Sydney' (North, 1901/4:136). 'Distributed over most parts of the county'(North, 1898). ' … moves through the city during its migrations'(Le Souef & Macpherson, 1920:87). 'A breeding resident found mainly in the open forest areas on the Shale in the western part of the County. Once more common …'(Hoskin, 1991:133). Would have once occurred on Pyrmont peninsula.
Willie Wagtail *Rhipidura leucophrys*	'Found at Port Jackson'(Latham, 1801:373/4).'This species was discovered by Mr. Brown at George's River in September 1803'(Vigors & Horsfield, 1827:248). 'A common breeding resident found in most habitats. Nomadic during the autumn and winter …'(Hoskin, 1991:133). Would have once occurred on Pyrmont peninsula.
Rufous Fantail *Rhipidura rufifrons*	Collected at Port Jackson(Bennett, 1837:22). 'Met with in open forest lands during the winter months …'(North, 1898). Pass through the city on migration(Le Souef & Macpherson, 1920:87). 'A regular migrant which breeds in rainforest gullies'(Hoskin, 1991:133). Would have occurred seasonally on the peninsula.
Grey Fantail *Rhipidura fuliginosa*	Collected at Port Jackson(Bennett, 1837:23). 'A breeding resident well distributed throughout forest country generally. Nomadic during the non-breeding season …'(North, 1898). Described by Mathews in 1911 from specimen collected at Homebush(Mathews, 1923:133). Resident, moving into more open areas in winter(Le Souef & Macpherson, 1920:87). Would have once resided on Pyrmont peninsula.
Black-faced Cuckoo-Shrike *Coracina novaehollandiae*	'Common in most parts of the County during the spring and summer months. Breeds chiefly in open forest lands'(North, 1898). Resident, breeding species at Riverview(Dixon, 1980:100/101). Would have once occurred on Pyrmont peninsula.
Cicadabird *Coracina tenuirostris*	'South of the Hawkesbury River it is less frequently met with until the Illawarra District is reached …'(North, 1901/4:113). Recorded by North(1907) at Roseville, as a breeding summer visitor. 'An uncommon but regular migrant [which] … inhabits mature forest country in Sandstone areas'(Hoskin, 1991:125). Would once have occurred in suitable habitat on Pyrmont peninsula.
White-winged Triller *Lalage sueurii*	Recorded at Chatswood(North, 1901/4:120) and once at Riverview(Dixon, 1980:103). Often seen in spring; used to breed in Sydney(Le Souef & Macpherson, 1920:87). A summer visitor(early September/February), which Hoskin(1991:126) mostly found in the open parts of the Shale forests although it passed through Sandstone areas. Would have sometimes visited Pyrmont peninsula.

Scientific Name	Comments
Olive-backed Oriole *Oriolus sagittatus*	According to Caley: 'I think I once saw a flock of them in Government Garden, and that the gardener complained of their destroying the figs'(Vigors & Horsfield, 1827:328). 'I frequently observed it in the Botanic Garden at Sydney, and in all the gardens of the settlers where there were trees of sufficient size to afford it shelter'(Gould, 1865a:462). According to North(1898) 'tolerably common in open forest lands'. Similarly assessed by Hoskin(1991:170). Would once have occurred on Pyrmont peninsula.
Dusky Woodswallow *Artamus cyanopterus*	'Frequently seen about Port Jackson …'(Latham, 1801:184). ' … found at Port Jackson'(Latham, 1801:197). Specimens collected at Cook's River(Bennett, 1837:12). Considered a common species by North(1898). Recorded by North(1906/9:248) from, inter alia, Roseville, Ashfield, Canterbury, Belmore, Burwood and Chatswood. 'Well distributed throughout the more open parts of the County in open forest, the borders of forest, heaths …'(Hoskin, 1991:176). Would have once occurred on Pyrmont peninsula.
Grey Butcherbird *Cracticus torquatus*	According to North(1906/9:9) this species: '… gives decided preference for open forest lands near the coast … In the neighbourhood of Sydney these birds … are fairly common …'. Generally a few about the parks and gardens, breeding one year at Double Bay(Le Souef & Macpherson, 1920:91). Resident breeding species at Riverview (Dixon, 1980:168/169). Would have once been resident on Pyrmont peninsula.
Magpie-Lark *Grallina cyanoleuca*	According to Vigors & Horsfield(1827:233): 'Our specimen was procured by Mr. Brown at Port Jackson in 1802'. 'A common resident species distributed all over the county. Frequents principally open forest lands … Breeds about … the Parramatta River'(North, 1898). ' … numerous throughout the city and suburbs'(Le Souef & Macpherson, 1920:88). It would have been a resident of Pyrmont peninsula, as now.
Australian Magpie *Gymorhina tibicen*	'Common in open forest … in the western half of the county, more sparingly distributed near the coast'(North, 1898:81). There would have been resident breeding pairs on Pyrmont peninsula, as now.
Pied Currawong *Strepera graculina*	Described by White(1790:251) from specimen collected at Sydney. Specimen from Port Jackson(Bennett, 1837:14). 'Widely distributed throughout sandstone forests, where it breeds'(Hindwood & McGill, 1958:101). Would have been a resident breeding species on Pyrmont peninsula, as now.

Scientific Name	Comments
Spangled Drongo *Dicrurus bracteatus*	Listed by North as a straggler(1888:1780), then as a 'rare visitant'(1898:73). 'Near Sydney it was not uncommon between Newport and Manly in the autumn of 1900, specimens also being procured further inland at Windsor, Penrith, and Campbelltown'(North, 1901/4:86). According to Hindwood & McGill(1958:98): 'A southern movement … takes place towards the end of summer. Individuals, pairs, or small parties are likely to be seen between February and September generally on the edge of forest country and the borders of clearings'. Listed by Stephens(1978:174) for Kuring-gai Chase National Park and Lane Cove Valley. A periodic visitor in autumn/winter to Riverview(Dixon, 1980:164/5). Recorded during several contemporary surveys of bushland adjoining Port Jackson. Would have visited Pyrmont peninsula periodically.
Australian Raven *Corvus coronoides*	Described by Vigors & Horsfield in 1827 from a specimen collected at Parramatta(Mathews, 1924:217). 'Frequents chiefly the mountain ranges' (North, 1898). 'In some seasons it is only met with in the coastal districts, in isolated pairs, but at all times it is more numerous in the autumn and winter … not infrequently [found] in the low-lying lands near the mouths of tidal rivers …'(North, 1901/4:1).'Common and widely distributed in most parts of the County from the beaches to the mountains …'(Hoskin, 1991:178). Would have occurred on Pyrmont peninsula, especially in autumn and winter, at European settlement.
Richard's Pipit *Anthus novaeseelandiae*	Collected at Port Jackson(Bennett, 1837:24). 'A ground frequenting species seen in the Sandstone .. areas in … open country generally'(Hoskin, 1991: 124). Would have found suitable habitat on Pyrmont peninsula.
Red-browed Finch *Neochmia temporalis*	According to Lewin(1813) this species occurred on: 'Barren tracts near Sydney and Paramatta. They go in large flocks in autumn and spring …'. 'It is particularly abundant in the neighbourhood of Sydney; even in the Botanic Gardens numbers may always be seen flitting from border to border'(Gould, 1865a:412). 'It is abundantly distributed near Sydney, giving preference to tea-tree scrubs, and low vine-covered trees bordering the sides of creeks intersecting well grassed lands; also open forest country with a light undergrowth'(North, 1906/9:289). Occurred around Ashton and Taronga Parks and other places, where it nested freely(Le Souef & Macpherson, 1920:91). 'Plentiful throughout the County, frequenting scrubby localities bordering creeks and swamps; also found in sheltered forest country and seldom far from water'(Hindwood & McGill, 1958:97). Would have once occurred on Pyrmont peninsula.
Beautiful Firetail *Stagonopleura bella*	According to Vigors & Horsfield (1827:257): 'Some specimens of this species in the collection were brought by Mr Brown from Port Jackson, where he obtained them in September 1803'. Collected at Port Jackson(Bennett, 1837:20). North(1906/9:271) noted: 'It generally inhabits scrub-lined creeks and swampy locations, and is occasionally met with about the upper parts of Middle Harbour and Hornsby'. According to Hoskin(1991:167): 'Rare. A quiet and unobtrusive species that frequents scrubby creeksides and moist, sheltered heathlands in the Sandstone, especially where the heath-leaved banksias(*Banksia ericifolia*) grows profusely'. Would once have occurred in suitable localities on Pyrmont peninsula.

Scientific Name	Comments
Diamond Firetail *Stagonopleura guttata*	Specimens collected at Port Jackson(Bennett, 1837:21). North(1898:89) considered this species fairly common at Belmore but 'more freely distributed in the open forest lands between Blacktown and Penrith'. 'In the neighbourhood of Sydney it is more plentiful in the western suburbs than close to the coast, and is still common in the open forest lands between Parramatta and Penrith'(North, 1906/9:269). Listed for Lane Cove Valley as rare with no recent sightings by Stephens(1978:174). Recorded for Royal National Park(NSW National Parks and Wildlife Service, 2000:21). Also listed from the Manly Reserves(Skelton et al., 2004). It is associated with Sydney Coastal Dry Sclerophyll Forest(NSW Department of Environment & Climate Change, 2008), and so likely once occurred in small numbers in more open parts of Pyrmont peninsula.
Mistletoebird *Dicaeum hirundinaceum*	Described by Latham in 1801 with specimen from Sydney(Mathews, 1924:181). 'Generally distributed all over the county'(North, 1898). '… frequently heard in trees bearing the food plant(*Loranthus*)'(Le Souef & Macpherson, 1920:90). Would once have occurred on Pyrmont peninsula.
Welcome Swallow *Hirundo neoxena*	'I have frequently observed them … flying over the lawn of the inner domain in Sydney'(Ramsay, 1868:275). 'Common all over the county, but not so numerous in the depth of winter'(North, 1898). '… very numerous in the city and suburbs'; they used to nest on buildings in Castlereagh Street(Le Souef & Macpherson, 1920:85). Would have been a familiar sight over the peninsula and adjoining waters.
Tree Martin *Hirundo nigricans*	Collected at Port Jackson(Bennett, 1837:36). '… I remember seeing it comparatively numerous in and about Sydney, during a visit there in August 1871'. 'Frequents chiefly open forest lands …'(North, 1898). 'It is … common during the late Spring and Summer months in and around Sydney …'(North, 1906/9:241). Would once have occurred in mixed flocks with Welcome Swallows over Pyrmont peninsula, as today.
Clamorous Reed-Warbler *Acrocephalus stentoreus*	'It is a strictly migratory species, arriving in the neighbourhood of Sydney usually early in August … Generally they leave … towards the end of March or early in April'(North, 1901/4:239). Recorded by North from, inter alia, the Botanic Gardens, Redfern, and Centennial Park. Reported by Morris et al.(1990:57) as an uncommon summer migrant to freshwater wetlands and saltmarsh reed swamps at Homebush Bay; breeding noted. Could have once occurred in wetlands at the head of Cockle and Blackwattle Bays.
Tawny Grassbird *Megalurus timoriensis*	Status around Sydney at European settlement unclear. Although usually associated with swampy areas(Hoskin, 1991:135), it is also observed in coastal heath and shrubland(Higgins, Peter & Cowling, 2006b:1631). Recorded at several locations in the County of Cumberland (North, 1901/4:255: Hoskin, 1991:135). May have once occurred on Pyrmont peninsula.

Scientific Name	Comments
Little Grassbird *Megalurus graminea*	'Common in the mangrove flats of the Parramatta River'(North, 1898). This species may once have been found in similar habitat at the head of Cockle and Blackwattle Bays.
Golden-headed Cisticola *Cisticola exilis*	' … it is common near Sydney …'(Ramsay, 1875:589). 'Near Sydney these birds are not uncommon about Randwick, Long Bay and La Perouse …'(North, 1901/4:259). North also recorded this species from Curl Curl and Five Dock(on the Parramatta River). Small numbers of this species might once have found suitable habitat on Pyrmont peninsula, especially at the head of the bays.
Silvereye *Zosterops lateralis*	'Exceedingly abundant in all parts of the county…"(North, 1898:86). ' … perhaps the most numerous of our local native birds'(Le Souef & Macpherson, 1920:89). Throughout all types of forest country(Hindwood & McGill, 1958:87). Would have been widespread on Pyrmont peninsula at European settlement.

Appendix E: Species likely to have been vagrants to Pyrmont peninsula in 1788

Name	Comments
Freckled Duck *Stictonetta naevosa*	North(1913/14:89) recorded one shot at Tom Ugly's Point, Botany Bay in April 1889. Morris et al.(1981:18) considered this species nomadic 'seldom recorded Coast'. One recorded at Homebush Bay saltmarsh in November 1985(Morris et al., 1990). A coastal build up was noted during 2002(Morris, 2002c:16), including Homebush Bay on 22.2.2002(Morris & Gladwin, 2002c:14), in response to drought. This species might have occurred periodically around Pyrmont peninsula.
Pink-eared Duck *Malacorhynchus membranaceus*	'The species seldom occurs in the neighbourhood of Sydney. A few examples were brought under my notice in May, 1897, obtained at Botany during a period of drought inland … I have never seen or heard of its occurrence near the metropolis since'(North, 1913/14:85). According to Frith(1982:239), could occur in salt-water estuaries during inland droughts. Reported from Homebush Bay(Olympic Co-ordination Authority, 1996:54)(Morris & Gladwin, 1999a:13, 1999b:11). Likely occurred periodically in water adjoining Pyrmont peninsula.
Southern Giant-Petrel *Macronectes giganteus*	Considered common along the coast and harbour around Port Jackson(Morris, 1986a:70). Individuals might have sometimes reached Pyrmont peninsula, especially in poor weather.
Great-winged Petrel *Pterodroma macroptera*	Morris(1986b:92) described a sighting of two birds off Watson's Bay and referred to a live bird collected in Hyde Park. In extreme weather this species, which is typically marine, could have reached Pyrmont peninsula
Kerguelen Petrel *Lugensa brevirostris*	A beach-washed individual recorded at Rushcutters Bay on 25 August 1974(Hoskin, 1991:16). Could be vagrant to Pyrmont peninsula.
Kermadec Petrel *Pterodroma neglecta*	'one found floundering in Sydney Harbour, 22 April 1988' (Hoskin, 1991:15). Could be vagrant to Pyrmont peninsula.
Tahiti Petrel *Pterodroma rostrata*	An individual observed by D. Hobcroft at Darling Harbour on 25.8.1998(Morris & Gladwin, 1998:9).
Wedge-tailed Shearwater *Puffinus pacificus*	'During easterly gales in New South Wales these birds are frequently driven over land; one was collected alive in Oxford Street(North, 1913/14:358). Morris(1986a:71) noted this species within the harbour during bad weather; it may have reached Pyrmont peninsula at such times.
Fluttering Shearwater *Puffinus gavia*	Occasionally occurs inland or onshore, with individuals found at Victoria Park and Bondi Beach(Mathews, 1918/19:421). It might have reached Pyrmont peninsula at such times.

Name	Comments
Wandering Albatross *Diomedea exulans*	'Seen occasionally in Sydney Harbour'(Hoskin, 1991:9). '… formerly(prior to c.1950) regularly occurred within the harbour' (Morris, 1986a:70). May have once ventured into waters off Pyrmont peninsula.
Black-Browed Albatross *Diomedea melanophris*	'Occasionally seen in Sydney Harbour'(Hoskin, 1991:10). '… formerly(prior to c.1950) frequently up the harbour to Garden Island'(Morris, 1986a:70). May have sometimes ventured into waters adjoining Pyrmont peninsula.
Yellow-nosed Albatross *Diomedea chlororhynchos*	'Occasionally seen in Sydney Harbour'(Hoskin, 1991:11). May have sometimes ventured into waters off Pyrmont peninsula.
Shy Albatross *Diomedea cauta*	North(1907) observed an individual of this species at the entrance to Lavender Bay on 22 September 1905. May have periodically occurred off Pyrmont peninsula.
Grey-headed Albatross *Diomedea chrysostoma*	Specimen obtained at Rose Bay in April 1931(Hoskin, 1991:11). May have rarely ventured into waters off Pyrmont peninsula.
White-faced Storm-petrel *Pelagodroma marina*	Australian Museum specimen O.66182 was collected at Pyrmont on 10 September 1961.
White-tailed Tropicbird *Phaethon lepturus*	Mathews(1914/15:308) described an immature bird blown onshore at Botany Bay in 1898, after easterly gales. One flying over Neutral Bay early 1939(Hindwood & McGill, 1958:299). Morris(1979) described inland observations of both White-tailed and Red-tailed Tropic-Birds following a large rain depression in March 1978. One observed in Sydney Harbour in March 1988(Hoskin, 1991:33). Would likely reach Pyrmont peninsula during easterly gales.
White-necked Heron *Ardea pacifica*	'In New South Wales, while it is abundant inland, it is seldom seen near the coast'(North, 1913/14:28). Predominantly a bird of freshwater swamps and lagoons, and rarely in tidal areas(Pizzey & Knight, 2003:110). Recorded in four contemporary surveys along Port Jackson and at Homebush Bay(e.g. Morris, 1986a:71, Olympic Co-ordination Authority, 1996). Would have occasionally occurred around Pyrmont peninsula.

Name	Comments
Straw-necked Ibis *Threskiornis spinicollis*	North(1898:102) described this species as 'Plentiful during periods of drought inland'. 'With a continuance of unusually dry weather, for the first time I noted the Straw-necked Ibis frequenting the suburbs of Sydney during April and May, 1897'; recorded on that occasion at Ashfield, Belmore and Randwick(North, 1913/14:6/7). Although it favours open grassland, it sometimes frequents tidal mudflats and saltmarsh(Pizzey & Knight, 2003:120). Contemporary surveys recorded this species from Canada Bay and Lane Cove. These birds may once have occurred on the mudflats adjoining Pyrmont peninsula during inland drought.
Australian White Ibis *Threskiornis molucca*	'I have never seen it in the neighbourhood of Sydney'(North, 1913/14:2). 'Seasonal conditions throughout the range of this species … have a strong bearing on distribution. The White Ibis has occurred in numbers up to several hundred; at other times only a few, or none at all, are recorded'(Hindwood & McGill, 1958:45). Could have been a periodic visitor to Cockle and Blackwattle Bays.
Pacific Baza *Aviceda subcristata*	Mills(1991:94) regarded this species as 'probably a straggler to the Sydney Region …. where it is at its southernmost limit of distribution'. While there would have been suitable habitat on Pyrmont peninsula at European settlement, it is unclear whether it would have occurred this far south at that time. This species has been recorded in Sydney only since the early 1970s; it may be that it is re-establishing a distribution it had before European settlement or, and more likely, it is responding to favourable habitat change.
Letter-winged Kite *Elanus scriptus*	Ramsay(1876:43) described two adult females collected at Sydney. According to North(1912:254): '[It] is more abundantly distributed inland than near the coast … it is nomadic in habits'. He had specimens from Springfield(Potts Point) and Randwick. Hindwood & McGill(1958:54) noted: 'Only a few records, the most recent being for a bird seen at Botany in March, 1933'. Hoskin(1991:44) recorded observations of three birds at Long Reef in 1976/77. This species could have been a vagrant to Pyrmont peninsula.
Square-tailed Kite *Lophoictinia isura*	Could be depicted in a "Watling" drawing of an unidentified raptor from Sydney around 1790(Hindwood, 1970). 'I have known the Square-tailed Kite to be obtained in the neighbourhood of Sydney on two occasions only [at Ashfield and Carlingford], and in both instances the birds were driven to the coast during periods of excessive drought inland'(North, 1912:241). According to Debus & Czechura(1989:85), a bird of coastal and subcoastal habitats, with a clear preference for eucalypt open forest and woodland: 'The Square-tailed Kite may have suffered considerable habitat degradation and loss'(p.86). Hoskin(1991:45) considered it 'a very rare straggler' to the County of Cumberland. As the Kite prefers drier forest types than would have occurred on Pyrmont peninsula(Debus <u>et al,</u> 1993:111), it may have once been a straggler to this location.

Name	Comments
Spotted Harrier *Circus assimilis*	Described by Jardine & Selby in 1828 from specimen collected near Sydney(Mathews, 1910/27:66). This species was considered by North(1898:98) as: 'Not uncommon about Randwick and Botany in the spring and summer months'. Although Pyrmont peninsula would not have provided optimal habitat, the species probably occurred there periodically at European settlement.
Brolga *Grus rubicundus*	'The Brolga is figured among paintings done during the early years of settlement(about 1790) from a bird, or birds, that must have been collected near Sydney. Described by Perry in 1810 from specimen collected at Botany Bay(Mathews, 1910/27:48). Hindwood & McGill(1958:44) reported observations of this species in coastal areas, presumably in response to inland drought. It is sometimes found in tidal areas and mangroves(Pizzey & Knight, 2003:146). Stragglers might periodically have occurred in suitable habitat around Pyrmont peninsula.
Dusky Moorhen *Gallinula tenebrosa*	While this species prefers well-vegetated wetlands, it will use mangroves in dry periods(Pizzey & Knight, 2003:154). See also Morris(1983:3). It would likely have visited Pyrmont peninsula in droughts.
Little Button-Quail *Turnix velox*	Considered 'remarkably scarce' and 'remarkably rare' around Sydney by North(1913/14:195). A nomadic, irruptive species which both North(1907) and Hoskin (1991) recorded seldom; could have been a rare visitor to Pyrmont peninsula in times of severe inland drought.
Red-backed Button-Quail *Turnix maculosa*	'Near Sydney [this] species is not uncommon in the neighbourhood of Randwick, Botany, and La Perouse, localities also frequented by [the King Quail *Coturnix chinensis*]'(North, 1891:195).
Plains Wanderer *Pedionomus torquatus*	An inland species which occasionally reaches Sydney. Procured in the neigbourhood of Botany Bay(Gould, 1848: Vol.1, lxxix). Collected at Newtown(1863) and Springfield (Potts Point)(1890)(North, 1913/14:198).
Little Curlew *Numenius minutus*	Preferred habitats include tidal mudflats(Pizzey & Knight, 2003:168). Considered rare around Sydney by North (1898:111), with periodic sightings noted by Hindwood & McGill (1958:38) and Hoskin(1991:68). Could have periodically occurred around Pyrmont peninsula.
Terek Sandpiper *Xenus cinereus*	Regular summer migrant to coastal Australia; habitats include tidal mudflats and estuaries(Pizzey & Knight, 2003:176). Considered rare until the mid-20th century, gradually increasing in number since(Hoskin, 1991:72). Could have once been an occasional visitor to suitable habitats around Pyrmont peninsula.

Name	Comments
Broad-billed Sandpiper *Limicola falcinellus*	Considered a 'bird of the estuaries' by Hoskin(1991:79), may be found on tidal mudflats and saltmarsh(Pizzey & Knight, 2003:190). Seen at Homebush Bay[Morris et al., 1990:62), may have also visited Pyrmont peninsula.
Banded Stilt *Cladorhynchus leucocephalus*	Recorded by both North(1907) and Hoskin(1991:66), this species periodically reached coastal areas during severe inland drought. Could have occurred in suitable habitat at the head of Cockle and Blackwattle Bays at such times.
Grey Plover *Pluvialis squatarola*	Regarded by Morris et al(1981:26) as a rare visitor to the coast, where preferred habitats include mudflats, saltmarsh and estuaries(Pizzey & Knight, 2003:204). Could have been an occasional visitor to such habitats adjoining Pyrmont peninsula.
Greater Sand Plover *Charadrius leschenaultii*	A scarce visitor to the coast of New South Wales south to Shoalhaven River(Morris et al, 1981:26). Preferred habitats include tidal mudflats, mangroves, saltmarsh. May once have periodically visited such habitats around Pyrmont peninsula.
Oriental Plover *Charadrius veredus*	Although generally an inland species, it can occur on estuarine mudflats; a straggler to Sydney where sightings include Homebush, Rose Bay and Randwick(Marchant & Higgins, 1993:877/8). Considered an irregular visitor by North (1898:110) and Hoskin(1991:64), who noted periodic observations during the last century.
Red-kneed Dotterel *Erythrogonys cinctus*	According to Morris et al.(1990:54): 'The occurrence of this bird in coastal wetlands is usually attributed to inland droughts'. Recorded from saltmarsh at Homebush Bay(Hoskin, 1991:62). It may have been a straggler to Pyrmont peninsula during inland drought.
Pomarine Jaeger *Stercorarius pomarinus*	Morris(1986a:73) considered this species a rare summer visitor to Sydney Harbour. At such times it might have occurred in waters off Pyrmont peninsula.
White-fronted Tern *Terna striata*	Listed by North(1888:1779, 1898:113). Regarded as a regular autumn migrant from New Zealand(Hindwood & McGill, 1958:31). Although largely an offshore tern, it 'has also been observed in harbours and bays, though not very frequently'(Hoskin, 1991:88). Probably occurred periodically around Pyrmont peninsula.
Sooty Tern *Sterna fuscata*	North(1898:113) reported several specimens of this species in the Australian Museum obtained in Sydney Harbour, while Morris(1986a) recorded one at Ashton Park, Bradley's Head. Could have occurred occasionally in waters around Pyrmont peninsula.

Name	Comments
Diamond Dove *Geopelia cuneata*	Named by Latham in 1801 from specimen collected at Sydney(Mathews, 1910/27:10). Usually an inland species, listed as a rare visitor to the Sydney region by North(1898:106). Considered 'A rare straggler, apparently being driven in to coastal areas during inland droughts'(Hindwood & McGill, 1958:16). Has been recorded from heathland and wet sclerophyll forest at such times(Higgins & Davies, 1996:943). It could have periodically visited Pyrmont peninsula.
Peaceful Dove *Geopelia striata*	'In the neighbourhood of Sydney it is comparatively rare, but it has slightly increased in late years, especially in the vicinity of George's River, where it is chiefly found'(North, 1913/14:118). 'Infrequently noted in sandstone localities'(Hindwood & McGill, 1958:16). Preferred habitats include: 'Open sclerophyll forest, woodland or tall shrubland, often dominated by Eucalyptus, Acacia or Casuarina and with grassy understorey'(Higgins & Davies, 1996:949). Could have occurred periodically on Pyrmont peninsula at European settlement.
Gang-gang Cockatoo *Callocephalon fimbriatum*	Reported by Bougainville(1837). North(1912:75) noted: 'Although no longer to be found close to Sydney, specimens are sometimes received from Smithfield, Liverpool, Appin and Picton …'. Regarded by both North(1898) and Hoskin (1991:99) as occurring in the ranges south and west of the County. Contemporary records cluster around the Beecroft/Epping district and Peakhurst/Lugarno, near Hurstville. Might have occasionally visited Pyrmont peninsula.
Galah *Cacatua roseicapilla*	According to Plummer(1895:110): 'For many years after the formation of the infant settlement on the shores of Sydney Cove … the large island facing the entrance to the Lane Cove River was covered with stately trees … and dense vegetation, harbouring myriads of rose-breasted cockatoos, whence the name – Cockatoo Island …'. Although Galahs were not listed for Sydney by North(1898, 1912), Hindwood & McGill(1958:60) noted that: '[d]uring a period of drought in 1941 considerable numbers of Galahs, which are normally birds of the inland of New South Wales, were noted near Sydney'. Forshaw(2002:136) noted influxes to Sydney and the County of Camden in the late 1960s/early 1970s, and to the mid-north NSW coast in the early 1980s. It is likely that the species would have reached Pyrmont peninsula during such influxes.
Red-winged Parrot *Apromictus erythropterus*	Mathews(1916/17:281) commented: 'This species … was brought back by Captain Cook's party, so that it must have been a coastal bird in New South Wales at that time'; apparently more than one specimen was procured by Captain Cook's men. Hoskin(1991:103) noted 'the nine known records for the County are assumed to be aviary escapees', an assessment which might be reviewed. Possibly moves coastwards during inland droughts, at which time could have occurred on Pyrmont peninsula.
Superb Parrot *Polytelis swainsonii*	An inland species which straggles to the coast periodically (Hoskin, 1991:104), at which times it might have reached Pyrmont peninsula.

Name	Comments
Budgerigar *Melopsittacus undulatus*	Not recorded for Sydney by North(1898, 1912), According to Mathews(1916/17:476): 'Apparently only a straggler to the coastal districts was procured by one of the early travellers and provided material for the description of this species by Shaw and Nodder [in 1805]'. Hoskin(1991:105) described inland drought episodes when small parties of this species were driven to the coast. Stragglers from such episodes might have reached Pyrmont peninsula.
Oriental Cuckoo *Cuculus saturatus*	The first known record for the County is from a watercolour dated January 1888. This cuckoo is a regular summer migrant to coastal north and east Australia(Pizzey & Knight, 2003:292) and was noted by Hoskin(1991:109) from Royal National Park and Epping. Birds of this species may have occasionally visited Pyrmont peninsula at European settlement.
Black-eared Cuckoo *Chrysococcyx osculans*	The status of this species at European settlement is unclear. North(1912:16) considered it nomadic over the greater part of Australia; he reported specimens from Manly, Sydney and Flemington. Hindwood & McGill(1958:67) believed it was 'largely restricted to the shale country' while Hoskin(1991:111) was unequivocal: 'The bird is restricted to the shale areas of Sydney. Essentially an inland species, it may have periodically reached Pyrmont peninsula.
Sooty Owl *Tyto tenebricosa*	North(1898) considered this species rare around Sydney: 'Met with in the dense scrubs near George's River and at Port Hacking'. Seen by Stephens(1978:171) 1-2 times in Lane Cove Valley, who considered its occurrence may have been accidental or as a vagrant. Sooty Owls may have sometimes visited the moist forest at base of Pyrmont peninsula.
Red-backed Kingfisher *Todiramphus pyrrhopygia*	'In December 1869 it visited Dobroyde, near Sydney'(Ramsay, 1876:582). Listed by North(1888:1774). 'In New South Wales it is chiefly confined to the drier portions of the State, and I have never met with it in the coastal districts or anywhere on the eastern side of the Blue Mountains'(North, 1906/9:369). Considered a rare straggler by Hoskin(1991:119). An inland species which occurs south to the Cumberland Plain (Morris et al, 1981:42). Also as a straggler coastwards to e.g. Ashfield, Artarmon, Caringbah, between Luddenham and Bringelly, and at Camden(McBride & Dampney, 1982:46): 'Most … observations … have been in the winter months May-July and this is consistent with coastal occurrences elsewhere in New South Wales'. Could have reached Pyrmont peninsula at such times.
Rainbow Bee-eater *Merops ornatus*	'Never seen near the coast' according to North(1898) who, with Hoskin(1991), considered it chiefly a bird of the Hawkesbury and Nepean Rivers. According to North(1906/9:351): 'In New South Wales this species is generally found inland, and seldom occurs near the coast …'. Could have occurred on Pyrmont peninsula during adverse conditions inland.

Name	Comments
Brown Treecreeper *Climacteris picumnus*	North(1906/9:45) noted that this species was occasionally found in trees 'growing quite close to the coast …[being] more abundantly distributed on the rough barked open forest lands a few miles inland'. This species could have periodically visited Pyrmont peninsula.
Yellow-rumped Thornbill *Acanthiza chrysorrhoa*	'very common throughout the year'(Le Souef & Macpherson, 1920:88/89). This species prefers more open habitats than those which likely once occurred on Pyrmont peninsula, but may have been present in small numbers or as a vagrant.
Little Friarbird *Philemon citreogularis*	Not listed for Sydney by North(1898). North(1907) noted this species at Kurnell, Smithfield and Pittwater during the severe drought of 1902. Hindwood & McGill(1958:94), with Hoskin(1991:151), considered it a straggler from inland NSW. Individuals may have periodically reached Pyrmont peninsula at such times.
Spiny-cheeked Honeyeater *Acanthagenys rufogularis*	Not listed by North(1898). Hoskin(1991:150) noted several records towards the coast, indicating that this species may periodically reach this part of Sydney from inland.
White-plumed Honeyeater *Lichenostomus penicillatus*	Not listed for Sydney by North(1898, 1906/9). Hindwood & McGill(1958:91) noted: 'Until recent years considered to be largely an autumn and winter nomad, or straggler, to the Sydney district'. Considered by Hoskin(1991:156) as a straggler to the County before the 1950s. As such, this species may have occasionally visited Pyrmont peninsula.
Black-chinned Honeyeater *Melithreptus gularis*	Collected at Botany Bay(Bennett, 1837:40). According to North(1898:86): 'Rare. Met with in some seasons at Homebush, also at Toongabbie and Blacktown'. 'In the neighbourhood of Sydney … this Honeyeater is nomadic in habits, appearing in limited numbers some seasons, and then it may be absent for years'(North, 1906/9:194). Collected by North at, inter alia, Homebush, Five Dock, on the Parramatta River, and Roseville. Present in Ku-ring-gai Chase National Park(Department of Environment and Conservation, 2006:36). Hindwood & McGill(1958:156) noted: 'Small groups move about during the autumn and winter months', which is when this species would have most likely occurred on Pyrmont peninsula
Painted Honeyeater *Grantiella picta*	'Once uncommon and irregular in occurrence' according to Hoskin(1991:158). One observed at Riverview in 1921, which McGill(in Dixon, 1980:14) did not doubt. North(1907:340) reported two incidences of nesting, at Five Dock and Abbotsford, in early 1901. Also recorded for Royal National Park(NSW National Parks and Wildlife Service, 2000:21). Probably once an occasional visitor to Pyrmont peninsula.

Name	Comments
Flame Robin *Petroica phoenicea*	'… it is very rarely seen in the neighbourhood of Sydney during the winter months(North, 1901/4:166). 'A rare autumn and winter visitor, when a few birds descend from the highlands to the open lowlands of the County'(Hoskin, 1991:128). It might have visited Pyrmont peninsula at such times.
Red-capped Robin *Petroica goodenovii*	'In earlier years, comparatively common in the shale country in the west of the County. There are a few sandstone records …'(Hoskin, 1991:128). Although largely restricted to the shale, this species is 'inclined to be nomadic during the autumn and winter. Observed at times in coastal areas'(Hindwood & McGill, 1958: 73). May have occurred thus on Pyrmont peninsula.
Hooded Robin *Melanodryas cucullata*	Described by Vigors & Horsfield in 1827 from specimen collected at Prospect Hill(Pemulwuy), Sydney(Mathews, 1923:122). Specimens collected at Port Jackson(Bennett, 1837:23). Although favouring lightly timbered lands on shale, also found in sandstone heath close to shale(Hoskin, 1991:129). May have sometimes visited Pyrmont peninsula from shale areas further inland.
Pink Robin *Petroica rodinogaster*	Reported by Robert Brown as individuals taken by him at Port Jackson(Bougainville, 1837). Hoskin(1991:127) described this species as a rare migrant to the County of Cumberland.
White-bellied Cuckoo-Shrike *Coracina papuensis*	'Inhabits Port Jackson'(Latham, 1801:371). 'Near Sydney I have observed, during June and July, a few of these birds on the highlands of the Milson's Point railway-line, but they are by no means common, and I have never known them remain to breed'(North, 1901/4:108). Hoskin(1991:125) recorded this species mostly from the Baulkham Hills Shire and southwestern areas of the County. Stephens(1978) considered this species a rare visitor to Kuring-gai Chase National Park. Recorded at Riverview(Dixon, 1980:102). It may have periodically visited Pyrmont peninsula.
White-browed Woodswallow *Artamus superciliosus*	'For a period of nine years I had not observed the White-eyebrowed Wood Swallow in the neighbourhood of Sydney, but in October, 1895, it appeared in large numbers in company with [Masked Woodswallows], breeding freely about Ashfield, Canterbury and Belmore … Since 1895 this species has visited the western suburbs of Sydney, but in comparatively limited numbers, nearly every season; it is remarkable, however, that it does not occur in the coastal suburbs, and only once have I noted a flock flying over Roseville' (North 1906/9:254). Periodically breed in Sydney, most recently at Summer Hill and Granville(Le Souef & Macpherson, 1920:88). Both North(1898) and Hoskin(1991:176) regarded this species as a periodic visitor to the county, during periods of drought inland. At such times, it might have occurred on Pyrmont peninsula.

Name	Comments
Masked Woodswallow *Artamus personatus*	Less frequently seen in Sydney than the White-browed Woodswallow(North, 1906/9:258). This species periodically occurred in the county in large flocks during inland droughts(North, 1898:88). During such influxes it would likely have occurred on Pyrmont peninsula.
Black-faced Woodswallow *Artamus cinereus*	North(1907) recorded an individual collected at Randwick in July 1902, during a severe inland drought. At such times, this species may have reached Pyrmont peninsula.
Grey Currawong *Strepera versicolor*	Described by Quoy and Gaimard from a specimen collected at Port Jackson in 1825(Mathews, 1922/23). North(1898:72) recorded this species from the heavily-timbered ranges of the Hawkesbury River district and about George's River. Hindwood & McGill(1958:101) noted it 'occasionally wanders to the lowlands near the coast in autumn and winter', which would likely have been when it occurred on Pyrmont peninsula.
Little Raven *Corvus mellori*	This bird was given specific status in 1967. It was first recorded in the County in 1972, but Hoskin(1991:179) believed that some earlier observations attributed to the Australian Raven could have been this species. Although widespread on and west of the Great Divide, Little Ravens are occasionally recorded from the coastal plain(Higgins, Peter & Cowling, 2006a). This species could have been a periodic straggler to Pyrmont peninsula.
Green Catbird *Ailuroedus crassirostris*	'Found in the southern portion of the County, particularly in Royal National Park … Inhabits rainforest areas and lives largely on native fruits and berries … there could be some nomadic or migratory movement [of this species]'(Hoskin, 1991: 172). Perhaps an occasional visitor to Pyrmont peninsula during such movements.
Regent Bowerbird *Sericulus chrysocephalus*	According to Gould(1865a:457): '… it is occasionally seen in the neighbourhood of Sydney, which appears to be the extent of its range to the southward and westward'. 'I have never seen, or heard of it being found south of [the Hawkesbury] river'(North, 1901/4:61). Could have occurred on Pyrmont peninsula as a straggler from its former regional strongholds north and south of Sydney.
Satin Bowerbird *Ptilonorhynchus violaceus*	'Well distributed throughout the County in timbered gullies, hillsides, rainforests … and occasionally more open country. Common in Royal National Park and timbered areas to the south'(Hoskin, 1991:171). May have once occurred in the moist forests of Pyrmont peninsula.

Name	Comments
Zebra Finch *Taeniopygia guttata*	North(1898:98) believed this species had been driven to coastal New South Wales by a severe drought in 1896. Hoskin(1991:169) considered it well distributed in shale areas and the Hawkesbury Swamps, with 'small groups in some open situations close to the coast'. Stragglers could have reached Pyrmont peninsula during severe inland droughts.
Fairy Martin *Hirundo ariel*	Collected at Port Jackson(Bennett, 1837:36). Gould (1865a:113) remarked that the Fairy Martin 'appears to have an antipathy to the country near the sea', and that he had never observed it at Sydney, or even heard of its approaching the coast line nearer than twenty miles. 'Since, however, the time of Gould's visit to Sydney, in 1832, its immediate neighbourhood has undergone a vast change. What then was virgin forest, is now thickly covered with houses, which may have been the means of extending the range of this species nearer to the coast. At the present time they are seldom seen in the city …'(North, 1906/9:244/245). According to E.P.Ramsay(in Hindwood, 1938:208), writing to John Gould: 'we are annually visited by these birds, and … they build under the eaves of an outhouse at Dobroyde[Ashfield]'. 'A common species with regular seasonal movements, … mostly seen in the Shale areas but occasionally seen closer to the coast (Hoskin, 1991:123). Likely to have occurred occasionally over Pyrmont peninsula.
Russet-tailed Thrush *Zoothera heinei*	Status around Sydney unclear. One recorded at Mosman in 1992; historically recorded south to Thirroul(Higgins, Peter & Cowling, 2006b:1838). Habitat poorly described, currently considered to prefer rainforest. This species might have once occurred in moist forest at base of Pyrmont peninsula.
Bassian Thrush *Zoothera lunulata*	Illustrated as a bird ' … of Port Jackson' by George Raper(undated) (Hindwood, 1964:46). Collected from Port Jackson(Bennett, 1837:27). 'In New South Wales … I possess specimens from the north shore near Sydney …'(Gould, 1865a:440). According to North(1901/4:235): 'As in Gould's time it still frequents the neighbourhood of Sydney, and may be occasionally met with in the swampy undergrowth between Manly and Newport. I have observed it, too, at Roseville … it frequents alike the scrubs and flats near the coast …'. Seen at Riverview in 1921(Dixon, 1980:104). Scaly Thrush recorded as a rare visitor to Kuring-gai Chase National Park, with no recent records(Stephens, 1978:172). 'A bird of the rainforest floor or in damp sheltered gullies or moist timbered creeksides where it feeds among the fallen leaves … Seen mostly in the Sandstone …'(Hoskin, 1991:127). This species may have formerly occurred in the moist forest at the base of Pyrmont peninsula.

4.6 Mammals

4.6.1 Introduction

Australian native mammals comprise 5-6% of the estimated world total, a figure consonant with this continent's land surface(Strahan, 1995:19). Of the 313 substantially terrestrial Australian mammals extant at European settlement, 18(6%) are presumed extinct, 22(7%) are considered endangered, and 18(6%) are believed vulnerable. Wholesale habitat change or loss has been largely responsible for this decline in mammal populations since European settlement. Direct persecution may have also played a role, for some of the statistics provided by Troughton(1967) are remarkable:

- In 1906, over 4 million possum and 60,000 wallaby skins were marketed in London and New York alone(p. xxvi)
- Between June and September 1920, over 100,000 Brush-tailed Possums were killed in South Australia for the fur trade(p.118)
- In 1924, over 2 million koala skins were exported(p. xxvi)
- In Queensland in 1927, 600,000 koalas were killed(p. xxvi)
- In 1931, some 750,000 possums were slaughtered(p. xxv)

Despite such adversity, a residual native mammal fauna remains close to Sydney in the bushland reserves around Port Jackson. Initiatives taken today and in the future could consolidate and diversify this residuum.

4.6.2 Early accounts

A) Introduction

Description of the mammals of the Sydney region began prior to European settlement. A Common Ringtail Possum *Pseudocheirus peregrinus* was collected on Cook's first voyage(1770), apparently around Botany Bay(McKay, 1989:666), and taken back live to England. Cook's party also reported footprints resembling those of a polecat or weasel about Botany Bay; they were almost certainly those of a native cat or quoll(Mahoney & Ride, 1984).

Scientific accounts of the mammals from around Sydney took place in two waves. The first, in the 1790s and early 1800s, was led particularly by George Shaw and Robert Kerr and, less so, by the Frenchmen Etienne Geoffroy Saint-Hilaire and Anselme Gaëtan Desmarest. Together, these individuals described about a third of the mammals likely to have occurred on Pyrmont peninsula in 1788. Taxonomic studies regained momentum in the 1820s through the 1840s, led by people like George Waterhouse and John Edward Gray. Almost half of the peninsula's terrestrial fauna was formally described in these decades, but few would have still been on a peninsula by then increasingly devoid of native vegetation.

About two-thirds of the mammal species which could have once occurred on Pyrmont peninsula would likely have disappeared from that place before being formally named.

B) George Shaw(1751-1813)

Shaw's contribution to describing the likely fauna of Pyrmont peninsula in 1788 has been acknowledged elsewhere(p. 182). Suffice to say that he named six Australian mammals, mostly in the 1790s and including such iconic species as the Echidna, Eastern Quoll(Native Cat), and Eastern Grey Kangaroo.

Figure 4.6.1: Atkinson, L., 1855/72, [Sketchbook of miscellaneous drawings], folio 30: Native Cat or Quoll *Dasyurus viverrinus* (PXA 4500/30)

Formally described by George Shaw in 1800. According to Joan Kerr (1992:28): '[Louisa's] many accomplishments included being an expert taxidermist and she kept numerous stuffed animals to assist her in her work … She wrote in her Herald column about a native cat's skin she had been given when the animal was shot near Mt Tomah and from which she recreated the live animal in a charming ink and watercolour sketch'; perhaps this is it.

C) Robert Kerr(1755-1813)

Born in Roxburghshire, the son of a jeweller and grandson of the First Marquis of Lothian, Kerr studied medicine at the University of Edinburgh and practiced as a surgeon at the Orphan Hospital of that city. He became an independent scholar, a scientific writer and translator, especially of French texts. He translated Antoine Lavoisier's Traitée Elémentaire de Chimie in 1789 and published The Animal Kingdom in 1792. This latter was a translation of the first two volumes of a four-tome work, the Systema Naturae, of Carolus Linnaeus. His greatest work was A general history and collection of voyages and travel, an 18-volume text which was published between 1811 and 1822, largely after Kerr's death. His last work was a translation of Recherches sur les ossements fossils de quadrupedes by George Cuvier, published posthumously as Essays on the Theory of the Earth. Kerr was a Fellow of the Royal Society.

Kerr published descriptions of three Australian mammals in The Animal Kingdom, the Squirrel and Greater Gliders and the Long-nosed Potoroo.

Figure 4.6.2: Krefft, G., 1871, The mammals of Australia, Sydney, Thomas Richards, Government Printer, The Common Opossum *Phalangista vulpina* (ML DSM F 599/2).

This meticulous print of a Common Brushtail Possum *Trichosurus vulpecula* was done by Helena Forde(née Scott): 'By 1862 Helena Scott and her elder sister Harriet, were already well established in their careers as professional artists, natural science collectors and illustrators. They were the daughters of entomologist and entrepreneur Alexander Walker Scott of Ash Island, Hexham, on the Hunter River in New South Wales. As a result of their work the Scott sisters were elected honorary members of the Entomological Society – a unique honour for women of their time'(CHAH Collectors & Illustrators, http://www.anbg.gov.au/biography/forde-helene.html). According to Anna Haebich, of the State Library of Queensland, Harriet and Helena worked from home using prepared specimens (http://www.slq.qld.gov.au/whats-on/exhibit/online/becoming_qld/style/critters).

D) Etienne Geoffroy Saint-Hilaire(1772-1844)(Wikipedia)

Geoffroy began his working life in 1793, as 'sub-keeper and assistant demonstrator of the cabinet of natural history' at the Jardin des Plantes, in Paris, a position left vacant by the resignation of Lacépède(p. 184). He became one of twelve professors in the newly constituted Muséum National d'Histoire Naturelle soon afterwards, being assigned the chair of zoology.

In 1798, Geoffroy joined Napoleon's great scientific expedition to Egypt, as one of 167 scientists and artists. Early in 1802 he returned to France and became a member of the French Academy of Sciences in September 1807. It was in this latter period that Geoffroy named the Long-nosed Bandicoot *Perameles nasuta* and the Water Rat *Hydromys chrysogaster,* both well-known mammals of the Sydney region.

Geoffroy sustained an important career in the natural sciences, becoming professor of zoology at the faculty of sciences at Paris in 1809. His main contributions to science were in anatomy and evolution, on which he adopted a Lamarckian perspective. He resigned from his chair at the Muséum in 1841, due to ill-health, and died soon afterwards.

E) Anselme Gaetan Desmarest(1784-1838)(Wikipedia)

Desmarest was a colleague of Lesueur(p. 183/184), another French scientist active in naming Australian fauna. Among his publications were Mammalogie ou description des espèces des Mammifères(1820) and Dictionnaire des Sciences Naturelles(1861-30, with Andre Marie Constant Duméril). Desmarest contributed to our knowledge of Australian mammals through the description of three species well-known in New South Wales and once likely present on Pyrmont peninsula – the Eastern Pygmy Possum *Cercatetus nanus*, Red-necked Wallaby *Macropus rufogriseus* and Black(or Swamp) Wallaby *Wallabia bicolor*.

F) John Edward Gray(1800-1875)

A biography of Gray has been given already(p.185/186). He made the largest single contribution to naming mammals which could once have occurred on Pyrmont peninsula, eleven species in total. They included the Brush-tailed Rock Wallaby and several bat species.

G) George Robert Waterhouse(1810-1888)(Wikipedia)

Waterhouse was an English naturalist who, in 1833, was appointed Librarian and Curator of insects and records at the Royal Entomological Society of London. In 1836 he became curator at the Museum of the Zoological Society of London, an appointment which coincided with the return of HMS Beagle from its celebrated four-year voyage. Charles Darwin entrusted Waterhouse with studying the mammals and beetles collected during the voyage, this culminating in publication of The Zoology of the Voyage of HMS Beagle between 1840-1843. Other contributors included John Gould(birds) and Richard Owen(fossil mammals).

In 1843 Waterhouse became assistant keeper of Mineralogy and Geology at the British Museum, becoming keeper in 1851. Concurrently, Waterhouse published his two-volume A Natural History of the Mammalia between 1846-1848, and Mammalia: marsupialia or pouched animals in 1855.

He was well-placed to contribute to our knowledge of Australian mammals, and between 1838 and 1843 he formally described six Australian mammal species. All were small mammals, with the exception of the Sugar Glider *Petaurus breviceps*, and all would likely have occurred on Pyrmont peninsula in 1788.

H) John Gould(1804-1881)(Gould, 1863b)

Although Gould's contribution to describing the mammals of Pyrmont peninsula was limited, he played a key role in defining the fauna of Australia as a whole. It is interesting to note a few quotes from this great zoologist on how his plans for this contribution evolved:

- 'It was not … until I arrived in the country, and found myself surrounded by objects as strange as if I had been transported to another planet, that I conceived the idea of devoting a portion of my attention to the mammalian class of its extraordinary fauna'(p.vii).
- 'While in the interior of the country, I formed the intention of publishing a monograph of the great family of Kangaroos; but soon after my return to England I determined to attempt a more extended work, under the title of the 'Mammals of Australia'(p.ix).
- ' … I do not consider my work to be in any way complete, or that it comprises nearly the whole of the Mammals of a country of which so much has yet to be traversed; but I bring it to a close after an interval of eighteen years since the commencement[1841-1860], during which constant attention has been given to the subject, as treating upon the genera and species known up to the present time' (p.x).

4.6.3 Mammals of Pyrmont peninsula in 1788

A) Introduction

As with other faunal groups, a two-pronged approach was taken to establish the likelihood of certain mammals occurring on Pyrmont peninsula at European settlement:

- The tabulation of mammals recorded in contemporary surveys of bushland relicts adjoining Port Jackson. The results of ten surveys were so tabulated(Table 4.6.1). They will be used to contextualise the individual species accounts described next.
- Historical accounts of mammals were reviewed for records of species found around Port Jackson. Individual species profiles were created from the information obtained.

These two information flows were then used to assess the likelihood of occurrence of a particular species on Pyrmont peninsula at European settlement.

B) Contemporary mammal surveys

Table 4.6.1 lists those mammal species which remain today in the bushland reserves adjoining Port Jackson. Twenty-nine species are listed. Not all of these have been observed in the recent past, but it is clear that there exists a reservoir of mammal diversity close to Sydney.

Table 4.6.1: Mammal surveys of bushland reserves adjoining Port Jackson

Common Name	Canada Bay	Lane Cove	Kelly's Bush/	North Sydney Remnant Bush	Mosman bushland	Middle Head/ George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Short-beaked Echidna *Tachyglossus aculeatus*		+			+			+	+	+
Spot-tailed Quoll *Dasyurus maculatus*					+					
Eastern Quoll *Dasyurus viverrinus*					+					
Brown Antechinus *Antechinus stuartii*		+		+	+			+	+	+
Long-nosed Bandicoot *Perameles nasuta*		+							+	+
Common Brushtail Possum *Trichosurus vulpecula*	+	+		+	+	+		+	+	+
Eastern Pygmy Possum *Cercatetus nanus*										+
Sugar Glider *Petaurus breviceps*		+			+			+	)) +)	
Squirrel Glider *Petaurus norfolcensis*										
Yellow-bellied Glider *Petaurus australis*		+								
Greater Glider *Petauroides volans*		+								
Common Ringtail Possum *Pseudocheirus peregrinus*		+		+	+	+		+	+	+
Black Wallaby *Wallabia bicolor*		+			+			+		+
Grey-headed Flying Fox *Pteropus poliocephalus*	+	+	+	+	+			+	+	+
Little Red Flying Fox *Pteropus scapulatus*		+								
East-coast Freetail Bat *Mormopterus norfolkensis*		+			+					
Eastern Freetail Bat *Mormopterus* sp.										

Common Name	Canada Bay	Lane Cove	Kelly's Bush/	North Sydney Remnant Bush	Mosman bushland	Middle Head/ George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Little Freetail Bat *Mormopterus sp.1*	+									
White-striped Freetail Bat *Tadarida australis*	+	+				+				+
Gould's Wattled Bat *Chalinolobus gouldii*	+	+		+		+				+
Chocolate Wattled Bat *Chalinolobus morio*	+	+								
Little Bent-wing Bat *Miniopterus australis*	+									
Common Bent-wing Bat *Miniopterus schreibersii*	+	+	+	+	+				+	+
Lesser Long-eared Bat *Nyctophilus geoffroyi*	+	+								
Gould's Long-eared Bat *Nyctophilus gouldi*		+								
Greater Broad-nosed Bat *Scoteanax rueppellii*					+					
Eastern Broad-nosed Bat *Scotorepens orion*	+	+								
Little Forest Bat *Vespadelus vulturnus*		+								
Water Rat *Hydromys chrysogaster*					+			+	+	+
Bush Rat *Rattus fuscipes*					+			+		
Australian Fur Seal *Arctocephalus pusillus doriferus*					+			))) +)		
New Zealand Fur Seal *Arctocephalus forsteri*					+					
Leopard Seal *Hydrurga leptonyx*					+					+
Southern Elephant Seal *Mirounga leonina*					+					
Pantropical Spotted Dolphin *Stenella attenuata*					+					
Common Dolphin *Delphinus delphis*					+					

Common Name	Canada Bay	Lane Cove	Kelly's Bush/	North Sydney Remnant Bush	Mosman bushland	Middle Head/ George's Heights	Nielsen Park	Dobroyd Head	Manly Reserves	North Head
Common Bottlenose Dolphin *Tursiops truncatus*					+					
Southern Right Whale *Eubalaena australis*					+					
Humpback Whale *Megaptera novaeangliae*					+					

Sources:

Canada Bay	Hobcroft, 200?
Lane Cove	Department of Environment and Conservation(NSW), 2004
Kelly's Bush/Woolwich Dock	Skelton at al, 2003b
North Sydney Remnant Bush	Biosphere Environmental Consultants, 2001
Mosman Bushland	Oculus Environmental Planning, 2001
Middle Head/George's Heights	Australian Museum Business Services, 1995 Conacher Travers, 2001
Nielsen Park	Hilliard et al., n.d.
Dobroyd Head	Skelton, 2002
Manly Reserves	Skelton et al., 2004
North Head	Skelton et al., 2003a

C) Individual species profiles

Information on the distribution of individual species in the vicinity of Port Jackson was retrieved from accessible sources. This information ranged from before European settlement to the present. From it, individual species profiles were prepared, and these are given in Appendix F. This section provides commentaries on the various species with regard to their occurrence on Pyrmont peninsula.

i. **Monotremes** (based on Grant, 1998)

There are only three living species of monotremes in the world today, including the platypus and short-beaked echidna in Australia. There are fossil remains of the third species, the long-beaked echidna, from the late Pleistocene period(about 15,000 years ago), but the species is now found only in New Guinea. The earliest monotreme fossils so far discovered are from about 100 million years ago, before the ancient super-continent of Gondwanaland fragmented.

Monotremes are distinguished from other mammals by, among other things, their ability to lay eggs, instead of giving birth to live young. The eggs are soft-shelled, measure about 13x17 millimetres, and are incubated for about 10 days before hatching. Although egg-laying is seen as a reptilian feature, monotreme anatomy and physiology is largely mammalian in nature.

Figure 4.6.3: Bennett, G., 1835, Notes on the natural history and habits of the Ornithorhynchus paradoxus, Blum, Transactions of the Zoological Society of London, vol. 1, pp. 229-258, plate 34: *Ornithorhynchus paradoxus*(DQ 590.6/1).

Moyal(2001) described the exotic history of the platypus. The following extracts are from her condensed account in Wisenet Issue 59 of March 2002: 'From the moment the first preserved specimen of a platypus reached England in 1799 it was a 9-day wonder. Was this a colonial hoax? A creature with webbed feed and the bill of a duck attached to the body of a quadruped? Astonished naturalists pondered an animal that confounded all their views of taxonomic classification. Warm-blooded, furred, but with bird-like and reptilian features and structures, it was clearly unique. The single chamber for its reproductive and excretionary function(dubbed a 'one-holer' Down Under) challenged all established taxonomic boundaries…

From 1800 until the mid-1830s, scientists wrangled across the Channel. Was the platypus a mammal? Did it suckle its young? Where were its mammary glands? What implications did it have for their ideas of a Universe of Design and the Chain of Being?

…In Australia, Sydney naturalist and physician Dr George Bennett spent 50 years pursuing the platypus puzzle, hunting it in the field and in its labyrinthine underground burrows and wreaking considerable carnage …

In the event, the mystery was solved not by the long-involved major protagonists but by a visiting Scottish postgraduate student, William Caldwell, who camped on the Burnet River in northern Queensland in 1884, rounded up a horde of platypuses with the help of Aborigines and discovered a female who had just laid one egg and had a second egg dilated in her uterus. Staggering to a small telegraph station nearby, he communicated the news to the scientific world. 'Without the services of these people', Caldwell acknowledged later, 'I should have had little chance of success'.

According to Libby Robin(2005): 'Bennett celebrated the personality of the animal, speaking of the 'playfulness' of his captive platypus twins'. Perhaps these twins were the subjects of Bennett's engaging sketches.

It is likely that Pyrmont peninsula once supported small numbers of echidnas. It is unlikely, though, that any of the waterways associated with Pyrmont peninsula provided enough suitable habitat for platypi.

Table 4.6.2: Monotremes which may have occurred on Pyrmont peninsula in 1788

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Platypus *Ornithorhynchus anatinus*	The platypus appears to have been widely distributed and fairly common around Sydney in 1788.	It is possible, but unlikely, that Cockle and Blackwattle Creeks once provided enough suitable habitat to support small populations of this species.
Short-beaked Echidna *Tachyglossus aculeatus*	Once widely distributed in the neighbourhood of Sydney.	Would have once occurred on Pyrmont peninsula, but probably scarce.

ii. **Marsupials**(based on Strahan, 1998)

Marsupials constitute a large order of mammals, with 16 families, 77 genera and about 260 species. Australia has representatives of every family, almost three-quarters of the genera, and over half of all species of marsupials. Marsupials differentiated from other mammals at least 100 million years ago, and differ from them in giving birth to young in a much less developed state.

It seems likely that at least 20 species of marsupials once inhabited Pyrmont peninsula(Table 4.6.3). Notable among these were the quolls, or tiger cats, and several macropod species. It is possible that the Brush-tailed Rock Wallaby would have inhabited the large sandstone ridge which once characterised Pyrmont peninsula.

Table 4.6.3: Marsupials which may have occurred on Pyrmont peninsula in 1788

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Yellow-footed Antechinus *Antechinus flavipes*	Few historical records found for the Sydney region.	Suitable habitat would once have been widely available on Pyrmont peninsula, so this species should have once been present there.
Brown Antechinus *Antechinus stuartii*	Available records include the upper and lower north shore of Port Jackson.	Would have occurred on Pyrmont peninsula in 1788.
Dusky Antechinus *Antechinus swainsonii*	Although currently found mostly in the Blue Mountains, records for Terrey Hills and Kogarah indicate a former coastal distribution	Probably would have occurred in moister habitats, particularly at the base of the peninsula
Spot-tailed Quoll *Dasyurus maculatus*	Available records only from the north shore of Port Jackson. Observation by Phillip suggests it once occurred on the south side also.	Presence on peninsula likely in 1788, as suitable habitat would have been available.
Eastern Quoll *Dasyurus viverrinus*	Once well-distributed around Port Jackson.	Would have occurred on Pyrmont peninsula in 1788.
Brush-tailed Phascogale *Phascogale tapaotafa*	Records widely but sparsely distributed over the Sydney region.	Suitable habitat would have been available on Pyrmont peninsula, so its presence there in 1788 would have been likely.
White-footed Dunnart *Sminthopsis leucopus*	Status of this species around Sydney at European settlement unclear	Suitable habitat would have been available on Pyrmont peninsula, so this species could have once occurred there.
Common Dunnart *Sminthopsis murina*	Available records sparsely but widely distributed over Sydney region.	Would have once occurred on Pyrmont peninsula.
Southern Brown Bandicoot *Isoodon obesulus*	Records sparsely distributed north and south of Port Jackson.	Likely present on Pyrmont peninsula in 1788, as suitable habitat would have been available.
Long-nosed Bandicoot *Perameles nasuta*	Once widely distributed north and south of Port Jackson and along the Parramatta River.	Would have once occurred on Pyrmont peninsula.

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Koala *Phascolarctos cinereus*	Records of this species southwards from about Port Hacking and northwards at least from French's Forest and Dee Why. Also recorded from Balmain.	It is likely that this species formerly occurred on the peninsula.
Common Brushtail Possum *Trichosurus vulpecula*	Still widely distributed north of Port Jackson, once recorded south of the harbour and along Parramatta River.	Would have once occurred on Pyrmont peninsula.
Eastern Pygmy Possum *Cercatetus nanus*	Available records widely if sparsely distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
Sugar Glider *Petaurus breviceps*	Particularly recorded north of Port Jackson, but some records also from the south.	Would have occurred on Pyrmont peninsula in 1788.
Squirrel Glider *Petaurus norfolcensis*	Records widely, if thinly distributed in the Sydney region.	May have once occurred on Pyrmont peninsula.
Greater Glider *Petauroides volans*	Few records, to west and south of Sydney.	Status on Pyrmont peninsula at European settlement uncertain; unlikely to have been present.
Common Ringtail Possum *Pseudocheirus peregrinus*	Historical records are restricted to the north shore. Contemporary records show the species well distributed through remnant bushland adjoining Port Jackson.	Could have once occurred patchily in suitable habitat on the peninsula.
Feather-tail Glider *Acrobates pygmaeus*	Records from north and south of Port Jackson; once abundant around Sydney.	Would have once been widespread on Pyrmont peninsula.
Rufous Bettong *Aepyprymnus rufescens*	Once considered common around Sydney.	Status on Pyrmont peninsula in 1788 unclear.
Southern Bettong *Bettongia gaimardi*	Little information on the distribution of this species around Sydney at European settlement.	Status of this species on Pyrmont peninsula in 1788 is unclear.

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Woylie *Bettongia penicillata*	Very limited records suggest a former distribution west of Parramatta, including Penrith and Campbelltown. The naming of this species in 1837 also indicates that it was not close by Sydney at settlement.	Unlikely to have occurred on Pyrmont peninsula at settlement.
Long-nosed Potoroo *Potorous tridactylus*	This species once occurred in the neighbourhood of Sydney, but seems to have disappeared early in settlement.	It could have once occurred in suitable habitat on Pyrmont peninsula.
Eastern Grey Kangaroo *Macropus giganteus*	Early observations indicate that this species was once widespread around Sydney.	Would have once occurred on Pyrmont peninsula.
Red-necked Wallaby *Macropus rufogriseus*	This species appears to have once been common near Sydney, but disappeared early in European settlement.	This species was likely present on Pyrmont peninsula in 1788.
Brush-tailed Rock Wallaby *Petrogale penicillata*	Although most museum specimens are from western Sydney, it seems that this species was once widespread in sandstone areas around Sydney.	This species would likely have once frequented the large sandstone spine of Pyrmont peninsula.
Red-necked Pademelon *Thylogale thetis*	Seemingly once common around Sydney, although confined to rainforest and wet sclerophyll forest.	With a home range of 5-30 hectares(Johnson, 1995:400) it is unlikely that the moister forests at the base of the peninsula would have supported a viable population of this species.
Black Wallaby *Wallabia bicolor*	This species appears to have been widespread around Sydney in 1788, and is still found in bushland relicts adjoining Port Jackson.	Would have once occurred on Pyrmont peninsula.

iii. Bats

Churchill(1998) recognised 75 bat species in Australia, including those of Lord Howe and Christmas Islands, in contrast with some 950 species worldwide. Almost half of these species occur in New South Wales and almost two-thirds of these latter may once have occurred on Pyrmont peninsula(Table 4.6.4). That approaching a third of the bat species which occur in Australia may once have been present on Pyrmont peninsula reflects on the mobility of these creatures, their capacity to exist in a range of habitats, and the extensive sandstone outcrops and forest which would have once been available on Pyrmont peninsula.

Table 4.6.4: Bats which may have occurred on Pyrmont peninsula in 1788

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Grey-headed Flying Fox *Pteropus poliocephalus*	Seemingly once a periodic visitor to the Sydney region, moving in response to food availability.	Would have been a periodic visitor to Pyrmont peninsula, exploiting eucalypt blossoms and native fruits.
Little Red Flying Fox *Pteropus scapulatus*	A periodic visitor to the Sydney region in small numbers.	Would have once periodically visited Pyrmont.
Eastern Horseshoe Bat *Rhinolophus megaphyllus*	Sydney is within the overall range of this species.	This species exploits several habitats which would once have occurred on Pyrmont peninsula.
Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*	Widely distributed north and south of Port Jackson.	Would have once occurred on Pyrmont peninsula.
East-coast Freetail Bat *Mormopterus norfolkensis*	Museum records broadly distributed across Sydney region.	Would likely have once occurred on Pyrmont peninsula.
Eastern Freetail Bat *Mormopterus sp*	Museum records broadly distributed across Sydney region.	Would likely have once occurred on Pyrmont peninsula.
White-striped Freetail Bat *Tadarida australis*	Most records for northern Sydney.	Would likely have once occurred on Pyrmont peninsula.
Large-eared Pied Bat *Chalinolobus dwyeri*	Status around Sydney unclear.	Status on Pyrmont peninsula in 1788 unclear.
Gould's Wattled Bat *Chalinolobus gouldii*	Well distributed north and south of Port Jackson and along Parramatta River.	Would have once occurred on Pyrmont peninsula.

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Chocolate Wattled Bat *Chalinolobus morio*	A few museum records for the general Sydney region. Contemporary observations include the Parramatta River area.	Would likely have once occurred on Pyrmont peninsula.
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	Status in Sydney region unclear, but perhaps more associated with shale than sandstone sites.	Could have been present on Pyrmont peninsula at European settlement, particularly in the moister forest at the base of the peninsula.
Little Bent-wing Bat *Miniopterus australis*	Few records of this species for the Sydney region	This species may well have once occurred on Pyrmont peninsula, as it exploits diverse habitats.
Common Bent-wing Bat *Miniopterus schreibersii*	This species is widespread in the Sydney region.	It would have occurred on Pyrmont peninsula at European settlement, especially in more heavily timbered areas at base of the peninsula(see Dwyer, 1995:494).
Large-footed Myotis *Myotis adversus*	Habitat for this species was predicted to be widespread in the George's River catchment(NSW Department of Infrastructure, Planning and Natural Resources, 2004), in association with waterways. It likely once occurred in similar situations throughout Sydney.	This species would have once occurred in the various wetland habitats on and adjoining Pyrmont peninsula.
Lesser Long-eared Bat *Nyctophilus geoffroyi*	Records well distributed north and south of Port Jackson and along the Parramatta River.	Would have once occurred on Pyrmont peninsula.
Gould's Long-eared Bat *Nyctophilus gouldi*	Records indicate that this species was once widely distributed around Sydney.	Would have once occurred on Pyrmont peninsula.
Greater Broad-nosed Bat *Scoteanax rueppellii*	Historical and contemporary records broadly distributed north and south of Port Jackson.	It is likely to have occurred on Pyrmont peninsula at European settlement, with a preference for more open eucalypt woodlands and corridors along the larger creeks(see Hoye & Richards, 1995).

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Eastern Broad-nosed Bat *Scotorepens orion*	Historical and contemporary records well-distributed north of Port Jackson and along the Parramatta River. Suitable habitat also believed widespread in the Georges River catchment(NSW Department of Infrastructure, Planning and Natural Resources, 2004).	Probably once occurred on Pyrmont peninsula, particularly in the moister forest at base of the peninsula(see Tidemann, 1995b:532).
Large Forest Bat *Vespadelus darlingtoni*	The few historical and contemporary records indicate a largely coastal distribution, inland at least to Parramatta.	This species could have once occurred on Pyrmont peninsula.
Eastern Forest Bat *Vespadelus pumilus*	Widely distributed in south-east Australia, this species seems to prefer moist forests.	This species may once have occurred in the moister forests at the base of Pyrmont peninsula.
Southern Forest Bat *Vespadelus regulus*	Despite few museum records, this species is likely to have once been widespread in the Sydney region across various habitats.	Likely to have occurred on Pyrmont peninsula at European settlement.
Little Forest Bat *Vespadelus vulturnus*	Records sparingly distributed north and south of Port Jackson; uses a wide range of habitats.	Likely to have occurred on Pyrmont peninsula at European settlement.
Forest Bat *Vespadelus sp*		

iv. Rodents

Rodents are thought to have evolved 60-80 million years ago in Eurasia, and today comprise about half of all known mammal species(Watts & Aslin, 1981:3). These authors recognise 55 rodent species in Australia today, excluding those introduced by Europeans.

The six native rodent species present around Sydney in 1788 all seem likely to have occurred on Pyrmont peninsula at that time(Table 4.6.5).

Table 4.6.5: Rodents which may have occurred on Pyrmont peninsula at European settlement

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
White-footed Rabbit-Rat *Conilurus albipes*	The status of this species around Sydney at settlement is unclear, as museum specimens have no precise locations provided. Less-reliable sources indicate that this species was initially common around Sydney.	It is likely that this species once occurred on Pyrmont peninsula, as suitable habitat would have been present at European settlement.
Water Rat *Hydromys chrysogaster*	Widely collected around Port Jackson and along the Parramatta River.	Would have occurred on Pyrmont peninsula in 1788.
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*	The status of this species in the Sydney region at European settlement is unclear. It appears to have had a patchy distribution coastally through New South Wales southwards at least to Jervis Bay.	Suitable habitat for this species would have been available on Pyrmont peninsula in 1788.
New Holland Mouse *Pseudomys novaehollandiae*	This species was widely distributed in the Sydney region at European settlement.	Would have occurred on Pyrmont peninsula in 1788.
Bush Rat *Rattus fuscipes*	This species was widely distributed in the Sydney region at European settlement.	Would have occurred on Pyrmont peninsula in 1788.
Swamp Rat *Rattus lutreolus*	This species was widely distributed in the Sydney region at European settlement.	Would have occurred on Pyrmont peninsula in 1788.

v. Sea mammals

The role of sea mammals in the ecology of Pyrmont peninsula at European settlement is not clear. While some seals and dolphins have an ability and inclination to travel sometimes considerable distances upriver, this phenomenon is not widely reported in either historical or contemporary accounts. Nonetheless, Krefft(1867:93) did observe that: 'The smaller whales are at times very common in the waters of Port Jackson, but are seldom captured; and for this reason, we are as yet profoundly ignorant as to the fact how many different species visit this coast'. Together with the historical accounts in Appendix F, there is some evidence that excursions of sea mammals up the Parramatta River may have been noted early in European settlement.

Whether the larger whales entered the lower reaches of the Parramatta River and around Pyrmont peninsula is less clear. In modern times, these animals have ventured as far as the Harbour Bridge, and it will be interesting to see whether they will one day travel further upstream.

Table 4.6.6: Sea mammals which may have visited waters around Pyrmont peninsula in 1788

Name	Likely status at Port Jackson in 1788	Likely status on Pyrmont peninsula in 1788
Dugong *Dugong dugon*	It seems likely that dugongs were once at least periodic visitors to Port Jackson.	It is likely that sea grass beds in the waters adjoining Pyrmont peninsula would have attracted dugongs entering Port Jackson and may, indeed, have been an established food resource for these animals.
Australian Fur Seal *Arctocephalus pusillus doriferus*	While this species can occur well inland from the coast, it appears to have been infrequent around Sydney.	Individuals of this species may have periodically reached Pyrmont peninsula.
Leopard Seal *Hydrurga leptonyx*	As with the preceding species, the Leopard Seal can travel some way inland from the sea.	Individuals of this species probably once reached Pyrmont peninsula from time to time.
Common Dolphin *Delphinus delphis*	This species has periodically entered Port Jackson in the past.	At such times, it may have reached the waters around Pyrmont peninsula.
Common Bottlenose Dolphin *Tursiops truncatus*	Like some other marine mammals, this species seems inclined to travel some distance inland in coastal rivers.	This species may have periodically reached Pyrmont peninsula during such incursions.
Killer Whale *Orcinus orca*	No records have been found of orcas entering Port Jackson or, more generally, of their travelling up coastal rivers.	It is unlikely that this species ventured inland as far as Pyrmont peninsula.
Sperm Whale *Physeter macrocephalus*	It appears that this species has been a straggler into Port Jackson from time to time.	It is unlikely that individuals would have reached Pyrmont peninsula on such occasions.
Southern Right Whale *Eubalaena australis*	This species has become a more frequent visitor to Port Jackson in recent years, reaching inland at least to the Harbour bridge.	It is possible that individuals of this species once travelled inland as far as Pyrmont peninsula.
Humpback Whale *Megaptera novaeangliae*	As for the preceding species.	It is possible that individuals of this species once travelled inland as far as Pyrmont peninsula.

vi. Dingo

Phillip(1790:173) described the native dog or dingo. Bougainville, who visited Sydney in 1825, noted that: 'Native dogs are numerous and cause a lot of damage'(Rivière, 1999:42). According to King (1827:412): 'This little animal … is common in the neighbourhood of Port Jackson …'. Localities listed by Iredale and Troughton(1934:90) included Port Jackson in 1793 and 1820. According to Bennett(1888:53) '[they] are destroyed in all the settled districts'. Native dogs were clearly a concern on Pyrmont peninsula. Fitzgerald & Golder(1994:29) noted: ' … the trees provided cover for the native dogs which still roamed the area when the first subdivision [in Pyrmont] was sold'. Anon(1889) reported: 'Peter Cook … relates how he used to shoot native dogs in the scrub around Pyrmont 50 years ago …'. Whether native dogs remained on the peninsula beyond the late 1830s is unknown.

4.6.4 Conclusions

It is possible that 60 or more mammal species, or about a third of the Australian mammal fauna, occurred on or around Pyrmont peninsula at European settlement. Some species would have been widely distributed across the peninsula, others would have occurred primarily in the moister forests at the base of the peninsula or were occasional visitors. The limited extent of moist forests, and of their associated creeks, suggests that some mammal species may not have been able to maintain viable populations in otherwise favourable habitat.

Most mammal species would have disappeared from the peninsula early in settlement, as the native vegetation was cleared, but some – like the fruit bats – still find food resources on the peninsula today.

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4.6.6 Appendix

Appendix F: Profiles of mammal species which may have once occurred on Pyrmont peninsula.

Diverse mammals would have inhabited the Sydney region at European settlement. Most were intolerant of human disturbance, and a rapid decline in the populations of some species would have occurred in the decades after settlement, aided by active persecution of some species. A few species, however, have been remarkably accommodating of humans.

Although the naming of mammals around Sydney began soon after settlement, a systematic knowledge of their distribution in 1788 was never compiled. This appendix initiates that process.

The nomenclature and sequence of species in this list follows Menkhorst & Knight(2004).

Name	Comments
Order Monotremata (Monotremes)	
Platypus *Ornithorhynchus anatinus*	The first platypus was caught by Europeans in November 1797, almost a decade after European settlement(Burrell, 1974:16). Robert Brown recorded this species at Port Jackson on 16 July 1802 and 7 September 1803(Wheeler & More, 1994). One of Bauer's botanical paintings bears, in respect of this species, the notation: 'Found on the way from Parramatta to the Hawkesbury Port Jackson Sept 8 1803. F. Bauer'. This notation likely elaborates on Brown's second sighting. Krefft(1864) recorded specimens from the Botanical Gardens(probably introduced, see Burrell, 1974:141), the "North Shore", and George's River. A specimen was collected at Robe's Creek, near South Creek, Penrith(Bennett, 1888:48). Burrell(1974:141) described the capture of a platypus in George's River at Glenfield, and noted that the upper reaches of the Nepean and its tributaries were 'still tenanted'. In 2001, platypi were recorded in the Hacking River(NSW NPWS, 2001). According to Grant & Denny(1991:3), this species occupies 100% of east-flowing river systems in New South Wales. In respect of the Sydney region, they wrote: 'Little is known of the historical distribution of the platypus in Sydney itself, but it seems to have been fairly common around what is now the western suburbs of the city'(p.65). Post-1970 records of these authors in and around the Sydney metropolitan area included Kuring-gai Chase National Park, Narrabeen, Heathcote, Waterfall and Royal National Park. Burrell(1974:140/5) noted that platypi occur in diverse freshwater situations, from alpine creeks to turbid tropical rivers, from large bodies of water to small creeks(e.g. Ourimbah and Wyong Creeks), swamps and small water-holes. According to Menkhorst & Knight(2004:44) the platypus: 'Prefers areas with steep, vegetated banks in which to burrow'. Burrell(1974:144) noted the ability of this species to travel at least 4-5 miles(up to 8km) across land.

Name	Comments
Short-beaked Echidna *Tachyglossus aculeatus*	White(1790) did not mention the Echidna in his journal(Nelson, 1998); Nelson surmised that an illustration of the echidna 'probably reached England on 22 April 1792 when the survivors of the wreck of HMS Sirius returned'(p.172). This may account for its description by Shaw that year. Robert Brown noted that the Short-beaked Echidna was 'extremely rare here[Sydney]' during his second visit (June/November 1803)(Vallance, Moore & Groves, 2001:420). According to Bennett (1860:147): 'They principally reside in the mountains …', but he collected one at Lane Cove. This species 'has no particular habitat requirements other than a supply of the ants and termites on which it feeds' (Augee, 2002:40). The Australian Museum(2007) collection has specimens from Kuring-gai Chase and Royal National Parks, Narrabeen, Smithfield, Prospect and Windsor. Gould(1883:8-12) observed it at Newington.
Sub-class Marsupialia (Marsupials)	
Yellow-footed Antechinus *Antechinus flavipes*	The current view is that this species occurs inland of the Great Dividing Range southwards from about Port Stephens(Menkhorst & Knight, 2004:54). Gould(1863) commented 'of all the Antechini yet discovered, the present is the most common. I observed it to be very abundant both in New South Wales and in South Australia …'. Krefft(1865:10) noted that: 'This animal is common on the North Shore, Sydney'. According to Iredale & Troughton(1934:4), Gould gave his locality for this species as 'Sydney'. The Australian Museum(2007) collection has specimens from Royal National Park, Smithfield and Kirrawee. Marlow(1958:80) regarded this antechinus as common in sclerophyll forest and 'widely distributed in eastern New South Wales from the coast to the western slopes of the Great Dividing Range'. Preferred habitats include dry sclerophyll forest, coastal heath and swampland(Menkhorst & Knight, 2004:54).
Brown Antechinus *Antechinus stuartii*	Collected at Spring Cove, Sydney Harbour(i.e. Manly) in August 1837 (Macleay, 1841:242). 'The Brown Antechinus is widespread in a variety of forested habitats in eastern Australia'(Braithwaite, 1995a:94). Troughton(1967:23) noted the presence of this species around Sydney. The Australian Museum(2007) collection includes specimens from Royal and Kuring-gai Chase National Parks, Church Point, Davidson SRA(near Roseville), Ingleside, Narrabeen, North Shore/Port Jackson.
Dusky Antechinus *Antechinus swainsonii*	Australian Museum has a specimen from Terrey Hills, otherwise most specimens west of Sydney(OZCAM, 2007). Also recorded in Kogarah remnant bushland(Kogarah Council, 2007). 'Inhabits dense wet vegetation, from coastal heath to wet sclerophyll forest'(Menkhorst & Knight, 2004:58).
Spot-tailed Quoll *Dasyurus maculatus*	Captain Phillip first recorded this species, from near Sydney, calling it the "Spotted Marten"(Troughton, 1967:45). Five were observed on Manly Beach(Ogilby, 1892). Found in a wide range of habitats, including open forest and coastal heathland(Edgar & Belcher, 1995:68). Australian Museum(2007) collection includes specimens from Lane Cove, Lindfield, Mosman Bay and North Head. Recorded from St Leonards(Krefft, 1864:26).

Name	Comments
Eastern Quoll *Dasyurus viverrinus*	A specimen was collected at Bare Island, Botany Bay during Cook's first visit, and published as a 'Quoll' by Hawkesworth(1773)[but see Mahoney & Ride, 1984:59]. Described and illustrated by White(1790). Met with 'around Port Jackson' (Bougainville, 1837:308). Once common in New South Wales (Marlow, 1958:86). It occurs in a variety of habitats including dry sclerophyll forest and heathland(Godsell, 1995:70). According to Troughton(1967:43): 'It is still found in some suburbs of Sydney; a specimen recently received at the [Australian] Museum had been run over by a motor-car at Vaucluse'. Krefft (1864:27) recorded it from Rose Bay and Dobroyd(home of Dr. E.P.Ramsay, Ashfield). Australian Museum(2007) collection includes specimens from Botany, Bronte/Waverley, Burwood, Concord, and Cooks River.
Brush-tailed Phascogale *Phascogale tapoatafa*	Described and illustrated by John White in 1790(see Waterhouse, 1846:407). 'This species was already known to the earliest settlers' (Krefft, 1871). Preferred habitats include dry sclerophyll forest (Soderquist, 1995:104). Marlow (1958:82) found it mainly east of the Great Dividing Range from extreme north to south of New South Wales; uncommon in this state. Krefft(1864:28) recorded this species from North Sydney. Australian Museum(2007) collection includes specimens from Camden Park, Kingswood and North Shore.
White-footed Dunnart *Sminthopsis leucopus*	Lunney(1995a:143) cautioned that it may be confused with the Common Dunnart *Sminthopsis murina*. According to Marlow (1958:84) it occurs in sclerophyll forest; he further observed that there was only one record from Sydney, in 1854, and it was presumed extinct there. Today, this species is patchily distributed in Tasmania, Victoria, southern NSW, with an outlying population in north-east Queensland(Menkhorst & Knight, 2004:70).
Common Dunnart *Sminthopsis murina*	Krefft(1864) listed this species for Sydney. Krefft(1865:10) noted that its distribution extended to Port Jackson. 'In the immediate neighbourhood of Sydney they have been found occasionally under stones during the winter-time, but never more than about two in three years of one collector'(Krefft, 1871). Marlow (1958;83) found this species widely distributed on both sides of the Great Dividing Range, and common in New South Wales. Fox(2002b) recorded it most commonly from woodland, open forest, and heathland. The Australian Museum(2007) collection includes specimens from Royal National Park, Cronulla, Smithfield, North Shore, Manly and Normanhurst.

Name	Comments
Southern Brown Bandicoot *Isoodon obesulus*	Gould(1883:30) described this species as 'one of the very commonest of the Australian mammals'. According to Dixon(1981:132): 'Present investigations indicate that this species has its northern limit at the Hawkesbury River …'. She described the habitat of the Kuring-gai Chase population thus: 'The vegetation comprised *Eucalyptus haemastoma* to a height of 6m, a tall shrub-layer consisting of *Banksia ericifolia*, *Hakea sericea* and *Persoonia lanceolata* to 3m, thickly growing smaller shrubs *Epacris microphylla*, *Boronia pinnata*, *Grevillea sericea* and *Bossiaea scolopendria* …'(p.133). According to Braithwaite(1995:176), it 'prefers sandy soil with scrubby vegetation and/or areas with low ground cover that are burnt out from time to time'. He also noted: 'Before European settlement, the use of fire by Aborigines maintained a complex mosaic of habitats very suitable for the Brown Bandicoot'. In respect of this species, Krefft(1867) commented: 'Though not observed near Sydney now, it has probably existed in former times …'. More recently, Marlow(1958:88) considered the species uncommon in New South Wales. The Australian Museum(2007) collection includes specimens from Botany, Maroubra, and Kuring-gai Chase National Park. Several populations of this species remain in Warringah Local Government Area (www.warringah.nsw.gov.au/council/documents/2002052861.pdf)
Long-nosed Bandicoot *Perameles nasuta*	Gould(1863) considered this species to be 'sparingly distributed', but found it 'even in the neighbourhood of Sydney'. Tate(1948:326) reported a specimen collected 3 miles NE of Sydney[about Middle Harbour]. According to Marlow(1958:88), this bandicoot favours rainforest and wet sclerophyll forest, and to a lesser extent dry sclerophyll forest and woodland. Troughton(1967:66) reported collections from Kogarah Bay and Wahroonga. The Australian Museum (2007) collection includes specimens from Hunters Hill, Elizabeth Bay, Mosman, North Shore, Lindfield, East Willoughby, Gladesville and Vaucluse. This species was recently trapped in Lewisham and, 4 years ago, in Dulwich Hill(Anon, 2007)
Koala *Phascolarctos cinereus*	Museum collections include specimens from Chiswick, Glenhaven, French's Forest and Dee Why(OZCAM, 2007). Hogg(1923/33) provided an engaging account by Hugh Morwick of one collected on Balmain peninsula in 1838: 'Arriving in due course at a ridge – probably in the vicinty{sic] of Nicholson Street – the lads … descended from the ridge in-to boggy flat land with water on each side. Here they were startled with strange weird-like crys[sic], resembling the wailings of an infant in pain. After close scrutiny there[sic] keen sailor-sight, detected in a gum-tree, almost hidden by the leaves, a strange wooly[sic] animal resembling a diminutive bear'. The koala was probably a young animal(c.f. Jackson, 2007). Contemporary observations occur in two areas near Sydney. Ward & Close(2004:48) reported 570 sightings of Koalas in an area bounded by Campbelltown, somewhat north of Port Hacking, the Pacific Ocean, and Cataract Dam. Koalas were patchily distributed through this area. The area broadly matches the predicted habitat map for this species in the Georges River catchment(NSW Department of Infrastructure, Planning and Natural Resources, 2004). Another population exists in Pittwater Local Government Area, between Ingleside and Elanora Heights in the south and Palm Beach on Barranjoey peninsula(NSW NPWS, 2007).

Name	Comments
Common Brushtail Possum *Trichosurus vulpecula*	Described and illustrated in White(1790). According to Gould (1883:39): 'Of all the Opossums inhabiting Australia, the *Phalangista vulpina* is by far the commonest'. Several specimens listed as collected at Sydney (Iredale & Troughton, 1934:30). Marlow(1958:93) considered it widely distributed in New South Wales and abundant. He found it in a wide range of habitats … common in dry sclerophyll forest and abundant in open woodland'. Krefft(1864) recorded it from Rose Bay, while the localities of Australian Museum(2007) specimens include Longueville, Burwood, Castlecrag, Neutral Bay, Chatswood, Vaucluse.
Eastern Pygmy Possum *Cercatetus nanus*	Krefft(1864:44) reported this species from St Leonards. ' … used to inhabit the North Shore'(Bennett, 1888:52). The Australian Museum(2007) collection includes specimens from Elanora Heights, Kuring-gai Chase and Royal National Parks. Turner & Ward (2002:217) noted this species is found from rainforest through sclerophyll forest to tree heath. Banksias and myrtaceous shrubs and trees are favoured food sources and nesting sites in the drier habitats'.
Sugar Glider *Petaurus breviceps*	'The short-headed Flying-Phalanger must be very local, since it has been rarely sent home amongst the skins of mammals from Australia …'(Waterhouse, 1846:335). ' … used to be very common about Sydney'(Bennett, 1888:52). There are many specimens in the Australian Museum (2007), including those collected at Roseville, Chatswood, St Leonard's, Summer Hill, and North Shore. Observed in Kogarah remnant bushland(Kogarah Council, 2007). Marlow (1958:93) found this species in sclerophyll forest and woodland, occurring on both sides of the Great Dividing Range. He considered it common: 'the most plentiful species of the genus'.
Squirrel Glider *Petaurus norfolcensis*	According to Gould(1883:60), this species was 'one of the commonest of the country, being very generally dispersed over the whole of New South Wales …'. Marlow(1958:92) observed it in sclerophyll forest and woodland, mainly in the coastal belt. Troughton(1967:98) noted that this species was found in Port Jackson, while the Australian Museum(2007) has specimens from Roseville, Strathfield, Avalon, and Smithfield.
Greater Glider *Petauroides volans*	Described and illustrated by John White(1790). Several specimens listed as from 'Sydney'(Iredale & Troughton, 1934:29). The Greater Glider lives in a variety of eucalypt-dominated habitats, ranging from low, open forests on the coast to tall forests in the ranges …'(McKay, 2002:240). Marlow(1958:96) considered it widely distributed on the eastern side of the Great Dividing Range, and abundant. Krefft(1867) recorded this species 'in the immediate neighbourhood of Sydney'. The Australian Museum(2007) has specimens from Royal National Park, Prospect, Smithfield and Sutherland.
Common Ringtail Possum *Pseudocheirus peregrinus*	Marlow(1958:95) found this species widely distributed in rainforest, sclerophyll forest and open woodland, from the coast inland across the Great Dividing Range. He considered the species common. The Australian Museum(2007) collection includes specimens from Mosman, East Roseville, Wollstonecraft, Castlecrag, Chatswood and North Head.

Name	Comments
Feather-tail Glider *Acrobates pygmaeus*	'The Feather-tail Glider is the world's smallest gliding mammal' (Woodside, 2002:262). According to King(1827:414): 'This little animal … is exceedingly numerous in the vicinity of Port Jackson'. ' … used to be very common about Sydney'(Bennett, 1888:52). Marlow (1958:91) recorded it in 'both heavily and lightly timbered country, particularly in open sclerophyll forest and woodland'. According to Troughton(1967:84) this species was among the earliest marsupials described from about Port Jackson. Gould(1883:68) considered it 'very common in every part of New South Wales'. Krefft(1864:42) reported this glider from Lane Cove and the Domain. There are Australian Museum(2007) records for Chatswood, St Leonard's, Summer Hill, Lindfield, and North Shore.
Rufous Bettong *Aepyprymnus rufescens*	Described by Krefft(1865:20) as ' … so common in the neighbourhood of Sydney …'. According to Troughton(1967:162): 'Once said to be universally distributed over the coastal region of New South Wales, from near the sea to the inland slopes of the mountains'. Distribution now much reduced. Habitats include coastal eucalypt forests(Dennis & Johnson, 1995:285).
Southern Bettong *Bettongia gaimardi*	According to Waterhouse(1846:208): 'The "Potoroo" of the French naturalists was found by M. Gaimard in the neighbourhood of Port Jackson …'. 'It inhabits open, dry, fire-prone forests with a grassy or heath understorey on poor soil. These forests are often of Peppermint Gums and Silver Wattle'(Rose & Johnson, 1995).
Woylie *Bettongia penicillata*	The status of this species in the Sydney area at European settlement is unclear. Gould(1973) observed it particularly on the interior side of the ranges of New South Wales, and specifically noted that he did not find it between the ranges and the coast. In an accompanying note, Dixon commented that 'Formerly *B. penicillata* group extended over most of mainland Australia south of the tropics'. According to Christensen (1995:292): 'It appears to have been primarily an animal of open forest and woodlands and a common factor in all habitats occupied by the surviving populations is a clumped, low understorey of tussock grass or clumped low woody scrub'. Krefft(1867:101) noted it from '… near the coast districts at least [with specimens] .. from the neighbourhood of Sydney'. Two specimens in the Australian Museum (2007) collection are from Kingswood and Campbelltown.
Long-nosed Potoroo *Potorous tridactylus*	Described and illustrated by John White(1790). 'One of the first mammals recorded from Australia … a description and illustration of which appeared in Governor Phillip's account of the settlement at Botany Bay in 1789 … it inhabits coastal heath and dry and wet sclerophyll forests. A major habitat requirement is relatively thick ground cover and it seems to be concentrated in areas where the soil is light and sandy'(Johnston, 1995:301). According to Troughton (1967:163) 'the "Common Potoroo" has vanished from … the Sydney district … Once common in the damp or scrubby brushes of coastal New South Wales …'.

Name	Comments
Eastern Grey Kangaroo *Macropus giganteus*	Phillip(1790:123) noted that 'Kanguroos[sic] were frequently seen …'. 'The animal … called the kangaroo … we found in great numbers' (Hunter, 1793:46). Writing in 1871, Krefft commented: 'It is just a century since Captain Cook discovered the Common or Great Kangaroo in the neighbourhood of Port Jackson, and not withstanding all the persecution by man and dog these large marsupials still hold their own. From the vicinity of the City they have certainly disappeared, but in the Port Hacking District, on the south side of Botany Bay, a few may yet be found'. According to Bennett(1888:46) ' … has become very rare, and this, as well as most of the larger kinds, are disappearing very fast from the settled districts'. Troughton (1967:220) wrote: ' …it was this fine kangaroo which was the object of so much interest to the first settlers about the shores of Port Jackson and Botany Bay'. The Australian Museum(2007) collection has specimens from Gladesville and Pennant Hills.
Red-necked Wallaby *Macropus rufogriseus*	According to Waterhouse(1846:126): ' … we are informed by Mr Gould that this animal was formerly common near Sydney, but is now gradually retiring before the advance of civilized man …'. '[This species] is found in the eucalypt forests where there is at least a moderate shrub stratum with open areas nearby and also in tall coastal heath communities'(Callaby, 2002:350). Marlow(1958:105) found it in dry sclerophyll forest(less frequently in wet sclerophyll forest) and woodland; he considered this wallaby common in New South Wales. According to Krefft(1871): 'It is stated that this Wallaby … was found even in the neighbourhood of Sydney … why it should not be found near Sydney now is inexplicable'. Australian Museum collection has specimens from Glenhaven, Jilliby and Thirroul.
Brush-tailed Rock Wallaby *Petrogale penicillata*	This was the first rock-wallaby to be named, in 1825: 'Originally an abundant and widespread species, it was found in suitable rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest … Most commonly, the sites occupied by *P. penicillata* have a northerly aspect, allowing the animals to sun themselves in the morning and evening'(Eldridge & Close, 2002:383). These authors described the early persecution of this species, with over half a million killed in New South Wales between 1884 and 1914: 'In 1908, 92,590 rock-wallaby skins were marketed through a single Sydney wool-broking company'(p.384). The original account of the species was from an animal collected near Sydney (Troughton, 1967:178). Krefft(1864) recorded this species from Pittwater/Middle Harbour and Port Jackson. Flannery (1999:32) noted that: 'Rock wallabies adorned Middle Harbour until hunters eliminated them sometime after the 1860s'. The Australian Museum (2007) collection has specimens from Hawkesbury, Kingswood, the Nepean River, Warragamba, Windsor and Smithfield.

Name	Comments
Red-necked Pademelon *Thylogale thetis*	Troughton & Iredale(1934:46) listed a specimen collected in 1827 at 'Sydney'. 'The "Pademelon Wallaby" of the colonists, is a small species … and is an inhabitant of New South Wales where it is very abundant. Mr Gould states, that it is strictly a brush animal …' (Waterhouse, 1846:145). Dixon(in Gould, 1973) noted: '… this species occurs throughout the rainforest and wet sclerophyll forest of coastal New South Wales from south of Sydney to southern Queensland'. Marlow(1958:101) recorded it from the coastal region and eastern slopes of the Great Dividing Range from Queensland to the Shoalhaven River; he considered it common. According to Troughton(1967:193): 'This species represents the "common" pademelon of the early colonists to whom it was the best known of the scrub wallabies owing to its great abundance'.
Black Wallaby *Wallabia bicolor*	'The Swamp(Black) Wallaby lives in thick undergrowth in forest, woodland and heath …'(Merchant, 1995:404). Krefft(1871) observed that: 'In the neighbourhood of Sydney no other but the Black Wallaby is found'; he also noted that it ' … is as plentiful as ever … '. He recorded it from Pittwater and Middle Harbour(Krefft, 1864). Stephens (1978:77) listed this species from Kuring-gai Chase and Bantry Bay, with a confirmed observation in 1950/51 in Fox Valley (Wahroonga). The Australian Museum(2007) collection has specimens from Royal and Kuring-gai Chase National Parks, Narrabeen and Richmond. It was observed in contemporary surveys of Mosman bushland, Dobroyd and North Heads.
Order Chiroptera(Bats)	
Grey-headed Flying Fox *Pteropus poliocephalus*	According to Bennett(1860:157): 'They are less frequently seen in the vicinity of Sydney; but in the year 1858, to my surprise, a number of these animals were observed suspended from the topmost branches of lofty trees in Sydney Botanic Garden, hanging by their hind claws: it was an unusual event, as for several years not a specimen had been seen in that locality'. Uses a variety of habitats, including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests. Major food sources are eucalypt blossom and native fruits(e.g. figs). Move in response to local food availability(Churchill, 1998:90)
Little Red Flying Fox *Pteropus scapulatus*	Australian Museum collection includes specimens from Punchbowl, Paddington and Haberfield(OZCAM, 2007). Occurs in a broad range of habitats, including temperate eucalypt forests and paperbark swamps. Predominantly a blossom-feeder, utilising all dominant tree and shrub species within their range(Churchill, 1998:92/93)
Eastern Horseshoe Bat *Rhinolophus megaphyllus*	Recorded in Pittwater reserves(Basham, 2006). Roosts in caves, typically in small colonies. Habitats include rainforest, dry & wet sclerophyll forest, open woodland, coastal scrub. Insectivorous (Churchill, 1998:110/111)
Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*	Australian Museum collection includes specimens from Killara, Glebe, Gladesville, Rose Bay and La Perouse(OZCAM, 2007). Roosts in tree hollows, singly or in small numbers. Occur in most habitats. Insectivorous(Churchill, 1998:94/95)

Name	Comments
East-coast Freetail Bat *Mormopterus norfolkensis*	Specimen collected by W.S. Macleay in Sydney in 1839(Iredale & Troughton, 1934). Collected 'near Sydney'(Le Souef & Burrell, 1926: photo facing p.88). Museum collections include specimens from Seven Hills, Smithfield, Canley Vale, Gladesville and Watson's Bay(OZCAM, 2007). Mostly roosts in tree hollows. Favours dry eucalypt forest and woodland east of the Great Dividing Range. Insectivorous(Churchill, 1998:202).
Eastern Freetail Bat *Mormopterus sp*	Australian Museum collection includes specimens from Smithfield and Gladesville(OZCAM, 2007). Contemporary records from Pittwater reserves(Basham, 2006) and North Head. Roosts in tree hollows and spouts. Occurs in a wide range of habitats. Insectivorous(Churchill, 1998:203).
White-striped Freetail Bat *Tadarida australis*	Australian Museum collection includes specimens from West Pennant Hills, Lane Cove West and Narrabeen(OZCAM, 2007). Contemporary records from Pittwater reserves(Basham, 2006) and Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2). Roosts in trees, singly or in small groups. Uses a wide range of habitats. Insectivorous(Churchill, 1998:212).
Large-eared Pied Bat *Chalinolobus dwyeri*	No Museum records for the immediate Sydney area. Contemporary record for the Pittwater reserves(Basham, 2006). Roosts in caves. Habitats include dry sclerophyll forest/ woodland, and edges of rainforest/wet sclerophyll forest. Insectivorous(Churchill, 1998:130/131)
Gould's Wattled Bat *Chalinolobus gouldii*	Australian Museum collection includes specimens from Gladesville, Mosman, Double Bay, and Manly(OZCAM, 2007). Contemporary records from Pittwater reserves(Basham, 2006), Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2), Lane Cove, Canada Bay, North Sydney bushland, Middle and North Heads. Roosts most commonly in tree hollows, also among leaves, singly or in small colonies. Occurs in most habitats. Insectivorous(Churchill, 1998:132)
Chocolate Wattled Bat *Chalinolobus morio*	Australian Museum collection includes specimens from The Oaks (Campbelltown), Garie, and MacMaster's beach(OZCAM, 2007). Contemporary records from Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2), Canada Bay, and Lane Cove. Roosts in tree hollows, under exfoliating bark, in Fairy Martin nests. Habitats include wet and dry sclerophyll forests, woodlands. Insectivorous(Churchill, 1998:134)
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	Australian Museum collection includes a specimen from Burwood Heights(OZCAM, 2007). Roosts in hollow trunks, caves, in small colonies. Habitat includes sclerophyll forests from the Great Dividing Range to the coast. Insectivorous(Churchill, 1998:142)
Little Bent-wing Bat *Miniopterus australis*	Australian Museum collection includes a specimen from Cabarita (OZCAM, 2007). Contemporary records from Pittwater reserves (Basham, 2006) and Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2). According to Churchill(1998:144), this bat 'shows a preference for well-timbered areas, including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests'.

Name	Comments
Common Bent-wing Bat *Miniopterus schreibersii*	Australian Museum collection includes specimens from Denistone, Naremburn, Botanical Gardens, and Double Bay(OZCAM, 2007). Hoye & Spence(2004:147) provided historic and/or contemporary records for Elizabeth Bay House, North Sydney Railway Tunnel, Balmain Power Station, Turramurra, Wahroonga, St Ives, Kuring-gai Wildflower Gardens, Henry, George's, and Middle Heads, Balmain coal loader, Primrose Park(Cremorne), Silverwater, Coups Creek, and Comenarra Parkway. Numerous contemporary records for the Sydney region, including Pittwater reserves(Basham, 2006), Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2), Potts Hill Reservoir, Birrong(Fly by Night Bat Surveys, 1997), Malabar(White, 2007:31), and Canada Bay, Lane Cove, Woolwich Dock, North Sydney bushland, Mosman bushland, Manly reserves, North Head. Roosts in caves, sometimes in large colonies. Habitats include rainforest, wet and dry sclerophyll forests, paperbark forests(Churchill, 1998:146/147)
Large-footed Myotis *Myotis adversus*	Australian Museum collection includes specimens from Penrith, Campbelltown, Appin, and Royal National Park(OZCAM, 2007). Primarily coastal in distribution. Roosts mostly in caves, also tree hollows, amongst vegetation etc. Most habitats, preferably near water and including mangroves, paperbark swamps, wet and dry sclerophyll forest. Insectivorous (Churchill, 1998:150/151)
Lesser Long-eared Bat *Nyctophilus geoffroyi*	Museum collections include specimens from Meadowbank, Auburn, Chullora, Botanic Gardens, Watson's Bay and Mascot(OZCAM, 2007). Contemporary records from Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2), Canada Bay, and Lane Cove. Roosts in crevices, under lifting bark, in tree hollows, singly or in small numbers. Uses most habitats. Insectivorous (Churchill, 1998:156)
Gould's Long-eared Bat *Nyctophilus gouldi*	Australian Museum collection includes specimens from Carlingford, Marsfield, Lucas Heights, Gymea Bay, and Banksmeadow(OZCAM, 2007). Contemporary record from Lane Cove. Roosts in tree hollows and under exfoliating bark, alone or in small groups. Uses a variety of habitats. Insectivorous (Churchill, 1998:158)
Greater Broad-nosed Bat *Scoteanax rueppellii*	Sydney is type locality(Iredale & Troughton, 1934:98). Australian Museum collection includes specimens from East Lindfield, Nielsen Park, Sandringham, and Caringbah(OZCAM, 2007). Contemporary record from Mosman bushland. Roosts in hollow tree trunks and branches. Prefers moist gullies in mature coastal forest or rainforest, also in wet and dry sclerophyll forests. Coastal in south of range. Insectivorous(Churchill, 1998:170)
Eastern Broad-nosed Bat *Scotorepens orion*	Museum collections include specimens from Seven Hills, Gladesville, Greenwich and Georges Heights(OZCAM, 2007). Contemporary record from Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2), Canada Bay, and Lane Cove. Roosts in tree hollows, usually in colonies. Habitats include tall wet forest or rainforest, low-open forest. Insectivorous (Churchill, 1998:176)

Name	Comments
Large Forest Bat *Vespadelus darlingtoni*	Australian Museum collection includes a specimen from Wattamolla, Royal National Park(OZCAM, 2007). Contemporary records from Pittwater reserves(Basham, 2006) and Sydney Olympic Park(Sydney Olympic Park Authority, 2006:2). Roosts in tree hollows, singly or in small/moderately large groups. Habitats include rainforest, wet and dry sclerophyll forest. Insectivorous(Churchill, 1998:184)
Eastern Forest Bat *Vespadelus pumilus*	Australian Museum collection includes a specimen from Harrington Park(OZCAM, 2007). Prefers moister forests(Parnaby, 1995:542). Found in rainforest, wet and dry sclerophyll forest. Insectivorous (Churchill, 1998:190).
Southern Forest Bat *Vespadelus regulus*	Australian Museum collection includes specimens from Hawkesbury Heights, Emu Heights, and Lion Island NR(OZCAM, 2007). '… it is common in most areas where it occurs'(Tidemann, 1995a:543/4). Roosts in tree hollows in small/large numbers. Habitats include rainforest, wet and dry sclerophyll forest, shrubland. Insectivorous (Churchill, 1998:192)
Little Forest Bat *Vespadelus vulturnus*	Australian Museum collection includes specimens from Turramurra, Botany and Cronulla(OZCAM, 2007). Contemporary record from Lane Cove. Roosts in tree hollows, mostly in small colonies. Uses a wide range of habitats. Insectivorous(Churchill, 1998:196)
Forest Bat *Vespadelus sp*	
Order Rodentia(Rodents)	
White-footed Rabbit-Rat *Conilurus albipes*	' … originally found in woodlands from Adelaide to Sydney … Sydney natives called it 'gnar-ruck'. It was a problem in the settler's stores at about 1788. The last specimen was recorded about 1845, but some were reported in 1856-57 and perhaps in the 1930s(Wikipedia). Gould (1983:296) found this species 'dispersed over all parts of New South Wales'. Watts & Aslin(1981:130) similarly concluded that its distribution 'at the time when European settlement began was apparently wide', and believed it favoured eucalypt woodlands and open forests(p.131); their distribution map included the coastal belt, eastern slopes of the Great Dividing Range extending onto the western slopes in New South Wales.
Water Rat *Hydromys chrysogaster*	Usually lives close to permanent bodies of fresh or brackish water (Strahan, 1995b:628). Krefft(1864:72) found it along rivers, creeks and inlets, and reported it frequently in salt water. This species was once widespread in Port Jackson, being collected from such locations as Rose and Elizabeth Bays(Krefft, 1864:72), Botanic Gardens, North Sydney, Gladesville, Goat Island, Hen & Chicken Bay, Hunters Hill, Vaucluse, Watson's Bay, Lady Macquarie's Chair, Long Nose (Yurulbin) Point(Australian Museum, 2007). A specimen was also collected at Pyrmont.

Name	Comments
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*	The status of this species at European settlement is unclear. It is currently known to occur south to Brisbane Water National Park, just north of the Hawkesbury River, with an apparently isolated population at Jervis Bay. Sub-fossil specimens have been found further south in NSW and from south Victoria(Watts & Aslin, 1981:180). It prefers heathland and especially dense wet heath and swampy areas(Fox, 1995a:601).
New Holland Mouse *Pseudomys novaehollandiae*	According to Kemper(2002:611): 'Originally described in the mid-nineteenth century, this small rodent lived unnoticed for over 100 years on the edge of Sydney before it was rediscovered in Ku-ring-gai Chase National Park in 1967. Since then it has been found in many dry heath and open forest localities in coastal New South Wales …'. Australian Museum collection includes specimens from Glenfield, Royal National Park, and Maianbar.
Bush Rat *Rattus fuscipes*	Predominantly a coastal species, found in many different habitats. In New South Wales it 'is commonly found in open-forest with dense undergrowth, and favours areas near watercourses'(Watts & Aslin, 1981:224).
Swamp Rat *Rattus lutreolus*	Recorded in Royal National Park in 1914(Le Souef & Burrell, 1926:118). According to Lunney(1995b:656) the habitats of this species 'are usually swampy or moist, [but] they often dry out and, at such times, the Swamp Rat could be described as a rodent of heath, grass or sedge'. Avoids forest, except with a grass or sedge understorey, and is dependent upon dense cover.
Order Sirenia(Dugong)	
Dugong *Dugong dugon*	In Collins's 'Account of the English colony in New South Wales, Volume 1, 1798, he noted that in March 1795 head bones of a manatee were collected 'southward of Botany Bay'(Troughton, 1928:223). Etheridge(1905) described two sites – Arakoon, at the entrance to the Macleay River, and Shea's Creek, Cook River, Botany Bay – where Dugong bones were excavated. The bones were marked by blunt instruments, suggesting that the animals had been eaten by aboriginals. Etheridge also noted reliable records of dugong as far south as Broken Bay. The NSW Parks and Wildlife Service has records of Dugong along the NSW coast almost to the Victorian border(Llewellyn et al, 1994).
Order Pinnipedia (Seals & Sea Lions)	
Australian Fur Seal *Arctocephalus pusillus doriferus*	In Tasmania, this species regularly visits the upper reaches of the Tamar River, Launceston(Whinnett, 2000; Wade, 2004) and Coal River, near Hobart(Paine, 2006). According to Troughton(1967:251): 'The distance stray [fur-seals] will ascend streams was indicated by the capture of a four-foot fur-seal some 30 miles[48 km] up the Shoalhaven River at its junction with the Kangaroo River …'. A specimen in the Australian Museum from Rushcutter's Bay indicates that this species also entered Port Jackson.

Name	Comments
Leopard Seal *Hydrurga leptonyx*	Angas(in Gould, 1983:397) reported the collection of 'a fine specimen of an adult Sea Leopard(*Stenorhynchus Leptonyx*), killed some miles above the saltwater in the Shoalhaven River; it had an *Ornithorhynchus* [Platypus] in its stomach when captured. Krefft(1871) considered this 'a proof that the animal must have gone far up the river into freshwater'. He noted a second specimen obtained at Double Bay in October 1870. He also observed that this species occasionally appears in rivers or lagoons. Considered a straggler to east Australian coasts by Troughton(1967:258). '… apparently only driven ashore in Australian regions by very heavy weather …'(Le Souef & Burrell, 1926:97/8). The Australian Museum has a specimen from Garden Island, also in Sydney Harbour. Krefft(1867), while referring to the Leopard Seal, noted: 'The seals of the Australian coast frequently ascend rivers to a great distance …'(p.93). According to Shaughnessy (1999:64) most reports of this species in south-eastern Australia are of juveniles.
Order Setacea (Whales, dolphins)	
Common Dolphin *Delphinus delphis*	This species is widely distributed in temperate, sub-tropical and tropical waters throughout the world in a band roughly spanning 40^0S to 50^0N (http://en.wikipedia.org/wiki/Common_dolphin). Two juvenile Common Dolphins were seen about 6km up the River Dart, in South Devon, in late 1998/early 1999: 'In the 18th Century Daniel Defoe described an army of dolphins driving a shoal of pilchards up the River Dart as far as Totnes', about 15km inland(Anon, 1999d). By 1930 people were paid to shoot these animals in the Rivers Dart and Tamar, as they were considered a nuisance to salmon stocks. Pollution then deterred the dolphins, so recent observations – the first since about the 1970s – were considered a good indication of the health of the river. According to Waite(1898:63), this species occurred in Australia on 'our coasts and harbours'.
Killer Whale *Orcinus orca*	Several observations in New Zealand indicate that orcas are frequent visitors to harbours(Baker, 1999:102/103; Anon, 2001; Robson, 2003; Anon, 2005; McCarthy, 2006)
Common Bottlenose Dolphin *Tursiops truncatus*	This species is well-known as a visitor to rivers from its more usual marine environment globally. Riverine records in Australia include animals found in the Port River, Adelaide(Anon, 1999b). In America, Bottlenose Dolphins have been found more than 14 miles(22 km) up the Raritan River, New Jersey(Wheeler, 2007) and in the Potomac River, Washington DC(Anon, 2006). Bottlenosed Dolphins swam the waters of the Humber River(England) in Anglo-Saxon times, with sightings from 1892(Herbert, 2007).
Sperm Whale *Physeter macrocephalus*	An 1851 account described this species for Port Jackson(Iredale & Troughton, 1934:59).
Southern Right Whale *Eubalaena australis*	Individuals, or female with calf, have been seen in Sydney Harbour at least since 1966(Anon, 1999a). This whale has become a regular visitor in recent years(Pryor, 2003), with harbour sightings in 1993, 1999, 2002, 2003, 2004. They have reached the Harbour Bridge.

Name	Comments
Humpback Whale *Megaptera novaeangliae*	Humpback whales have been recorded singly or in small groups in Sydney Harbour in recent years, on one occasion reaching the Harbour Bridge(Marks, 1999; Benson, 2001; Anon, 2003). It has been suggested that the harbour may act as a refuge for injured individuals.

4.7 General conclusions

Pyrmont peninsula would have had a rich native flora and fauna at European settlement. The typical sandstone vegetation of the peninsula itself likely exhibited high patchiness due to variations in substrate, water availability, aspect, all superimposed by the fire regimes of native peoples over millennia, together with chance lightning strikes. The marine environment would have been diverse also, probably with extensive seagrass beds in shallow waters, and stands of mangroves and limited patches of saltmarsh at the interface between land and water.

The botanical diversity would have supported a varied fauna, likely somewhat restricted by the limited extent of some vegetation types. The wetlands at the heads of Cockle and Blackwattle Bays would have been important refugia in times of drought or extensive burning. The seasonal variation in bird life would have been considerable, as largely resident species were supplemented by different migratory species according to the time of year. The peninsula and its surrounding waters would also have provided refuge for bird species escaping periods of extreme drought and fire inland.

Despite the high diversity of plant and animal species likely found on the peninsula at European settlement, populations of many of these would have been restricted by the limited extent of several of the available habitats.

Part 5

Transformations

5.1 General Introduction

It is well-known that European impacts on the social, physical and biological systems of Pyrmont peninsula have been both substantial and sustained. These impacts likely began within days of the First Fleet's arrival at Sydney Cove and progressively increased until peaking in the early decades of the twentieth century. This section of the report overviews the successive waves of European exploitation of the peninsula during the last 220 years.

Matthews(1982), Fitzgerald & Golder(1994), and Irving(2006) have already collectively documented the substantial transformations of Pyrmont peninsula over time. The intention here is to supplement their insights, rather than replicate them, and to better understand the ecological consequences of these waves of human activity.

Eight transformations of Pyrmont peninsula are recognised (Table 5.1)

Table 5.1 Major transformations on Pyrmont peninsula

Transition	Period
Aboriginal occupation	(50,00BP) – 1840s
Land clearing	1790s – 1840s
Agriculture	(1796) – mid-19thC – (early 1900s)
Sandstone removal	1820s - 1890s – (1931)
Urbanisation	(1804) – late 1830s – early 1900s
Industrialisation & Commercialisation	(1807) - 1840s – mid/late 1900s
Land reclamation	(1840) - 1850s – mid-1950s
Railways and wharves	(1854) – mid-1870s – mid-1980s
Urban renewal	Early 1980s - present

These transformations sometimes, and increasingly, took place concurrently, so that competition for the peninsula's land surface became more intense. There is thus a significant dynamic between competing land uses, one which progressively forced some land uses off the peninsula altogether(e.g. agriculture, quarrying, industry) and the intensification of others(especially urbanisation).

It is essential that Council and community alike recognise the ongoing nature of these processes, and ensure that future change will collectively improve the quality of the human and ecological systems of the peninsula alike.

5.2 Aboriginals

5.2.1 Introduction

While the time when Aboriginals first arrived in Australia is unclear, there is a general consensus that they left South-East Asia between 50,000 and 70,000 years ago. There is also some evidence to suggest that they may have arrived in Australia much earlier - up to 175,000 years ago(Discover Sydney, 2009).

The aboriginals of Pyrmont peninsula were part of the Gurangi people, the local band being the Cadigal(Casey & Lowe, nd), and they referred to the place as Pirrama(Fitzgerald & Golder, 1994:14). They probably maintained a mixed food economy, based on resources from the waters around the peninsula, on hunting terrestrial animals, and on collecting and processing plant materials.

In respect of marine resources, Turbet(2001:54/7) described the different fishing styles of the women and men. While the women used fishing lines and hooks(made of mother of pearl and sometime baited), the men would use four-pronged spears(mooting) launched either from the shore or a canoe. Fishing took place both during the day and night. Usually, pieces of lobster, sea urchin, cunjevoi or shellfish were thrown into the water to attract fish, sometimes after having been chewed first. In parentheses, it should be noted that Europeans fished the waters around Pyrmont at least until 1875: ' … half a century ago[1875], one Johnson, a fisherman, used to haul his nets to add to the city's fish supply … [off CSR works]'(A.M., 1925).

Coastal middens attest to the importance of shellfish in the Aboriginal diet. Shellfish were prised off rocks by an underwater diver, using a woomera with a shell on the end(Turbet, 2001:57/9). The shellfish were cooked on a fire. Cockles would have been important to the aboriginals of Pyrmont peninsula.

Other sea-life, such as sea birds, seals, dolphins, whales and dugongs, were used as food opportunistically. The extent to which such resources were available to the aboriginals on Pyrmont peninsula is discussed elsewhere.

It is unclear to what extent the creeks of Pyrmont peninsula, and especially Cockle and Blackwattle Creeks, provided aboriginals with food. Eels, freshwater mussels and yabbies might all have been available.

Possums and gliders may have been an important food resource for aboriginal people on Pyrmont peninsula. These animals were either prodded out of hollows directly or, if the tree was fully hollow, a fire would be lit in a hole at the base of the tree to smoke out any animals inside(Turbet, 2001:62/5). Hunters would cut footholds in tree trunks, climbing to a height of at least 20 metres this way, to retrieve prey. Turbet(2001:65) surmised that possum hunting was likely less important in coastal districts as alternative food resources were available.

Both southern brown and long-nosed bandicoots were also hunted as food. They were disturbed from their well-concealed nests and then clubbed, speared, or set upon by dingoes(Turbet, 2001:65).

Kangaroo and wallaby hunting was an organised affair, in which a number of people would participate. An area of land, such as a valley, would be encircled, and the animals chased towards experienced spearmen, close to where the escaping animals had to pass (Turbet, 2001:65/66). The catch was roasted and eaten. Other animals, such as bandicoots, potoroos, snakes and lizards were also caught in this way. Often fire was an important part of the process.

Pit and funnel traps were also used by some aboriginals(Turbet, 2001:66/67), but whether this was the case on

Pyrmont peninsula is not known. Witchetty grubs were also regarded as a delicacy. Other wildlife – such as platypi, echidnas, flying foxes, dogs, bird's eggs were all collected by aboriginals as the opportunity arose.

According to Turbet(2001:68): 'The area around Sydney contains at least two hundred plant species the fruit, seeds, tubers or nectars of which are edible. It seems reasonable to assume that the Aborigines utilised most of these in season'. Fern rhizomes were an important food resource, being roasted in the ashes of a fire. Another staple food was the seed of the burrawang or macrozamia; they must be well-pounded and soaked to remove poisons, before being cooked in ashes. Other root crops which could have been used by the aboriginals of Pyrmont peninsula would likely include the Cumbungi(*Typha orientalis*), Gymea lily(*Doryanthes excelsa*)(the young flower stalks can also be cooked), some orchid species, pith from tree ferns, and the fruits of rainforest trees including figs.

Another source of nourishment for Pyrmont peninsula aboriginals would likely have been the nectar-rich flowers of plants like the heath banksia(*Banksia ericifolia*), Mountain Devil(*Lambertia formosa*), and Waratah(*Telopea speciosissima*). In some instances, the nectar was mixed with water, sometimes with honey, to make a pleasant beverage. The gum of the Sydney green wattle(*Acacia decurrens*) was soaked in water to produce a liquid accompaniment to the meal.

The food resources of Pyrmont peninsula and its adjoining waters and wetlands would have provided rich and varied diets for the local aboriginals up to, and for some time after, European settlement. Fitzgerald & Golder(1994:23) believed that the Aboriginals continued to camp near Tinker's Well at least into the 1820s and 1830s: 'In the 1820s Pyrmont was still effectively Aboriginal land … we have the testimony of the first white settlers who in their old age would reminisce that there were 'any amount' of Aborigines on Pyrmont in the 1820s and 1830s'.

By the mid-1830s though, European activities on the peninsula started 'to push Pyrmont's Aborigines down the peninsula to camp in the open spaces of Ultimo where, in the middle of the nineteenth century, they could still harvest cockles from the bays near Ultimo House'(Fitzgerald & Golder(1994:24). The peninsula was probably cleared of native vegetation soon afterwards, while Cockle and Blackwattle Bays were becoming polluted and silted as concomitants of European settlement. In short, the traditional food sources of Aboriginals were disappearing. Just when the Aboriginals left the peninsula is unclear, but their migration to the environs of Ultimo House could indicate that they vacated soon afterwards.

Their presence on the peninsula, probably for tens of thousands of years, effectively ended within 50 years of European settlement. Their departure signalled that a dramatic shift in tempo for all life on the peninsula was already underway.

5.2.2 Ecological consequences

Clark(1983) reviewed the complex issues surrounding the nature and extent of Aboriginal burning of native vegetation, one of the more likely impacts by these people on the ecology of Pyrmont peninsula. While natural fires, particularly from lightning strikes, would have been the commonest ignition source in the Australian environment before Aboriginal settlement, it is likely that fire regimes after this settlement would have modified the peninsula's vegetation although to an unknown extent.

Benson(1991) also recognised the difficulties in determining the effects of Aboriginal practices on Australia's vegetation 'because they occupied the continent simultaneously with great changes in climate'(p.344). There is a view, though, that ' … Aborigines played a maintenance role to the major determinant of vegetation, climate'(Clark, 1983).

5.3 Land clearing

5.3.1 Introduction

'And so began the immense struggle to subdue the country, to Europeanise it, to convert it into something quite different from what it had been before. It is estimated that within the first 100 years of white occupation one third of the forests of New South Wales were cut down to make way for farms and grazing lands of imported grass upon which sheep, cattle and horses could thrive'

Moorehead(1966:p.[1])

It is likely that the natural resources of Pyrmont peninsula were being exploited within days of settlement at Sydney Cove. According to Baglin & Austin(1980:30): 'Within three months not a single cabbage tree palm was left standing within 20km of the settlement. The natural beauty of the virgin country was quickly being desecrated'.

Early houses of the colony were made of daub and wattle and thatched with cabbage palm leaves(Andrews, 1986:50). According to Stephenson(1966: 190), the early settlers gathered wattles and reeds for their houses in Cockle Bay. He also noted that: 'The name [Blackwattle] bay was evidently conferred on it by boat parties sent there from Sydney Cove in 1788 to gather wattles and reeds for hut-building'(pp.214/215). Thorne(1979) noted that in 1789 building material for the development of Sydney was being supplied from the North Shore – grass, timber and bark were brought from an area extending from St Leonards to Lane Cove: 'Sydney of that era was a hamlet composed largely of slab huts covered with sheets of bark and floored with bricks or impacted clay'(p.1).

When John Hunter arrived to take up his appointment as Governor(1795), he noted: 'projects such as the burning of shells to make lime(used in the making of mortar) were initiated'(Baglin & Austin, 1980:30). According to Andrews (1986:50), the daub and wattle structures of the first settlers were being replaced by more substantial structures by 1800; these would have entailed the use of mortar.

Bigge(1966a), who visited Australia for 17 months between late 1819 and 1821, made several references to the use of natural resources around Port Jackson:

- 'The stone-cutters gangs are very numerous, and are distributed in five or six different places in and about Sydney, for the purpose of raising and quarrying stone as near as it can be produced to the buildings'(p.27)
- 'Eight boats carrying six coxswains and 38 men, are daily employed cutting grass for the Government horses and draught cattle … '(p.28)
- 'The daily task of the grass-cutters has been raised lately from 40 to 60 bundles of grass for each man, and it is procured on the banks of the Parramatta River or the tracts of unoccupied land adjoining' (p.28)
- Shell gangs retrieved oyster shells from the bed of the river 'when the tide is retiring' to generate lime; one site was Iron Cove(p.39)

Ritchie(1971) elaborated on these observations:

- Lime was being produced at the rate of about two thousand bushels a week in Sydney(p.6)
- According to the Chief Engineer, interviewed by Bigge on 8 November 1819: 'all the valuable wood within eight miles of Sydney has been cut down for some years past'(p.34)
- Mangroves were being used to make the felloes and stocks of wheels(p.112)
- Green and black wattle or mimosa were being used for tanning (p.114)

Peter Cunningham(1827), who visited New South Wales five times between 1819 and 1828, also saw woodmen and grass-cutters along the Parramatta River(p.91).

The intensifying use of the natural resources of Pyrmont peninsula was a precursor to land clearance. A view of Brickfield Hill by Edward Dayes in 1796 shows a forest clearing just north of the road to Parramatta, containing a small cluster of houses with fields of crops in the background(Figure 2.7). Of this, Collins(1975) observed in March 1788: 'a gang of convicts were employed, under the direction of a person who understood the business, in making bricks at a spot about a mile from the settlement, at the head of Long Cove[Cockle Bay]; at which place also two acres of land were marked out for such officers as were willing to cultivate them and raise a little grain for their stock'.

Bigge(1966b) described in some detail the process of land clearance: 'The system of cultivation pursued in New South Wales is of a very simple kind. The first operation consists of felling the timber, with which most parts of the County of Cumberland abounds, and burning it off. The trees are cut at the height of two feet from the root, after which they are piled into heaps and burnt; the land is once ploughed or hoed; it is then sown with maize, and where the means of the cultivator permit, the maize should be tilled and cleaned twice'(p.12).

5.3.2 Macarthur Estate

In an 1805 issue of the Sydney Gazette, it was announced that: 'several persons are in the constant practice of cutting and taking Wood from his[Macarthur's] Farm at Blank Cove[presumably Pyrmont Bay, which may not have been named at that time], opposite the Barracks, Sydney. This is to give notice that an Agent is now appointed for the preservation of the wood thereon …'(Anon, 1805).

Despite the exuberance of a 'select party of ladies and gentlemen' picnicking at the tip of Pyrmont peninsula on 18 December 1806(Fitzgerald & Golder, 1994:12), within weeks John Macarthur was exploiting his property both for its natural resources and as an early industrial site(p. 449/452).

The 1807 Cashbook for Pyrmont(Macarthur Papers, Vol. 7, ML A2903/CY 2308) has a record of paying woodcutters on 14 February, barely two months after the picnic party. On 22 March 1807, one Dunn was paid £2.10.0 're Acct. of falling Timber'. There was an entry on 25 April 1807: 'Paid for falling 45¼ Acres of Timber @ 12/-[per acre]'. Over four-fifths of Macarthur's Pyrmont Estate had been logged by some four months after the fateful visit.

By 10 June 1807, Pyrmont Estate was paying 'Soldiers on Acct. of burning of timber'. There were two further entries, on 25th July and 1st August 1807, to 'Soldiers on Acct. of Firemaking'.

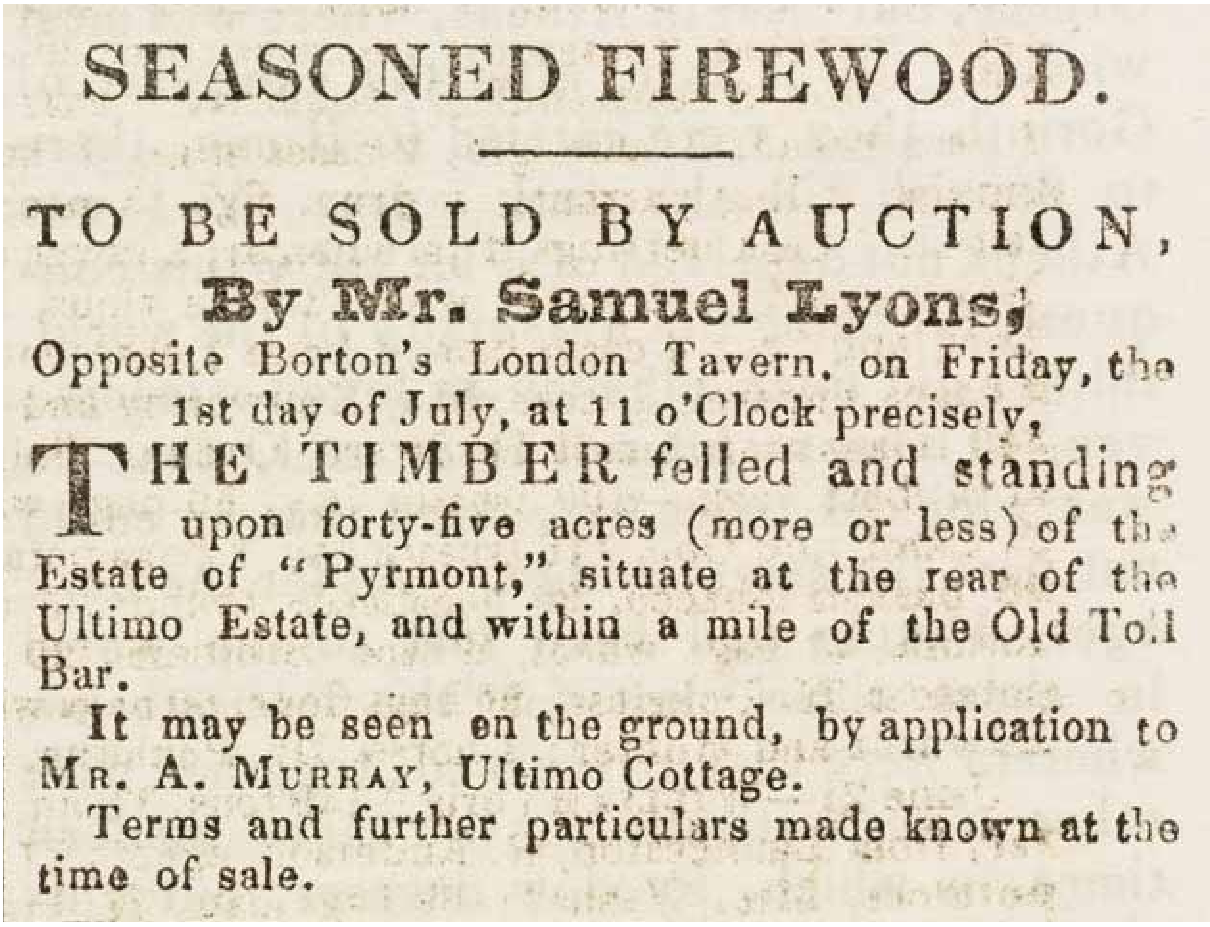
It appears, then, that Pyrmont Estate was substantially logged in 1807. The felled timbers were apparently either used to build Macarthur's windmill(p. 449) or burnt. Absalom West's engraving of Pyrmont peninsula in about

1812 (Figure 2.14) shows the thoroughness of this episode, with trees of the Harris Estate behind the devastation wreaked by the soldiers.

A more informative impression of the condition of Pyrmont Estate, in about 1819/1820, is provided by James Taylor's 'Cockle Bay, now Darling Harbour' (Figure 2.11). It shows that an area around Macarthur's windmill had been cleared. There was a large cleared area south of a line between Darling Island and the windmill, running almost from the shore to about halfway to the ridge. This area would have been roughly where Star City Casino is now. The southern head of Pyrmont Bay was rocky and wooded, and behind it was another open area with some individual trees evident.

It seems likely that, despite its early logging, the vegetation of Macarthur's estate was let regrow, for a view by John Thompson of the 'haunted' mill in Cockle Bay(Figure 2.12) in 1832 showed that part of the peninsula to be still predominantly wooded, with two clearings between the water and mill; Darling Island was still wooded. These may have been residual areas of the original woodland or more likely of secondary regrowth. Regardless, almost 30 years later, in 1836, Samuel Lyons was auctioning 'seasoned firewood' from the Pyrmont Estate(Figure 5.3.1). The proximity of Pyrmont peninsula to Sydney town permitted the commercial sale of firewood to inhabitants of the latter.

Figure 5.3.1: Auction of 'seasoned firewood'(SRL BN417: The Australian, vol.4(new series), no. 309, p.3(28 June 1836)



SEASONED FIREWOOD.

TO BE SOLD BY AUCTION,
By Mr. Samuel Lyons,
Opposite Borton's London Tavern, on Friday, the 1st day of July, at 11 o'Clock precisely,

THE TIMBER felled and standing upon forty-five acres (more or less) of the Estate of "Pyrmont," situate at the rear of the Ultimo Estate, and within a mile of the Old Toll Bar.

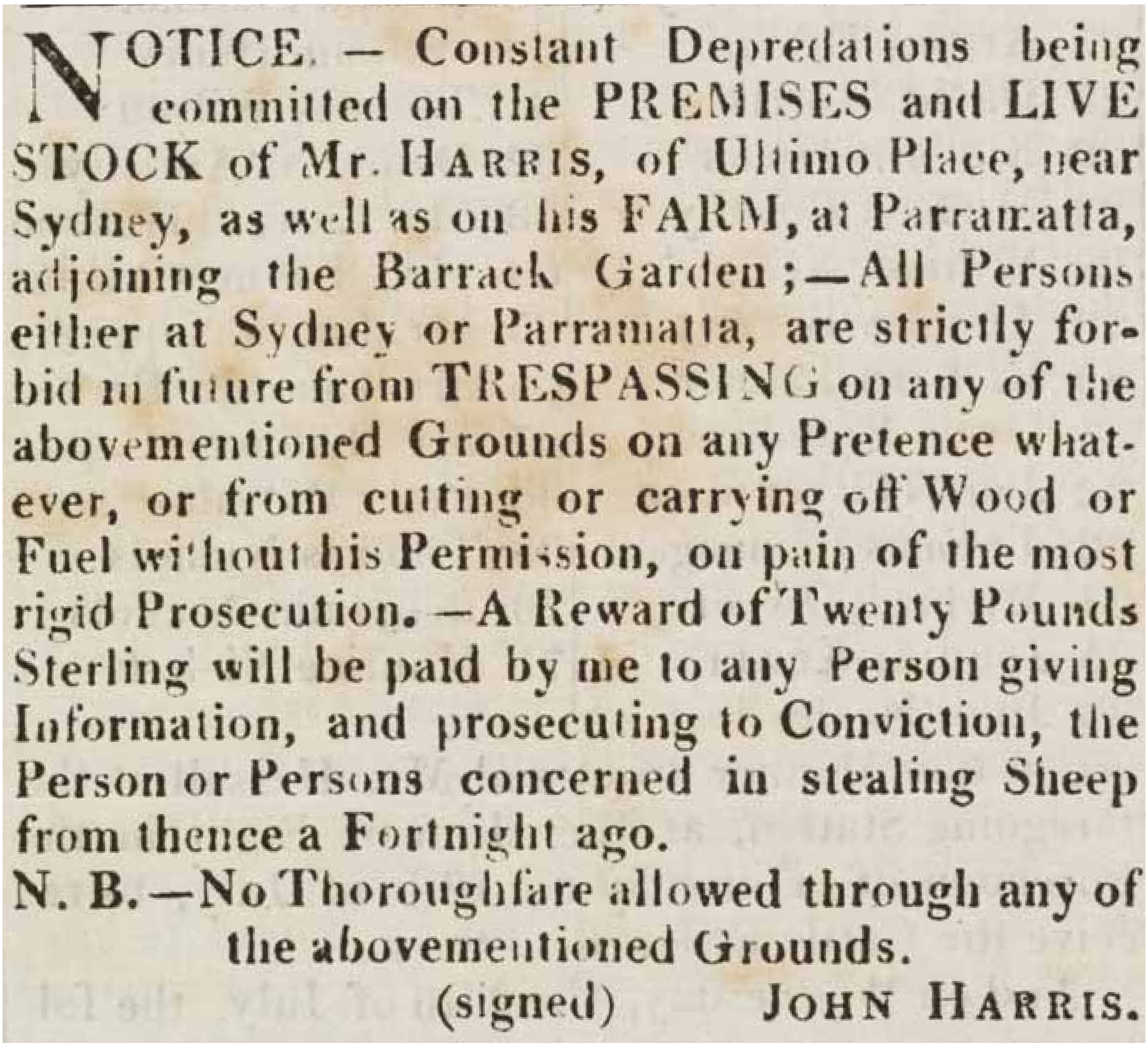
It may be seen on the ground, by application to Mr. A. Murray, Ultimo Cottage.

Terms and further particulars made known at the time of sale.

5.3.3 Harris Estate

An engraving of Ultimo House from the south by John Eyre circa 1813(West, 1814), less than a decade after the house was built, shows a bull, several sheep and deer on cleared land in front of the house(Figure 2.6). In 1816, John Harris warned against the removal of wood from his Ultimo Estate(Figure 5.3.2).

Figure 5.3.2: Harris, J., 1816, Notice(The Sydney Gazette and New South Wales Advertiser, vol.14, no.657, 22.6.1816, p.2)



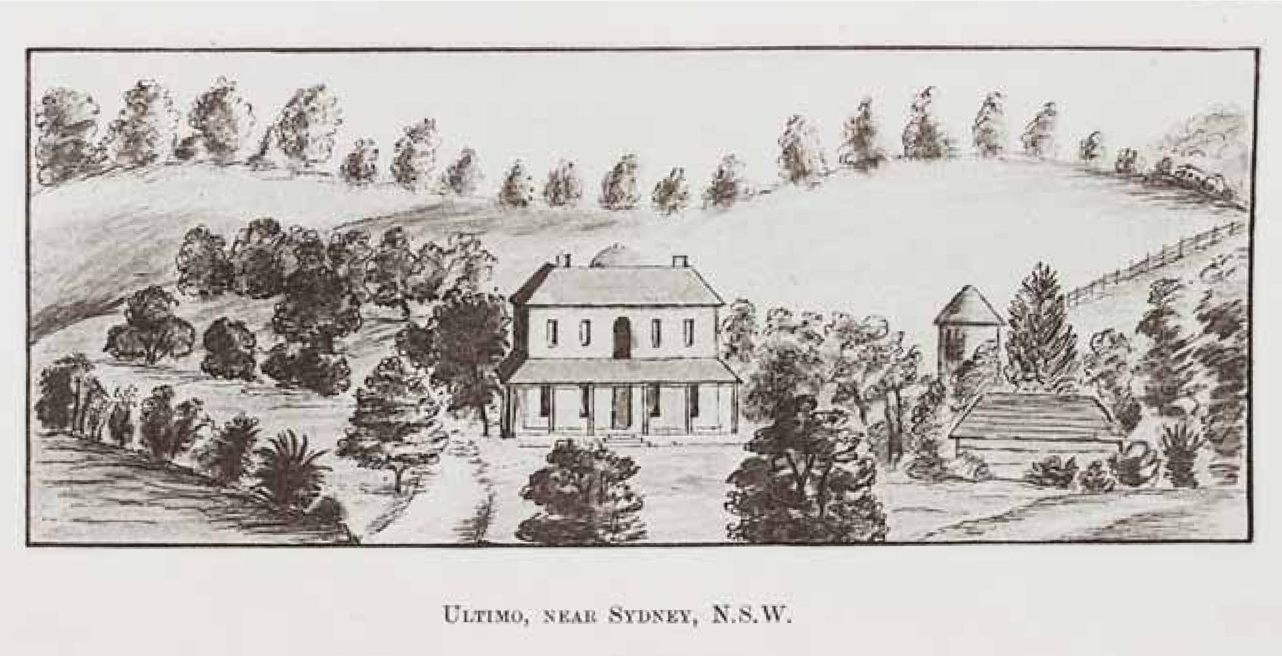
NOTICE. — Constant Depredations being committed on the PREMISES and LIVE STOCK of Mr. HARRIS, of Ultimo Place, near Sydney, as well as on his FARM, at Parramatta, adjoining the Barrack Garden;—All Persons either at Sydney or Parramatta, are strictly forbid in future from TRESPASSING on any of the abovementioned Grounds on any Pretence whatever, or from cutting or carrying off Wood or Fuel without his Permission, on pain of the most rigid Prosecution.—A Reward of Twenty Pounds Sterling will be paid by me to any Person giving Information, and prosecuting to Conviction, the Person or Persons concerned in stealing Sheep from thence a Fortnight ago.

N. B.—No Thoroughfare allowed through any of the abovementioned Grounds.

(signed) JOHN HARRIS.

Several artworks about 1820 show that the land around Ultimo House had been extensively cleared, to beyond Ultimo Cottage to the north and Cockle Bay to the east(e.g. Joseph Lycett's 'Ultimo' and Edward Mason's 'Ultimo'. The latter shows Ultimo House with a dome (Figure 5.3.3) The native vegetation around it had been entirely cleared by this time, with planted trees around the house and along some of the fence lines. There is a hilly area behind the house.

Figure 5.3.3: Mason, E., c.1820, 'Views of Sydney and surrounding district, Plate 27: 'Ultimo, near Sydney, NSW'(ML PXC 459/27)



Nonetheless, Taylor's work 'Sydney looking south from Flagstaff Hill' (Figure 2.9), painted about 1820) shows substantial areas of the Harris Estate still wooded. Joseph Lycett's 'South View of Sydney, New South Wales', dated 1819(Figure 2.10) shows the eastern side of Pyrmont peninsula to Darling Island as still heavily wooded. Edward Mason's 'Ultimo Place, with Cockle Bay'(1820) (Figure 2.8) likewise shows dense woodland between John Harris's cottage and Macarthur's windmill. Finally, Joseph Lycett's(1819) 'West view of Sydney taken from Grose's farm'(Figure 2.24) indicated that at the time natural vegetation still fringed the head of Blackwattle Bay on the Ultimo side.

Harris(1816:2) announced, inter alia, that 'All Persons … cutting or carrying off Wood or Fuel [from the Ultimo Estate] without his Permission, [were doing so] on pain of the most rigid prosecution'.

Fitzgerald(1990:17) described an incident between John Harris and Robert Cooper, his neighbour at the Brisbane Distillery across Parramatta Street: 'Cooper apparently made free with timber from Harris's land in the building of it, for in September[1825] Harris was instructing Wentworth, his solicitor, to instigate an action against Cooper for illegally 'cutting and slashing' on the estate'.

According to Godden Mackay(1994:15): 'Harris gradually cleared the land and utilised the majority of the estate for a deer park, and to graze sheep and cattle'. Indeed, it seems that Harris intentionally retained native vegetation on his estate to enhance the hunt. A notice in the Sydney Gazette of 18 September 1803 read: 'The Public are hereby CAUTIONED not to allow DOGS of any description to hunt about the inclosure belonging to Mr HARRIS, Known by the name of the SWAMP, in which Deer are kept'(p.1).

A little over three months later, on 11 December 1803(Sydney Gazette, vol.1, no.41, p.4), another notice advised:

> *'All persons are hereby strictly required not to permit their dogs to run on or about the Blackwattle Swamp, a Stag being at this time at large thereabouts, which by accident escapt a few days ago from the inclosure of J. HARRIS Esq.*

Dogs seen on or about the said swamp after this Notice will be shot, and the Owners prosecuted in case of damage'.

On 18 May 1806(Sydney Gazette, vol.4, no.166, p.1), a further notice advised that: 'Twenty head of deer having lately escaped from the inclosure of JOHN HARRIS Esq at the Blackwattle Swamp, all persons are hereby strictly cautioned against shooting or in any other way maiming or hurting of the said Deer, on pain of prosecution; and Owners of Dogs are at the same required to take Notice, that should any of the said Deer be harassed or torn, the Dog will be destroyed, the Owner prosecuted, and a Reward of Five Guineas paid by the above Gentleman to any informer prosecuting to conviction'.

It seems some of these deer reached Brickfield village, for the following advertisement appeared on 2 November 1806 in The Sydney Gazette(vol.4, no.190, p1): 'ADVERTISEMENT – Whereas several complaints have been made concerning the Deer belonging to JOHN HARRIS Esq., committing depredations on the gardens about Brickfield, it is that Gentleman's desire that any person in whose Gardens they may be hereafter found will shoot them, and return to him the dead bodies immediately after'.

Harris's penchant for deer is clear in this extract from his memorial, dated 9 July 1813, to Earl Bathurst: ' … one [herd] of spotted deer(the only one in the Colony), the number of which your memorialist believes to be about four hundred, and which your memorialist procured at great expense and risqué from India'(Jervis, 1926:66). Whether the whole herd was on his Ultimo estate is unclear, but more likely it was distributed across his several properties.

Finally, the following account of a deer hunt appeared in the Sydney Gazette in mid-1820(Anon, 1820a):

'On Tuesday last the fox hounds threw off near Ultimo House, the seat of Doctor Harris. After drawing the covers in this demesne, and not finding, they tried the glebe ground, where they put up a very fine doe. She took head towards Birch Grove, crossed the Parramatta road near Annandale, making for Cook's River; passing through Canterbury re-crossed the road at Petersham; at length, being closely pursued, she took the soil across the Bay from Colonel O'Connel's estate to Ultimo Point, the hounds giving tongue and swimming after her. The scene was truly interesting, as the melody of the hounds was encreased[sic] by the echo which was reverberated from the dells and deep caverns of the surrounding rocks. The huntsmen were thrown out, but soon rejoined, when they found the dogs breast high on the Point near the Windmill. After pursuing her some time she again took the soil, pursued by the hounds into Cockle Bay; but here, we regret to say, the hunt was foiled by some fishermen(who were in a boat) rowing after the deer, and taking her up in spite of all the hunters could say; they being in sight on the beech[sic], and the hounds within a few yards. We are sorry to find that Gentlemen are thus impeded in the few sports which this country affords; and we caution all persons from interfering in future with them, as we learn these Gentlemen are determined to punish to the utmost rigour of the law any persons who may either shoot at or entrap any game they may be in pursuit of.'

Reports of John Harris's deer span the period 1803 to 1820, suggesting that the Ultimo Estate was still largely in a natural state during this period. It may be that systematic land clearance in this estate began in the 1820s.

5.3.4 Later decades

By the 1850s, clearance of native shrubs and trees from Pyrmont peninsula appears to have been complete. A 'View of Kent St, and Darling Harbour, looking south' by W.S. Hatton in 1850(Figure 5.4.2) showed the peninsula to have but a few small clumps of trees, while another work by 'R.N.', titled 'Site of the University'(Figure 5.4.4), showed the southernmost part of the Ultimo Estate to be bereft of all but a few trees. Likewise, Christie's 'Pyrmont from Barker's Mills'(ML 1426) of 1859 depicts the central part of Pyrmont peninsula as clear of trees and devoted primarily to pastoral agriculture.

Paintings and photographs of the 1860s and 1870s confirm that the clearance of shrubs and trees from Pyrmont peninsula was essentially complete by this time; they include:

- Samuel Elyard's 'Johnstone's Bay', painted in 1865(Figure 2.16)
- Samuel Elyard's 'Glebe Bridge'(DGD 5/12 Elyard)
- Samuel Elyard's 'Glebe Island Bridge'(Figure 2.18)
- Francis Boyer's 'Sydney from Glebe Point', painted in1870/73 (Figure 2.22)
- Photographs of Harris Estate from Sydney, about 1872(DL PX 162)

5.3.5 Conclusions

The systematic clearing of native vegetation on Pyrmont peninsula began in early 1807. It seems likely that most, but perhaps not all, of the Macarthur Estate was cleared at this time, and that some secondary growth occurred subsequently. Clearance of the Harris Estate was an altogether more leisurely affair, and continued into the 1840s and perhaps later.

Although it is unclear when the peninsula was fully cleared of native shrubs and trees, the departure of aboriginals may provide a clue. According to Godden Mackay(1994:15): 'Contemporary sources indicate that aboriginal people continued to reside in Pyrmont until the 1820s …'. They moved closer to Ultimo House from 1836, and departed from the peninsula in the 1840s. These dates suggest that land clearance by then had eliminated much of the fauna from the peninsula and traditional hunting practices were no longer possible.

5.3.6 Ecological considerations

Not surprisingly, the impacts of land clearance on the ecology of Pyrmont peninsula would have been drastic and fast. Adamson & Fox(1982:110) graphically describe the impact of European settlement on the native vegetation of Australia:

> *'The arrival of European man less than 200 years ago was an apocalyptic event for Australian ecosystems. Within decades the Aborigines were displaced and all but destroyed by bullets, poison, disease and starvation. By this alone Australian ecosystems were altered, but the full and rapid impact of European settlement also involved grazing, cultivation, mining and urban development. The new human invasion brought huge numbers of new plants and animals, devegetation, soil changes, extinctions and population changes to the original organisms, and changed frequency and intensity of bushfires … In an instant on the geological and evolutionary scales of time Australia was overtaken by the agricultural and the industrial revolutions. The magnitude and the rate of these changes were unprecedented in the history of Australian organisms, and no other continent has experienced such rapid change.*
>
> *If the previous history of the region included environmental upheaval in relative isolation from the rest of the world … European man caused a cataclysm. The European invasion was a watershed beyond which Australian ecosystems are permanently changed. A revolution has occurred and no new steady state is in sight. Completely new ecosystems are being created from the interaction between human activities, the original organisms, the many successful immigrant organisms, and the changed environmental factors. Virtually the whole continent is in flux because the new impact is open ended and because not all changes instituted earlier have worked through the system. It is salutary to realise that the life-span of individuals of many Australian plants is greater than the total time since the European arrival, so that some plant communities contain abnormal numbers of ageing individuals inherited from before European settlement. In such vegetation, hidden changes have yet to become fully manifest.'*

A Queensland study (Cogger et al, 2003) gives some idea of faunal impacts of land clearance, providing 'a broad, rough average of animals killed by land clearing at about 223 vertebrate mammals, birds and reptiles per hectare'(ibid). Vegetation type, climate and biogeographical factors would have all determined the precise impact. Cogger et al(2003:4) identified a process of increasing faunal impact as land clearance progressed:

- Rapid death of individuals: 'Animals and plants are killed when their habitats are cleared, or die soon after by starvation or by predation'

- Local and Regional Extinction of Populations: 'Longer-term threats, such as habitat fragmentation and degradation, continue the path of decline. The richest habitats are typically cleared first and most extensively'
- Total extinction of species: 'Over time, successive cycles of local impacts and habitat fragmentation lead to the decline, endangerment(through local or regional extinctions) and then the final and irreversible extinction of a species'

Cogger et al(2003) estimated that, at the time of their study, over 2.1 million mammals(p.19), at least 8.5 million birds(p.24) and an estimated 89 million reptiles(p.29) were dying each year as a result of land clearing in Queensland.

In Australia overall, 'the extinction of 20 different mammal, 12 bird and 97 plant species have been partially attributed to land clearing'(Wikipedia, http://en.wikipedia.org/wiki/Land_clearing_in_Australia). Land clearing also leads to substantial losses in land condition and, on large enough a scale, to climate change.

Land clearing on Pyrmont peninsula alone would have caused large local extinctions of both flora and fauna. As this process occurred progressively through the Sydney metropolitan area, regional extinctions of many species would have occurred. This is clear from the attempts to reconstruct the flora and fauna of Pyrmont peninsula at European settlement in 1788, described in Part 4.

5.4 Agriculture

5.4.1 Historical perspectives

Use of Pyrmont peninsula for agriculture began within a decade of European settlement. A view from Brickfield Hill by Edward Dayes(Figure 2.7) in 1796 shows a forest clearing just north of the road to Parramatta, containing a small cluster of houses with fields of crops in the background.

A view of Ultimo House from the south by John Eyre about 1813(West, 1814) (Figure 2.6), less than a decade after the house was built, shows a bull, several sheep and deer on pasture in front of the house.

Writing in the early 1820s, Bigge(1966b:13) commented: '… it is only within the last two years, and upon a very few estates of the more opulent settlers, that any attempts have been made to introduce the cultivation of the artificial grasses. Lucerne, saintfoin and burnet are found to succeed in the alluvial lands; and rye grass and meadow fescue are considered as the best species for resisting the heat of summer …'. It is not known whether exotic species were used to enrich the pastures of Pyrmont peninsula.

Agriculture was well-established on the peninsula by the mid-nineteenth century. A view of Ultimo House in the early 1820s by Edward Mason showed extensive pastures around the building(Figure 5.3.3.). Emily Manning(1837a&b, Figure 2.23) sketched several views about Ultimo House, and these incorporated paddocks and/or livestock. One is a sketch taken from the back of Ultimo House, and shows extensive pastures leading down to Blackwattle Bay, although apparently flanked by native vegetation(Figure 5.4.1).

Figure 5.4.1: <u>Manning, E., 1837, View of Blackwattle Bay from Ultimo House</u> (ML SSV1/Har/Blacwt B/1;digitalorder no. a1528067)

Law(1844) recorded a C. Gardener, farmer, at Johnson's Bay, Pyrmont. Several paintings by W.S. Hatton(ML ZV1/1850/1, DG VIA/30, DG VIA/31) show the extent of agriculture on the peninsula in the 1850s. There seems a consensus that Hatton did not actually visit Australia but worked off photographs and/or lithographs in London(Platts, 1959; Williams, 1964; Grover, 1969; Kerr, 1992).

Figure 5.4.2: Hatton, W.S., 1850, Kent St and Darling Harbour(ML V1/1850/1c)

An unusual view of the peninsula was published in R. Montgomery Martin (1853)(Figure 5.4.3). The original sketch is by William Hardy Wilson, is undated, and was engraved for illustration by H. Bibby. Initially titled 'View of Sidney'(1853), then 'View of Sydney'(1855), it shows the eastern side of Pyrmont peninsula, Darling Harbour and much of Sydney town, with Goat Island in the middle ground. Notes on the back of a copy in the Mitchell Library's Small Picture File include: 'The near street bounded by the wall is Parramatta Street'. Handwritten below the sketch itself on this copy is 'From the old Cleveland Paddock'. The portion of the peninsula shown has been fully cleared, while the Cleveland paddock supports a small flock of sheep. It is worth noting that the track shown in this sketch meanders somewhat on its way to Pyrmont, thus pre-dating the construction of Harris Streeet. Fitzgerald & Golder (1994:24) date 'making Harris Street' as around 1836. It appears that Wilson's work thus preceeded its publication in Montgomery Martin's book by at least 17 years.

Figure 5.4.3: Wilson, W.H., 1853, View of Sydney(in Martin, R.M., 1853/55)(ML Q990.1/M(opp. p.109)

Godden Mackay(1994) provided an insight into arrangements specifically on the Harris Estate:

> *'A moderate degree of agricultural activity was undertaken on the estate by tenant farmers. Harris leased the arable and fertile tracts of land around the headwaters of Darling Harbour, Blackwattle Bay and other unspecified areas within the estate. In 1845 the Phillip ward rate books noted that the estate was 'dotted with about 51 one and two roomed huts, occupied by tenants … who built their own huts and cultivate what land suits them at £6 per annum.' The majority of huts were constructed from fairly primitive materials; wood slab, wattle and daub with bark or shingled roofs. A few stone and brick dwellings were noted as the exception, not the rule. Plots ranged from a quarter acre to one acre. Larger areas were also leased as evidenced by the large fenced areas depicted in contemporary plans. In 1855, a large cornfield(cultivated by Thomas Halloran), was located along Harris St. Some tenants conducted small scale enterprises from their allotments; Nicholas McNeil manufactured soap and John Bryan made bricks. The location of these allotments is unknown.*
>
> *Notwithstanding the occasional entrepreneur, the majority of the tenant farmers lived an anachronistic semi rural existence, gleaning a subsistence living from the animals and garden plots around their homes, which would probably have been supplemented by seasonal or casual work where available.*
>
> *The cultivated fields and most of the leaseholds noted in historical records are not depicted in contemporary plans. The precise location and number of these agricultural tenancies cannot be defined from the surviving*

historical records.

On 21 April 1855 all vacant land in the Ultimo Estate … was leased to Thomas Cardwell for the sum of £1 per week, to graze cattle. The lease was renewed on a weekly basis, and Cardwell was responsible for removing all dead cattle found on the estate.'

A view from the grounds of Sydney University, in 1854, shows the body of water later to become Victoria Park lake, the roads to Parramatta and Newtown, and the buildings along the southern extremity of the Ultimo Estate (Figure 5.4.4). The latter was essentially pastureland at this time, with few, if any, trees or shrubs. The initials RN on this illustration are thought to refer to James Glen Wilson, RN, an artist retained by the Royal Navy on HMS Herald, which visited Sydney for a second time between 1 January and 27 May 1854. It is believed that an unknown artist prepared a woodcut from an original pencil drawing by Wilson, and that this provided the illustration given here (catalogue notes, Mitchell Library). According to Higginbotham(1994:17-18) the Harris Estate ' … remained largely rural until subdivision from 1859 onwards'.

Figure 5.4.4: R.N.[J.G. Wilson], 1855, Site of New[Sydney] University (ML V/177; transferred from VI/[c] 1855/1)

Another view of Pyrmont peninsula in the 1850s was published in Gill[1856] (Figure 5.4.5). This time it is from Erskin[i.e. Erskine] wharf looking south-west over the first Pyrmont Bridge. Mrs Bunn's Cottage is clearly shown at the Pyrmont end of the bridge, while a few houses are dotted through a largely pastoral landscape. The incipient industrialisation of Sydney is evident from the high factory smokestacks.

Figure 5.4.5: Gill, S.T., 1856, Scenery in & around Sydney, Plate 5: Pyrmont Bridge from Erskin[i.e. Erskine] Street wharf, Sydney, Allan & Wrigley(ML DSM/Q981.1/G)

The raising of cattle for milk and meat seems to have been the main agricultural activity on the peninsula during this period. Fitzgerald & Golder(1994), for instance, refer several times to dairying:

- a dairy nearby to Athlone Place(p.37)
- '… the small dairies around the junction of Ultimo Road and Harris Street'(p.40)
- the dairy of Bridget O' Toole in Little John Street, Pyrmont(p.69)
- by the 1890s, there were 'only eight cowkeepers left in the city, five of them in Pyrmont or Ultimo'(p.69)

An occupant of Point Street, Pyrmont was a dairyman who had a 'cow house' at the rear of his property, in about 1867(Casey & Lowe, 1993:14), while a dairy operated at Nos 67/69 John Street, Pyrmont between 1873 and 1906.

It is evident that arable crops were also grown on Pyrmont peninsula, but not widely.

Notable later images of this agricultural period were those of Frederic Terry and Samuel Elyard. Terry's 'Grose Farm from the Toll Gate', dated between 1862/69, shows fenced pastures of the Ultimo Estate fronting onto the Parramatta Road(Figure 5.4.6): there are essentially no trees or shrubs left on this part of the estate. The smoke stacks of the industrial age were starting to dot the landscape.

Figure 5.4.6: Terry, F.C., 1862/69, Grose Farm[University of Sydney grounds] from the Tollgate(ML 315; Digital order no. a2291001)

Elyard's 'Darling Harbour'(1864) and 'Darling Harbour from Harris Street' (1867) take us further up the peninsula towards Pyrmont. In the former (Figure 5.4.7), post-and-rail fenced paddocks to the left of Harris Street contrast with the more roughly fenced lands of tenant farmers on the right-side. Most of the land to the right of Harris Street is devoted to pasture for grazing animals. Between the church and the first Pyrmont Bridge(built 1858) is Bunn's Cottage with its Norfolk Island pines. In-between the cottage and the artist is what may be a quarry. Just beyond the road in the foreground is a small cluster of simple cottages with their immediate surrounds fenced.

Figure 5.4.7: Elyard, S., 1864, 'Darling Harbour'(DGD 5 f25)

His 'Darling Harbour from Harris Street', painted three years later(1867), again contrasts the neatly post-and-rail fenced paddocks west of Harris Street with the more roughly fenced lands of the tenant farmers east of the road(Figure 5.4.8).

Figure 5.4.8: Elyard, S., 1867, 'Darling Harbour from Harris Street' (DG V* Sp Coll/Elyard/18)

Both paintings show the Darling Harbour Branch line, a decade or so after construction - cutting off the simple dwellings from Darling Harbour. The first Pyrmont Bridge, and St Bartholomews Church on the skyline, are also evident.

It is clear, particularly from photographs taken in the early 1870s(DL PX162), that the peninsula's pastures were also used to graze horses. These latter would probably have played an important role pulling carts and drays around the city. The photographs also show sheds well filled with hay, again probably collected for feeding the horses while in the city - perhaps also the cattle during winter.

5.4.2 Conclusions

It seems that agriculture was practiced on Pyrmont peninsula from soon after settlement into the early 1900s – for somewhat over a century. The land mostly supported pasture, although some crops were also grown. The heyday of agricultural production on the peninsula was over several decades in the mid-nineteenth century.

5.4.3 Ecological considerations

'Ground-level conflict derived from differing ecological visions. Anthropologist A.P. Elkin, writing in 1951, analyzed Aborigines' vulnerability, as "a food-gathering people", to farming and pastoral interests whose "usurpation of hunting and food-gathering grounds" undermined their livelihood. First, if the settlers are farmers, at once certain areas are put out of bounds". But "when cultivation is associated with grazing cattle and sheep … ever increasing in numbers, [they] require all the grass and must not be disturbed by the huntsmen's activities. So the native fauna must go, including the Aborigines, unless they change their way of living". When this was impossible, war often lead to genocidal massacres'

Kiernan, B.(2007: 252)

Conflicts between the ecological visions of the aboriginals and colonial settlers on Pyrmont peninsula would likely have been most intense during the transitional period(1820s/30s), as land clearance progressively gave way to agriculture. The aboriginal lifestyle would have contrasted greatly with the expectations of European agriculture as introduced by the settlers.

Adamson & Fox(1982:112) described the ecological consequences of pastoral agriculture, which predominated on Pyrmont peninsula after land clearance: "Vegetation cleared …, often leaving isolated shade trees which became senescent. Fertilisation and sowing of a large number of species of introduced legume and grass species in higher rainfall areas. Soil probably affected by trampling by hard-hoofed animals; grazing habits and intensity of sheep and cattle different from those of native animals. Soil erosion widespread. Fire regime severly altered. Altered insect and bird populations which in turn affect remaining eucalypts(one type of dieback)'.

Adamson & Fox(1982:123) described more specific changes to the temperate woodlands of south-east Australia, with grazing: 'rapid elimination of tall perennial grasses sensitive to grazing such as *Themeda australis*[Kangaroo Grass], progressive removal of shorter perennial grasses, an increase in unpalatable native annuals and perennials, the rapid establishment and dominance of introduced annuals and occasional perennials, and finally the sowing of fertilised pastures'.

These changes would have broadly occurred on the cleared lands of Pyrmont peninsula, although the extent to which the lands of the peninsula were improved by the sowing of fertilised pastures is unclear.

The effects of farming were also felt by the wetlands of the peninsula, as described by Fitzgerald & Golder(1994:39): 'Scraps [from the slaughterhouses] were also fed to the hundreds of pigs who roamed the swamp[Blackwattle], more or less under the control of keepers like Pig Mary ..'

At another level, the introduction of exotic plant species became a double-edged sword for the early settlers. According to Tanner & Begg(1983:10/11):

'The man most instrumental in the introduction of plants to the Colony was Sir Joseph Banks. His voyage with Cook in 1770 provided the basis for his interest in New South Wales, and this continued throughout his life. The position which Banks held at Kew, that of director of scientific operations, aided this exchange, with 'cases and seeds of useful plants being sent to the antipodes, while the cases were returned to England with living plants for the Royal Gardens, together with seeds of interesting plants'.

Sir Joseph Banks was Governor Phillip's principal adviser concerning the introduction of economic plants to the Colony of New South Wales. However, the first plants introduced … were certainly those obtained *at Rio de Janeiro and the Cape of Good Hope by Phillip in 1787 …*

When the second fleet was being prepared, Banks proposed to the Under Secretary Nepean that the Guardian, a fast sailing vessel, be fitted to convey useful plants to the Colony … This vessel left for the Colony in November 1789 … At the Cape of Good Hope she … completed a plant inventory containing about 150 of the finest fruit trees. Resuming her voyage on 23 December 1789, the Guardian struck an iceberg. Her loss was one of the most severe blows to the Colony …

Again Banks suggested(30 April 1794) to Nepean that the Reliance be fitted with containers for plants. The subject was raised again on the 15 May 1798, when the Porpoise was about to leave for Sydney. This ship was equipped with a plant cabin on a quarterdeck fitted with boxes as suggested by Banks.'

Sir Joseph Banks remained interested in the introduction of new species to New South Wales until his death in 1820. When Governor King compiled his 'List of Plants in the Colony of New South Wales that are not indigenous, March 20th, 1803' it comprised 29 varieties(Tanner & Begg, 1983:11). According to McTaggart(1945:56): 'From the time of arrival of the "First Fleet" in January, 1788, plants have been introduced into Australia. Individuals, companies, acclimatization societies, botanic gardens and State Departments of Agriculture have played their parts in populating the country with exotic plants, while many species arrived as "stowaways" …'. Today, there is an estimated 1036 naturalised garden plant species and taxa that are an actual or potential environmental and agricultural weed(WWF-Australia, 2006).

An early account of problems with exotic plants was given by George Caley (1803) in respect of *Lolium temulentum*. According to Campbell(1901:52): 'This *Lolium* has long been termed poison rye-grass in Europe, but so far as is known the poison lies only in the fungus termed ergot, to which this grass seems to be very subject … the fungus is mixed up with the wheat grown, and becomes mixed with the flour, causing sickness, headache and so on. Should this fungus be taken in quantity it is liable to cause gangrene and death. Cows feeding on ergotised grass are very liable to abort …'.

John Harris made his own contribution in this regard, as is clear from the following notice of 30 April 1814 in The Sydney Gazette(vol.12, no.40, p.1), titled 'Ten Guineas Reward':

'WHEREAS during the Night of Saturday the 23rd, or early in the Morning of Sunday the 24th Instant, some daring Villains entered the Grounds of Ultimo, near Sydney, and stole therefrom … Four Guinea Fowls, which had been imported for the Purpose of introducing their Species into the Colony …'.

Today, 485 species are on the 'Noxious Weed List for Australian States and Territories'(Australian Weeds Committee, 2009).

5.5 Sandstone removal

5.5.1 Introduction

Sandstone was the primary substrate for life on Pyrmont peninsula for millions of years before Europeans arrived. The flora and fauna of the peninsula would have had a complex interaction with it, one which would have changed with other variables like season, rainfall, fire etc. The ecology of the peninsula was progressively diminished through land clearing followed by a series of land uses unsympathetic to ecological values.

An overview is provided here of those human activities which modified the sandstone substrate of Pyrmont peninsula in various ways. Quarrying is an obvious candidate, and its widespread practice across the peninsula must have greatly affected the native flora and fauna which had survived to that time. But other forms of sandstone disturbance would have been similarly impactful. Among these, the levelling of extensive areas of the peninsula's topography for railway construction would have had considerable adverse ecological impact. Major impacts would also have resulted from the urbanisation process, with the widespread construction of buildings and their associated infrastructures – water supply, roads, energy supply, drainage, waste disposal among others.

The first two of these influences on the ecology of Pyrmont peninsula are addressed here, as substantial information is available on each. The adverse impacts of urbanisation on the sandstone substrate of the peninsula are briefly considered.

Figure 3.4 shows the peninsula's topography as surveyed by Sir Thomas Mitchell in 1853. Mitchell's map clearly shows the dominant sandstone outcrop of the peninsula, running between (what is now) Distillery Hill and Mount Street. This section of Pyrmont was then more-or-less a large plateau, the saddle now evident between the two ends being due to quarrying. A notable spur ran almost northerly from Distillery Hill to the present junction of Bank and Bowman Streets but, again, most of this spur has been removed by quarrying. Another important sandstone outcrop ran south-easterly from Pyrmont Point to where St Barholomew's church once stood and then, as now, fell away sharply a little south of the church. Much of this outcrop was quarried by the McCredies, leaving the much-diminished hump of today. Another significant outcrop constituted Darling Island, to be fully levelled by Charles and Robert Saunders respectively. Bunn Street still sits atop a lower outcrop with spurs in four directions which once defined the large rock mass jutting out into Darling Harbour below Pyrmont Bay. This rock mass was whittled back as Darling Harbour goods yard progressively extended up Pyrmont peninsula. There were also low rocky outcrops just behind the shoreline of Blackwattle Cove, in the central sector of the peninsula.

The materials from which this sandstone formed were deposited by large rivers between 278 and 230 million years ago, when Australia was part of Gondwana(Ray, 2000:152).

5.5.2 Sandstone quarrying

A) Introduction

Quarrying has occurred on the peninsula at least since the 1820s, perhaps a decade or so earlier. Quarrying activities may have been substantially boosted when Macarthur imported 25 stonecutters and masons in 1826 to build a house on Pyrmont which never materialised(Matthews, 1982:24). Also, the Rev. Dunmore Lang imported nineteen Scottish stonemasons in October 1831 to help build his Australian College(Anon, 1831); they were retained for this purpose for 12 months after their arrival in Sydney(Baker, 1985:80). However, none is listed as a quarrymaster in Table 5.5.1.

The first recorded use of Pyrmont sandstone outside of the peninsula appears to have been in the building of Cooper's Chippendale distillery in the 1820s (Fitzgerald & Golder, 1994:15). Newington House at Silverwater was completed in 1832 with a colonnade of 14 Doric columns, long-rumoured of sandstone from Pyrmont(Houison, 1934, Scurrah, 1963:1, Baglin & Austin, 1980:163, Morris, 1993); each column was of one piece.

There were a few small quarries on Pyrmont through the 1830s, and by the mid-1840s the end of the peninsula was 'pock-marked' with quarries (Fitzgerald & Golder, 1994:28).

In 1840, the NSW Government Gazette(v1840/2 n84 p1383) carried the notice: 'All permissions to Quarry from the Government Lands in the neighbourhood of Sydney … will be withdrawn from the 31st Instant, and all persons found Quarrying or removing materials of any description after that period will be prosecuted'. This edict may have helped formalise the quarrying industry around Sydney. The Operative Stonemasons' Society was formed in 1852(Irving, 2006).

An early - and distant - use of Pyrmont sandstone was in the construction of 'Boyd's Tower', some 506km south of Sydney, in 1846. It is a 'solid, monolithic structure … intended as a prominent landmark to reflect upon the glory of Boyd's good name and enterprises, as well as a whaling lookout and a lighthouse'(http://www.walkabout.com.au/fairfax/locations/NSWBoydtown.shtml).

By the late 1840s/early 1850s the quality of Pyrmont sandstone became more widely recognised and, coupled with the construction of major buildings in Sydney, this led to 130-140 loads of stone being carted out of Pyrmont daily by bullock teams in the late 1850s(Fitzgerald & Golder, 1994:33), At this time, half of the 44 quarrymen listed in Sands Directory were from Pyrmont (ibid). There were 21 quarries operating in Pyrmont by 1854 (www.amonline.net.au/geoscience/earth/sandstones.htm).

This broad pattern of events is borne out by the Sydney directories of the time. Low(1844) listed three stonemasons and one quarryman living in Pyrmont at that time. Just 14 years later, Sands and Kenny(1858) listed 22 quarrymen for Pyrmont. Known quarrymasters of Pyrmont peninsula are listed in Table 5.5.1.

Table 5.5.1: Known Quarrymasters, Pyrmont peninsula

Name	Location	Period	Source
Agnew, Thomas	Leased lots 3 & 4, 2nd portion, Pyrmont Estate	April 1841 -	4
Carroll, Michael	Allowed to quarry on Pyrmont Estate		4
Cowsley, John	Ultimo Quarries	mid 1840s	5
Crampton, George	Leased a quarry in August 1842, but never commenced		4
Crossland	Pyrmont		2
Doyle	Pyrmont		2
Earnshaw, William	Pyrmont	Early 1820s	1
Erwin	Pyrmont		2
Fulton, William	Pyrmont	Pre-1862 to 1890s	2

Name	Location	Period	Source
Hayes, R.	Darling Point, Pyrmont	May 1841 -	4
McCredie, Thomas	Pyrmont		2
McKeon, W.Humphrey	Darling Point, Pyrmont	June 1841 -	4
O'Brien	Pyrmont(ballast quarrying)	1870s	6
Owen	Pyrmont	Pre 1862 to	
Pearce	Pyrmont		2
Reynolds, Andrew	Leased an allotment on Pyrmont Estate	Early 1840s	4
Ryan, Nicholas	Pyrmont	To about 1900	2
Saunders, Charles	Pyrmont/Ultimo	1853-	2,3
Saunders, Robert	Pyrmont/Ultimo	1870s-1929	3
Thompson, Samuel	Darling Point, Pyrmont	December 1840 -	4

Sources of information:

1. Morrison(1929)
2. Irving(2006)
3. Waugh & Cox(1855)
4. Macarthur Papers, vol.98, Pyrmont Estate 1832-1870(ML A2994: Reel CY2991)
5. Low(1844)
6. Godden(1978): Matthews(1982)
7. Hagarty(2005)

B) Macarthur Estate

i. Early developments

Anon(nd) described early sandstone quarrying on the Macarthur Estate as follows: 'Some intermittent quarrying was carried on, but the valuable beds of freestone which have since been opened up on that and the neighbouring [Harris] estate were so thickly overlaid with "surfacing" that the greater part of the stone turned out was used for such purposes as ballasting vessels. This rough quarrying was the only improvement which had been effected in Pyrmont at the time of Captain Macarthur's death in 1834'.

A more particular account is given by Casey & Lowe(nd): 'The northwestern point of Elizabeth [Macarthur] Bay was known as Ballast Point, the source of much of Sydney's ballast for ships, roads and railway building'.

According to Morrison(1928:205): 'Perhaps W. Earnshaw was the first to establish a sandstone quarry for building stone in Pyrmont. He supplied sandstone for the old St Mary's Cathedral', the foundation stone of which was laid in 1821(as St Mary's Chapel which, in 1835, became the cathedral). The Earnshaw family lived in Mount Street, Pyrmont, and presumably worked nearby.

On the eastern side of the peninsula, Thomas McCredie and his family were establishing quarries around Point, Bayview, and Mill Streets in the late 1860s/early 1870s to supply their building projects(Fitzgerald & Golder, 1994:45). It is worth noting that James Martyr's 'View of Pyrmont and Balmain'(Figure 2.15) depicts a quarry at this location in about 1844, over two decades before the McCredies began to work the site.

ii. Darling Island

Initially called 'Cockle Island', due to the abundance of shellfish on the shores of then Cockle Bay it was, according to Davies(1984:70) 'a rocky inhospitable place of no more than a couple of hectares …'. Its early state is well-illustrated in Joseph Lycett's 1819 watercolour 'South View of Sydney, New South Wales' (Figure 2.10).

The island was levelled by the Saunders family, but by whom and when needs clarification. Matthews(1982) believed it was levelled by Charles Saunders in 1855 for the Australian Steam Navigation(ASN) Company. Davies(1984:71) elaborated this view: 'In 1854 … ASN Company … contracted Charles Saunders to level the island and connect it to the mainland'. The narrow causeway thus built remained at least until 1865(City Engineers Department, Municipal Council of Sydney, 1865, Map X2). On the levelled area ASN built what, for more than a quarter of a century, was one of Australia's foremost slipways and engineering workshops(see also Hagarty, 2005:329). Irving(2006), on the other hand, believed that Robert Saunders levelled Darling Island in about 1889, the stone extracted being used to make a sea-wall on the western side of the Island. Fitzgerald & Golder(1994:45) noted: '… the tradition which says that in 1855 Charles Saunders levelled Darling Island for the ASNC is misleading. This massive project was quite beyond Saunders' early resources and in fact it was his son Robert who remade the Island in the mid-1880s'(p.45). It now seems clear that Darling Island was levelled in two stages, with Charles Saunders levelling the north-western section in about 1855 so that ASN could install a patent slip. According to Matthews(1982:24): 'The contract time for excavation, quarrying and removal was two years; it was completed in one year'. An 1875 photograph(Anon, 1875) showed that only the tip, about a third, of Darling Island had been levelled at that time. The resultant rock face is shown in Frederick Garling's painting of the patent slip on Darling Island, dated as between 1859/68(Figure 5.7.3). Robert Saunders completed the island's levelling in 1889, ready for its use as part of the Port of Sydney(see p. 552/553).

Today, Darling Island has none of its former character, being a flat and rather lifeless appendage to the peninsula.

iii. Recent

Quantities of yellowblock sandstone have been quarried from Pyrmont in recent years:

- 200 cubic metres was retrieved during excavations for the Capitol Apartments 'Sydney Harbourside' development in 1996(Totaro, 1996)
- Over 4500 cubic metres(about 20,000 tonnes) were recovered from the CSR site between Cadigal Avenue, John and Mount Streets in 2000/01, now broadly defined by the tennis courts and much of 'The Mews' development (CMPS&F Environmental, 1994).
- In 2000, Troy Stratti excavated an estimated 7,000 tonnes of stone from the Jackson's Landing development at Pyrmont; a further 3,000 tonnes were retrieved in early 2001(O'Brien, 2001).

C) Harris Estate

i. Introduction

The earliest sandstone quarries on Pyrmont peninsula may have been located on the Ultimo Estate, closer to the construction sites of Sydney. Low's Directory(1844) listed three individuals as associated with 'Ultimo Quarries', suggesting that these latter were well established by that time.

ii. Railway quarries

Hagarty(2005) made several references to the sandstone of Pyrmont peninsula in respect of the Darling Harbour Branch Line:

- 'In the 1850s the Ultimo-Pyrmont area was the source of much stone for the buildings of Sydney. The quality of what stone was available along the line is not known but it may be assumed that a stone culvert could be made from it. It is known that Randle started a quarry on private lands near by on the Harris Estate for which the owner, a Mr Donovan, claimed a fee of £80. Possibly, facing stone was obtained from the quarry with stone from the line used as rubble filling. This would be cheaper than bringing bricks to the area' (p163)
- 'The straight Branch main line required extensive excavation through rock …'(p231)
- 'The stone arch bridge[on Parramatta Street, today at Railway Square] could also be built mainly from the Darling Harbour end where there were large quantities of suitable stone both on the railway reserve and from private quarries at Pyrmont'(p232)
- 'The attractiveness of stone reflected the amount of good quality stone available in the vicinity of the branch of the railway from the major stone quarries used for buildings throughout Sydney. This stone would have been easier to use and be more durable than bricks. One known supplier was a Mr Donovan, another was Robert Saunders'(p235). At the time of construction, 1854, it would have been Charles rather than Robert Saunders
- Stephen Chandler, writing of a time in 1854 when the first rails were laid from the Parramatta Street Bridge work site towards Darling Harbour, noted: 'This work was carried on to the Pyrmont Quarry which was very high and of freestone …'(p236)
- ' … more timber was used on the Darling Harbour line bridges than Wallace originally intended considering the readily available stone from adjacent quarries supplying the Sydney builders'(p403)
- Additionally, James Wallace, Engineer-in-Chief of the Sydney Railway Company, noted: 'Stone quarries have been opened upon the Harris Estate' to provide construction materials for the line (Sydney Railway Company, 1854:4)
- While discussing rock excavation rates at a meeting in November 1854, William Randle advised that the 'stone cuttings on the Darling Harbour Branch … were blasted out with the rock being used in the wharf area …'(Hagarty, 2005:176).

It seems likely that at least two, possibly more, quarries were opened on the Harris Estate in about 1854 to provide ballast for the Darling Harbour Branch Line being built at that time. Logically, these quarries would have been close to the construction site, to minimise cartage. A series of early photographs of the Pyrmont peninsula, taken from Sydney ('Sydney Harbour, 1865-1930', DL PX 162), show four substantial quarries on the east-facing slopes of the Ultimo Estate. Three of these were immediately adjacent to the railway line. Accounts of these three quarries are given in Table 5.5.2.

Table 5.5.2: Likely railway quarries, Ultimo Estate

Figure No.*	Comments
34	This quarry was located along the northern side of the inlet severed from Darling Harbour by construction of the Darling Harbour Branch Line. It may have supplied ballast for construction of the railway across this inlet. It is well illustrated by Henry Grant Lloyd in his painting of Darling Harbour in 1857/58 (Lloyd, 1863)(Figure 5.9.1); Lloyd's painting also shows the first Pyrmont Bridge and Mrs Bunn's cottage. It may also be the quarry referred to by Matthews(1982:47): 'In October 1881 the roof of the [Murray Street] school building was damaged by rocks from the nearby quarry. Complaints were made and school officials were assured that there would be no recurrence'. It is also likely the quarry shown on Map L3 of the City of Sydney Metropolitan Detail Series – albeit in a much truncated form due to extension of railway lands towards Murray Street. The quarry would have been effectively lost when the railway was further extended almost to Murray Street.
35	This quarry extended between Fig and Quarry Streets, and had two faces in different sections of Block 37 of the Ultimo Estate. Today the lower section is a car park in Pyrmont Street behind the former Government Printers building(ML Digital Order Nos 1729002/4). This may now be the oldest quarry face extant on Pyrmont peninsula.
41	A deep rock face existed between Harris and Pyrmont Streets, Macarthur and Mary Ann Streets. An 1888 map of the site in the City of Sydney Metropolitan Detail Series shows a difference in building style above and below Omnibus Lane, with terrace houses above and possibly factories below(NSW Department of Lands(1883-); this break in building type could indicate where the quarry face was once located. Between 1899 and 1956 the lower site was occupied by the Ultimo Tram Depot, the first all-electric depot opened for the Sydney tramway system. There appears to be no remnant of the original rock face today(ML Digital Order No. a 1729001). The quarry face is well defined in Figure 17 of Aplin & Storey(1984), being highlighted by sunshine.

* Numbers refer to Figure 5.5.8

A fourth quarry is also evident in one of the 1865 photographs(ML Digital Order No a1729002), on Block 24 of the Ultimo Estate(numbered 40 in Figure 5.5.8). It probably extended between William Henry and Macarthur Streets, and fronted onto Harris Street. The quarry face reached the eastern side of Hackett Street. It is still evident behind terraces fronting Harris Street, although the adjoining commercial buildings seem to have incorporated the quarry face into their fabric. The proximity of this quarry to the one between Macarthur and Mary Ann Streets, and its extra distance from the railway line, suggest that it was unlikely to have supplied material for construction of the line. More likely, it provided stone for 'buildings throughout Sydney', and could have been the 'Ultimo Quarries' referred to above.

Christie's painting 'Pyrmont from Barker's Mills'(ML 1426) clearly shows two of the quarries, most probably the northernmost(Figure No.34) and that between Fig and Quarry Streets(Figure No.35). Each quarry adjoined a section of the Darling Harbour Branch Line which would have required considerable ballast to build.

iii. Saunders quarries

It is well-known that the Saunders family developed the largest quarrying concern on Pyrmont peninsula. Charles Saunders reached Sydney on 9 April 1852. He 'leased land from the Harris family in 1853 and established a quarry on the north-west of Pyrmont where there were already minor ballast quarries operating and where there was also a sizable population of Scottish stonemasons brought out by the Rev. Dunmore Lang from Clyde in 1831' (Matthews, 1982:22). Initially, Saunders provided ballast for the railways (Fitzgerald & Golder, 1994:45).

Fitzgerald & Golder(1994:45) record that during the 1860s the Saunders family extended their quarries northwards from Fig and Quarry Streets to Miller Street and, eventually, right around the north-west tip of Pyrmont peninsula to Johnston's Bay.

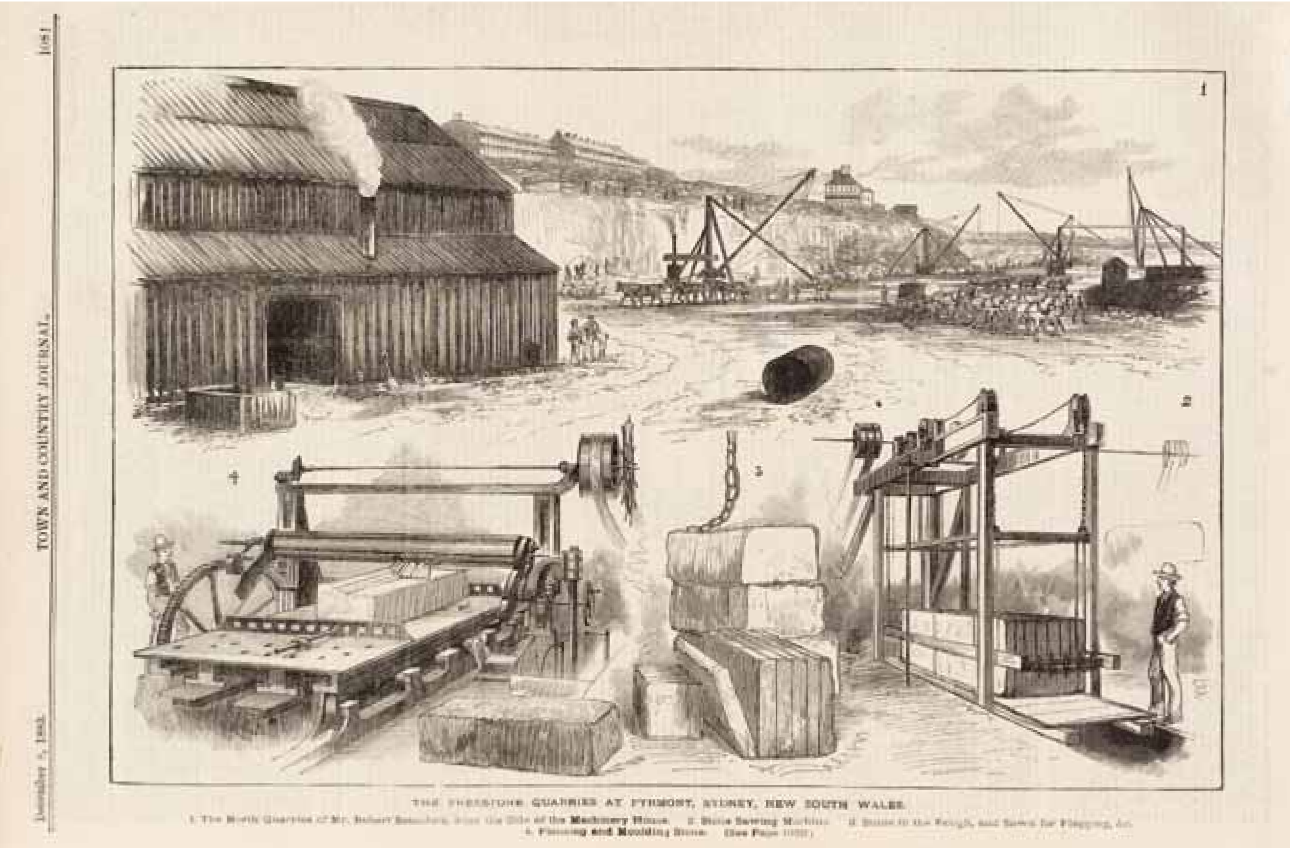
The Saunders family had three major quarries on the peninsula:

Hell Hole was apparently named after 'a fairly deep excavation … made on this land to get to the bottom of the main block'(Anon, 1917:50). The quarry floor extended to some twenty feet(6m) below street level(Irving, 2006:27). The quarry wall varied from 40ft(12m) to 60ft(18m) in depth(Anon, 1883). It eventually stretched from about Quarry Street, across what is now Fig Street, and through the present Wattle Street depot of City Council(Irving, 2006:27). Indeed, Quarry Street was apparently constructed over the old quarry(Balint, 1984:102). The depot site apparently constituted the initial quarry, for: 'Adjoining this quarry, where Winchcombe Carson's store[The Ultimo Trade Centre] now stands, a quarry was opened by the late Sir [sic] John Young to obtain stone for the first portion of the General Post Office, the quarry was not a success financially and Mr Young arranged with Mr [Robert] Saunders to take it over – cranes and all – and supply him at a fixed rate'(Anon, 1917:50).

This observation seemingly confused John Young the builder with Sir John Young, a Governor of New South Wales. The first section of Sydney's General Post Office was started in 1866 and completed in 1874. John Young, the builder, moved to Sydney from Melbourne in 1866, and engaged with various major projects(Johnson & Roberts, 1976). Young invested in quarries in both Sydney and Melbourne. It seems likely that he acquired the Ultimo quarry soon after arriving in Sydney, and passed it to the Saunders family shortly afterwards. Hell Hole quarry can probably be dated by these observations, from the late 1850s/early 1860s. This relates well to the comment by Morrison(1928:212) that: 'The first quarry in which "yellow block" stone was worked systematically was established at Pyrmont more than sixty-three years ago …'.

An 1883 sketch gives some idea of the scale of operations at this quarry(Figure 5.5.1).

Figure 5.5.1: <u>Anon, 1883, The freestone quarries at Pyrmont, Sydney, New South Wales</u>(SRL TN83: Australian Town and Country Journal, vol.28, no.726, 8 December 1883, p.1081).



After exhaustion, Hell Hole was used as a rubbish dump, followed by construction of the Winchcombe & Carson woolstore in 1890. The former Commonwealth Wool and Produce store was built in 1899 at the corner of Wattle and Quarry Streets(Irving, 2006:38). Robert Saunders initially leased what was to become the Wattle Street depot to City Council in 1906 for use as a tar distillation plant

<u>Purgatory</u> was north of 'Hell Hole', and extended from just south of Miller Street(Cooke, 1888) as far as present-day Pyrmont Bridge Road (Irving, 2006:27). It was worked out and progressively filled in from the 1890s(Irving, 2006:27), some of the fill coming from excavation of the Queen Victoria Markets(now QVB) basement. One face of this quarry was 77 feet(23m) high.

<u>Paradise</u> quarry began as Charles Saunders' workings in the early 1860s between Miller Street and Gipps Crescent(Irvine, 2006:83). Robert Saunders reactivated the quarry in the late 1870s(Fitzgerald & Golder, 1994:52). By 1917 it extended north-westwards from Miller Street towards John Street, to what is now called the Saunders Street Cliff Face(Irving, 2006:29/30). Thence it continued practically to the end of the peninsula(Fitzgerald & Golder, 1994: 52). A City Council incinerator was built on part of the quarry in the mid-1870s.

Ron Powell(pers.comm., 1 Feb 2006) commented: 'What I can definitely 'vouch' for is that the "Paradise" quarry extended well below the present level of Saunders Street where it meets Quarrymaster Drive. I witnessed an excavation at the former quarry face in about 1996 … The excavated material was then (temporarily) pushed up against the cliff to allow a tracked machine to "climb up" the cliff face to trim off a piece of overhanging rock, part of 'cliff stabilisation' work'.

Tinkers Well is mentioned by both Matthews(1982) and Fitzgerald & Golder(1994). Matthews described the role of the well in providing water first for aboriginals and then European settlers 'right up to the beginning of the present century'. Regrettably, this was 'one of the landmarks that disappeared as the cliffs were quarried back'(Anon, nd) (but see p. 59).

Charles Saunders also quarried the site of the Primitive Methodist Church in the mid-1870s, to bring it to the level of Harris Street. The quarry wall is still partially visible behind the Maybanke Centre.

Figure 5.5.2: *Detail from* Cooke, A.C., 1888, Sydney in 1888 (ML XV1/1888/4)

Figure 5.5.2 is a detail from a fine aerial view of Sydney. Of particular interest are the two quarries shown in the bottom right-hand corner of the print. Comparison with the City of Sydney map for the same year, in Irving (2006:29), is instructive. The triangle of roads where Gipps and Harris Streets intersect is clearly visible on Cooke's drawing, as is the continuation of Pyrmont Bridge Road between the two quarries into the gloom of the bottom right-hand corner of the print. Irving shows the 'Purgatory' quarry of Saunders as reaching just short of Pyrmont Bridge Road, this presumably being the southern of the two quarries drawn by Cooke. Cooke's northern quarry is not illustrated in the 1888 map, but would have occupied the quadrant of land between Miller Street, Crown(Bulwara) Road, Pyrmont Bridge Road and Gipps Crescent; significantly this block of land is shown as vacant apart from two buildings on the 1888 map – these are presumably the two buildings flanking this northern quarry in Cooke's drawing. Irving(2006:83) noted that in 1860: 'Charles [Saunders] leased 'good quarrying land' from John Harris's Ultimo Estate: Block 54 at the west end of Miller Street. Paradise quarry began here'. Cooke's northern quarry, on Block 55, adjoined Block 54. The relationship between the quarrying of these two blocks(54/55) needs clarification, also whether the quarry shown by Cooke in Block 55 was a part of 'Purgatory' or 'Paradise'.

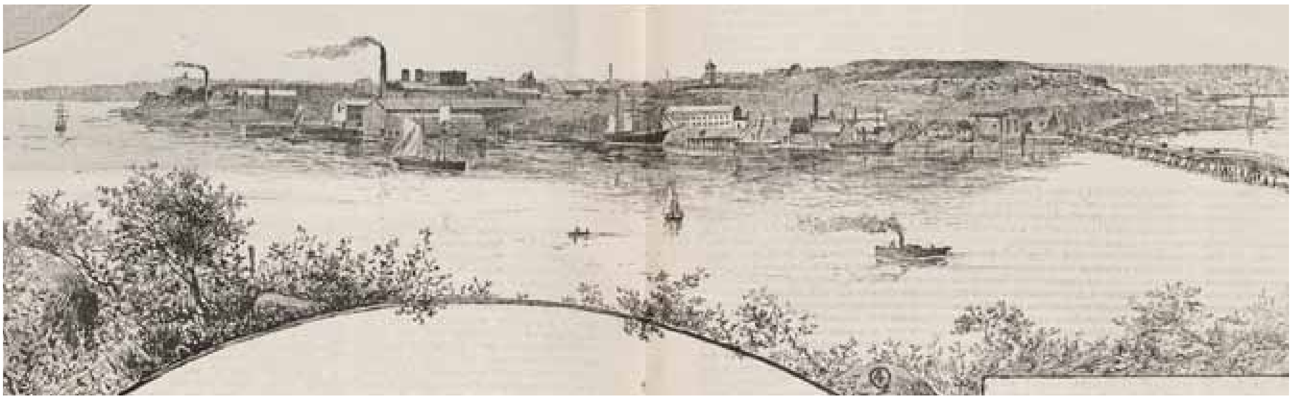
Other points of interest in the print are:

- The extensive Goldsbrough Mort wool store towards the mid-right-hand edge of the print; it had been built five years earlier
- The meat market, between Goldsbrough Mort and Darling Harbour Goods Yard; the stumps of iron girders which may have belonged to this building may still be seen in the concrete wall between Pyrmont Street and the egress road to the Novotel car park/Darling Harbour maintenance depot
- Development of Darling Harbour goods yard and wharfage at this time, with the railway ending just south of Union Street
- The Murray Street school, built in 1877, located close to the railway a short distance south of Pyrmont Bridge with Mrs Bunn's cottage immediately to its north
- The Goodlet & Smith saw mills and wharf north of Union Street, east of Murray Street, and fronting both Darling Harbour and Pyrmont Bay
- The extensive yards of the Australasian Steam Navigation Company (ASNCo) on Darling Island, between Pyrmont and Jones Bays in the bottom left of the print. At this time 'the ASN yards covered six and half acres and had a deep water frontage of over half a mile'(Matthews, 1982:56). Also, the narrow neck of land linking Darling Island to the mainland in the 1865 Municipal Council of Sydney map had been greatly widened by 1888
- St Bartholomew's Church at about five o'clock from the ASN yards, which had been built some 40 years earlier

iv. North-west peninsula

Anon(1889b) provided a most informative view of quarrying in this part of the peninsula in the late 1880s(Figure 5.5.3).

Figure 5.5.3: Anon, 1889b, [North-west of Pyrmont peninsula] (SRL TN115: Illustrated Sydney News, vol.26, no.9, pp.16-17(25 July 1889))



Quarrying is evident along the entire frontage to Blackwattle Bay, from west of the first Glebe Island Bridge. It is also occurring on the upper level, east of what is known now as Distillery Hill. This quarry eventually cut through between the north and south faces of the rock outcrop, to isolate Distillery Hill from Mount Street. The drawing also shows, from left to right:

- the extensive timber/log piles in the timberyards on the eastern foreshore of Blackwattle Bay
- the considerable establishment of the City Iron Works immediately east of Glebe Island Bridge
- the still-unquarried ridgeline behind the City Iron Works
- John Street school
- the quarry face between City Iron Works and CSR, which yielded ballast for ships
- the CSR factory, then 14 years old and still quite compact
- the steep roof of St Bartholomew's Church on the skyline above CSR
- John Kellick's woolstore on the skyline behind CSR
- Goodlet & Smith's establishment on the eastern side of Elizabeth Macarthur Bay
- the large(probably fig) trees on Pyrmont Point
- the Pyrmont Baths on the tip of Pyrmont Point, then about a decade old

Finally, Tischbauer illustrated sandstone quarrying along the peninsula frontage to Johnston's Bay in 1893, with Balmain in the background(Figure 5.5.4).

Figure 5.5.4: Tischbauer, A., 1893, Pyrmont Quarry Sydney (ML SV/38; Digital order no. 1528589)

5.5.3 Railways and wharves

Cumulatively, development of the Darling Harbour Branch Line into a substantial rail network reaching the tip of Pyrmont peninsula greatly modified an area of sandstone similar to or greater than that changed by quarrying. The huge topographical transformations which accompanied the formation of this rail system are partially captured by this 1898 account:

> *'The work done under the supervision of the Railway Construction Branch by contract consisted of a cutting through Union and Murray Streets, a steel and concrete bridge to carry Union-street, a wooden bridge to carry Murray-street, an extension of the Union-street bridge forming part of the new Pyrmont Bridge, a diversion of Union-street, and various smaller works, the cost of which amounted to about £6300. The work now being carried out by day labor consists of the levelling of the resumed area – about 24 acres – quarrying and breaking of ballast for the sidings, obtaining of sleepers, laying of permanent way, drainage, and erection of fencing and gates'(Anon, 1898).*

Aplin & Storey(1984:68) have a photograph of the levelling behind Pyrmont Bay in about 1900, as the railway was extended towards Darling Island. They noted the need to 'cut away' the rock face. Any relict habitat and vertebrate fauna associated with it would have been eliminated at this time. As can be seen at the bottom of the photograph, this involved levelling of sandstone outcrops along this section of the shoreline.

The impact of railway and wharf construction on the peninsula's ecology is also clear from the works associated with construction of the Jones Bay wharf. Figure 5.5.5 shows the almost completed bridge over(now) Pirrama Road, which carries the extension of Bayview Street onto the first level of the wharf. Some idea of the depth of sandstone removed from the cliff in this process is given by the step in the rock wall a little north of the overpass.

Figure 5.5.5: Anon, 1917, Construction of overhead bridge to Jones Bay wharf(ML Government Printing Office GPO 1_24482/digital order no. d1_24482)

Figure 5.5.6 provides some idea of the cumulative impact of this work on the rock wall between Jones Bay Road and the tip of Pyrmont Point. These works would have devastated any residual flora and fauna on this part of the peninsula.

Figure 5.5.6: Anon, 1917, Wharf construction, Jones Bay, about 1917(ML Government Printing Office GPO 1_47213/digital order no. d1_47213)

5.5.4 Urbanisation

The progressive urbanisation of Pyrmont peninsula would also have had major effects on its residual native plants and animals. There is substantial or complete loss of habitat during the construction of dwellings and their associated infrastructure, which is compounded by the importation of exotic plants and animals and the impacts of daily human activity after occupation.

Figure 5.5.7: Detail from Anon, [1861], [View from Kent St., overlooking Darling Harbour & old Pyrmont Bridge](ML SV1/ST/KEN/1)

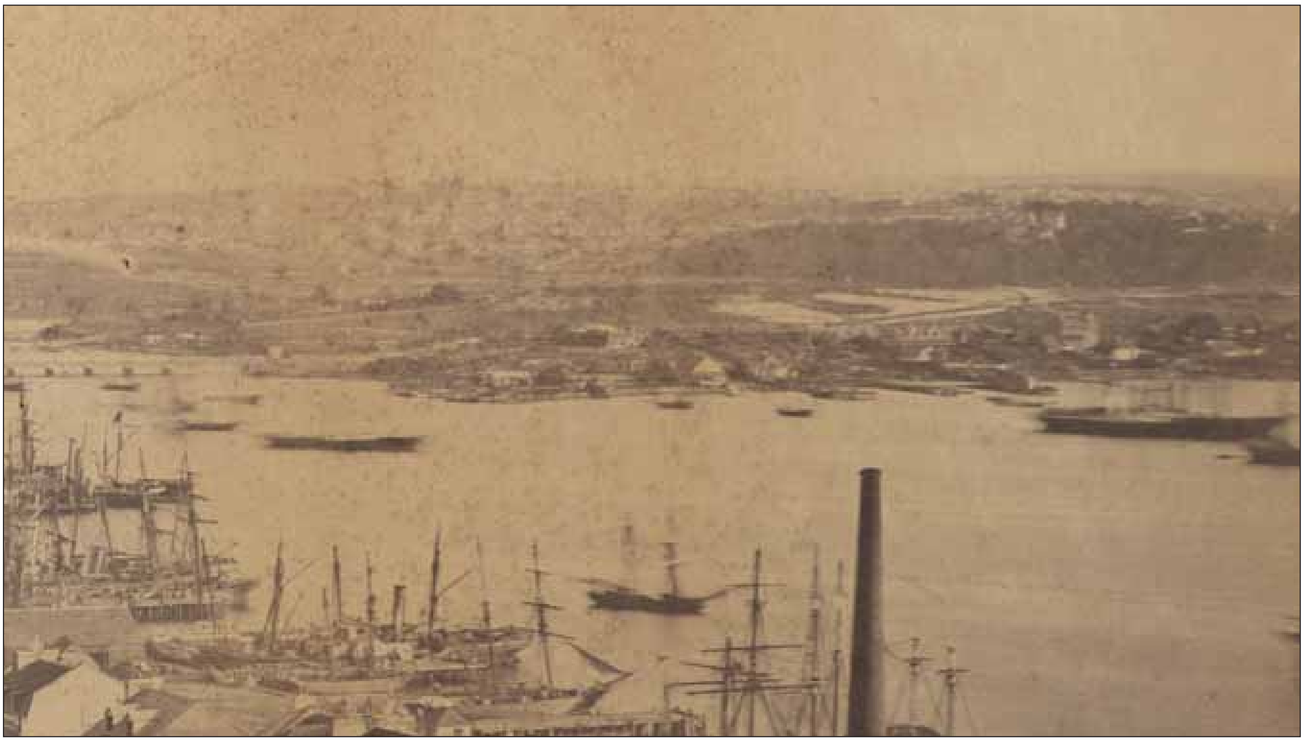


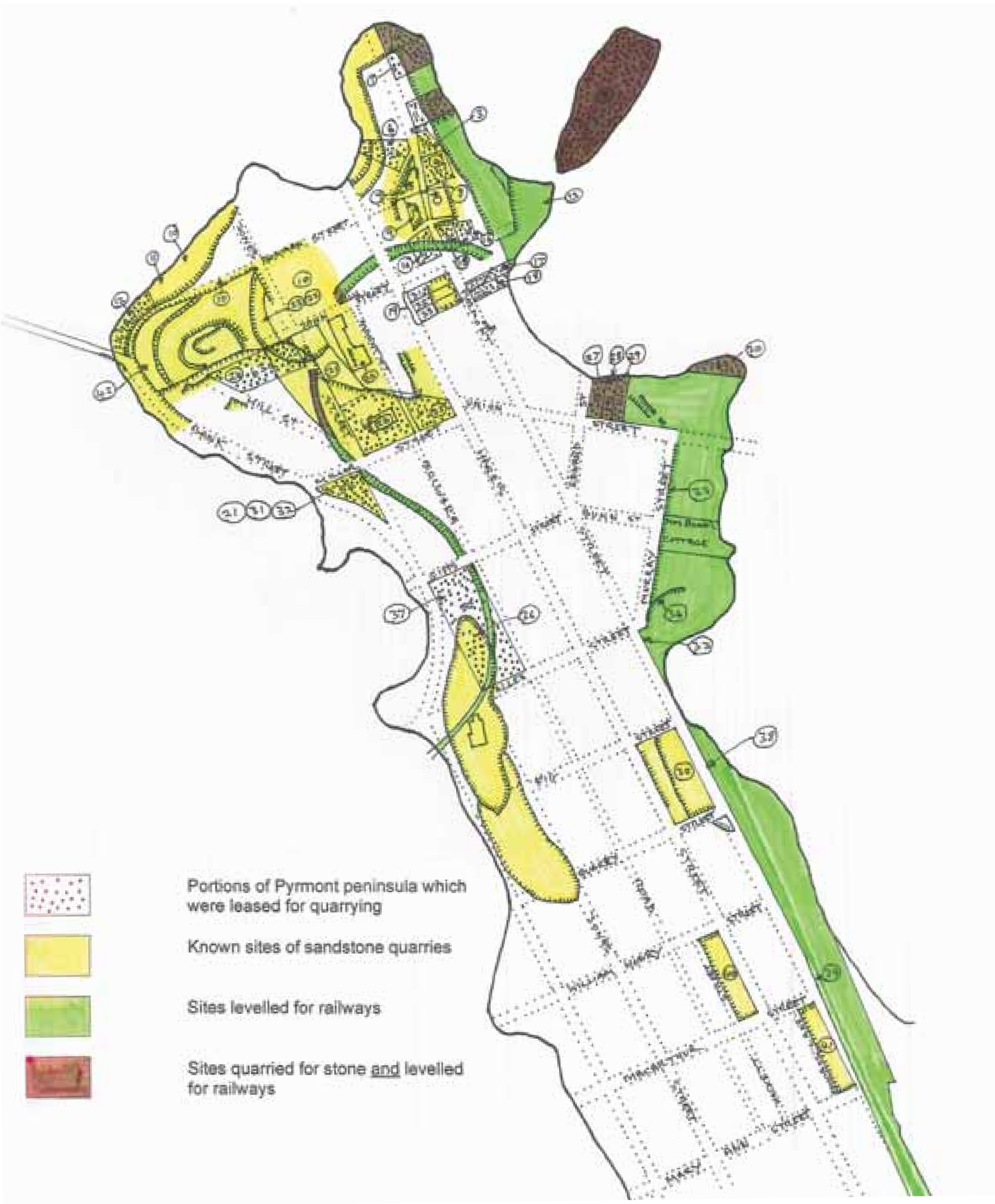
Figure 5.5.7 is a detail from a photograph showing the effects of early urbanisation on sandstone ecology. It has been variously dated as c.1875(ML SV1/ST/KEN/1) and ca 1860s(ML SPF/835). Its publication in the Illustrated London News of 31 August 1861(vol.39, no.1106, p.218) supports the latter view. The detail shows an early stage in the development of Block 57 of the Ultimo Estate, freeholds on which were auctioned on 30 September 1895. Preparations are underway for the construction of buildings fronting Pyrmont St., Paternoster Row and Harris St., immediately south of Union St. and, it seems, of the roads themselves. The inevitable ecological devastation of this activity is evident.

The Select Committee on the 'Railway through Ultimo Estate' also heard examples of the impacts of urbanisation on the sandstone ecology. Thus, Charles Langley noted that both Harris and Pyrmont Streets had been 'cut down' in their construction(NSW Legislative Assembly, 1864:231). John Kellick noted that: 'In some places Harris-street has been cut through ten feet …'(NSW Legislative Assembly, 1865:830).

5.5.5 Conclusions

A sense of the cumulative impact of quarrying and railway construction on the sandstone of Pyrmont peninsula may be gained from Figure 5.5.8. It is a major understatement, as the effects of urbanisation have been excluded. Possibly two-thirds of the sandstone in the northern third of the peninsula was substantially affected by quarrying and railway construction. Impacts from urbanisation would have greatly increased these effects. Possibly a more accurate assessment of the scale of impact of quarrying and railway construction is provided for the southern two-thirds of the peninsula. The subsequent impacts of urbanisation would then have been correspondingly greater.

Figure 5.5.8: Sandstone disturbance through quarrying and railway/wharf construction on Pyrmont peninsula



Footnotes

Figure number	Date	Comment
1		Excavation for construction of Waterside Cold Store Ltd. Demolished in late 1990's
2	1840s	Portion 11 of second land sale of Pyrmont Estate, held by Thomas McCredie, would likely have been quarried
3		Thomas McCredie leased a lot on the corner of Point and Bayview Streets from Edward Macarthur, to establish a quarry(Fitzgerald & Golder, 1994:45)
4		James Watkinson Reserve and adjoining lands show evidence of former quarrying. A 1994 photograph shows the rock-face behind the present façade(Building Better Cities No.4). The quarry was on Block 16, 2nd Release, Pyrmont Estate.
5		Darling Island part-levelled in 1855 by Charles Saunders. Robert Saunders completed the levelling in 1889(see p. 411)
6		Portion 24 of 2nd sale, Pyrmont Estate was owned by Thomas McCredie and would likely have been quarried
7	1994	Quarrying of this block, Number 18 of 2nd land sale, Pyrmont Estate, is clearly illustrated in photograph taken about 1994(NSW Department of Housing, 1994)
8	1867	James Martyr, in his 'View of Pyrmont and Balmain' work showed a considerable quarry at the base of Pyrmont Point and over Darling Island as viewed from his house in Kent Street. This quarry was likely near the junction of Bowman and Point Streets, where 'The Point' apartments are now. The illustration gives a sense of how much sandstone was removed by the McCafferys from that part of Pyrmont.
9		Matthews(1982:60) provided a photograph showing St Bartholomews Church with a quarry close by. This quarry was located in Block 19 of the Pyrmont Estate second land release.
10	1865	Elyard's remarkable painting 'Johnstone Bay'(ML DG XV*/Spec Coll/ Elyard/18) provides much detail on quarrying activities between Elizabeth Macarthur Bay and the first Glebe Island Bridge. A substantial quarry is evident immediately east of the City Iron Works, shown with smoking chimney stacks. Behind, a small quarry on the hillside defines the upside of Bowman Street. East from this quarry, but still uphill from Bowman Street, and behind the western headland of Elizabeth Bay, there is a large quarry which could extend eastwards from about Jones Street. Its eastern end is unclear but could be Mount Street. Higher still, the whole ridge top seems to be under quarrying. This activity appears to extend from the top of the cliffs fronting Bank Street probably to Mount Street. It is an example of the superficial quarrying which often preceded deeper quarrying as practiced by the Saunders family.
11		Subdivision plan ML SP811.1738/10 shows the extent of quarrying in NW Pyrmont peninsula
12		Sale advertisement for Block 69A on the Ultimo Estate, indicating that the block was largely quarried and with a rock face below Bowman Street(ML SP811.1738/43). Former site of the City Iron Works.
13	1899	Article entitled 'Darling Harbor Works' on page 3 of The Daily Telegraph of Wednesday 13 January 1899 shows extent of land resumptions for railway purposes around Pyrmont Bay and Darling Island
14 & 15	1841	Thomas Agnew leased lots 3 and 4 of the second land release of Macarthur Estate for quarrying from 2 February 1841(Macarthur Papers vol.98, frame 118)

Figure number	Date	Comment
16	1841	Thomas Agnew purchased Lot 2 of the second land sale of the Macarthur Estate (Macarthur Papers vol.98, frame 108)
17	1840	'On lot 27 there are about 156 feet of superior cut stone and about 40 Loads of uncut'(Macarthur Papers, vol.98, frame 16)
18	1840	'On lot 26 there are about 378 feet of superior cut stone and about 30 loads of good uncut'(Macarthur Papers, vol.98, frame 16)
19	1865	This site was purchased by St Bede's Church from the Macarthur Estate in 1865; the church was built in 1867 mostly from stone quarried on the site (Sydney Harbour Casino, 1994. It is comprised of lots 31, 32 and 33 of the first release of Pyrmont Estate.
20	1994	Shows extent of Yellowblock Sandstone extraction from Portions 54, 55 and 56 of Pyrmont Estate and Block 62B of Ultimo Estate, at corner of John and Mount Streets, proposed in 1994(CMPS&F Environmental, 1994)
21	c. 1861	Conrad Marten's 'Pyrmont and the North Shore from Mr Blacket's house, Glebe'(ML ZXV/Martens/4) provides some interesting insights into the quarrying of NW Pyrmont. In the middle foreground is a low quarry face, probably that of Charles Saunders on Block 54 of the Ultimo Estate with Miller Street above and to the right. On the ridge top to the left are the houses of the Pyrmont(Macarthur) Estate, with those of Mount Street fronting an area which has been surface-quarried and has a few residual waste heaps on it. Between these two areas is a cliff-line which was to become that part of 'Paradise' quarry now seen in Jones Street Pocket Park. At the time of painting, this section does not appear to have been quarried and shows the topography of the land before quarrying.
22	1890	An aerial view titled 'The City of Sydney, NSW'(ML XVI/1890/1) shows an active quarry west of John Street, Pyrmont – above the cliff line of 'Paradise' quarry where it runs north of Miller Street. The quarry could have been west of Jones Street, in which case it marks the extension of 'Paradise' quarry to the north-west facing slopes of that part of Pyrmont, being the 'deep quarry' illustrated on ML SP 811.1738/21
23		Subdivision plan ML SP811.1738/21 shows a 'deep quarry' fronting Jones Street between Bowman and John Streets
24	1889	Block 63A of the Ultimo Estate was leased to Charles and Robert Saunders in 1889 for 50 years at an annual rent of £300(Irving, 2006:37)
25	1878	In 1878, Block 61 of the Ultimo Estate was transferred from Charles Saunders to Robert Saunders for an annual rent(Irving, 2006:18)
26	1889	Block 62a of the Ultimo Estate was leased by Robert Saunders for 50 years from 1 October 1889, with a ground rent of £400 per annum(Anon, 1888). His stable building on this land was part of the original NSW Art Gallery(Irving, 2006:31). The site is now occupied by the 'Richmont' and 'Palladium' apartments.
27	1840	'On lot 13 there are about 207 feet of very superior cut stone'(Macarthur Papers, vol.98, frame 16)
28	1840	'On lot 12 there are about 688 feet of very superior cut stone'(Macarthur Papers, vol.98, frame 16)
29	1840	'On lot No 11 there are about 200 loads of good uncut stone, sufficient to build a good sized House'(Macarthur Papers, vol.98, frame 16)
30	1839	Humphrey McKean purchased Lot 6 in the first land sale of the Macarthur Estate (Macarthur Papers vol.98, frame 82)

Figure number	Date	Comment
31	1860	Block 54 of Ultimo Estate leased as 'good quarrying land' by Charles Saunders in 1860(Irving, 2006:10): 'there was … good stone to be had at the foot of Miller Street overlooking Blackwattle Bay'(Fitzgerald & Golder, 1994:33).
32	1860s	Elyard's painting of Glebe Bridge across Blackwattle Bay, before its reclamation, provides a south-westerly view of the sandstone escarpment of NW Pyrmont before it had been much quarried. Quarrying appears to be taking place in the middle ground and far right of the painting. The site is set in from the small headland into Blackwattle Bay, just south of Glebe Bridge, and a short distance north of the track leading into Pyrmont from the bridge. It is most likely Block 54 of the Ultimo Estate, which was leased to Charles Saunders for quarrying in 1860. The muddy bay between bridge and quarry is the present home of the Sydney Fish Markets.
33		Richardson & Wrench advertisement(ML SP811.1737/1) details land resumption for railway purposes between Monaro(Bunn) and Fig Streets
34	1854	See Table 5.5.2
35	1854	See Table 5.5.2
36	1888	A lithograph by A.C. Cooke, titled 'Sydney in 1888'(ML/XVI/1888/4) and printed by Gibbs & Shallard as a supplement to 'The Illustrated Sydney News' Centennial Number in January 1888, shows 'Purgatory' quarry in the lower right corner. The quarry is located on Block 50 of the Ultimo Estate and is separated by Gipps Street from a second quarry to the south – presumably 'Hellhole'. Mrs Bunn's Cottage and the Murray Street Public School are just south of the bridge while Goldsbrough Mort's woolstore on Harris Street if further south still. Towards Darling Harbour from the latter is the meat market. Also evident is the fine row of sandstone terraces built by Charles Saunders on Harris Street at Union Square.
37	1898	Lease on Block 50 of Ultimo Estate extended in 1898 by Robert Saunders senior
38		Subdivision plan ML SP811.1736/15 shows resumption of land for railway purposes between Fig and Quarry Streets
39		Subdivision plan ML SP811.1735/7 shows resumption of land for railway purposes between William Henry and Thomas Streets
40	1854	See page 413
41	1854	This quarry is more fully described in Table 5.5.2
42	1860s	Samuel Elyard's 'Glebe Island Bridge'(ML DG XV*/Sp Coll/Elyard/5) is remarkable in that it shows the sandstone cliffs of NW Pyrmont peninsula before much quarrying had been done. The cliffs facing Blackwattle Bay were perhaps 200 metres long before giving way to steeply sloping ground. The beginnings of Paradise quarry are evident over the burnt house and between the two small clumps of trees. Two quarries can also be seen below the main cliffs, running alongside Blackwattle Bay from the Pyrmont end of the bridge. Possibly, the relics of one or other of these quarries may still be seen on Bank Street today.
43		Matthews(1982:26) located O'Brien's ballast quarry between the City Iron Works and the CSR refinery on the north-west shoreline of Pyrmont peninsula. The quarry is well-illustrated in an 1871 photograph of the City Iron Works attributed to Charles Percy(ML SPF/725). It is seen to extend from the West of, and behind, the iron works along the entire frontage onto Johnson's Bay at least to the western point of Elizabeth Macarthur Bay (Ballast Point). The coastline itself, at least at the western end of this expanse, is seen to be very rocky and, probably was once cliffy.

Figure number	Date	Comment
	1840	Samuel Thompson leased land to quarry on Darling Point from 12 December 1840 (Macarthur Papers vol.98, frame 117)
	1840s	William Hayes let a quarry on Darling Point(Macarthur Papers vol.98, frame 119)
	1840s	Humphrey McKean let a quarry on Darling Point(Macarthur Papers, vol.98, frame 119)
	1840s	Michael Carroll let 'a quarry as pointed out on the Pyrmont Estate'(Macarthur Papers vol.98, frame 120)
	1840s	George Crompton let a quarry but never commenced(Macarthur Papers vol.98, frame 125)
	1853	Charles Saunders leased land from the Ultimo Estate, west of Macarthur's land, in 1853, but location not known exactly(Irving, 2006:5-9)
	1870/73	Francis Boyer's painting of 'Sydney from Glebe Point' shows Glebe Bridge leading into Pyrmont Bridge Road east of Blackwattle Bay. 'Purgatory' quarry of the Saunders family is evident just south of the bridge, with the workings of 'Hellhole' further south. The southern end of the cliffs where 'Paradise' quarry was located are just visible on the left side of the painting. The impact of quarrying on the landscape depicted by Boyer is all to evident to the contemporary eye
	1925	Robinson(1925) overviews the railway system on the Pyrmont peninsula, and so relates more specific information

<u>Other sources of information</u>

Anon, 1840, Memorandum of Stone on the Pyrmont Estate, June 23rd 1840, Macarthur Papers, vol.98, frame 16(ML CY2291). Irving(2006).

NSW Department of Lands(1883-)(Map Sheets B3, D3, H3, K3, M3, N3, P3, R3, W2, Y2). NSW Department of Lands, 1888,

Map of the City of Sydney, New South Wales, 2nd edition, Sydney, Surveyor-General(ML M4 811.17/1888/1)(outlines two quarries on Pyrmont peninsula).

Richardson & Wrench, 1895, Sale No.12, Harris Estate(ML SP811.1738/8).

Richardson & Wrench, 1896, Sale No.13, Harris Estate(ML SP ?)

Sydney Harbour Casino, 1994, Development Application: Statement of Environmental Effects, Volume 1, Appendix F.

The extent to which quarrying and railway construction complemented reclamation as major forces for ecological change around the periphery of the peninsula is evident from Figure 5.8.16. The core lands around Bulwara Road and Harris Street were largely spared this adversity, although not, of course, the effects of urbanisation.

By 1900 there were only two Pyrmont quarry masters, and the Saunders' quarry was the last operating in Pyrmont by 1915. The Saunders firm left Pyrmont in 1929. By 1931, no quarries were listed for Pyrmont in Sands Directory(Irving, 2006:63).

Irving(2006:69) summed up well the cumulative impact of quarrying on the Pyrmont peninsula: 'The physical shape of the peninsula was steadily transformed. Saunders and the other quarry masters made vast cuts through the landscape and caused the cliff faces to recede; much of Pyrmont was carted away to build other places'. Morrison(1928) estimated the total production of <u>dressed</u> sandstone from the Pyrmont quarries as between 500,000 and 600,000 cubic yards(380,000 – 460,000 m^3). Irving(2006:64) commented that 'the refuse, estimated at about

10% of the total, has filled in big sections of the harbour, ballasted roads, made retaining walls around the harbour …'. It has elsewhere been estimated that 10 million tons of sandstone have been excavated from Pyrmont(Anon, 1927). These figures may not take account of the numerous small-scale quarries on the peninsula, used to produce ballast or local building stone, and they may scarcely – if at all - consider the quarrying associated with creating a railway network on the peninsula.

5.5.6 Ecological considerations

(Ratcliffe, 1974; Business & Biodiversity Resource Centre, nd)

The removal and processing of sandstone is very detrimental to native flora and fauna. It destroys habitat, alters landform, drainage and soil conditions, creates waste pollution, and usually generates noise and dust – all of which can adversely impinge on plants and animals. Existing features, like Tinker's Well, can be removed or obliterated, and local waterways affected by sedimentation. More widely, the extraction and processing of sandstone requires considerable energy, with its related environmental impacts.

Once quarrying is finished, re-colonisation by certain plant and animal species has been widely observed. In the case of the Pyrmont quarries, the cliff faces are richly diverse in ferns(as well as exotic weed species). This diversity is likely to increase with time, if the cliffs are left undisturbed, and could be supplemented by considered introduction of cliff-loving species. Quarries can also attract cliff-dwelling birds, by providing safe nest sites. In the Pyrmont context, two such species have been recorded locally – the Nankeen Kestrel *Falco cenchroides* and the Peregrine Falcon *Falco peregrinus*. Perhaps the overall life needs of these species could be re-created, so that they become residents of the peninsula once more. Bats will also colonise suitable cliff sites, although this may be less likely in the Pyrmont context.

5.6 Urbanisation

5.6.1 Introduction

Although structures appeared on Pyrmont peninsula soon after European settlement, urbanisation was to be a prolonged affair. Subdivision of the two estates – Macarthur and Harris –operated on unrelated agendas, on different timeframes, and with distinct underlying strategies. Urbanisation of the peninsula was thus spatially and temporally complex.

In this account, information is presented first on the early structures which preceded more general urbanisation – sometimes by several decades. There then follows sections on the urbanisation of each estate. The aim is to elaborate rather than repeat information given by Matthews(1982) and Fitzgerald & Golder(1994), although some contextualisation based on these earlier works was needed. A conclusion seeks to identify some key features of this important process in land-use change.

5.6.2 Individual structures

A) Ultimo House

Ultimo House was built by John Harris in 1804, on high ground in the Ultimo Estate not far from Parramatta Road. It had extensive gardens to the north-west, where Mary Ann Park is today; Law(1844) recorded the 'Gardener and Seedsman' of Ultimo Gardens in that year as John Luckings. A few years after Ultimo House was built, the smaller Ultimo Cottage was built directly north of the House.

According to Forde(1912): 'There were two entrances to Ultimo House, one opposite the turnpike at the Benevolent Asylum, … and the other opposite the distillery'. This latter was on the Sydney side of a bridge across Blackwattle Creek on the Parramatta Road.

When Harris returned to Sydney in February 1814 on the General Hewitt, after visiting Britain, Francis Greenway was a fellow passenger: 'By July 1814, Harris had engaged Greenway to enlarge his house and Greenway had prepared plans which he showed to the governor'(Broadbent, 1997:87). Greenway's re-work of Ultimo House is well described by Broadbent & Hughes(1977).

The house remained in the ownership of the Harris family until the late nineteenth century(Hughes, 1999:54). There was a succession of tenants during this period(Table 5.6.1). One of interest is John Edye Manning, whose relative, Emily Anne Manning, stayed at Ultimo House in 1837. Emily made several sketches in the environs of Ultimo House, and these are referred to elsewhere. A late sketch of Ultimo House, is contained in 'Views of residences of the Manning family', ca 1860-1870(ML PXA 402)(Figure 5.6.1).

Figure 5.6.1: Manning, J.E., 1860/70, Views of residences of the Manning Family, Folio 6:Ultimo House, near Sydney (ML PXA 402f6: Digital order no. a1180005)

Manning was severely affected by the depression of the early 1840s, as graphically described by Newton(1967). His household goods – including furniture, a library, china and glassware, carriages and horses – were auctioned by Samuel Lyons at Ultimo House on 27/28 January(Anon, 1842a) and 2/3 February 1842(Anon, 1842c), and Manning returned to England.

Table 5.6.1: Occupants of Ultimo House

Occupant	Known dates of occupancy*	Comments	Source
Surgeon John Harris	1804 to July 1820	Noted as a Justice of the Peace in Sydney on 9 June 1820, and as same at Parramatta by 20 July 1820	Archives Authority of New South Wales, (1987:60, 137-8)
Edward Riley	1 July 1820 to late August 1824	Merchant and pastoralist; business associate of Garnham Blaxcell; moved to Woollomooloo after reversal of fortunes	Anon(1822, 1824a-e) Riley(1820)
John Stephen	30 December 1824 to 19 December 1829	'… came to Sydney in 1824 as Solicitor-General and Commissioner of the Court of Requests. A few weeks afterwards he became Assistant Judge …'(Forde, 1909)	Anon(1824f, 1825, 1826c-e, 1828), Fitzgerald & Golder (1994:20)

Occupant	Known dates of occupancy*	Comments	Source
John Edye Manning	10 September 1831 to January/ February 1842	Registrar of Supreme Court of NSW	Forde(1912b) Anon(1831c, 1842a, c, d)
Thomas Duigan	Early 1840s		Forde(1909)
Burton 'Bob' D'Arcy	1846 possibly to death on 23 March 1850	Listed as Inspector of Distilleries and living at 70 George St in Low's City of Sydney Directory for 1844-1845(ML 981.1/L); dismissed in 1845. Listed as living at Ultimo House in notice about will of William Burleigh in NSW Government Gazette No.100 of Tuesday 1 December 1846. Established a brewery in basement of Ultimo House (Forde, 1909). Listed as being a brewer, living at Ultimo House in Lowe's City of Sydney Directory for 1847(ML 981.1/L).	
John Harris and family	1854 – (1860)	Son of George Harris; arrived from Ireland in 1844, took occupation of the House in 1845	Matthews (1982:14)
George Harris	1860 – 1897	'By agreement, George, as eldest son [of John Harris], got the Ultimo House land in the distribution[1860], and he lived there till his death in 1897'	Matthews (1982:14)
State government	1889	'In 1878 the Sydney Mechanics' School of Arts opened the Sydney Technical College … The ultimate outcome was the creation in August 1883 of a Board of Technical Education which took over the Sydney Technical College'(Barcan, 1980:190). According to a report in the Maitland Mercury & Hunter River General Advertiser of Tuesday 16 October 1883, the Board recommended 'the Govt resume the block of land on which Ultimo House stands in Harris-street, for the purpose of having college buildings and workshops erected there'(p.5). In 1889, the Government purchased three-and-a-half acres of land adjoining Ultimo House as a site for a technical college (Howard, 1960): 'Building was commenced in 1890 and the premises were occupied for technical instruction from 8th February 1892'. It was not until 1899, after George Harris had died, that Ultimo House itself was bought by Government and used by Technical Education before being used by Sydney Technical High School from 1911 to 1924 http://www.sths.nsw.edu.au/past_history.php . Ultimo House was demolished in 1932(Hughes, 1999:54)	

* The dates of occupancy need further validation, as Ritchie(1971) noted that Edward Riley had taken possession of Ultimo House by 1818

B) John Macarthur's Windmill

See pages 449 - 452

C) Western Lea

'Western Lea' was the residence of Thomas Smith. He is mentioned as having shares in the Sea Gull, which was 'launched at Ultimo, Sydney, Septmber 19, 1849', and as living at 'Western Lea' at that time(The Maritime Heritage Project, 2009). Smith was apparently a shipbuilder. Letters from Thomas Smith in the Macarthur Papers(vol.98, Pyrmont Estate 1832-1870, ML A2994:Reel CY2291) indicate that he resided in 'Western Lea' at least until 1870.

The house is marked on two versions of a subdivision plan for Barker's allotments at Pyrmont(ML SP811.1737/48; Baker, nd). The structures are drawn as intact and located on that part of the Barker estate bounded by Pyrmont, Marian, and Edward Streets to the north, west and south respectively, and Pyrmont Bay to the east. The plan is not dated. A similar structure is shown also on a sketch map of the Pyrmont Bay foreshore by Reuss and Browne(1856); the structure is seen to straddle two portions in the first Macarthur Estate subdivision, both purchased by Reuben Uther. The house is also mapped in an attachment to a NSW Legislative Assembly(1868) return on land reclamations in Sydney Harbour.

D) Pierpoint or Pierrepoint

An account in the Sydney Gazette(Anon, 1826a) noted that John Macarthur was: ' … erecting a most splendid mansion after the Grecian style. This scite [sic] is the property of Mr. M^{c}Arthur, and he intends laying out some thousands in raising an edifice worthy of this rising empire. There are from 25 to 27 stonemasons and stone-cutters already employed, and the free stone, of which there is a plenitude for ages, is allowed to be the finest in the Country'. Garnham Blaxcell suggested the name for 'this fascinating spot' (Anon, 1826b).

Broadbent(1997:261/3) described in detail the proposed design for Macarthur's Pyrmont home. The design was by 'the obscure architect Henry Cooper'(p.261) and 'By April[1826] the foundations had been dug and in May timber scantling was delivered to the site, but by June Macarthur had lost interest in the project and transferred his enthusiasm to rebuilding at Parramatta'(p.262). Stones had been 'cut for the purpose of erecting his Grecian cottage at Pierrepoint', but were relocated to Macarthur's residence near Parramatta for work there(Anon, 1826f).

E) Newstead House(Mrs Bunn's cottage)

George Bunn was born in 1790 and emigrated to Sydney from England as a free settler in 1825. He became a merchant, master mariner and banker, being also an early chairman of the Bank of Australia(Rubinstein, 2004). In 1828 he was appointed a justice of the peace and acted as principal superintendent of Sydney's police in the absence of its permanent head. He was one of the first merchants in Sydney and senior partner of the firm which owned Preservation Bay Whaling Station. John Harris gave Anna Maria 1½ acres of land on her marriage to George Bunn on 5 May 1828(Matthews, 1982:13), on which the latter built a large stone house, Newstead, by 1834(Fitzgerald, 1995).

The 1835 edition of the New South Wales Calendar & General Post Office Directory noted: 'On the margin of Darling Harbour stands Newstead, a commodious house and premises recently built by the late George Bunn Esq., - a gentleman whose early death[in January 1834] was alike a loss to his amiable family, his numerous friends, and the country at large, and whose public spirit and private wealth could not be too publicly or permanently recorded'(pp.130/131).

According to Fitzgerald & Golder(1994:23), Newstead 'remained in the Bunn family until the 1870s when proposals to extend the railway along Darling Harbour pushed up the value of land'. The house is clearly evident on a NSW Department of Lands(1888) map.

F) Rose Cottage or Dayswood

According to the Mitchell Library catalogue Rose Cottage was built about 1840 at 95 John Street, Pyrmont from Pyrmont sandstone, and occupied by Thomas and Jane Day until their deaths in 1868 and 1902 respectively: 'Thomas Day was born at Sydney in 1795 and Jane(nee Fairweather) his second wife in 1813'. The Day estate was auctioned by H.W. Horning on 15 April 1905 as 16 lots, one of which contained Rose Cottage. About 20% of the original estate had earlier been resumed for railway purposes. The cottage was variously recorded as being demolished in 1908, 1912 or 1916(Mitchell Library catalogue; Hughes, 1999:54), during or prior to construction of the Wardell goods line(p. 557).

Notes on the Mitchell Library's Small Pictures File copy of the Rose Cottage photograph, taken in 1860, record that Thomas Day built the cottage, which was located about 600 feet(183m) from high tide mark at Darling Harbour. John Street, then little more than a footpath, went down to a stone jetty and wharves: ' …where the garden stood, there is now a two storied store fronting Pyrmont Street'. This store, somewhat neglected, is still there today.

G) Saunders' stables

Robert Saunders acquired the temporary Art Gallery, then in the Botanical Gardens as part of the International Exhibition of 1879-80. According to Du Faur(1904) the Trustees of the 'NSW Academy of Art were granted use of the building in August 1880 'where they remained until the (literally) "internal foundation walls" of their proposed permanent "National Art Gallery of NSW" had been erected by Mr Harbury Hunt and temporarily roofed in'.

Saunders '…erected [the structure] on his own land, at 62 Miller Street, Pyrmont, where it stands to-day[1917], it has a fine lantern roof, well lighted, ventilated and with a stone paved floor which was specially laid, it makes one of the best stables in the City even to-day'(Anon, 1917). The site had been leased by Saunders from the Harris Estate for 50 years from 1 October 1889, with a ground rent of £400 per annum(Anon, 1895).

An 1888 map located the stables on the corner of Miller and Mount Streets, where the Richmont Apartments now are(NSW Department of Lands, 1883-).

H) Unidentified House

This house was first illustrated by Joseph Lycett in his 1819 'West view of Sydney taken from Grose's Farm, New South Wales'(Figure 2.24). It appears as a two-storey structure on the ridge-line some distance north of Ultimo House on the Pyrmont peninsula, apparently set in woodland. A building then appears on a series of maps in the 1850s, located west of Harris Street and just south of present-day Allen Street(Table 5.6.2). It is again illustrated in Francis Boyer's painting 'Sydney from Glebe Point'(Figure 2.22), this time in essentially treeless surroundings.

Table 5.6.2: Records of unidentified house

Date	Record	Source	Comment
1819	Painting	Joseph Lycett 'West view of Sydney taken from Grose's Farm, New South Wales'(Figure 2.24)	A two-storey house apparently set in woodland
1853	Map	Mitchell, T.L.(1853)	Shows building west of Harris St about three-fifths of distance between Parramatta Road and Elizabeth Bay
1854	Map	Woolcott & Clarke(1854)	As above
1856	Map	Reuss, F.H. & Browne, J.L., 1856, Reuss and Browne's map of the subdivisions in and about Sydney and Environs, Sydney, Reuss & Browne(ML 811.12/1856/1)	As above
1858	Map	Russell, J., 1858, Map of Sydney and its environs (ML M3/811.17/1858/1)	As above
1870/73	Painting	Francis Boyer 'Sydney from Glebe Point'(ML SSV1/Bri/Glebe I/1) (Figure 2.22).	Two-storey house on ridge-line south-east of Glebe(Blackwattle Bay) bridge

Whether these records all relate to the same building is unclear. The visibility of the building in the paintings , especially Lycett's, suggests that it was west of what is now Bulwara Road. The site may have been close to where Mayor John Harris, the grand-nephew of Surgeon Harris, built 'Bulwara House' in 1880. This grand, Italianate house was built on the site of what is now Ultimo Public School. It is probably the resplendent building overlooking Hellhole Quarry in a Town & Country Journal illustration(Anon, 1883). It is also pictured by Matthews(1982:16).

I) Royal Edward Victualling Yard

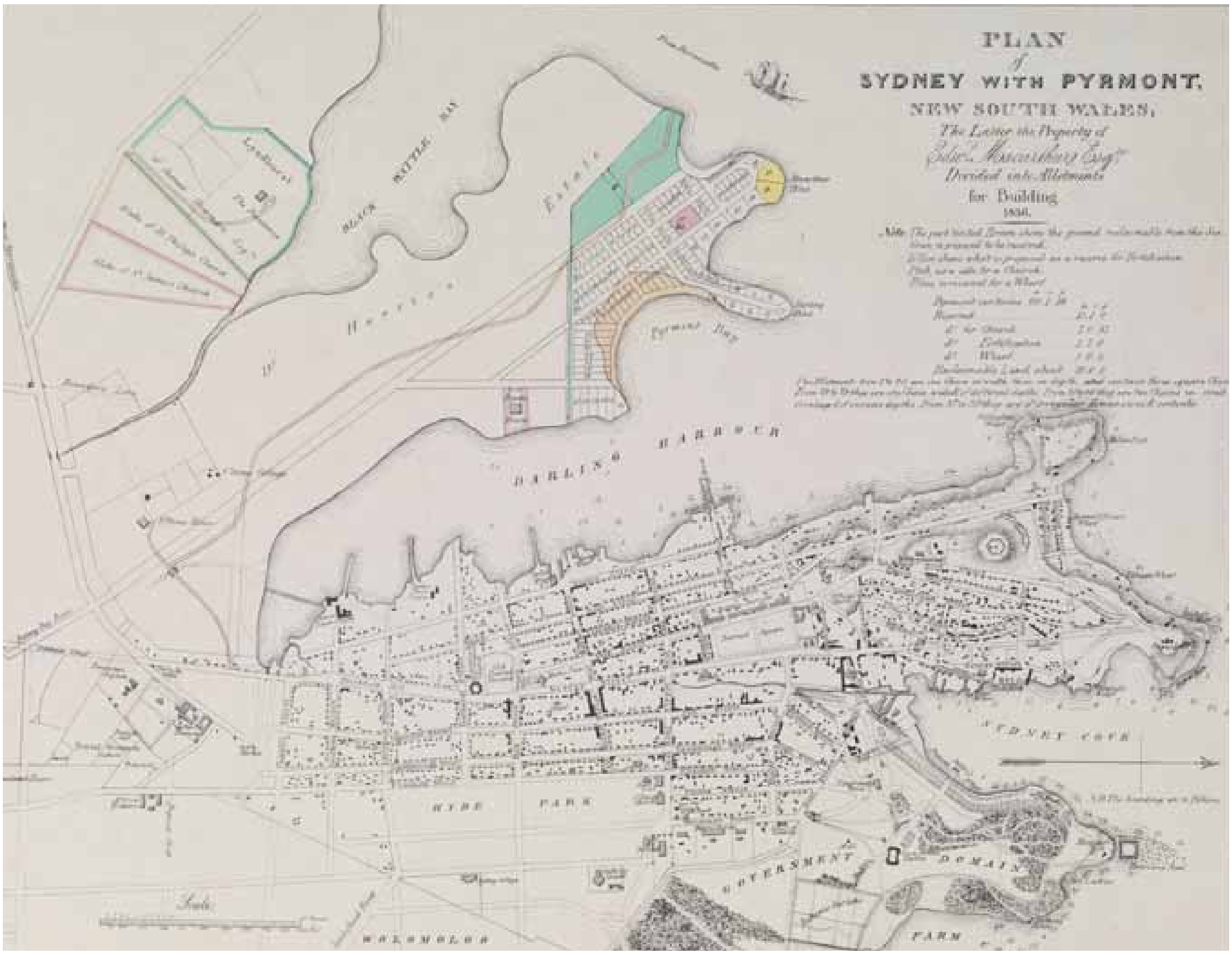
Almost a century old, the Main Warehouse and Naval Stores Building remain important visual components of the Pyrmont landscape. The National Trust of Australia(NSW)(1984) provided the following notes on these two structures:

- **Main warehouse:** A patterned red brick warehouse designed c1910 by the Government Architect, W.L. Vernon. Containing one 5-storey wing and one 6-storey wing joined by a water tower of Romanesque design, the building contains traces of the Art Nouveau style and is roofed with Marseilles patterned tiles. Good example of load bearing brickwork in the functionalist tradition.
- **Naval Stores Building:** A steel framed warehouse of 9 storeys clad in dark red bricks with Flemish gabled parapets and a sandstone base. Built c1915 to Government architect design, it is a good example of a multi-level dockside warehouse rare in Australia. The elevations are enlivened by the arched window openings, cantilevered steel fire stairs and concrete lift towers. Condition appears to be excellent.

5.6.3 Macarthur Estate

A subdivision plan for the Macarthur Estate was prepared by Edward Macarthur, son of John Macarthur, in the year of his father's death(Basire, 1837). The plan had 99 allotments for sale, with additional portions allocated for a church, harbour fortification and wharf. West of Harris Street an area of just over 13 acres(5.26ha) was set aside as a reserve(Figure 5.6.2).

Figure 5.6.2: Basire, J., 1836, Plan of Sydney with Pyrmont, New South Wales(M2 811.17/1836/2)



This plan was not executed, and instead the Macarthur Estate was sold in two lots. The first, of 41 allotments, was auctioned by William Smart on 12 December 1839. All but three allotments were sold, for a total of £18,875.3s.0d. The second auction, also by William Smart, was held on 27 July 1840(Anon, 1840). Of the 58 allotments for sale, just thirty were bought, half at auction and half by private contract(Macarthur Papers, Frame 23). The Australian was moved to observe the next day: 'We regret to have again to refer to the depressed condition of trade, and the reported prospect of many serious failures. It is most sincerely to be hoped that these may prove to be false prophets. There is, however, an undoubted stagnancy in mercantile matters, and a corresponding dearth of money. The land mania already droops and languishes and will, we apprehend, soon die'(Anon, 1840). According to Godden Mackay(1994), sale of the remaining allotments continued into the 1850s and 1860s.

The process of urbanisation on the Macarthur Estate seems to have mirrored the wider economic situation in

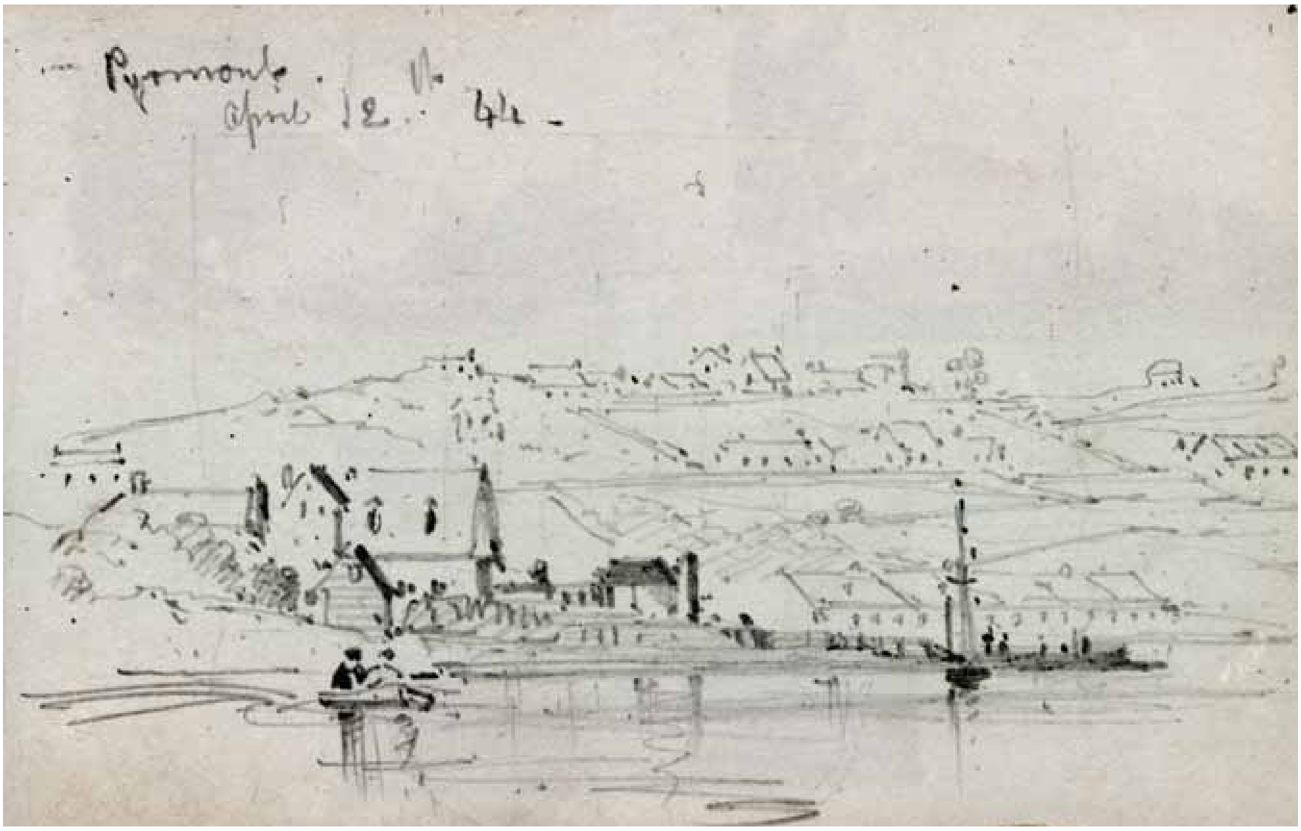
New South Wales and, indeed, Australia as a whole. According to Lee(1999): 'the bubble burst in 1840 after the local banks curtailed credit, producing a wave of business failures. In 1841 wool prices dropped again and Crown Land sales slumped, throwing public finances into disarray. Between 1841 and 1843 … government outlays were cut by 64 per cent. This had dire social consequences … By 1844 four of the local banks had failed, innumerable merchants and pastoralists had been bankrupted, and there was widespread destitution'.

Some original purchasers of allotments on the Macarthur Estate moved quickly to subdivide and sell part or all of their holdings. Edward Flood, for instance, subdivided his portions in Pyrmont into 41 lots, which were offered for auction by Mr Stubbs on 19 July 1841(Anon, 1841;ML M2 811.1739/1841/1; ML M2 811.1738/1841/1). Lundie/Lundy purchased Allotment 42, which fronted John Street between Harris Street and the Estate's western boundary, and thereon constructed 18 stone buildings. He offered these for sale by public auction through Mr Stubbs on 28 February 1842(Anon, 1842b).

Wells's(1850) Plan of the City of Sydney shows that approaching half of the original allotments on the Macarthur Estate still had no buildings on them, while others had meanwhile been subdivided or consolidated. Later maps indicated that urbanisation of the Macarthur Estate occurred slowly through the 1850s(Woolcott & Clarke, 1854; Reuss & Browne, 1856; Sands & Kenny, 1858).

The Martens family provided two sketches of the early urbanisation of Pyrmont. Conrad Martens sketched Pyrmont in 1844, his view being of Pyrmont Point, probably from near the ferry jetty in John Street. His sketch showed some 25 dwellings, with considerable open lands around them but no relict stands of natural vegetation are evident.

Figure 5.6.3: Martens, C., 1842/6, Sketchbook of drawings and notes, mostly concerning the construction of St Thomas Church, ca 1842-1846, Folio 25: Pyrmont(DL PX 19/25)



His daughter, Rebecca Martins, depicted a similar view, possibly from Darling Island, some 14 years later(Martens, 1858)(Figure 5.6.4). She shows the high ground of Pyrmont Point, dominated by St Bartholomew's Church, completed 8 years earlier and surrounded by a cluster of houses. To the left – on lower ground towards John Street – were individual houses set in farm land. According to Matthews(1982:110), Pyrmont had 130 dwellings in 1850, so the sketch of Martens showed perhaps a quarter of these. Compared with the plan of Wells in 1850, there was considerable urbanisation of Pyrmont in the intervening 8 years.

Figure 5.6.4: Martens, R., 1858, Album: Sketches around Sydney and in the Blue Mountains, 1853-77, Folio 24: Pyrmont, dated March 11th 1858(DL PX37/24)

A hindrance to rapid urbanisation at this time was the lack of services. According to CMPS&F Environmental(1994:48): '… it was not until the 1860s and 1870s that substantial residential subdivisions were made in Pyrmont, as settlement was severely limited until the introduction of town water in the middle of the 19th Century. Prior to this, Pyrmont was dependent upon wells for water'.

With respect to Pyrmont Point: 'there was almost no occupation of the area in the 1830s. Little appeared to change for some considerable time;(Casey & Lowe, 1993:6). According to Godden Mackay(1994:9/10): ' … the area around Pyrmont Point(then known as Macarthur's Point), which was the highest and steepest area, was the slowest to develop. Its topography was less suited to commercial development and the major expansion in this area was for residences in the late 1860s and early 1870s, though there were scattered houses from the 1850s … By the end of the 1870s, Pyrmont Point's development matched that of the area south of John Street, with small scale residential housing on the ridges and some industry grouped on the foreshore'.

William Alison's property fronting the southern end of Pyrmont Bay was not subdivided until being auctioned by Hardie & Gorman on 30 November 1885 (ML 811.1739/1).

According to Matthews(1982:26): 'Pyrmont in 1875 had almost reached the zenith of its residential development. Ultimo was just taking off, its building boom occurred in the 1880s'. An 1888 Department of Lands map shows a substantially settled Pyrmont, but a partially-urbanised Ultimo(Figure 5.6.5).

Figure 5.6.5: *Detail from* NSW Department of Lands, 1888, Map of the City of Sydney, New South Wales, Sydney, General Survey Branch, Surveyor General's Office(ML DSM/Q 811.17/1888/1)

5.6.4 Harris Estate

Surgeon John Harris subdivided portions of his estate fronting George Street near the old toll bar(Railway Square) in the early 1830s. An advertisement in the Sydney Gazette(Lyons, 1830) announced a sale on Wednesday 13 October 1830 of 30 'valuable allotments' on 'The Great Ultimo Estate'. A further 15 allotments were sold on Wednesday 9 November 1831(Lyons, 1831): 'The whole of the property … realised the sum of £2,370; being, on an average, nearly £160 each allotment'(Anon, 1831b). Some of these subdivisions appeared on maps soon afterwards(Great Britain. House of Commons Select Committee on Transportation, 1837). The maps of Wells(1843), Mitchell(1853) and Woolcott & Clarke(1854) further chart their development.

Early development also occurred on the Paddy's Market site(SHFA, 2007a). The last land grant to be acquired by Surgeon John Harris was twelve and three-quarter acres(5.16ha) in extent and located in the (now) Haymarket area. He was granted the land in May 1818 and houses were built on it from the 1840s: 'It is estimated that around 20 terrace houses were located on the Paddy's Market site, fronting Engine Street by 1865'(SHFA, 2007a). These properties, with one exception, were built on land leased from the Harris Estate and are shown on the maps of Mitchell(1853) and Woolcott & Clarke (1854).

Surgeon John Harris died in 1838, leaving the Ultimo Estate to his brothers George and William. According to Matthews(1982:13), the two brothers were 'to receive rents for their lifetimes and after the deaths of both, the whole estate was to be divided equally between George's son John and William's son John'(John Harris of Shane's Park). William Harris lived until 1856 and 'it took another three years for the [Harris] family to agree on a method of partition and subdivision, which was finally effected in 1859. Maps showing the intended form of urbanisation of the Ultimo Estate were published by Reuss & Browne(1856) and Sands and Kenny(1858). A definitive subdivision map of the Ultimo Estate, showing block numbers, was published in 1859(Matthews, 1982:14): 'Streets and blocks were surveyed, and the 70 blocks were then numbered, John Harris of Shane's Park, who was entitled to one half, and his cousin's widow on behalf of her children, took the alternate blocks. Then in February 1860, in what became known in the family as The Lottery, the children divided up their half-share between them by drawing lots out of a box … '.

'From 1860 on, both sides of the family set about a rapid development of their lands. George Harris, the eldest of the children, told a parliamentary enquiry in 1874 that "within the last seven years our family has laid out £20,000 in buildings and we have not a vacant house on the estate'. Godden Mackay (1994:17) also referred to 'the rapid development and urbanisation of Ultimo from the late 1870s'. Apart from the above developments, the Ultimo Estate was largely rural at this time(Gibbs & Shallard, 1879).

On the death of John Harris(of Shane's Park) in 1891, the Perpetual Trustee Company was appointed as administrator of the estate(Godden Mackay, 1994:16). This led to a building boom in Ultimo during the 1890s, about a decade after that of Pyrmont(Shaw, 1999). The 'First Subdivision of Harris Freehold Estate' was auctioned on 12 November 1892(Figure 5.6.6). The Estate had, up to this time, been almost entirely leased to interested parties, but freehold title was now being offered. Over the next five years some 270 allotments were offered from about half the blocks comprising the Estate. The allotments were auctioned exclusively by estate agents Richardson & Wrench. Nineteen such auctions were held by 1900 (Table 5.6.3), although those held after 1896 were mostly of allotments not previously sold. It should be noted that the allotments varied widely in size, some being suitable for the woolstores which came to characterise the peninsula while others were sufficient only for a single house.

Table 5.6.3: Auction dates for blocks of the Ultimo Estate

Auction Number	Date held	Source
1	12 November 1892	SMH No. 17,044, p.15
2	9 December 1892	SMH No. 17,068, p.15
3	13 February 1893	SMH No. 17,122, p.15
4	24 April 1893	SMH No. 17,182, p.15
5	9 October 1893	SMH No. 17,332, p.15
6	6 August 1894	SMH No. 17,584, p.12
7	15 October 1894	SMH No. 17,644, p.15
8	17 December 1894	SMH No. 17,698, p.15
9	25 February 1895	SMH No. 17,758, p.15
10*	30 March 1895	SMH No. 17,782, p.15
11	24 June 1895	SMH No. 17,866, p.15
12	30 September 1895	SMH No. 17,944, p.15
13	17 February 1896	SMH No. 18,064, p.15
14	20 July 1896	SMH No. 18,196, p.15
15	10 May 1897	SMH No. 18,448, p.15
16	6 September 1897	SMH No. 18,550, p.15
17	20 January 1899	SMH No. 18,982, p.15
18*	20 November 1899	SMH No. 19,234, p.15
19*	27 November 1899	SMH No. 19,252, p.17

* sale of country properties only

Figure 5.6.6: Richardson & Wrench, 1892, First subdivision of Harris Freehold Estate, Ultimo, City(ML SP 811.1735/5)

Notwithstanding the above, a NSW Department of Lands(1903) map shows little urbanisation of the western flank of Ultimo Estate south to William Henry and Macarthur Streets and east to Crown(Bulwara) Road/Jones Street. The photograph provided by Fitzgerald & Golder(1994:69) shows that this situation had changed little by 1907.

Matthews(1982:15) indicated that the Harris family retained property interests in Ultimo into recent times.

Figure 5.6.7: Sydney Council, 1911/33, Photographic views of Sydney: City Council resumptions, Vol.2, Photograph No. 19: Harwood Lane –East side(ML PXE 907(v.2), Photograph no.19)

Figure 5.6.7 reflects on a period of the urbanisation of Pyrmont peninsula when some housing stock was resumed for a 'greater purpose'. This particular photograph is from a collection made in October 1915 of the properties bordered by Bunn, Murray and Edward Streets, and Pyrmont Bridge Road. The precinct included Harwood Lane and Harwood Street, Edward Lane and Little Edward Street. The dwellings were demolished sometime after being photographed, for 'remodelling'.

5.6.5 Conclusions

Systematic urbanisation began on Pyrmont peninsula in the late 1830s. It happened quickly on the Macarthur Estate, which was largely urbanised by 1875. Despite early urbanisation of small portions of the Harris Estate along George Street/Parramatta Road and in Haymarket, it was not until the 1860s that urbanisation began in earnest. Further impetus to this process was provided from the early 1890s by a series of freehold auctions which continued up to the 20th Century. The urbanisation of Pyrmont peninsula overall thus took more than 60 years to run its course.

5.6.6 Ecological considerations

'Urbanisation in nineteenth century New South Wales largely preceded the process of industrialisation. The waste disposal problems occurred with biological wastes that were chiefly domestic sewage and animal(especially horse) excreta and, secondarily, liquid and malodorous wastes generated by animal rendering works and the processing of certain primary products'

Coward(1976)

Coward(1988:89/92) graphically described the sewage disposal problems of early Sydney:

'Among the numerous sources of supposed 'miasma'[defined by the Macquarie Dictionary as 'Noxious exhalations from putrescent organic matter; poisonous effluvia or germs infecting the atmosphere'] *in the City of Sydney – uncollected household garbage, decomposing shop wastes, butchers' offal, dead animals, filthy stables and dairies(in 1876, there were about 100 cowyards in the City), horse excreta in the streets – none absorbed so much time and energy of sanitary reformers as the problem of what to do about removing and disposing of human excreta. Reformers were united in opposing the cesspit. But their views confronted formidable obstacles. In effect they were attempting to change habits, attitudes and perceptions of excreta, to transform the common view of excreta as a nuisance to excreta as a threat to life. Reformers preached three basic warnings: that excreta itself was 'poisonous' and a source of numerous diseases; that these diseases were in large part preventable by adopting certain sanitary measures; that no-one was safe from disease. Accordingly, safer methods of managing human excreta were, in the words of Sir James Martin, for "the public good". The logic of this view was the adoption and enforcement of a standard public system for regulating its disposal. But what was to be the system? Reformers were divided as to what sort of privy should replace the cesspit. The large majority favoured water closets at each house, which meant the building of costly underground sewers for removing excreta.. …*

But what were the problems caused by the cesspit? First, excreta remained in the site of a dwelling, sometimes for years at a time. An official inquiry of 1852, headed by Colonel George Barney, assumed that the approximately 6000 cesspits were emptied once every three years. The second problem arose from the removal of excreta from the cesspits and its transport through the City by horse and cart. The third arose from the dumping and disposal of cartloads of excreta outside the City.

Cesspits could fill with water either from rainfall or from seepage where the water table lay near the surface. The first was common because, in the absence of any construction regulations, pits mostly did not have a ledge of brick or stone raised above the earth surface. Stormwater accordingly could flood in. …

Cesspits, because of the belief in miasma, kept alive the fear of disease. If sewers were constructed and, equally important, a permanent and reliable water supply obtained, then "cesspits might be totally abolished, and one of the principal causes of effluvia and disease removed", Colonel Barney wrote. …

The existence of cesspit privies were[sic] not simply perceived as dangerous to their users. They threatened all the City. Overflows "send up their exhalations to poison what might be the pure air of the city and to inflict upon the wealthy the natural penalty of their indifference to or neglect of the sanitary welfare of their poorer brethren" J.H. Palmer declared in 1859. In short, the habits and behaviour of the poor were poisoning the rich. The discoveries of the middle class investigators in 1859-60 and 1875-77 confirmed what their everyday observations had led them to believe, namely the existence of a marked contrast in personal habits and attitudes to excreta between themselves and large segments of whom Dr Roberts called in 1860 "the lower orders". …

Cesspits also existed in districts where sewers were available. But the City Council lacked the power to compel property owners to connect their houses to the adjacent sewer. For example, tenants of three houses in Union Street [Pyrmont] *complained of the stench given from a seven-foot square cesspit used by them. "The owner of this property, McEwan, should be compelled to connect with the public sewer, which is only a few feet from his property", wrote Read and Chapman* [in 1875].

The disposal of other household waste water, termed 'slops', was equally a problem. The combined volumes of both waste sources reinforced the case for sewers. The common practice was to discharge 'slops' into the street gutter. As piped water came to be connected to houses in unsewered districts this source of liquid waste undoubtedly exceeded in volume the overflow from cesspits. It was a constantly occurring flow, whereas cesspit overflows tended to be largely a wet weather phenomenon.

Water closets became a possibility in Sydney with the introduction of reticulated water in 1844(Coward, 1988:92). By 1875, about half the houses in the city had been connected to sewers. Nonetheless, 'Most of the installed water closets in Sydney in the mid-1870s had poor flushing capabilities' (ibid:94) and often 'the most offensive smell is carried through the whole of the building – conveyed from one room to another'. Further, ' … the plumbing of the majority of water closets – 87% in 1875 – had a dangerous defect: it enabled Sydney's drinking water to be polluted by excreta'(Coward, 1981:94). By 1859, Sydney had a rudimentary system of five sewers.

This was not the sum of the problem, as Coward(1976:9) noted: ' … the sewers ended at the water's edge: the raw sewage poured into the harbour and there accumulated. The growing pile provided further agitation for its removal. Some 3,800 affected citizens and waterside property owners declared in 1877 that the sewers had deposited 'all the filth of the city in the harbour, rendering all business occupations upon its shores disgustingly offensive', increased the sickness of the citizens and silted up navigable water'.

The long-run remedy to these problems was not resolved for over a decade: 'By laying a major intercepting sewer across the city, the Board advised liquid wastes could be directed from the harbour to the Pacific Ocean through an outfall near Bondi. This sewer began to flow in 1890 and has been flowing ever since'(ibid:10).

The problem was put further 'out of sight' in 1971, when a 2.2km submarine ocean outfall at Bondi was commissioned 'to improve water conditions along the coast'!

The provision of water to Pyrmont peninsula began in the early 1860s: 'Pyrmont was also promised a more regular water supply when a twelve-inch pipe was laid from Crown Street reservoir to Harris Street in 1861 and water was piped into Pyrmont along that street, crossing the awkward junction with the Pyrmont Bridge Road via a wooden aqueduct. Then water mains were quickly laid in streets such as Union, Edward, Pyrmont, John and Mount …' (Fitzgerald & Golder, 1994:35). However, ' … it was not until the late 1860s and early 1870s, when manufacturers were keen to move into Ultimo, that the Council began to give much attention to water supply at the southern end of the peninsula'(Ibid, p.42).

Urbanisation of Pyrmont and Ultimo thus preceded the reticulation of water, and hence the possibility of public sewerage disposal, by a decade or more, during and prior to which increasing pollution of the lands and adjoining waters of Pyrmont peninsula by domestic wastes would have occurred.

By this time, the terrestrial ecology of the peninsula had already been much diminished. The ecological impact of urbanisation would have been felt mostly by the aquatic ecosystems around the peninsula. Coupled with the processes of industrialisation (p.499) and land reclamation(p. 447), the once rich aquatic ecosystems around the peninsula would have rapidly lost their diversity.

Contemporary accounts lend support to this view. It appears that algal blooms were a regular feature of the hot summer months – January and February in particular – in the waters around Pyrmont peninsula. One such event is described in the Sydney Morning Herald of 15 February 1901: 'During the past few days concern has been caused amongst the residents of Annandale, Balmain West, Glebe, and Pyrmont at what appears to be a poisoning of the harbour in the vicinity, and more especially above the Glebe Island bridge. Not only is the water greatly discoloured, but a wholesale destruction of fish has taken place in a similar degree to last year, while the stench arising from the bays in question at low tide is almost unbearable'(p.3).

A repeat event, but far greater in extent, occurred in early January of the next year: 'Yesterday a visit to the locality[Rozelle and Blackwattle Bays] revealed the fact that, similar to the occurrence of nearly two years ago, at the time of the bubonic plague visitation, large numbers of various descriptions of fish were found to be floating about the bays, while on the northern side there were hundreds lying about the foreshores at low water. Not only have the two bays in question become polluted, but practically the whole of the waters of Johnstone's and White Bays have suffered more or less. At low tide yesterday the waters of these bays were of a dirty brown colour, and gave forth a rather bad odour, especially in White Bay. In Johnstone's Bay the discolouration of the water at low tide reached almost to Darling Island. On the White Bay side, and right up to the new embankment forming part of the new Glebe Island Bridge, rats abound in thousands'(SMH, 4 January 1902, p.13).

An excellent analysis of the causation of such episodes, based on knowledge of the period, was given in the Sydney Morning Herald of 16 February 1901: '[Officials from the Public Health Department] say that the discolouration of the water is due to the increased growth of "infusorial organism", which, in the mass, is of a reddish colour, and is therefore thought to be blood from the abattoirs at Glebe Island. The mass, it is explained by the officers, spreads like a cloud and discolours the water in patches, sometimes fully a quarter of a mile in area. Microscopically examined, they assert, the discolouration is seen to be due to the organisms. It was also stated by the health officer that the appearance of the discolouration was nearly always concurrent with the unusual death of fish, but apparently had no connection with it'(p.7).

These are classic symptoms of an algal bloom. The water is highly eutrophicated, or nutrient enriched, rapid algal growth quickly deoxygenates the water body and often produces toxins; mass fish killings usually result. The relevant issues were well canvassed in The Sydney Morning Herald of 6 January 1902:

> *'With the close and humid condition of the atmosphere during the last few days, the nuisance in connection with the Rozelle and Blackwattle bays has increased, especially on the Rozelle Bay side, where the water is not quite as deep as that on the opposite side and where the flushing by tide waters has, to some extent, kept the nuisance down. During Saturday and yesterday there was an unusually large number of seagulls in the vicinity feeding on the dead fish, which, however, are stated to be less plentiful than at the previous outbreak. On Saturday great shoals of little fish, consisting principally of this season's spawning, were to be seen floating about on the top of the water, and these formed the attraction for the gulls.*
>
> *In conversation with an ex-official of the Glebe Island Abattoirs on Saturday, a "Herald" reporter was informed that the pollution of the bays, in his opinion, arose principally from an old-time system of throwing offal and refuse from the abattoirs into the bays. Thousands of tons of refuse, he said, were pitched into the water in the vicinity in the early days long before the place became so thickly populated …*

Mr W.H. Mahony, M.L.A., who has for some time lived close to the Blackwattle Bay foreshores, and who has for years experienced the nuisance in all its phases, informed our reporter that in his opinion the pollution arose from the accumulations of the sewerage for half a century, and was to a large extent originally contributed to by the abattoirs and by the sewerage from the populated districts adjoining the bays. The nuisance, he said, had been mitigated to some extent by the extension of the sewerage system, and by the authorities insisting upon the cessation of the discharge of refuse by the abattoirs; but the contributions of recent years had been sufficient to keep the whole of the bays in a state from which they would not recover until the low level sewerage was completed, the abattoirs removed, and the bays kept absolutely free from pollution'.

In the event: ' … the sewerage system would be completed by the middle of the year, if not before …'(Sydney Morning Herald, 6 January 1902, p.5). Removal of the abattoirs from Glebe Island was altogether slower, with the new abattoirs at Homebush being built in 1915(Fitzgerald & Golder, 1994:73).

5.7 Industrialisation and Commercialisation

5.7.1 Introduction

The industrialisation of Australia, and here more specifically of New South Wales, has been examined in detail by Linge(1979); his work largely informs this introduction.

Linge noted that: 'Industrial development can be viewed at four spatial scales: in the continent as a whole vis-à-vis other countries, especially of course Great Britain; between the political units into which Australia became divided; within each of the colonies; and within each of the main urban areas'(p.7). The interplay of these influences largely determined the development of Australian manufacturing and, more especially, that of the Sydney region.

Linge made the point that European colonisation of Australia occurred soon after the start of the Industrial Revolution in Britain, a country which by 1787 was 'in the throes of industrial change – in reality a quickening of a process that had been gaining impetus for two centuries or more'(p.21). The resultant highly dynamic state in Britain greatly influenced the industrialisation of a nascent Sydney, as the new colony struggled to cope with rapid technological change and its attendant shifts in industrial organization and skill needs. Nevertheless, there was sometimes a considerable lag period – the first steam engine in Australia was not set to work until 1815, for example, although Richard Trevithick introduced engines using high-pressure steam about 1800. At other times the uptake of innovation was rapid.

Conditions, both local and international, greatly depressed Sydney's commerce during the first 25 years or so of settlement(pp.26/27): 'It is not known how much this depression immediately affected industrial activity - though shipbuilding was undoubtedly curtailed – but in the longer-run it probably gained significantly because funds were invested by individuals and partnerships who could no longer see easy openings in trade, commerce, land and livestock'(p.27). During this period, what industrial activity there was largely centred on Sydney itself, with more limited initiatives at the Hawkesbury and Parramatta.

In 1815, however, 'the first steam engine commenced operations and about this time, too, colonial capitalists began to turn to manufacturing as a form of investment. Through the 1820s, state-level administrative frameworks evolved from autocracy towards self-government, a process which continued through the 1830s. During this period through to the 1850s, 'New South Wales held the centre of the industrial stage, and in 1850 had perhaps 4,700 of the estimated 10,800 'factory' workers in Australia'(p.52). Nonetheless, ' … the continuing concentration of much of the colony's non-agrarian activity in and around Sydney … affected not merely the location of manufacturing but also the range and scale of industrial enterprise that could be sustained in the colony as a whole'(p.53).

Some idea of the scope for manufacturing industry can be gained from the population estimates for Sydney – 21,361 in 1836 and 49,261 in 1851 – and for NSW as a whole 178,668 in 1851. Not surprisingly, 'Sydney was the administrative, commercial and industrial hub around which the rest of the Colony revolved'(p.71) during the first half of the nineteenth century. 'There is no doubt … that Sydney was the business centre of the colony'(p.71).

A growing manufacturing competence was evident '… as instanced by the fact that in 1813 a mechanic had to be brought out from England to set up the first steam engine imported into the colony whereas in 1836 local foundries and engineering firms started to build engines from scratch'(p.79). There was a rapid shift from direct involvement of government in production in 1815, thus spurring the development of industry. Linge(1979:81) noted that:

'At least three other factors contributed to the growing interest in manufacturing. The first was the high cost of freight and insurance and the delays and uncertainties associated with importing materials and products from the other side of the world. Second, there was the lack of interest in British mercantile circles about the problems of this remote and puny outpost of empire. Third, for a number of years there was uncertainty about whether the arrangement for merchandise to be brought to the colony aboard convict ships would be allowed to continue'(p.81). The growth of manufacturing was also encouraged by people with capital and entrepreneurial experience migrating to the colony, for example John Dickson in 1813, and the proclivities of some farmers and landholders to initiate industrial enterprises. Wentworth estimated that by 1817 investment in colonial industry would not be 'far short of £50,000', and enterprises like brewing, flour-milling, woollen cloth and rope, even paper-making were established in the first two decades of the new century(p82). Apart from a relatively few large establishments – such as Simeon Lord's cloth-mill and John Dickson's steam flour mill – the enterprises were small mills and workshops(p.82). Drought and an economic downturn constrained developments in manufacturing during the 1820s although: '… in general, the 1820s saw enlarged capacity in existing industries and a widening range of products being made'(p.85).

Three more steam engines were imported in the mid/late 1820s, leading to the acquisition of basic engineering skills '… and prepared the iron and brass foundries for the increasingly complex demands to be placed on them in the 1830s'(p.87). Shipbuilding was also becoming an established industry in the colony at this time. Emerging entrepreneurs were mostly men who had arrived in the colony as convicts, and their inclination was to spread their risks across several, sometimes related, ventures alongside maintaining agricultural properties outside of Sydney(p.87).

Butlin(1953:225/314) characterised the 1830s as: 'a period of extraordinarily rapid economic growth in which immigration and capital input furnished the material for a vast geographic expansion of the wool industry'. Agricultural exports increased rapidly: 'Stimulus was thus given to developments like the construction of wharves and stores, the expansion of shipping and transport services, and the growth of the merchant houses, agencies, shipping offices, retail stores, and other businesses that made up Sydney's commercial world …'(p.90). Specialisation was starting to occur and 'share-lists at the end of 1840 named twenty-one companies, all but three of which were formed after 1830'(p.90). Industrial trends of the 1830s included 'the increasing use of steam power on land and water with the accompanying growth of engineering and metal-working skills, and the emergence of external markets for some processed commodities'(p.90). Thus, in 1831 only six steam engines were known to operate in the colony, but this had increased to 46 by end 1840. The 1830s marked the beginning of mechanical and marine engineering in Australia(p.91). Demand for metal products such as pipes and guttering increased, although most of this was imported until the 1850s(p.91).

Linge(1979:92) described a slackening of industrial development in the colony during the 1840s, due to a slowing of male population growth, a depression which triggered a spate of industrial insolvencies, and a lack of further expansion of external markets: 'One feature of the 1840s was the way in which industries that had grown up during the previous decade consolidated their gains despite the economic uncertainties'(p.101).

5.7.2 Early decades

Specifically on Pyrmont peninsula, there is evidence of limited industrialisation within two decades of European settlement.

A) James Underwood

According to Clark(2004:20): 'Born in 1776, [Underwood] was transported at an early age for seven years for theft, arriving in Sydney on the Admiral Barrington in 1791. Having skills as a shipwright, he set up as a boat-builder when he obtained a conditional pardon. Although the Governor forbade the building of ships since these could be used for convict escapes, smaller craft were required for local transport and for fishing. Underwood's first boats were built at the head of Sydney Cove, now the junction of Pitt and Underwood Streets. He was soon crowded out of there by Government needs, and moved to Pyrmont in 1798, where he obtained a small land grant to operate the first private shipyard in the colony'. Other records of Underwood having a shipyard at Pyrmont are Flapan(2008) and the Australian Science and Technology Heritage Centre(2000). None of these references is sourced, though; searches in The Historical Records of Australia and The Sydney Gazette did not reveal more detail of this venture. Its authentication is needed. Underwood died in 1844 (http://www.absoluteastronomy.com/topics/Summer_Hill,_New_South_Wales).

B) Macarthur's Windmill

Macarthur seemed disinterested in his Pyrmont Estate from when he purchased it from Obadiah Ikin in 1799 to 18 December 1806, when it was named Pyrmont during a visit by 'a select party of Ladies and Gentlemen' to Macarthur Point – now Pyrmont Point(Anon, 1806; Fitzgerald & Golder, 1994: 13/14).

Nonetheless, Macarthur was among the first to bring industry to the peninsula. Cash Books for the Pyrmont Estate(ML CY2308/ A2903) give details on the costs and activities involved in constructing a post windmill on Pyrmont Point(Table 5.7.1). Some entries in the table are incomplete due to their illegibility.

Table 5.7.1: Cashbook entries on the construction of Macarthur's windmill

Date	Activity	**Cost** (£.s.d)
1807		
1 March	Paid carriage of shafts for the mill	4.0.0
19 May	Soldiers for making road and getting timber for mill	7.15.0
30 May	Soldiers on Acct. of digging sawpits & cross cutting timber	4.0.0
10 June	Pd. for carrying an anchor to work up for mill	0.7.0
2 July	Pd. for getting over shafts to the mill	0.8.6
5 December	Brown on Acct. of drawing wing shaft	1.10.0
22 December	Pd. for sawing timbers and boards for mill	7.3.1
1808		
8 January	Paid for sawing timber for the mill	2.4.1
27 February	Paid for getting millstones to the mill	2.0.0
19 March	Paid 8 soldiers getting spar for the mill	2.0.0
26 March	Graham sawing for mill	2.15.0

Date	Activity	**Cost** (£.s.d)
7 May	2 double blocks for mill	0.15.0
	Pd. for carting brasswork	8.4.0
28 May	… for making … mill sails	5.3.6
2 July	Pd. Levers for 2460ft of boards & scantling for the miller's house	23.6.0
	Foster for 10,000 shingles £9 & 2500 laths £3.2.6	12.2.6
30 July	… for making a new suit of sails for windmill	5.12.0
31 December	Cash paid Government for mill stones	159.11.0
	To 6 bolts canvas for mill sails	24.0.0

Construction of the mill was underway in early 1807 and was probably completed in late 1808, upon construction of the miller's house. As to the working life of the mill, documentation is assembled in Table 5.7.2. 'There was a small post windmill on Macarthur's Point Pyrmont It … was no doubt erected by one of the Macarthur family … St Bartholomews Church of England has for many years occupied the site'(Selfe, 1902/3). Two Sydney Gazette accounts in 1809 attribute ownership of the mill at that time to Garnham Blaxcell. Blaxcell arrived in Sydney on H.M.S. Buffalo on 16 October 1802. He quickly won favour with Governor King, gaining senior positions in the government in 1803/1804(Dunlop, 1966:115). It is well known that Blaxcell was 'Mr John Macarthur's partner and agent'(Ellis, 1946:277).

According to Forde(1919): 'In 1809 the partners, Macarthur and Blaxcell, became deeply involved in debt to Surgeon Thomas Jamison' and that, at this time, Blaxcell assigned some of his assets to cover his debts. While the windmill appears to have belonged initially to John Macarthur, Joseph Underwood(1816) was claiming ownership by May 1816. From this time, the fortunes of Macarthur's windmill appear linked to those of Blaxcell. Blaxcell was smuggled out of the Colony on 9 April 1817, on board the Kangaroo; he was nearing bankruptcy and legal proceedings were underway(Wright, 1983:88). He left behind several creditors and debts with the government which Macquarie(1817) believed exceeded £2000. Blaxcell's abscondment led William Gore, the Provost-Marshal, to arrange a series of public auctions of Blaxcell's property, to recover debts to such creditors as McKenna, James, Wood and Rowley(Gore, 1817 ab&c, 1819).

Joseph James deserves particular mention. He was a ship's captain, for example operating the Little Mary between Sydney and George Town, Port Dalrymple(Launceston) in van Diemen's Land(Tasmania)(Historical Records of Australia, 1921:723/4). Apparently Blaxcell had not paid for wines purchased from the Daphne, of which James was captain. James obtained a Writ of Fieri Facias from the Court of Appeals, permitting a public auction on 19 August 1817 at which the items to be sold included: 'Lot 5. All the Estate and Interest of the Appellant in the lands of Pyrmont, with the dwelling-house, out-houses, mill-house, gear and tackle thereon'(Anon, 1817a&b).

Although Blaxcell appealed this decision in the Supreme Court, The Sydney Gazette(Anon, 1818) carried an advertisement: 'To be let, the Windmill at Pyrmont, formerly in the occupation of Mr. Blaxcell'. Meanwhile, John Dickson had opened a steam mill towards the head and to the east of Cockle Bay on 29 May 1815; it could crush 260 bushels of grain/day compared with the 12 bushels/day of traditional windmills(Oakes, 1999: 203). George Best's evidence to Bigge on 4 September 1820(Ritchie, 1971:81) suggests that Macarthur's windmill remained operational for a few years after Dickson's mill had begun business.

Table 5.7.2: Records of Macarthur's Windmill, Pyrmont

Year	Source	Comment	Likely state of mill
Nov. 1809	Blaxcell(1809)	Noted that several persons were charged with the robbery of seven canvas bags, containing fifteen bushels of wheat, from the mill of Garnham Blaxcell on Pyrmont	Functional
Dec. 1809	Anon(1809)	James Heath and Henry Williams convicted for above theft	-
1816	Underwood(1816)	Claims ownership and desire to let mill	Functional
August 1817	Anon(1817a&b)	Blaxcell appeals a *Fieri Facias* through which he would lose ownership of the mill	-
March 1818	Anon(1818)	Mill for rent; formerly owned by Blaxcell	Functional
November 1818	Anon(1820b)	Account of theft of iron work from the mill at Pyrmont, property of John McArthur	-
1819	Joseph Lycett's 'South view of Sydney, New South Wales'(ML 54)	Macarthur's mill clearly shown, seemingly in good condition	Functional
Late 1819	Morawa District Historical Society(2009)	Mill advertised for rent by John Atkinson, a Castlereagh Street merchant	Functional
1819/ 1820	James Taylor's 'Cockle Bay now Darling Harbour' (ML 941)	Showed the windmill	Functional
c.1820	Edward Mason	As above	Functional
1820	Anon(1820b)	Windmill is mentioned	-
1820	Ritchie(1971:81)	George Best, in evidence to Bigge on 4 September 1820, described taking some wheat 'to Mr M'Arthur's mill to be ground'	Functional
May 1821	Morawa District Historical Society(2009)	John Atkinson 'entered into a partnership with Mr McQueen(of the Segenhoe Estate), to operate the business, and the post windmill was put up for sale, it having a pair of four-feet French Burr Stones'	Functional
1822	John Septimus Roe 'Map of Sydney'	Shows location of mill	-
1826	Anon(1826a)	Noted that the windmill on Macarthur's Point was 'ruined'	In disrepair
1832	John Thompson	Sketch depicts a badly deteriorated mill, the 'haunted' mill	In disrepair
1837	New South Wales Calendar & General Post Office Directory	Previous editions(1832/35) had noted the 'old windmill' as 'a very picturesque object'; this edition had no reference to the windmill	In disrepair or demolished
1839	Manuscript of 12 December 1839, in Macarthur Papers Vol.98: Pyrmont Estate 1832 – 1870(ML Call No: A2994 (Frame 13)	Noted that a lot sold at public auction by J.W.Smart, Licensed Auctioneer, was 'associated with Old Windmill': ' A lot of stone, with old windmill etc to J. Yabsley for £10.0.0	Dissassembled

In summary, Macarthur's windmill was operational for less than two decades before falling into disrepair. Sometime in the mid/late 1830s, the mill was demolished and its operating mechanism sold at auction in December 1839(see also Godden Mackay, 1994b:8).

C) Macarthur's salt boiling works

Macarthur also engaged briefly in salt production(Fitzgerald & Golder, 1994:15). According to Rogers (1990:38): 'In July[1807] the try pots from the Hawkesbury operation were taken to a boiling works at Pyrmont along with four others. This establishment began operating in mid-October and continued until the following July[1808], producing about 20 tonnes(48,689 pounds) of salt in this time … There are no records to indicate that the venture continued beyond July 1808'. The Pyrmont Estate Cashbooks(ML CY2308/A2903) broadly confirm this account, with the operation at Pyrmont starting on 19 October 1807 and ending on 18 July 1808. Four men were initially employed for 17 weeks, then five men for 22 weeks, to cut wood and carry it to the pans. This activity would have substantially impacted on the Estate's timber resource and hence its ecology. No records have been found as to the location of the works. Hainsworth(1981:188) believed that: 'Garnham Blaxcell was almost certainly associated with John Macarthur in the Pyrmont salt-making'.

D) Macarthur's yard

According to Hainsworth(1981:124): 'The Pyrmont yard … was a general timber, carpentering and joinery business which carried out a variety of maintenance work'. He also noted that construction of Macarthur's windmill was carried out at this builder's yard. It is tempting to speculate on whether this yard was in some way associated with the shipyard reputedly built by James Underwood at Pyrmont in 1798(p.449).

5.7.3 Later developments

Subdivision of Macarthur's Pyrmont estate in the late 1830s/early 1840s made land available for industrial development in a timely manner. The process of industrialisation began modestly. The incipient industrialisation is shown in W.S. Hatton's 1859 painting of Darling Harbour(ML DG VIA/31)(Figure 5.7.1), with six chimney stacks evident on Pyrmont.

Figure 5.7.1: Hatton, W.S., 1859, Darling Harbour(DG VIA/31)

Further:

- Between the 1830s and 1860 various noxious industries were established along the shore [of Blackwattle Bay], including, and in particular, abattoirs and boiling down works …'(Thorp, 1990:)
- Surgeon John Harris sold an eastern portion of the Paddy's Market site, 1 acre 0 roods and 36 perches(about 0.4ha) in extent(Lyons, 1845) to John Terry Hughes in 1838: 'Hughes established a flourmill there in 1845 …'(SHFA, 2007a:2)

By 1850, there were 103 commercial enterprises on Pyrmont peninsula (Godden & Mackay, 1994:7).

By 1900, it was noted that:

> *'During the decade just past*[1880s]*, there has, among the many phases of Australian progress, been no development more pronounced than the forward move of the Pyrmont district towards importance as an industrial centre. Its position, within easy distance of the city's heart, the natural advantages which it possesses in having deep water along the greater part of its extensive water frontages, and in there being an absence of any such gradients as would make road traction difficult and expensive, are enormously in its favor, and this fact is becoming generally recognised. As a result, the waste and vacant land which was available on all sides as late as the eighties has been utilised for the accommodation of the business first of one great firm and then of another, until but little remains'*

By the 1900s, the process of industrialisation was well advanced:

> *'From Darling Island to Pyrmont Point, and thence to Glebe Island Bridge, the shores are taken up with the establishments of engineers, boiler makers, and iron shipbuilders, steamship joinery works and timber yards, above all of which the great smoke-begrimed and four-turreted pile of the Colonial Sugar Refining Company's works raises its conspicuous mass. On the Blackwattle Bay shore … one may now see a row of sawing and planing mills, joinery works, cooperages, and box factories and timber yards – all with an appearance of briskness and prosperity'* (Anon, 1900:79).

The author elaborated as follows:

> *'Throughout the whole district, during the last twelve or fifteen years, great wool warehouses, mills, factories, machinery stores, iron foundries, and blacksmithing and engineering sheds have been established on all sides, and the air resounds daily with the incessant roar of machinery, the whirr and shriek of the sawmills, the rumble of heavy wheels, and the clattering and hammering of the foundries, while innumerable tall chimneys burden the atmosphere with their outpouring of dense, black smoke'.* (Anon, 1900:79)

Figure 5.7.2: Kent, M., 1930/70, Further collection of negatives, chiefly aerial views of Sydney, ca 1930-1970: [Industrialisation of Pyrmont Point in the late 1920s](ML ON 297/156)

The extent of industrialisation in Pyrmont during this period is difficult to comprehend today. Figure 5.7.2 shows Pyrmont Point as it was probably in the late 1920s. The Waterside Cold Stores are cut into the sandstone of the Point itself, with a row of terraces in Herbert Street behind. The large sheds fronting the eastern side of Elizabeth Macarthur Bay belonged to Goodlet & Smith, the company which at one stage sought to expand into the adjoining Pyrmont Baths. A short distance up Harris Street from these sheds is John Kellick's multi-storey stone wool store, while the substantial establishment of CSR extends westwards from Elizabeth Macarthur Bay. The second Glebe Island Bridge can be seen in the upper right of the photograph, with tanks of the Vacuum Oil Company on Distillery Hill in the centre and the cement silos (of today) on Blackwattle Bay to the left.

5.7.4 Selected industries

Both Matthews(1982) and Fitzgerald & Golder(1994) describe at some length the industrialisation of Pyrmont peninsula; their particular findings need not be repeated here. Rather, the purpose of this section is to more fully document the development of selected industries on Pyrmont peninsula. Through this process, it is hoped to gain a clearer chronology of the industrialisation process on the peninsula and some sense of its scale. The ecological consequences of these events can then be more clearly ascertained.

The distinction used below between iron-founders, engineers and ship-builders on the peninsula is one of degree. Some of the iron-founders were engineers but their main business was to produce the iron used by others in the fabrication of artefacts. The engineering works on the peninsula often had their own foundries, but their prime value-added activity was to create artefacts with the iron produced. The ship-builders were essentially engineers who had specialised into a particular area of their profession.

A) Ship building

i. Introduction

Pyrmont is one of 16 historical centres of boat and ship building around Port Jackson listed by Flapan (2006b).

> *By the beginning of the 1850s, according to Ford's Sydney Commercial Directory, there was a scattering of shipwrights and boat-builders on the [Pyrmont] peninsula. But they were well outnumbered by stone-masons, quarrymen, brickmakers and carpenters …'(Fitzgerald & Golder, 1994:29).*
>
> *'The peak in production of wooden ships in New South Wales occurred in the 1870s and 1880s with over five hundred vessels registered in each decade as having been built in the colony. During that period, Port Jackson was the main shipbuilding centre, contributing 42 per cent of the total …'(Evans, 1989:127).*

According to Evans(1989:127/128): 'The introduction of iron for major elements in ship construction from the 1830s had a far-reaching effect on the shipbuilding industry worldwide … The major effect in Australia was to concentrate activities in the shipyards of the larger ports, such as Port Jackson, where repair facilities for visiting overseas iron vessels was of great concern from the 1850s, and where also there was a concentration of both capital and labour. The problem for local shipbuilders in wood was not merely the need to learn new skills to work in iron, but the great increase in size and deadweight of visiting iron ships was far beyond the capacities of existing yards. It was only the largest of the early iron ships that could make a profitable business of the long haul from Europe. Their size and weight necessitated the building of larger and far more massive slipways than were needed for drawing wooden hulls out of the water'.

ii. John William Russell

Russell acquired original Macarthur Portions 7-9 on Pyrmont Bay from William Barnett. According to the ledger of Pyrmont Accounts(ML Macarthur Paper, Pyrmont Estate, 1832-1870, A2994(CY2291)), Barnett bought these portions from James Macarthur on 12 December 1839. It is also recorded that Russell paid one year's rent on the portions, up to 12 December 1840 on 2 April 1841(Frame 83), and that the portions had been sold by Barnett to Russell(presumably on, or soon after, acquisition by the former).

According to Portus(1904/07), though, Russell was in business in 1836. If his works were located on the above land portions, Russell would seem to have established a shipyard on the Pyrmont Estate at least three years before the portions he later acquired were sold at auction. This raises the possibility that some portions sold at the 1839 auction had been settled already.

Russell's portions ran from Union Street to the bay, and were immediately west of Murray Street. In 1837, Russell built the Maitland for John Edye Manning (http://www.flotilla-australia.com/vic.htm). He also 'completed a steamship with a locally made engine as early as 1838' (http://www.environment.gov.au/heritage/ahc/publications/commissioin/books/linking-a-nation/chapter-2.html). Russell built at least five vessels between 1837 and 1849(Flapan, 2006a). In 1844, J.W. Russell had a yard at the end of Union-street, Pyrmont(Watson, 1920). His address was variously given in Sand's as 82 Union Street and 21 Murray Street.

The last entry for J.W. Russell, boatbuilder, in Sand's Sydney & NSW Directory was for 1875, while one John W. Russell was listed at Lower Ocean Street, Woollahra in the 1876 edition. On the other hand, 'A shipbuilder, Captain John William Russell, died in 1872, aged 79 …'(Middleton, 1962:238).

iii. Chowne, Thompson & Chowne

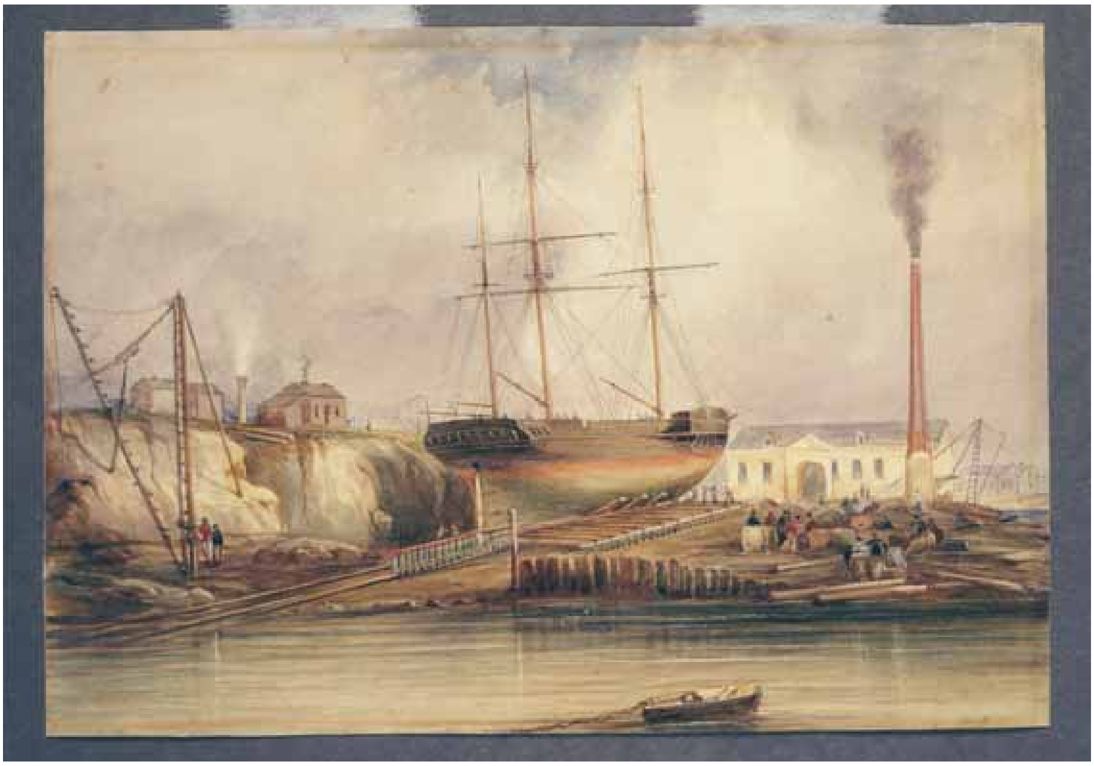
Thomas Chowne acquired land just west of Elizabeth Bay in 1840 to establish a shipbuilding firm. The company built at least 13 vessels between 1840 and 1863(Flapan, 2006a). The site was bought by CSR in 1875.

iv. Australasian Steam Navigation Company

The Hunter River Steam Navigation Co built a shipyard on the eastern side of Pyrmont Bay in February 1846(Matthews, 1982:56). It became the Australasian Steam Navigation Co in March 1851. That year, the company 'brought out new iron steamers and a goodly supply of skilled artisans … Australia's first iron vessel, the "Ballarat", was launched in 1853 … her components had been prefabricated in England, and reassembled at Pyrmont … [The works] were fully equipped with foundries and machine shops for the manufacture of complete engines, and with a patent slip for the ready repair of vessels' (Hughes, 1968:15).

According to Davies(1984:71): 'Until 1854 Darling Island served no particular purpose except possibly as a storage area for surplus metal stock from the huge shipyard … opposite on the shore of Pyrmont. ASN Company … contracted Charles Saunders to level the island and widen its connection to the peninsula,(see p.411). ASNCo installed a giant patent slip on Darling Island in 1855(Fitzgerald & Golder, 1994:31). It was able to take vessels up to 1,500 tons burthen(NSW Official Publications, 1886:5). This development was illustrated soon afterwards in a painting by Frederick Garling(Figure 5.7.3).

Figure 5.7.3: Garling, F., 1859/71, Views of ships, ca 1859-1871, Folio 1: Patent slip belonging to the Australasian Steam Navigation Co.[ca 1855](DGD 3/1)



By the 1870s the Pyrmont works employed ' … 350 hands, and were originally established for the purpose of effecting the necessary repairs to the machinery, & c., of the large steam fleet of the company … by degrees [the company] became engaged in engineering and shipbuilding on a large scale. Nearly all the work done here is marine work …'(Anon, 1871:451). By 1887 the ASN yards covered six and a half acres(2.63ha)(Matthew, 1982:56).

Early in 1887 'the Steam Navigation Company's assets were taken over by the British India and Queensland Agency Ltd, the fleet being operated by the newly formed Australasian United Steam Navigation Company … On 27 October 1887 the board of Mort's Dock decided to purchase the Steam Navigation Company's 'tools, goodwill, patent slip and other appliances for working same' for £15,000.

'The concentration of these shipping facilities at Sydney was significant not only from a monetary point of view but also because it provided an opportunity for local firms to keep in touch with overseas marine technology at a critical stage in the colony's industrial development'(Linge, 1979:423/425).

'The yards were sold on 27 July 1895 for £64,000 to a private syndicate; this in turn onsold them four years later[1899] to the State for £135,000'(Matthews, 1982:56).

v. Chapman & Gunn

It is unclear how long this partnership survived. Based on entries in Sand's Sydney & NSW Directory, Donald Gunn took up residence in Harvey Street, Pyrmont around 1863, while John Chapman arrived in Pyrmont about 1865 and found accommodation in Murray Street. Both advertised as shipwrights. The only reference to the partnership in Sand's Sydney & NSW Directory is in the 1867 edition, in which they advertised as ship-builders. However, the Black Diamond collier was built by the partners in 1864; it weighed 159 tons and was lost on 25 May 1872(Flapan, 2008; http://www.wreckdatabase.com/wreck.aspx?52053).

Gunn remained in Pyrmont at least until 1873, but had moved to Balmain by 1877. By 1877, Messrs Chapman & Co were operating the Pacific Foundry and employing 150 hands; 'While the work was principally marine, other products were colliery work, flour mills, wool-washing machinery, sugar mills' (Anon, 1877a). Chapman had several addresses in Pyrmont, mostly in Harris Street, until he also moved to Balmain – in about 1882.

vi. James Bower & Co

James Bower appears to have built at least three boats, including a tug, at Pyrmont between 1873 and 1875(Flapan, 2008), mostly in association with David Drake. They included the Alexander Berry, a wooden screw steamer, in 1873 (http://maritime.heritage.nsw.gov.au/public/documents/shellharbour.pdf).

vii. David Drake/David Drake Ltd.

Drake first appeared in Sand's Sydney & NSW Directory in 1877, as a shipwright at Alma Terrace, Pyrmont. Evans(1989:127) gave the establishment date for the company as 1878. By 1880 Drake had moved to Mill Street, mostly 33 Mill Street, and remained there until 1890, after which he had a Smith Street, Balmain address. Drake & Bower built the Manly in 1874(Matthews, 1982:56). The Powerhouse Museum has a half-ship model of the paddle steam SS Bendon made by David Drake in 1885 (http://www.powerhousemuseum.com/collection/database/?1rn=211566). Drake built the wooden paddlewheel steam ship Bunya Bunya, gross weight 202 tons and launched in 1885, in Pyrmont(http://www.ferriesofsydney.com/bunyabunya.html). From 1886, Drake advertised himself in Sand's as a shipbuilder. Flapan(2006a) recorded the company as actively shipbuilding in Pyrmont between 1885 and 1934.

A namesake, William Drake, shipwright, appeared in the 1887 edition of Sand's, and lived in Bowman Street(mostly 118) until 1905. He is attributed with building a tug in 1903(Flapan, 2008).

viii. Jonathan Piper

A shipwright, who briefly stayed at 1 Albert Street, Pyrmont, in 1882, possibly to 1884(Flapan, 2006a). He previously lived in Balmain and, his entry in Sand's Sydney & NSW Directory indicates that he returned there in 1884.

ix. M. Morrison, Shipwright, 27 Murray Street

A 'M. Morrison, Shipwright' was listed in Sands Sydney & NSW Directory as living in Murray Street from 1891. This same person was listed in the NSW Telephone Directory of 1900 as 'Engine, Ship and General Blacksmith, 27 Murray St, Pyrmont'; his entry continued until 1918.

x. Morrison & Sinclair

According to Wikipedia: 'Morrison & Sinclair was a Sydney, New South Wales based company and one of the great ship and boat-building names of Port Jackson. The company was founded in the early 1890s and ceased trading in 1970'(http://en.wikipedia.org/wiki'Morrison_&_Sinclair). It was based initially in Johnston's Bay, Balmain, and, in 1923, transferred its operations to a site at the end of Yurulbin(Long Nose) Point.

According to Evans(1989:127) though: ' … a prominent twentieth century builder of wooden harbour ferries was Morrison and Sinclair(Pyrmont 1898 and Longnose Point 1905)'. The view that Morrison & Sinclair were initially located in Pyrmont is shared by Andrews(2004:55): 'Early in the 1890s Thomas Ferret Morrison(1851-1944) and Thomas Callender Sinclair(1856-1940) formed a boat and ship building known as T.F. Morrison & Sinclair, Shipbuilders, at a waterfront site in Jones Street Pyrmont, close to the present RAN site, previously known as the Royal Edward Victualling Yard, or REVY. This site was soon needed for new wharf development in Jones Bay and the company moved its works to an area in Johnston's Bay, Balmain, close to the Stephens Street ferry wharf'.

The NSW Phone Directory provides more insights into the early days of the company. The first entry for T.F. Morrison's Steam Joinery Works at Mill Street, Pyrmont was in October 1897. The partnership with Sinclair, as 'Morrison, T.F., Sinclair & Co, Steam Joinery Works' first appeared in the May 1901 directory. The company remained at Mill Street, Pyrmont, until late 1903, the December 1903 directory listing 'Morrison, T.F., Sinclair & Co., Shipbuilding and Steam Joinery Works, Johnston's Bay, Balmain'. It appears that the company's expansion into shipbuilding coincided with its move from Pyrmont to Balmain.

Based on Sand's Sydney & NSW Directory, a T.F. Morrison – sometimes Thomas Morrison and sometimes listed as a joiner – lived at several Pyrmont addresses prior to formation of the company – 36 Point Street(1897), Murray Street(1895/6) and 90 Union Street(1891/4).

Flapan(2008) noted that 49 vessels were built by the company.

xi. Joseph Banfield & P. Allen

Banfield was first recorded in Sand's Directory as a carpenter living at 50 Mill Street, Pyrmont. By 1875 he is listed as a shipbuilder and, in 1877, as a shipwright living at 4 Alma Street. He lived in Alma Street until 1883, when he moved to Pyrmont Street(variously 42 and 66) until 1891, when records ceased. The company built two boats, a schooner and ferry, at Pyrmont during 1872(Flapan, 2008).

xii. Other boatbuilders

Other ship/boat building enterprises on which little or no information was found were:

- James Bridge, engineer, of Harris Street.
- George Foster & Sons, located at the corner of Crown(Bulwarra) and Mary Ann Streets.
- Henry Beattie, 14 Harris Street, Pyrmont: A shipwright and builder of ship's models.
- Davidson shipyard, which built the Hornet in 1883(Matthews, 1982:56)
- Fenwicks, Flapan(2006a) listed a tug built by the Fenwicks in 1871.
- William Stephens, entries in Sand's Sydney & NSW Directory indicate that this person, a boatbuilder, lived at (50) Mill Street between 1863 and 1868.
- H.E. Jeffrey: Flapan(2008) attributed construction of an iron vessel in 1870 at Pyrmont to this individual.
- William Robertson was listed in the 1867 edition of Sand's Sydney & NSW Directory.
- Thomas Armstrong was listed in the 1867 edition of Sand's Sydney & NSW Directory.
- Holdsworth: Flapan(2008) listed this person as building a wooden ferry at Pyrmont in 1856. He was probably Philip Risby Holdsworth, 'a respected boatbuilder'(Heseltine, 1972), who was listed as insolvent in 1849(www.gownewspaperindexes.com.au/mm1849.html).
- Henry Hawkins, Shipwright, 10 Harris Street

xiii. Conclusions

Until there is clarification of James Underwood's reputed shipyard in Pyrmont, J. W. Russell should be considered among the first shipbuilders on the peninsula, from 1836. While at least three shipyards were established during the decade 1836/46, other yards came into being from time to time over the next 50 years. Most yards were short-lived, lasting for less than a decade before closing or moving off the peninsula, but others survived for up to four decades. Notable among these were J.W. Russell, the Chowne Brothers, and the Australasian Steam Navigation Company. While most yards closed during the late 19th century, those of M. Morrison and T.F. Morrison & Sinclair persisted until 1918 and 1903 respectively – by which time the latter had transferred its operations to Balmain.

B) Breweries

i. Introduction

There were 9 breweries in Sydney in 1834, brewing ale for a population of less than 25,000(Holden, 1939:22). According to Stubbs(2000:56): 'At its numerical peak around 1890, the brewing industry in NSW comprised c.80 breweries, up to about 17 of which were located in the capital city, Sydney …'. Most of these breweries served small, local markets only. As Tooth & Co (1953:22) noted: ' … during this period a swarm of minor businesses sprang up, all destined to have a comparatively short existence and most of them doomed to extinction when, in 1901, The (Commonwealth) Beer Excise Act came into force'. The breweries of Pyrmont peninsula, regrettably, seem to have been in this latter category!

ii. **Parramatta Brewery,** Ultimo House, Ultimo

Operated by Burton D'Arcy from about 1846, possibly until his death in early 1850(see also p.440).

iii. **Castlemaine Brewery,** 69 Hay Street, Haymarket

According to Linge(1979:521): ' … Castlemaine Brewery [was] founded in 1870 as a private concern by Nicholas Fitzgerald and Prendergast, a Victorian partnership. Brennan was the brewer. Further, The Sydney Morning Herald in 1874 commented: ' … when a branch of the Victorian Castlemaine firm settled down in Sydney and began to supply an article equal in every respect to that produced in the sister colony, our established city breweries found that it was time to look to their laurels and to keep pace with the improvements then going on … This brewery may be said to be the pioneer of the new state of things in brewing, the introduction of the light Castlemaine ale having driven the old-fashioned colonial ale, known familiarly as 'string-bark', completely out of the market, substituting for it a good, sound, and wholesome drink that is fast superseding in public estimation the heavier ales imported from England' (Godden Mackay, 1990a). George Harris referred to the brewery in evidence to a Parliamentary inquiry in 1874(Matthews, 1982:14).

The company was registered as a public company on 30 November 1881, The Castlemaine Brewery Malting Company, at which time it was producing some 450 hogsheads of beer/week. It was rebuilt in 1882(Sydney Harbour Foreshore Authority, 2009), and 'was reconstituted as The Castlemaine Brewing, Malting, Wine and Spirit Company Ltd on 18 December 1883 'to enlarge the trade of the company by combining wine and spirit business with brewing'(Linge, 1979, 798). On 11 March 1890, the three Cornwell brothers, who had previously been employed by the brewing firm of Tooth and Company, agreed to amalgamate their business – the Australian Brewery, in Bourke Street, Waterloo – with Castlemaine, to form the Australian Brewery & Wine & Spirit Co Ltd. It appears that at this time the brewery expanded into 91-123 Hay Street, where it remained until 1905(Godden Mackay, 1990a:13). The Australian Brewery Company was wound up voluntarily in May 1906(Linge, 1979:521).

iv. **Pyrmont Brewery** cnr. Union & Murray Streets, Pyrmont

Established in 1880. Arrangements for liquidation on 1 August 1887 were tardily advertised in The Brisbane Courier of 4 August 1887(p.2).

v. **Anglo-Australian Brewery** 557-559 Harris Street

Operated by Messrs Miller and Mason from 1882 until early in 1890: 'During the eight years that the brewery operated it was known by three different names, had five different owners and two locations. In the early years the brewery earned the distinction of being the first to commercially produce lager beer in New South Wales …'(Deutsher, 1999:59). Its other names were 'Red Heart Brewery' and the 'Sydney Brewery'. It had moved to Harris Street from George Street South by 1885. Brewing stopped in early 1890 and its operators sold the equipment and moved out.

vi. **Conclusions**

Apart from Burton D'Arcy's venture in the basement of Ultimo House, the three breweries of Pyrmont-Ultimo were all part of the efflorescence of small breweries serving local markets over the two decades 1870 to 1890. None survived or became part of the breweries of today.

C) Flour mills

i. **Victoria Steam Mill** 62-88 Engine Street/91-123 Hay Street

John Terry Hughes established a flour mill on the eastern portion of Paddy's Market site, 'first named for his business partner John Hoskins, and then renamed a number of times between 1845 and 1908 by/for its subsequent owners as the Victoria Steam Mill, Smart's Mill and Pemmell's Mill' (Sydney Harbour Foreshore Authority, 2009). At about this time, the site was purchased for construction of the new(Paddy's) Vegetable Market in 1909. Hallen & McEvoy(1867) showed the extent of the establishment in that year.

Sand's Sydney & NSW Directory recorded James E. Pemmell as proprietor of the Victoria Roller Flour Mill in Engine Street, Ultimo, from 1893 until his death in 1906: 'His name and the date 1893 can still be seen on his later mill building on the corner of Ultimo Road and Thomas Street in Haymarket' (http://www.cityofsydney.nsw.gov.au/newtownproject/History_of_the-Streets_of_Newt/body_history_of_the_streets_of_newt.html).

ii. **S. Freeman & Sons Ltd.** Ultimo Roller Flour Mills, Allen Street, Ultimo

Stephen Freeman emigrated from Shropshire to the colony in 1849. While company advertisements claimed that his business was established in 1872, the first entry for Stephen Freeman in Sand's Sydney & NSW Directory is in 1884, as having a residence in Westmoreland Street, Glebe. In 1885 this entry was elaborated to describe Freeman as a commercial traveller and, in 1886, as a manufacturer of baking powder. Freeman acquired extensive property holdings in Ultimo, with a total floor space of 76,000 square feet exclusive of storage sheds, and manufactured a huge array of products(Anon, 1900). Among those, Sand's listed an establishment in Harris Street - giving the address as 256 Harris Street, perhaps a typographic error, in 1888. According to Fielding(1985:44) '… in 1890 their address had been 354-356 Harris Street, and a steel engraving on the building of that year shows the initials S.F.1886 on the parapet'. Freeman seems to have acquired adjoining properties in the ensuing years and, by 1905, Sand's showed the company to occupy 350-362 Harris Street.

The site in Allen Street, with Jones Street on its western boundary, was purchased by Stephen Freeman in the 9th sale of the original Ultimo Estate – which included Block 42 – on 16 February 1895. Freeman was clearly engaged in flour milling by 1900. Entries for the company in Sand's ceased in 1923.

iii. **Edwin Davey & Sons** Chanticleer Roller Flour Mills, Allen Street, Pyrmont

Edwin Davey purchased Freeman's Ultimo Roller Flour Mills in 1901(Fielding, 1981:215). He had a telephone installed at the mill by late 1901(NSW Telephone Directory). 'Shortly after the purchase, the capacity of the Ultimo mill building and plant was doubled'[in 1902](Fielding, 1985:45). In 1906, a further 100 feet was acquired at the back of the mill property. The mill was extensively damaged by fire on 24 March 1911(SMH 25.3.1911, p.15), and was re-built. Edwin Davey & Sons merged with N.B. Love Pty Ltd on 15 August 1940, but continued to trade under its former name. The mill had a considerable export trade with India, Europe, Egypt, South Africa, America, and the Far East. Although only sections of the outer walls of the building remain today, an excellent aerial view of the full establishment in the early 1980s is provided by McCauley, Conran & Briger(1983). Matthews (1982:63) also had an aerial view of the mill, showing its frontage onto Allen Street. The mill closed in 1992, being 'small and old fashioned compared to modern facilities'.

Jean Fielding, in her 1985 book 'The Golden Grain' reproduced a striking watercolour of the mill painted in about 1925. The unknown artist was located on a section of Jones Street now lost to the Western Distributor and the painting included some of the sawmills fronting Pyrmont Bridge Road/ Blackwattle Bay. It also included Wentworth Park and the urban landscape behind. Some of the cuttings made during construction of the Wardell line are evident.

iv. **Fielder Gillespie** Anchor Flour Mills, 50-72 Union Street, Pyrmont

This mill fronted Union and Edward Streets. It was constructed in 1920 and commissioned in 1921. It operated until 1990(Anglin Associates, 1992). The mill was an early example of the shift from bag to bulk handling in the NSW flour industry. Twenty concrete silos were initially constructed, facing Edward Street, and another 20 bins were erected during the 1940s. The mill delivered flour throughout Sydney and to Asia, the Pacific Islands and the United Kingdom. It employed 70 people. Figure 5.7.4 shows the mill in 1946.

Figure 5.7.4: <u>Sydney Council, 1946, Photographic views of Sydney: City Council resumptions, Vol. 3: Photograph 125: Demolishing chimney stack, Gillespie Bros. Ltd. Anchor Flour Mills, 52 Union Street, Pyrmont</u>(ML PXE 907 Vol.3/125)

One of the company's labels, with an Asian destination, is illustrated in Figure 5.7.5.

Figure 5.7.5: Anon, n.d., A collection of flour bag label prints: Stork Brand Flour bag label, from Gillespie Bros, Anchor Mills, Pyrmont (ML XX/125)

v. White Rose Flour Mills

349 Bulwara Road, Ultimo

The first entry for this establishment in the NSW Phone Directory was in October 1925, and the last was in 1963. By 1964 the company had relocated to Hamilton Street, Homebush. According to Matthews(1982:62), the mill was demolished in 1965, and replaced by the Gazal Building. Matthews has a photograph of the mill.

vi. Conclusions

Flour milling had a long history in Pyrmont-Ultimo, from opening of the Victoria Steam Mill in 1845 to the closure of Edwin Davey & Sons in 1992.

D) Engineering Works

i. Introduction

The distinction between iron-founders and engineers on the peninsula is one of degree. Most of the engineering works on the peninsula at this time operated their own foundries, but they also fabricated artefacts. There were some 44 manufactories in Sydney classified under the heading "engineers, boilermakers and ironfounders" in 1877(Anon, 1877a). Together they employed over 2,000 persons. Many of these establishments were located on Pyrmont peninsula at that time. Engineering works on Pyrmont peninsula included:

ii. John Fyfe and Sons

Marian Street, Pyrmont
John Fyfe(1804-1889) arrived in Sydney in 1841 on the paddle steamer Rose (http://www.cityofsydney.nsw.gov.au/Council/documents/meetings/2005/05MeetCalendar20_06FinanceReport4.pdf). He served as an engineer with the Hunter River Steamship company until, 1855, overseeing construction of the Darling Island site in 1851, and becoming Engineer Superintendent. He opened his own establishment on Saturday 2 June 1855(Matthews, 1982:55). It was situated 'on a large piece of ground, between the western end of Marian-street and the waterside'(Anon, 1855:315); this source also provided a detailed account of the establishment. An advertisement on page 4 of the Moreton Bay Courier of 25 August 1855 announced that: ' … their works are in full operation, and are adapted for iron foundry, millwright, engineering, and the general blacksmith business … Iron castings of every description, both in loam and sand, executed … Steam engines manufactured, repaired, and erected to order. Boilers made and repaired. Steamboat engineering in all its branches, executed' (http://ndpbeta.nla.gov.au/ndp/del/printArticlejpg/3714107/2?print=y). John Fyfe was elected the first President of the Engineering Association of New South Wales(Portus, 1904/07:209).

iii. Davy & Co, Atlas Works

33, 37-41Hay Street, Ultimo
Listings for this company appear in the 1873, 1875 and 1876 editions of Sand's Sydney & NSW Directory, with its location given variously also as the New [Iron] Wharf and 'head Darling Harbour'. George Harris referred to the establishment in evidence to a parliamentary inquiry in 1874(Matthews, 1982:14). The company advertised as millwrights, engineers, boiler-makers, and blacksmiths. They also built a ferry in 1879(Flapan, 2008).

Possibly the same company acquired a ten-acre portion of the Clarke land grant at Woolwich in 1883, which went to Atlas Engineering Company: 'One of the Clarke's houses was used as an office and new workshops were erected. A floating dock was imported from England(http://www.discoverhuntershill.com.au/suburbs.asp?id=2).

The City of Sydney Archives also record Davy & Co as having an iron foundry in Murray Street, Pyrmont. Perhaps Davy & Co was a precursor to Davy & Sands, and the latter was linked to the Atlas Engineering Company in some way.

iv. Bladen & Crocker, Pyrmont Bridge Ironworks

Union Street, Pyrmont
First listed in Sand's Sydney & NSW Directory in 1875, with entries to 1879. The company operated an iron rolling mill and had a wharf on Darling Harbour. By 1877, the company had 25 hands: 'the works are capable of turning out upwards of 30 tons per week'(Anon, 1877).

The Brisbane Courier of Saturday 13 March 1880(p.8) carried two advertisements for sale of the business, on dissolution of the partnership. The property had a '63ft frontage to Darling Harbor, and 165ft to Union-street, Pyrmont(immediately over the Pyrmont Bridge)', and the plant included a steam engine, 14 pairs of rolls for making round, square and flat bars, and two furnaces(http://ndpbeta.nla.gov.au/ndp/del/pape/75013?zoomLevel=2). The site was later occupied by D. and W. Robertson.

v. George & Charles Hoskins

Enterprise Ironworks, 85 Hay Street/46-60 Engine Street, Ultimo

The company was apparently established at this address in 1876, and is shown there in an 1880 plan by Percy Dove. It appears that Hoskins retained this property at least to 1892, as the NSW Telephone Directory of that year listed the company there as 'Engineers, Boilermakers and Iron Founders'. An 1892/1901 map of the Public Works Department(Godden Mackay, 1990a: Figure 12) shows this site still as an engineering works but in the name of 'Jas Williams & Co', to whom no reference could be found in Sands.

> *'By 1889, the firm had decided to purchase a more spacious property, and selected a site at 512 Wattle Street, Ultimo … As well as catering for the manufacture of boilers, the brothers decided to go into the manufacture of cast iron pipes'(Hoskins, 1995:21). The Hoskins brothers invested £15,000 in this plant, which finally opened in February 1890, at which time it was already making 1,500 tons of 24-inch diameter pipes for the Government(Linke, 1979:428). The site was bounded by Wattle, Thomas and Jones Streets, and a row of terraces fronting Mary Ann Street to the north. The company still owned this site in October 1893, when it was auctioned by Richardson & Wrench Ltd for The Perpetual Trustee Co. Ltd in Sale No. 5 of the Harris Estate*(Hoskins, 1995:21)

By 1904 the company was the sole supplier of cast iron pipes in New South Wales. About this time: 'As the volume of this work [pipe-making] grew, another property was acquired(I think this was under leasehold) nearby in William Henry Street, and here the plant was designed for vertical casting of larger pipes up to thirty inches diameter'(ibid:21). This site was flanked by Blackwattle Lane, William Henry, Macarthur and Wattle Streets; it is now occupied by the Sydney City Council Garage.

'In January 1908 the company took over William Sandford's Eskbank ironworks at Lithgow, acquiring a blast furnace, iron and steel works, colliery, iron leaseholds at Cadia and Carcoar, stocks of raw materials, some 400 acres of freehold town estate at Lithgow, Eskray Park at Bowenfels, and a seven-year government contract'(Godden Mackay, 1990:37).

' … the plants at Ultimo and Rhodes were ultimately to be made redundant by the transition to centrifugally cast pipes, in the Company's new plant to be erected at Port Kembla, which commenced operation in June 1929'(Hoskins, 1995:31). The NSW Telephone Directory ceased to list the Wattle Street site that year.

vi. Henry Vale & Co.

12 Edward Street, Pyrmont

Vale was born in 1835 in London, and emigrated to Sydney in 1855. He had been in the engineering business since 1865. His works may have built the first locomotive in New South Wales. Other fabrications included iron steamers, steam launches and punts(Anon, 1877a) Vale was in partnership with William Lacy in 1875, with an Engineering and Boilermaking establishment in Druitt Street. He apparently moved to Pyrmont in 1876, where he established the Pyrmont Engine Works in Alma Street. The company is variously referred to as Vale's Engineering Works(1879) and Alma Engineworks(1882) in Sand's. The latter is recorded at 12 Edward Street. According to City Council records, in 1882 Vale lived at 56 Pyrmont Street and had a foundry off Pyrmont Street (http://www.cityofsydney.nsw.gov.au/assessmentbooks/CR517%201882/1882%20DENISON%20WARD.pdf).The 1883 entry was for Vale's foundry, in Alma Street. The address in 1884 was given as Vale's Wharf in Edward Street, Pyrmont. By 1885, the company name and address had reverted to Pyrmont Engine Works at Alma Street.

In 1878 Vale was contracted by the NSW Government to build railway rolling stock(Kass, 2008). It seems likely that the Pyrmont works also built a tram now held by the Powerhouse Museum (http://www.australiansteam.com/nswindframe.htm).

There is no entry for the company in the 1886 Sand's, and from 1887 Vale and Sons were established as an engineering and locomotive works in Auburn.

vii. Atlas Engineering Works

Pyrmont
An 1877 article stated that the company had invested a capital of £3000 and was employing 130 hands at that time(Anon, 1877a). It was producing sugar mills and marine engines and had completed a contract for 125 railway wagons. 'The Atlas Engineering works at Pyrmont was building railway engines and passenger and goods rolling stock from 1878 on land adjacent to the Darling Harbor line'(NSW Heritage Branch, nd).

Part of the establishment was resumed in 1881 for extension of Darling Harbour Railway to Pyrmont Bridge. The site was provided with a railway siding in 1883(Fitzgerald & Golder, 1994:65).

Some idea of the establishment and its location is provided by Hill (1888), who shows a factory immediately south of Union Street at the western end of Pyrmont Bridge and set back somewhat from Darling Harbour. The factory appeared to consist of four large sheds, running parallel to each other on an east-west orientation, perhaps with a covered railway siding running north-south immediately to their east. The factory is separated at this time from Mrs Bunn's cottage by vacant land.

In 1878, Atlas successfully bid to build 48 locomotives for the Department of Railways(Linge, 1979:434). In the event, the Company gave notice 'that it would be unable to complete its contract(in fact it delivered, in 1881 and 1882, only six locomotives altogether) on the grounds that the government had resumed part of its site for [extension of the Darling Harbour branch line to Pyrmont Bridge]'(Linge, 1979:435).

In 1888, Atlas again bid to build locomotive engines for the Government, and was awarded a contract for twenty-five engines to be delivered within three years(Linge, 1979:438): 'within a year [Atlas] had thrown up [its contract] without delivering a single locomotive'.

The company also built eight boats between 1878 and 1886(Flapan, 2008). The Powerhouse Museum has a model of the <u>Acheron</u> torpedo boat, designed by the influential engineer Norman Selfe in 1877 in association with the Atlas Engineering Company(http://www.dhub.org/object/211569). The company built both the <u>Acheron</u> and the <u>Avernus</u>, also designed by Norman Selfe (http://home.vicnet.net.au/~maav/hmvslonsdale.htm). They entered service in March 1878(http://www.diggerhistory.info/pages-navy/colonial=navy2.html).

viii. William Grant, boilermaker

32 Point Street, Pyrmont
William Grant was a boilermaker who probably lived briefly in Harvey and McCredie Streets before moving to Point Street, where entries in <u>Sand's Sydney & NSW Directory</u> suggest that he lived at least between 1879 and 1899. He had been in the trade for several years by 1877, when he was employing 24 persons; boilermaking and repair was the speciality of his establishment(Anon, 1877a).
Grant applied to reclaim land to the limit line for reclamations fronting his property in 1882(Government Gazette,

1883, vol.3, p.3910). He advertised as a boilermaker in Sand's until 1894. The peak of his operations may have been in 1880, when his address was given in Sand's as 18-34 Point Street. The company apparently also offered engineering and iron ship building services.

A photograph of Pyrmont Point taken about 1900(Matthews, 1982:34) shows Grant's establishment. It is adjacent to the point itself, which at that time had sandstone cliffs rising out of Johnston's Bay. The establishment consisted of a wharf on piles with two workshops along the northern and southern property boundaries, with a linking structure behind. The site appears to have been set in residential buildings at that time.

ix. Davy & Sands, Albion Engine Works and Patent Slip,

1-17 Harris Street, Pyrmont
The company was established in May/June 1877(Anon, 1877a). Frederick Davy and John Sands were initially the proprietors, and the company advertised as engineers, brass and metal founders, and blacksmiths(at 31 Harris Street). In regard to the company principals: 'They are both practical men, and invested about £3,000. They will start with about 30 men, and expect that within six months they will be able to put on 100 men. They are about erecting a patent slip capable of taking vessels and steamers up to 300 tons burden'(Anon, 1877a). Elsewhere, it was reported that the company's slip was 180 feet long, and could take ships up to 600 tons gross.

The first reference to the company in Sand's Sydney & NSW Directory was in 1880, although they built the Fairy in 1879 (Flapan, 2006a). In 1880, a Frederick Davy, engineer, lived at 126 Bowman Street. Previous editions of Sand's gave Davy's address as 15 Church Street, Pyrmont(1879) and 56 Sophia Street, Surry Hills (1875/77). John Sands built a wooden boat in 1884(Flapan, 2008). The company also made 'the first direct lifts yet introduced into the colonies' in association with the engineer Norman Selfe(Maitland Mercury and Hunter River General Advertiser, 10 February 1881, p.7).

By 1884, Frederick Davy appears to have left the partnership, Robert Bryden having become Sand's new partner. The company was last listed in Sand's in 1891.

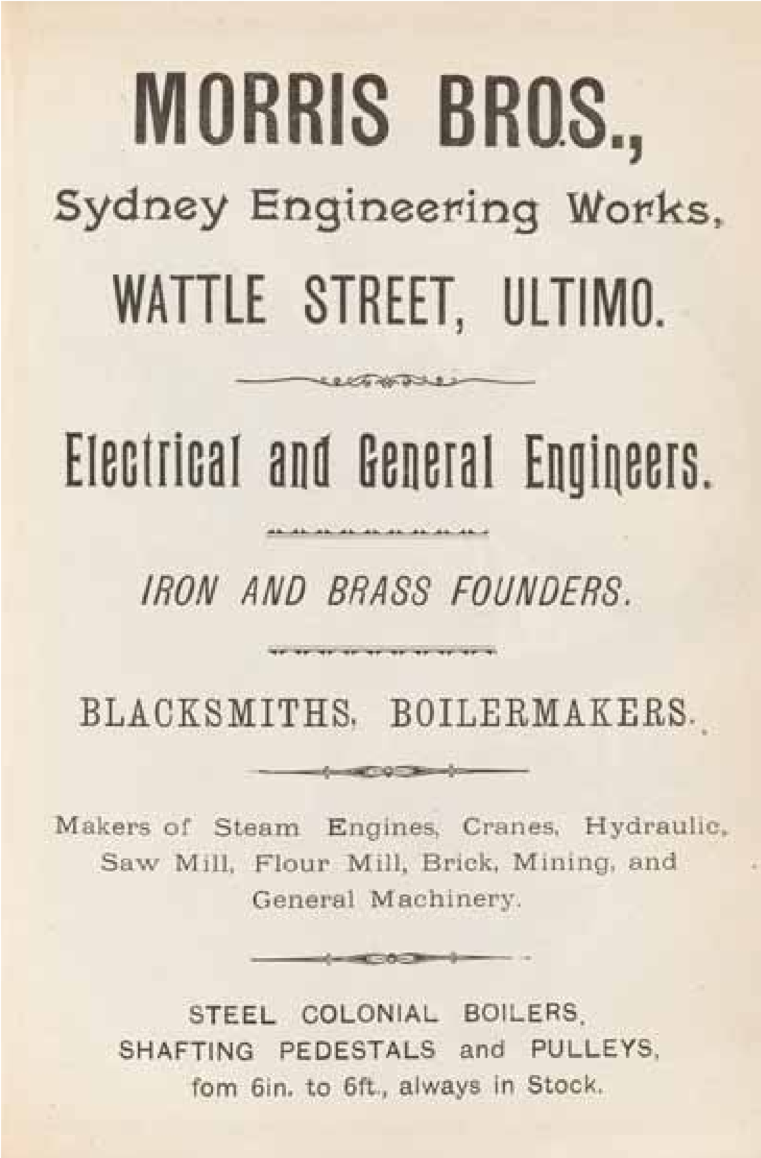
x. Morris Brothers, Sydney Engineering Works

Based on Sands Sydney & NSW Directory, John, Benjamin and W.H. Morris first established an engineering/ blacksmithing company at 67 Hay Street, Ultimo in 1880. By 1886 they were listed as 'engineers, iron-founders & c.' with premises flanked by Hay, Quay and Matthew Streets and a brickworks at Prospect/ Sherwood.

They apparently established a business at 445-483 Wattle Street, Ultimo, in 1887, by which time their company was 'Sydney Engineering Works' and they offered services as 'engineers, millwrights, iron and brass founders, boilermakers & c.'. They retained multiple sites until 1894/95, when they apparently consolidated their operations in Wattle Street. The company's final entry in Sand's was in 1912. Today, this site houses the 'Scientific Motor Body Works'.

An advertisement for the company in the 1910 Sand's Sydney, Suburban & Country Commercial Directory is shown in Figure 5.7.6.

Figure 5.7.6: Advertisement for Morris Bros., *in* Sands, J., 1910) Sand's Sydney, Suburban & Country Commercial Directory, Sydney, J. Sands(ML 981.1/S)



xi. D. & W. Robertson

The first entry in Sand's Sydney & NSW Directory for this company was in 1880, when it was located in Castlereagh Street and operated as an iron and steel merchant. By 1882, the company had stores in Union Street, Pyrmont, on the former Bladen & Crocker site. The entry in the 1885 edition of Sand's advised that the company was also in shipbuilding and had an operation at Abattoirs Road; this latter was the Blackwattle Iron or Engine Works. In 1888 the company pre-assembled 'an elegant wrought iron arch bridge', the Smollett Street Bridge over Bungambrawatha Creek, Albury, at its Blackwattle Bay-works and then dismantled it for shipping to Albury on the recently opened railway (http://www.rta.nsw.gov.au/cgi-bin/index.cgi?action-heritage.show&id=4301661). Entries for the company in Sand's ceased in 1888.

xii. Robert Tulloch & Co, Phoenix Ironworks

162 Crown(Bulwara) Road, Pyrmont

' … a Scottish tradesman migrant, Robert Tulloch, established an engineering business in Pyrmont in 1883, after working for some six years after his arrival for Atlas Engineering Co. His establishment was located east of Crown (Bulwara) Road, just south of its junction with Pyrmont Bridge Road(where McWilliams Wines was built). It remained on Lot 5 of Block 49, Ultimo Estate to 1903, extended to Lots 2 through 5 between 1907 and 1918, contracting to Lots 4 and 5 in 1919 and 1920(Higginbotham, 1994:4). In 1888 his company was awarded the contract for all structural ironwork at Eveleigh Railway Workshops, and this was followed by contracts for railway bridges and viaduct iron work and, inevitably, rolling stock'(Stewart, 1989:204). By 1910, Tulloch was advertising himself as an engineer in Sand's Directory. Stewart(1989:207) noted that Tulloch's purchased a site at Rhodes in 1914. According to Higginbotham(1994a:4/5) the Pyrmont establishment was operational until 1920, although the last Sand's entry for the company was in 1917. The first entry for Tulloch's Phoenix Iron Works Ltd at Rhodes was in the 1916 edition of Sand's Sydney & NSW Directory. 'In 1920 the Phoenix Iron Works Pty Ltd began to produce railway rolling stock. The name Tulloch Limited was adopted when the business became a public company. Tulloch Limited manufactured diesel-hydraulic locomotives; suburban electric trains; diesel railcars; passenger and freight cars of all types and tank wagons' (http://www.ozsite.com.au/files/hallcollection2.htm).

xiii. Souter & Martin, Globe Foundry and Ironworks,

484-486 Jones Street/17 McKee Street, Ultimo

It seems likely, from entries in Sand's Sydney & NSW Directory, that James Souter moved from Petersham to 484-486 Jones Street, Ultimo in 1884, where he established a blacksmithing and engineering business. An elaborate entry in the 1885 edition of Sand's described his business thus: 'Blacksmith and engineer, every description of ironwork made to order, all kinds of ornamental castings, special lines in ornamental iron gates, palisades, balcony railings, girders, bridge work, railway gate mountings and all kinds of railway contractors work, Jones St, Ultimo'. This site today appears to be sandwiched between the Casa Mia and Kennards buildings.

In 1888 Souter went into partnership with Martin and their entry in Sand's for that year first mentions Globe Foundry. By 1890, Souter & Martin had established Globe Ironworks at 488 Jones Street and Globe Foundry at 17 McKee Street, Ultimo. This is the only mention in Sand's of the McKee Street site, although City Council records show James Souter as having a foundry in McKee Street in 1901 (http://www.cityofsydney.nsw.gov.au/assessmentbooks/CRS17%201897-1902/1901%20DENISON%20WARD.pdf). This source also shows Souter & Martin as having a foundry at their Jones Street site in 1901. What appears to be an iron foundry is shown both on Sheet T3 of the City of Sydney section: Metropolitan Detail Series(NSW Department of Lands, 1883-) and the 1888 'Map of the City of Sydney'(NSW Department of Lands, 1888), although its location does not entirely conform with its street address.

The partnership lasted for less than a decade. An advertisement announcing its dissolution appeared in The Argus(Melbourne) on Saturday 4 May 1895 (p.11), with an invitation to purchase all or parts of the business. The entries in Sand's mention only Souter after 1895. The last Sand's entry for the company was in 1901.

xiv. William Turner, Clyde Engine Works

Pyrmont Bridge Road, Pyrmont

William Turner, proprietor of this establishment, advertised his company in the Northern Territory Times and Gazette, in both the 19 and 26 April 1884 issues, as a 'manufacturer of sugar mills, sawmills, land, marine, and other engines'(http://ndpbeta.nla.gov.au/indp/del/article/3155695). Turner and/or his company have entries in the 1893 and 1894 editions of Sand's Sydney & NSW Directory.

xv. George Bowman Mackenzie, Seaforth Iron Works

Located west of Crown(Bulwara) Road and backing onto a lane between this road and Jones Street, about midway between Allen and Fig Streets. The site was leased from the Harris Estate by George Bowman Mackenzie. Mackenzie advertised himself in Sand's Sydney & NSW Directory as an engineer. The company had entries in Sand's only between 1892 and 1895.

xvi. Conclusions

John Fyfe was probably the first engineer to establish himself on Pyrmont peninsula, in 1855. It was almost two decades before others followed, with most engineering shops established on the peninsula during the 1870s and 1880s. Most of these establishments were short-lived, lasting only a decade or less. A few, though, like G.C. Hoskins, Robert Tulloch and Morris Brothers remained in business on the peninsula for three or more decades.

E) Iron foundries

i. Introduction

Iron was discovered near Mittagong by Surveyor Jaques in 1833, while locating the Southern Road at Nattai(Southern & Platt, 1986:17). Massie (1935:4) recorded that: 'The first attempts to develop an iron and steel industry in Australia date back to 1848, with the opening of the Fitzroy Iron Works at Mittagong'. Small amounts of iron were smelted – but uneconomically – and after several unsuccessful attempts the operation finally closed in 1892.

According to Johnston-Liik et al(1998:4): 'In most cases the failure of the early [iron smelting] industries was so rapid and so absolute that it left little archaeological or even documentary evidence. Thus it is uncertain exactly how many attempts at establishing an iron-smelting business utilising local raw materials were made during the last[19th] century, but it seems quite likely that there were at least a dozen scattered through the eastern and southern colonies'.

Johnston-Liik et al(1998:32) elaborated on the downstream consequences: 'Hitherto[1870s] importing iron and manufactured goods and exporting wool had created a mutually satisfactory balance of trade between Britain and Australia. The Australian market was still small and divided among the individual colonies. These conditions had encouraged the development of secondary rather than primary iron manufacture reflected in the numerous small- to medium-sized ironworks, whose operations were based on processing imported iron for the domestic market … The individual requirements of these works were more suited to purchasing small parcels of imported pig-iron, steel or wrought iron than to absorbing the potentially larger, less reliable and more expensive local product'.

Imports of iron and iron products rose continuously for all the colonies until New South Wales alone was importing almost £2 million worth by the mid-1880s(Southern & Platt, 1986:24).

These circumstances defined the emergence of the iron industry in Sydney, and on Pyrmont peninsula specifically. Secondary iron manufacture was underway in Sydney in the 1860s; it was not until the mid-1870s that iron smelting became successfully established in Australia(Johnston-Liik et al, 1998:41). Later still, on 25 April 1900, the first steel was tapped in Australia, at the Eskbank manufacturing plant, Lithgow(Jack, 1988:48).

Early iron foundries on Pyrmont peninsula included:

ii. **William Hargreaves, Pyrmont Foundry** 2 Marian Street, Pyrmont

Hargreaves established his business in about 1857, and was employing 12 men in 1877(Anon, 1877a). William Hargreaves, engineer, is listed at 41 Pyrmont Street, Pyrmont in the 1861 edition of Sand's Sydney & NSW Directory. The first record of his iron foundry appears in the 1863 edition. Hargreaves's operation is listed to 1899, the final listing being for William Hargreaves, engineer, at 12 Harwood Street, Pyrmont. His establishment employed eighteen hands and worked up seven tons of iron per week(Anon, 1871:453).

iii. **Brown & Brown, City Iron Works** 3 Abattoir Road, Pyrmont

'In late 1864 [Enoch] Hughes joined his partner at Mittagong[at the Fitz Roy Ironworks], Benjamin Lattin[also known as Latter and Latta], as manager of Alexander Brown's City Iron Works … where he supervised the construction of the rolling mills. The first bar iron was produced from scrap iron in 1865'(McKillop, 2006:34). The mill was located between Johnstone Bay and Banks(Bowman) Street, and between the base of Glebe Island Bridge and the adjoining Block 67 of the Harris Estate(which extended to Jones Street and had a frontage of 264 feet to Bowman Street).

'The City Iron Works at Johnston's Bay employ sixty men. There is a very heavy and complete rolling battery at this establishment. Scrap iron is worked up here for the more important kinds of work, and pig-iron is puddled for ordinary work. About 100 tons per month are rolled here, and railway wheels and tires for contractor's locomotives or tank engines have been also turned out at this establishment'(Anon, 1871:453). It consumed some 2,500 tons of coal annually(Anon, 1877a). Also made were iron-bars, rails and angles(Anon, 1871:79). The company made the angle iron used in building the Louisa, 'the first iron steamship ever constructed in this colony' and launched on 26 March 1872(Brisbane Courier, 16 April 1872). Anon(1870) provided a detailed account of the iron works at that time.

Scrap iron for the works was sought as far afield as Brisbane(Brisbane Courier, 22 November 1876:1). The last entry for Brown & Brown at Pyrmont was in the 1937 New South Wales Telephone Directory. By 1938, the company had moved to new premises in Euston Road, Alexandria.

iv. **John Lutton & Sons, Phoenix Foundry** cnr Thomas & Wattle Sts, Ultimo

An early reference to 'J. Lutton' in Sand's Sydney & NSW Directory is in the early 1870s, as a blacksmith living in Bullanaming Street, Redfern. By 1875, Lutton & Sons were listed as Iron-founders at Hay Street, Ultimo – an establishment occupied two years earlier by Sutton & Sons as the Phoenix Foundry(An entry in Sand's Sydney & NSW Directory in 1877, though, gives the address of the latter as 42 Hay Street Ultimo). By 1880, John Lutton & Sons were listed at the Phoenix Foundry, 112 Hay St, Ultimo, an address they retained at least to 1888. In 1892, the company was listed in Sand's as Engineers, Iron-founders, Boilermakers etc, Phoenix Foundry, cnr Darling(Wattle) & Thomas Streets Ultimo, an address they retained at least to 1895. The company was not listed in the 1898/99 editions of Sand's. By 1900 Lutton Bros, Engineers and Iron-founders, were listed at 11 Buckland Street, Chippendale having perhaps left Ultimo.

v. **William Taylor, Paragon Foundry** 156-160 Crown(Bulwara) Road, Pyrmont

Based on Sand's Sydney & NSW Directory, William Taylor established the Paragon Foundry in 1883. It was located east of Crown(Bulwara) Road towards Allen Street, where 'Darlington One' apartments are now located. He may have worked previously in Sussex Street. The National Museum of Australia, Canberra has a postbox made at the foundry about 1912/13 (http://www.nma.gov.au/collections-search/display?irn=587027). The last entry for the company was in the August 1914 edition of the NSW Telephone Directory.

The City of Sydney Archives list William Taylor as also having a foundry at 92 Crown Street in 1882.

vi. Morgan Mainwaring, Austral Foundry Pyrmont

The first entry in Sand's Sydney & NSW Directory for Morgan Mainwaring is in 1883, when he advertised as a draftsman and lived in Redfern. He appears to have established his business as an engineer and iron-founder in Pyrmont in 1885, where his address was variously given as 22-261/2 Pyrmont Street. Reference to Austral Foundry in Sand's appears only once, in 1889. Mainwaring continued his business in Pyrmont Street until 1899, when he relocated to 36 Point Street. He remained in business here until 1910, when his Sand's entry is for Cook Road, Centennial Park(presumably in retirement). He is listed in City Council records for 1921 as living at 131 Cook Road (http://www.cityofsydney.nsw.gov.au/assessmentbooks/CRS17%201921/1921%20FLINDERS%20WARD.pdf).

Matthews(1982:55) provided a photograph of an unnamed foundry in Point Street, Pyrmont, and noted that it was demolished in 1970s. The Sydney Harbour Trust's 'Bird's-eye view of Sydney Harbour(1924b) shows the foundry at the southern end of what is now 'The Point' apartments. This foundry was likely associated with Morgan Mainwaring.

vii. Triggs & Marr 49-61 Miller Street, Pyrmont

Based on Sand's Sydney & NSW Directory, Henry Triggs and Gordon Marr operated a sizeable business in Clarence Street, the Central Iron Foundry, in 1880, and were in partnership at that time with William Taylor. Messrs Triggs, Marr & Taylor were employing 40 people in 1877(Anon, 1877b). Taylor apparently left the partnership in 1881, presumably to establish the Paragon Foundry in Crown Road, Pyrmont, in 1883.

In the 1888 edition of Sand's Sydney & NSW Directory, Triggs & Marr were listed as having an office at 54 Sydney Arcade, George Street with works at Miller Street. The latter fronted onto Jones Street and back to a laneway between this street and Crown(Bulwara) Road, and between Miller and Gipps Street. They advertised as iron-founders, engineers, and blacksmiths. The 1889 edition of Sand's listed them at the Pyrmont address only, given as 49-61 Miller Street in the 1890 edition. The last entry for the company in Sand's was in 1900, and May 1901 in the NSW Telephone Directory.

viii. Conclusions

From the above accounts, it appears that iron founders established their works on Pyrmont peninsula over two decades between 1861 and 1885, most closing down some 2-3 decades later. The exception was the City Iron Works, which remained in production for almost three-quarters of a century, before relocating to Alexandria.

F) Timber mills/Joinery Works

i. Introduction

(based on Hudson & Henningham, 1986)

The first settlers in Sydney were not impressed with the quality of the trees around Port Jackson: ' … tall trunks of good timber-trees were almost non-existent among the scrubby vegetation in the immediate environs of Sydney Town …'(p.2). However, within a few months of settlement, 'useful timber and bark were being brought from north of the harbour – the present-day North Sydney to Lane Cove …'(p.2). Good quality trees were soon found at Ryde and, later, around Pymble.

A key episode in the exploitation of Australian forests was the logging of Red Cedars, known as 'Red Gold'. Vader(2002) goes so far as to state: 'It is a little acknowledged fact that, but for a single native tree species, the early colony of Sydney might never have succeeded. That tree was the Australian red cedar'. He continued: 'The first extensive stands were found in the Illawarra region of the South Coast of New South Wales. The cedar-getters then moved north, first up the Hunter River, then the Manning, followed by the Hastings, the Clarence and finally up onto the Atherton Tablelands of Queensland'. The cedar-getters were closely followed by the farmers, who cleared the residual forest for agriculture: 'Following World War II a third wave ventured deeper and steeper into the valleys to cut out the remaining and least accessible cedars'. Vader(2002:231) concluded: 'The giant cedars are all gone but there are still some standing which could be described as very large'.

Australian timber was first exported in November 1791. In 1795, Governor Hunter made the first order to prevent the indiscriminate destruction of trees to clear land for agriculture, but to little avail. The 1830s saw the introduction of steam-powered sawmills, the first such being built at Darling Harbour(p.11): 'In 1850 a steam sawmill was built at the foot of Liverpool Street'(p.12).

In 1871 the Government created the first timber reserves in an effort to stem the loss of forests. An administrative branch of government was established in 1877, and attached to the Lands Department. The first Director of Forests was appointed in 1889, but forest destruction continued. It was not until 1892 that 'the first recognisable, independent State Government Forest Service was established', with the poet Henry Kendall as the first Forest Inspector(p.13). It is estimated that by 1888 some 2 million hectares had been set aside as forest reserves(p.14).

1916 saw the Forestry Commission created under the Forestry Act, and the gazettal of 2 million hectares of State Forest. 'The first Radiata pine plantation in New South Wales was established at Gosford about 1894'(p.14). Large-scale pine plantings continued intermittently during the first half of the 20th century (pp.15/16). The 1970s saw the emergence of a strong and vigorous lobby for the conservation of the residual forests, culminating in the Terania Creek blockade during six tense weeks beginning in August 1979 (Borschmann, 1999).

Today, Australia has an estimated 149 million hectares of forest, of which some 23 million hectares are in formal nature conservation reserves(Montreal Process Implementation Group of Australia, 2008): 'There is 1.82 million hectares of softwood and hardwood plantations'(p. vii), a 12% increase over the period 2000/2004. Of the total, just over 5 million hectares is classified as old-growth(or unlogged) forest. Also, some 260,000 hectares a year were being cleared between 2000 and 2004, mostly for agriculture and urban development, although this figure is declining: 'As much as one-third of Australia's native vegetation in the intensively managed agricultural and urban zones has been cleared or substantially modified over more than 200 years of European settlement. As a result, those areas exhibit a relatively high level of fragmentation'(p.viii).

In retrospect, the milling and joinery industries of Pyrmont peninsula spanned the period of greatest exploitation of the forestry resource in New South Wales. It was an industry very much of its time.

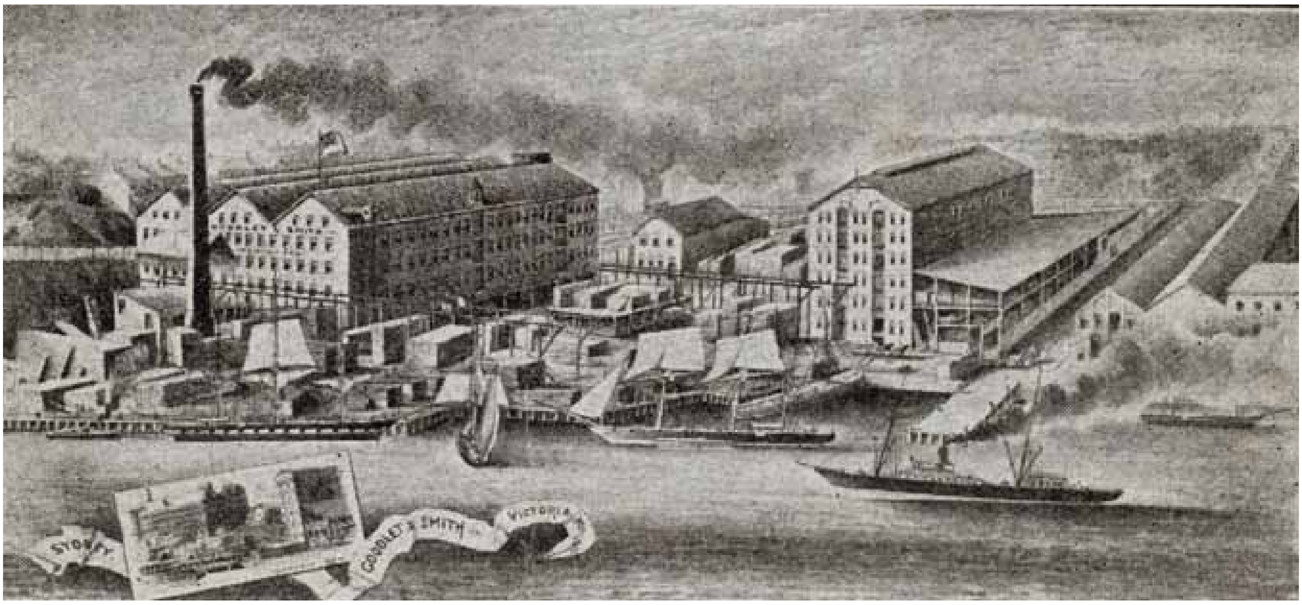
Known mills on Pyrmont peninsula are:

ii. Goodlet & Smith Timber Company

John Hay Goodlet and James Smith had premises at 14 Erskine Street and 5 Parramatta Road in 1865. By 1868 the company was operating a steam saw mill at Erskine Street and, in 1869, began its operation in Harris Street, Pyrmont – at Elizabeth Macarthur Bay. Here, it occupied 'much of the area between Herbert Street and the water's edge'(SHFA, 2003:15). By 1888 'they had built extensive yards off Point Street, with wharves for receiving timber from coastal areas' (Fitzgerald & Golder, 1994:67). The newly opened park on Pyrmont Point occupies much of this site.

By the early 1870s, the company had acquired a second site in Pyrmont, at 8 Murray Street. In respect of this site, Thomas Holt, in a letter to the Under-Secretary for Lands, noted that his land 'was sold and conveyed by me to Messrs Goodlet and Smith, on the 22nd November 1872'(ML Macarthur Papers, A4244-1(CY 1719), p.143). The site occupied much of the land north of Union Street and east of Murray Street to Pyrmont Bay. The scale of this establishment can be seen from Figure 5.7.7. The company also briefly retained premises in Mew Street, Ultimo in 1889/1890. For eleven years, the company appears to have been the only timber merchant/sawmiller in Pyrmont. By 1910 the company had acquired a site at Granville, its last entry for Pyrmont being in the 1915 edition of Sand's.

Figure 5.7.7: Advertisement for Goodlet & Smith's steam saw mills and wharf, Pyrmont Bay., *in* Sands, J., 1910) Sand's Sydney, Suburban & Country Commercial Directory, Sydney, J. Sands(ML 981.1/S)



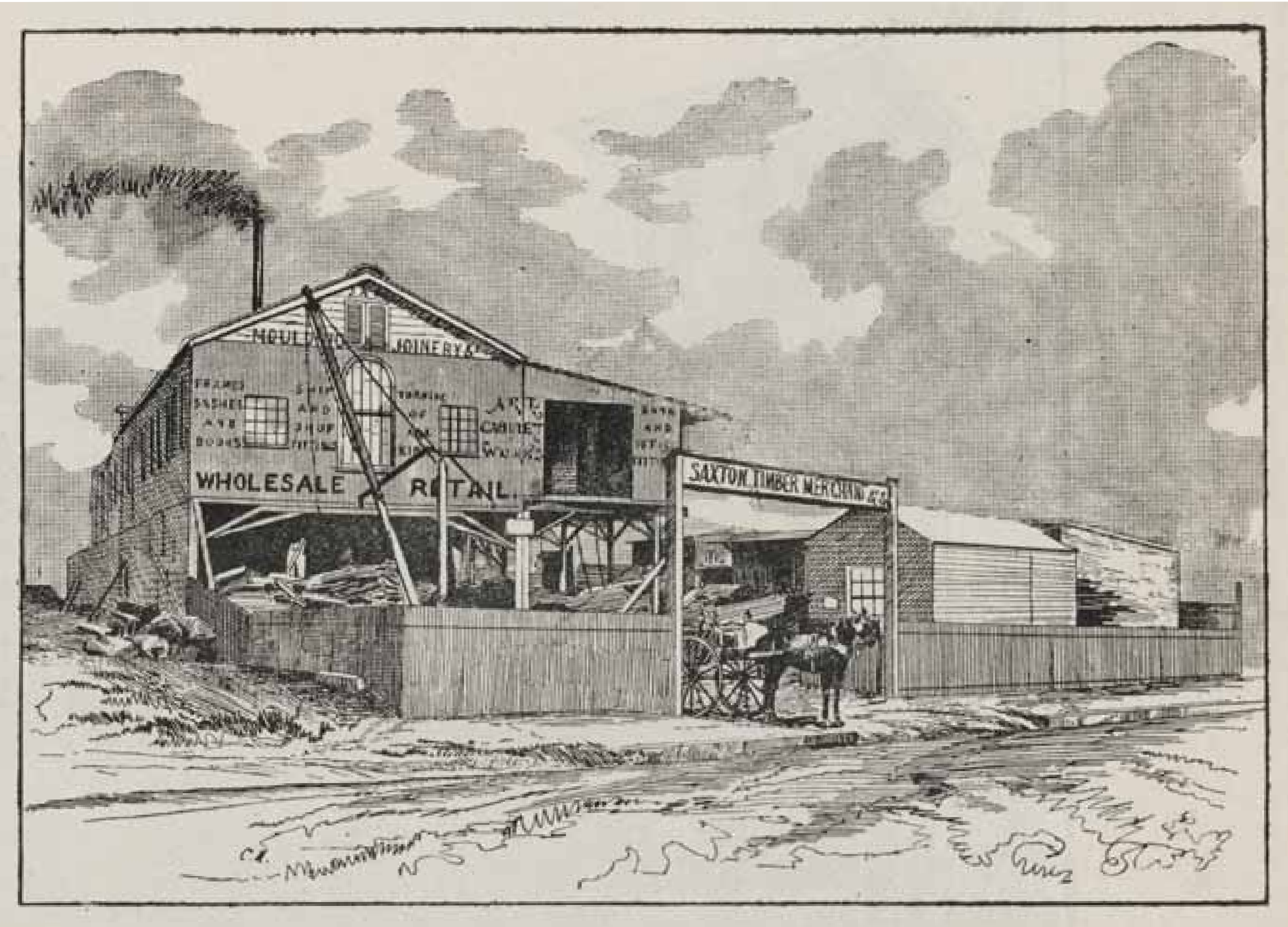
iii. Walker & Son, Sawmillers off Crown(Bulwara) Road(~259/261)

The company operated a Steam Joinery Works, 'off Crown Road' in 1880 and in Jones Street in 1882 and 1883, when entries in Sand's Sydney & NSW Directory ceased.

iv. Saxton & Binns

Charles Thomas Saxton, a Londoner, emigrated to Sydney in the late 1860s. He was a builder/joiner at 213 Cleveland St, Redfern in 1882/83. In 1882 he became a timber merchant(Anon, 1889b) and opened a facility at 55 Pyrmont Bridge Road, which operated there between 1885 and 1901 (Higginbotham, 1994a:4/5); this was on Lots 2,3, and 4 of Block 49 of the Ultimo Estate, on the corner of Pyrmont Bridge Road, Gipps Street and Crown Street[Bulwara Road], Ultimo. By 1886 Saxton had added a steam sawmill to his operation. A detailed description of the establishment was provided by Anon(1889b). The account was accompanied by a sketch of the establishment(Figure 5.7.8).

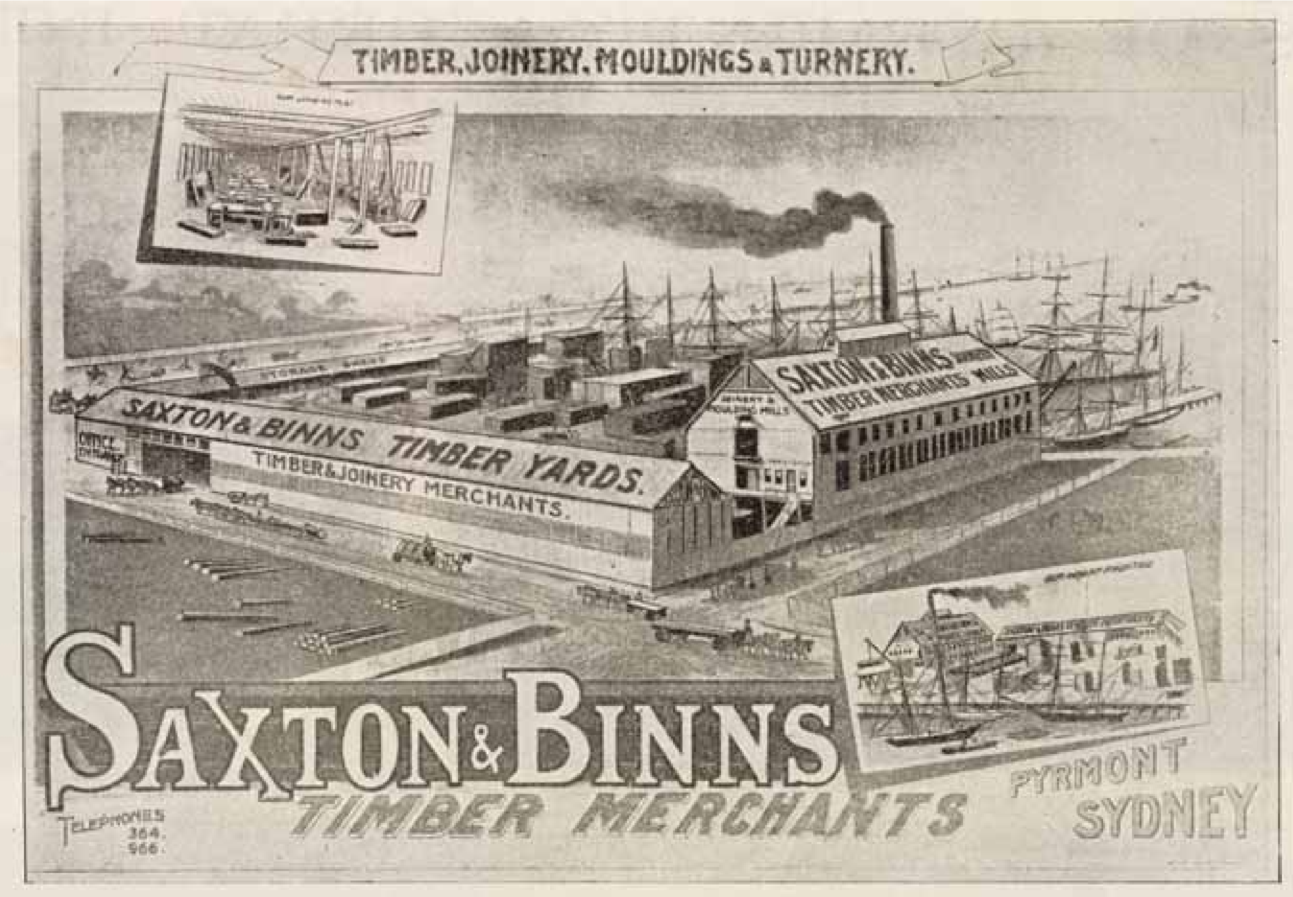
Figure 5.7.8: Anon(1889b), Saxton's steam saw mills, Pyrmont Bridge Road (SRL TN115: Illustrated Sydney News, 25/7/1889, p15)



MR. C. T. SAXTON'S STEAM SAW MILLS.

The Pyrmont Bridge Road site was advertised for sale by Richardson & Wrench in the Sydney Morning Herald, 6.10.1894, no.17644, p.15 – as part of the larger sale of the Harris Estate. By this time, Saxton had entered into partnership with Binns and they had established the Enterprise Steam Saw Mills and Joinery Works. The Sydney Morning Herald of 3 June 1899 carried an announcement by Richardson & Wrench Ltd which drew attention to '… the sale of Messrs. Saxton and Binn's commodious sawmill premises situate at the corner of Pyrmont Bridge-road, Gipps-street, and Crown-road, Ultimo, admirably adapted for manufacturing or storage purposes, with or without steam power. The sale was 'on account of the early removal to their new sawmills in Blackwattle Bay …'. The new mills were a considerable upgrade from their previous premises(Figure 5.7.9).

Figure 5.7.9: Advertisement for Saxton & Binns, Timber Merchants, Blackwattle Bay, 1900(SRL TN83: AustralianTown & Country Journal, 13.10.1900, p.31)



Indeed, by 1901, the enterprise had acquired a site in Abattoirs Road and a wharf. In 1918 the firm became A. C. Saxton & Sons Ltd, 'Successors to Saxton & Binns' and operated under this name until closure in about 1963 (Sand's Sydney & NSW Directory; New South Wales Telephone Directory). It is evident from the photograph in Matthews(1982:63) that the company also had a site where 'Parkview Towers' is now located.

The company handled 'all classes of foreign and colonial timbers, and builder's supplies, and manufacture joinery and all descriptions of mouldings etc.'(Anon, 1900:82). They also made windows and mantel pieces, and weatherboard and frame houses for ready assembly.

v. **Maze Brothers** 151-167 Abattoirs Road, Pyrmont

First listed in Sand's Sydney & NSW Directory at this site in 1885, the company remained here until 1895.

vi. **John Brown & Co., Central City Sawmills** 34-52 Pyrmont Street

In 1886 there was a John Brown, Timber Merchant, in Lane Cove Road, St Leonards. In 1887, J. Brown & Co., sawmills and timber merchants, were established in Murray Street, Pyrmont, where they stayed to 1889. In 1890, they relocated to 34-52 Pyrmont Street, where they were until the last entry in Sand's in 1895(Sand's Sydney & NSW Directory).

vii. A. Wallis and Sons, cedar sawmilling 63-69 Miller Street, Pyrmont

Wallis operated at Cowper Wharf sawmills, Woolloomooloo, before establishing a business at Miller Street in 1888. The sawmills were given as occupying Lots 1, 2, and 3 of Block 55 in the 11th Sale of the Ultimo Estate(Sydney Morning Herald, 22 June 1895). The company stayed at the Miller Street site into 1902, relocating to Abattoirs Road, Pyrmont, in 1903. The company remained here until 1936, and relocated to Annandale in 1937 (Sand's Sydney & NSW Directory).

viii. John J. Maxwell, Harbour View Sawmill 8 Bayview Terrace, off Pyrmont Street, Pyrmont

One J.J. Maxwell lived in Crown(Bulwara) Road until 1891, moving to Bayview Terrace in 1892. It seems that the sawmills were operating there from 1894 to 1898. By 1899, Maxwell had a sawmills and joinery works at White Bay, Balmain(Sand's Sydney & NSW Directory).

ix. H. McKenzie, Sawmills and Timber Merchant

The first entries for McKenzie in Sand's are for 213 Sussex Street in 1893/94. By 1895, McKenzie was listed at (50) Pyrmont Street, where he had a sawmill. By 1899, the company had acquired branch yards and a wharf at Blackwattle Bay; the photograph in Fitzgerald & Golder(1994:55) may be of this site. The company advertised as the Australian Steam Sawmills in 1902, when it had operations both in Abattoirs Road, Blackwattle Bay and Miller Street, Pyrmont. McKenzie's were contracted to construct the second Glebe Island Bridge, built in 1903(www.rta.nsw.gov.au/cgi-bin/index.cgi?action=heritage.show&id=430166).

The Miller Street site operated into 1907, when the company acquired a site on Glebe Island where, by 1908, it was offering electric sawmilling. The last entry in Sand's for the Pyrmont operation was in 1926, and by 1927 the company was located at Rhodes and Glebe Island(Sand's Sydney & NSW Directory).

x. Allen Taylor & Co. Ltd., Contractor, Ship Owner & Timber Merchant, 31 Union Street, Pyrmont

'If the Hudsons have had the largest stake in timber selling, Allen Taylor & Co became by far the largest sawmiller'(Hudson & Henningham, 1986:68): 'Allen Taylor entered the timber business early in 1892 as a timber and shipping agent … [in 1895] he opened an office at 31 Union St, Pymont'(ibid:69). Based on NSW Telephone Directory entries, Taylor moved his operation to Maze's Wharf, Abattoirs Road between January and April 1896. The company remained here until Taylor's death in 1940(Hudson & Henningham, 1986:69), and by 1941 it had relocated to Commercial Road, Rozelle.

xi. Austral Timber Co. Central Sawmills Abattoirs Road, Pyrmont

The first record of this company at this address was in the October 1898 NSW Telephone Directory. There was a fire at the works in 1907 (http://localnotes.files.wordpress.com/2008/05/balmain-observer-index-1884-89-1902-1907.pdf). By 1907 the company had renamed itself as the 'Austral Box & Timber Co. Ltd.', having promoted its specialisation in box and case manufacture since 1905. In 1949, the company moved to Leichhardt Street, Glebe(Sand's Sydney & NSW Directory).

xii. John L. Beck, Sawmills Mount Street, Pyrmont

Beck lived at 108 Miller Street for several years to 1897; he began here as a turner, becoming a furniture manufacturer. He installed his sawmills in Mount Street in 1899, and operated them there until 1907. By 1908, he had returned to Miller Street as a wood turner, establishing a box factory at No. 10 by 1915 (Sand's Sydney & NSW Directory).

xiii. Gustav Augenson & Company

In 1900, Augenson was a timber importer at 77 Pitt Street. By 1901 he had established his company at Augenson's Wharf, Abattoirs Road, Pyrmont, Prominent in the timber trade, it principally handled Baltic, Oregon, Kauri, Redwood as well as doors and sashes(Anon, 1900:84). The December 1906 NSW Telephone Directory has entries for the company at both Abattoirs Road, Pyrmont and 25A Pitt Street. The last entry for Abattoirs Road was in June 1907. From 1911 entries in Sand's were for Martin Place. Entries in Sand's ceased in 1928(Sand's Sydney & NSW Directory).

xiv. Cowlishaw Brothers, Timber Merchants Abattoirs Road, Pyrmont

At least from 1901, this company operated out of White Bay, Balmain. It relocated to Abattoirs Road, Pyrmont, in about 1906. Last recorded at this address in 1917, at which time the company also had a storage yard at Concord. By April 1928 the company had apparently fully relocated to Concord(Sand's Sydney & NSW Directory; NSW Telephone Directory).

xv. A. & E. Ellis Ltd Abattoirs Road, Pyrmont

A. & H. Ellis, shipowners and timber merchants of 138 Sussex Street in 1906, may have been the forerunners of this company. Whatever, A. & E. Ellis were operating a 'steam cooperage' in Abattoirs Road, Pyrmont by September 1907. They remained there until 1926, relocating to Rhodes in 1927(Sand's Sydney & NSW Directory).

xvi. A.C. Ingham Pty Ltd Bulwara Road, Pyrmont

According to entries in the Sydney Telephone Directory, this company established in Bulwara Road sometime between August and December 1911. The company's address was variously given in later directories as fronting [Pyrmont] Bridge and Bulwara Roads/Bridge Road and Jones Street/ Bridge Road and Wattle Crescent. It is unclear whether these changes of address relate to minor movements in the company's premises or reflect the growing road system in this part of the peninsula. The last entry for Ingham's at Pyrmont was in the 1986 directory, the entry in the 1987 issue being for 5 Bennelong Road, Homebush.

xvii. Holdship Timber Co. Ltd. Blackwattle Bay, Pyrmont

The first entry for this company in Sand's was in 1917. The company was located at Holdship's Wharf, Abattoirs Road/Bank Street. By 1922 the Company appears to have moved to the foot of Miller Street and in 1927 to the corner of Pyrmont Bridge Road and Jones Street. This latter move may have been associated with the company's incorporation that year with A.C. Ingham & Co. Ltd.(Canberra Times, 2 September 1927, p.11). It remained here until closure in 1967(Sand's Sydney & NSW Directory; NSW Telephone Directory).

xviii. Amalgamated Timbers Pty Ltd

First located in Pyrmont, in about 1919, 'moving to larger premises in the same area – the site of the present Castrol Oil Company'(Hudson & Henningham, 1986:79). Sand's Sydney & NSW Directory for 1921 gave the company's address as 110 Miller Street and Mount Street. Due to a post-WWII expansion, the company left its Pyrmont site in 1949 for Mascot(Ibid:82).

xix. Conclusions

Although arriving comparatively late on the peninsula, in 1869, the timber processing industry was large, located mostly on the foreshores of Blackwattle Bay, and remained on the peninsula for almost 100 years. According to

A.M. (1925), at that time, 'the eastern shore of Blackwattle Bay … is now a hive of imported-timber industry'. In terms of their operation, Max Solling(2006) commented: 'The new sawmills received consignments of sawn timber, logs, piles and girders from coastal parts as well as increasing quantities of imported softwoods'. These materials were evidently ferried from the coastal vessels to the wharves by a considerable fleet of small boats(Figure 5.7.10).

Figure 5.7.10: R.M. Phillips Photography, ca 1940/55, Pyrmont [Blackwattle Bay eastern waterfront, ca 1930s] (ML PXA 675/131)

As with other industries, several operations survived for less than a decade while others remained on the peninsula for considerable periods. Two companies – Austral Timber Co and Holdship Timber Co operated on Pyrmont peninsula for 50 years, while Saxton & Binns remained there for 79 years. Most timber firms eventually relocated from Pyrmont to suburbs further out from the city.

G) Tin smelting

i. Introduction

According to Holden(1935:20): 'although the profitable occurrence of tin in New South Wales was first referred to by the Rev. W.B. Clarke in 1849, it was not until Messrs Fearby discovered in 1872 tin ore near Inverell that a mild rush set in toward the New England District … the year 1872 may be said to be the birth year of tin mining throughout Australia …'.

Peaks in the production of tin concentrate occurred in 1876, 1881 and 1882, whereupon the superficial tin-bearing alluvial gravels had been worked over (Linge, 1979:382).

ii. Pyrmont Tin Smelting Co. 44 Alma Street, Pyrmont

Erected by Messrs Mort and Party, north-east of Edward Street in 1874. Managed by George Latter(or Latta), the facility occupied an area of some 6,000 square feet(557 m2) and contained nine furnaces(Brisbane Courier, 13 February 1874:3). By 1877, the company employed 30 persons. It had four furnaces at that time, capable of operating on from 30 to 35 tons of ore per day, producing 90-100 tons of tin weekly. The operation consumed 100 tons of coal weekly, 'fully a ton of coal for every ton of ore'(Anon, 1877b). The last entry in Sand's Sydney & NSW Directory for this company was in 1885. However, G.S. McKenzie was listed as Manager of the Pyrmont Smelting Works, Gladstone Avenue, Hunter's Hill in the 1894 edition of Sand's.

iii. Low, Meeks, & Co., Australian Tin Smelting Co. (also known as The Australian Steam Smelting Works) 87 Chowne Street, Pyrmont

Located at the end of Chowne Street, adjoining CSR, it was the 'John Meek's Tin Smelter' of Matthews(1982:26) on his 'Pyrmont 1880' map. An advertisement in the Brisbane Courier of 15 April 1874, advised that:

> *'The Undersigned beg respectfully to inform the holders of tin ore, and the public generally, that they are now in a position to SMELT TIN ORE at current prices.*
>
> *'The Furnaces and the Works generally are constructed on the most approved plan, under the able supervision of Mr. MEEKS, who has long been associated with the building of furnaces here and elsewhere, and no expense has been spared in perfecting them.*
>
> *'The Smelting Department will be under the management of Mr. ARCHER, whose success as a smelter is so well known.*
>
> *'The company feel fully confident that, with the aid of their efficient staff and improved machinery, special advantages must necessarily accrue to those entrusting their orders to them, and feel assured that a large percentage of tin will be saved over and above that smelted by any other process.'*

The company employed 33 people and turned out upwards of 100 tons weekly in 1877(Anon, 1877b). The last entry for this company in Sand's Sydney & NSW Directory was in 1880.

iv. Sydney Smelting Co, Pyrmont Works

According to Stewart(1989:204): 'In the late 1870s the Sydney Smelting Co was formed by the amalgamation of a number of small tin smelters, first at Pyrmont then at Woolwich supplying high purity tin ingots for industrial, tinplate and canning industry requirements'.

The only entry for this establishment in Sand's Sydney & NSW Directory was in 1880, when the address was given as Alma Street, Pyrmont. However, the company was at this address in the New South Wales Telephone Directory of 1892, but by October 1894 its address had changed to Woolwich.

v. **John Higgins, Tin Smelter** 69 Pyrmont Street, Pyrmont

Entries for this tin smelter occur in Sand's Sydney & NSW Directory between 1877 and 1885.

vi. Conclusions

Tin smelting had a brief history on Pyrmont, all four smelters starting production in the mid/late 1870s and the longest running – Sydney Smelting Co – being operational for some 15 years until 1892.

H) Woolstores

i. Introduction

An early history of the sheep industry in Australia is provided by Garran & White(1985). These authors noted that Captain Phillip purchased livestock on the government account at the Cape of Good Hope as the First Fleet was sailing to Australia: 'The fleet as it left Table Bay 'having on board not less than five hundred animals of different kinds … put on an appearance which naturally enough excited the idea of Noah's ark'(p.7). Some 100 sheep survived the voyage, and these together with subsequent imports provided the raw materials for the Australian sheep industry. Garran & White give an extraordinary account of the many twists and turns along the way to the Peppin Merinos, whose blood is present in most Australian flocks today.

Jervis(1938:330) described the start of wool sales in Sydney thus: 'The idea of selling wool by auction did not originate with T.S. Mort. In October, 1833, S. Lyons, a Sydney auctioneer, announced that he proposed to sell wool by auction. In the following year Lyons again reminded the public of his intention to hold periodic sales of wool by public auction, 'Once or twice a week as heretofore'. Lyons' attempt was not a success, and the first continuous series of wool sales by auction was held by Mort. He commenced business on his own account in 1843'.

Mort's efforts to initiate a wool trade in Sydney succeeded, and in 1850 he announced that he would construct a building to hold one thousand bales of wool in Phillip Street. The first produce sale in this new store was held on 5 December 1850(Jervis, 1938:331).

According to Balint et al(1982:18):

> *'In the late 1850s, Sydney's wool auctions were in their infancy. Mort & Co was the only firm selling wool by auction, the wool coming mostly from the smaller farms. Wool from the big estates was handled by the large mercantile firms of the day who, as soon as the wool from the inland reached the coast, put it on board ship for sale in England.*
>
> *'Until the coming of the railways, Parramatta Road and George Street were the avenues along which drays hauled their towering loads of wool laboriously towards the wharves at Circular Quay … Since most of the wool was sent to England, Sydney wool sales were minor affairs.*
>
> *'Several years had to run their course before English or continental wool buyers were attracted to the Sydney market where, since there were only a few sellers, the opportunity for buyers was limited. Meanwhile,*

> *Melbourne was forging ahead, beating Sydney in every particular … management, sales and export. It took Sydney fifteen years to collar her rival in exports alone, when, by 1885-6, the New South Wales figures were 340,000 bales compared with Victoria's 316,000. After that, Sydney never looked back'(p.19).*

'In the 1860s and 1870s, the rapidly expanding wool industry began to dominate the export trade from the port of Sydney'(Anon,). With the establishment of the railway goods yard at Darling Harbour, and the growing importance of Darling Harbour as Sydney's port, the wool trade started to shift across to Pyrmont and Ultimo(Balint et al, 1982:24).

By 1888, when Goldsbrough and Mort merged, 'the chairman of the new board announced plans to abandon trading at Circular Quay and develop stores in Pyrmont'(Balint et al(1982:94). According to Balint(1984:108): 'An earlier amalgamation, in 1881, gave Richard Goldsbrough the impetus and funds to erect the huge store in Pyrmont[completed 1883]. He anticipated the movement of wool storage to Pyrmont and located the store where some three years later[in 1886] the Darling Harbour spur link provided a useful rail connection'.

ii. The Woolstores

By 1900, it was noted that: 'A number of immense wool palaces(for they are nothing less) may be seen in Pyrmont and Utimo'(Anon, 1900). By 1910, of 1.7 million bales of wool shipped from Sydney, 1.5 million were auctioned and handled through Pyrmont and Ultimo(Anon, 2007e). According to Matthews (1982:74): 'World War 1 saw a stagnant period in the industry with the deprivation of the European market. Wool was stockpiled in temporary sheds which were erected over Wentworth Park. It was about 1923 before the stockpile was cleared and the market returned'. According to the Maritime Services Board(1984:49) twenty wool stores were erected in Ultimo and Pyrmont between 1883 and 1936(Table 5.7.3).

Table 5.7.3: Woolstores of Pyrmont and Ultimo

Built	Name	Comments	Map location
1883	Goldsbrough Mort Woolstore, 350-384 Harris Street	A five-storey woolstore built by Stuart Brothers at a cost of almost £90,000. Could store 50,000 bales. Extended by three storeys in 1924, burnt down in 1935, reconstructed in 1936 as Elders GM No. 1: 'This is a highly significant building as the last large scale woolstore to be built using timber post and beams'(Howells & O'Donnell, 1997:102). The six storey section fronting Harris Street is a remodelled version of a 1912 store built for Country Producers Selling.	10
1888	Hill Clark & Co Wool Store, became J.H. Geddes Woolstore, 24 Allen Street, cnr Pyrmont & Murray Streets	Probably the smallest self-contained woolstore built in the area(Balint, 1984: 110). Five storeys high. On a wedge-shaped site, originally intended to extend northwards. Now used for offices	17
1880s	Winchcombe Carson No 2 Store, cnr Fig & Jones Streets	Listed as a 'new warehouse' immediately opposite the Jones Street cottages in advertisement for 9th sale of the Ultimo Estate(Sydney Morning Herald of 16.2.1895, no.17758, p.15). Demolished in 1974 by the Department of Main Roads for the north-west freeway, which was never built(Matthews, 1982:74)	
1893	F.L. Barker Woolstore(1895 – 1923), Hill, Clark & Co(1895-1923), later Waite & Bull's printing premises, 137 Pyrmont Street	Completed in 1894 and extensively refurbished in the early 1990s (realcommercial.com.au, 2009). Howells & O'Donnell(1997:87) noted: 'This is a highly significant building. It was designed by Arthur Blacket and was an early derivation of the Chicago Style that started to influence Australian designers in late 1880s … this building contains a rare use of cast iron columns and wrought iron girders and is in excellent condition'(Figure 5.7.11).	15
1893	Winchcombe Carson No1 Store, 28-40 Wattle Street	'Messrs Winchcombe, Carson, and Company, were the first to perceive the special suitability of this locality[Wattle Street] for wool stores, and in 1893 they erected the first section of their present commodious premises. In 1894 they built large additions … Believing that economy of working could be achieved by keeping the bulk of their wool on one broad floor, they laid out their plans for a building to cover 122,000 square feet of ground(11,334m^2). There is still another wing to be added to complete the store, and when this is finished there will be a total floor space of about 4$^1/_4$ acres[17,199m^2], …'Anon, 1900:82). Enlarged in 1910 to hold 56,000 bales. Now the Ultimo Centre	16

Built	Name	Comments	Map location
1895	John Bridge Woolstore, Wattle, Jones & Macarthur Sts	According to Anon(1900:82): 'Starting in the trade on the Circular Quay thirty years ago [1870], and gradually building their business, the firm built what is now called their old Darling Harbor store. This was soon found to be too small for their ever increasing business, and some twelve years ago[1888] a substantial seven-storeyed building, adjoining the Darling Harbor Railway Station, was completed. At the time this was considered one of the most up-to-date and useful in the trade. Of course, in this business, unless a firm keeps abreast of the times, they soon have to make room for those who will do so, and Messrs. Bridge and Company, always to the front, some years back [1895] decided to erect another warehouse on the latest and most improved principles. They accordingly secured some five acres of land, and called for competitive designs for an up-to-date warehouse, which resulted in their building a magnificent block facing four streets, and with a floor space measuring four and three-quarter acres[19,223m^2]'. The architect was Harry C. Kent. Extended by three storeys in 1910/11(also dated 1919). John Bridge's sons ran the business until about 1917, when it failed and became the Farmers & Graziers Woolstore No. 1. Levels 6 and 7 were added in 1924. Work to convert the building into residential apartments began in 1996 and was completed in 1998. Now known as Dalgety Square.	8
1899	Commonwealth Wool and Produce Store No 1., 41-45 Jones Street/50-54 Wattle St.	Built as a five-storey brick store. Two storeys added in 1911, 30ft(9.1m) strip added to the NW of building to complete present complex. Became Elder Smith Goldsbrough Mort and Company No 3 Woolstore '… generally occupies the southern most quarter of a block bounded by Wattle Street, Quarry Street, Jones Street and Fig Street' (Planning Workshop, 1985:1). Leased to the Commonwealth Wool Corporation for a few years.	5
1906	Pitt Son & Badgery Woolstore No 1, 320-384 Harris Street, with frontage to Allen Street	Five storeys; built in 1906. Designed by John Reid. The building operated as a woolstore until the late 1970s and was renovated in the 1980s; the internal structure was replaced by concrete slabs and piers(Anon, 2007e)	12
1906	New Zealand Loan and Mercantile Store, Jones, William Henry Streets and Bulwara Road, 330-370 Wattle Street	Burnt down in 1947. Internal timber structure destroyed by fire in the 1980s; replaced by reinforced concrete slab floors on concrete pillars. 'Among the finest standing examples of the Federation Warehouse Style remaining in Sydney'(Anon, 2007e). Known as 'The Hub'(Anon, 2007c).	11
1909	Australian Mortgage Land and Finance(AMLF) Company No 1 Woolstore, Pyrmont Street	Originally five storeys high, two storeys were added in 1925(Balint, 1984:98). The woolstore occupied most of the land between (then) Bullecourt Lane and Pyrmont Street. A fire in 1992 destroyed much of the woolstore(Anon, CoS); sometime later the site was cleared, and residential units (Bullecourt Place, built in the early 2000s) and the Ian Thorpe Aquatic Centre (completed in 2008) were built there.	1
1912	Country Producers' Store 267 Bulwara Road (Bulwara Road/Quarry Street)	Engulfed by a huge fire in 1978; now the site of the Burlinson Gardens apartments (Matthews, 1982:74)	7

Built	Name	Comments	Map location
1919	Schute, Bell, Badgery & Lumby Woolstore, 94-136 Harris Street	'A large brick built seven storey woolstore which exhibits many of the distinguishing features of the Federation Warehouse style' (Anon, 2007d). Modifications were made about 1938. 'Interiors are not intact, as they have been altered for new commercial uses' (Anon, 2007d)	14
1921	Pitt Son & Badgery No 2 Store, Pyrmont Street	A seven storey building fronting Pyrmont and Allen Streets with a two storey tallow store on the Allen Street corner. Built on the site of a former woolstore owned by Hill Clark & Co	
1935/6	Farmers' and Graziers' No 2 Store, 492 Jones Street	The last woolstore to be built in Ultimo, and the last multi-storey woolstore built in Sydney (Matthews, 1982:74) Now Kennards Self-storage	9

Sources:

1. Anon, 2007a, Winchcombe Carson Woolstores, Aussie Heritage http://www.aussieheritage.com..au/listings/qld/Teneriffe-%20NewsteadWinchcombeCarsonWoolstore/1956
2. Anon, 2007b, Woolstores No2 Group, Aussie Heritage http://www.aussieheritage.com..au/listings/nsw/Ultimo/WoolstoresNo2Group/8434
3. Anon, 2007c, The Hub http://www.aussieheritage.com..au/listings/nsw/Ultimo/TheHub/7832>
4. Anon, 2007d, Schute, Bell, Badgery & Lumby Store, http://www.aussieheritage.com..au/listings/nsw/PyrmontSchuteBellBadgeryampLumbyStore/6994>
5. Anon, 2007e, Pitt Son and Badgery Wool Store http://www.aussieheritage.com..au/listings/nsw/PyrmontPittSonandBadgeryWoolStore/6498>
6. Balint, E., 1984, Historic record of Sydney city buildings: a review of historic building construction in the Victorian era, [Kensington], University of New South Wales(ML Q720.99441/4A).
7. City of Sydney, The Ultimo Woolstores <http://cityofsydney.nsw.gov.au/Development/CityImprovements/CompletedProjects/UltimoAquaticCentre/Woolstores.asp> (accessed 8 August 2008).
8. City Planning Department, 1983, p.4
9. Matthews, M.R., 1982, Pyrmont & Ultimo: a history, Ultimo, Pyrmont Ultimo History Project(ML REF 1 Q994.41/274).
10. Nield, A. & Shillito, N., 1976, Woolstores in Pyrmont and Ultimo, University of Sydney B.Arch thesis.
11. Planning Workshop, 1985, A submission to Sydney City Council's exhibited draft Local Environmental Plan No 30(Ultimo/Pyrmont/Haymarket Draft Plan in respect of Nos 41-45 Jones Street, Ultimo)(ML Q725.35099444/3)

Figure 5.7.11: Anon, n.d., Hill Clark & Co, wool store, Pyrmont St (1895-1923) (ON2/242: Digital order no. hall_34942, Negative HA34942)

iii. John Kellick's Woolstore

The State Library of NSW has photographs of another Pyrmont woolstore, referenced also by the City of Sydney and Picture Australia collections. The photographs were taken by Sam Hood, probably in the 1930s, of a woolstore at the corner of Lawson and Bowman Streets(ML DG ON4/7501 and 7502) (Figure 5.7.12).

Figure 5.7.12: Hood, S., [1930s], Old woolstore … Pyrmont (DG ON 4/7501; Digital order no. hood_07501)

The store was six storeys high fronting Elizabeth Macarthur Bay and 4 storeys high at the rear. Unusually, the external walls of the store were built of stone. Reference to Anon(1892) suggests that the store was built on land owned by John Kellick, and that it was at some stage almost doubled in size by a further section. Kellick was born in Sydney on 3 July 1803 and had varied interests in shipping, building industry, agriculture, property development and timber (Coleman, 2001). At 10 Harris Street, just behind his store, were the facilities of Henry Hawkins, a shipwright. Other references to the store are listed in Table 5.7.4.

Table 5.7.4: Kellick's store, Elizabeth Macarthur Bay

Date	Nature of Record	Comments	Source
1888	Map	A plan view of the woolstore	M4 811.17/1
1892	Photograph	Original store with addition	"Progress", August 1966
1907	Photograph	Front view of store from Balmain	Fitzgerald & Golder(1994:69)
n.d.	Photograph	Close view from Elizabeth Macarthur Bay	City West Development Corporation and Margaret Park(1977)
1924	Sketch	'Bird's-eye view of Sydney, Harbour Trust reconstruction of Jones Bay'	Sydney Harbour Trust(1924b)
1929	Text		Sydney Harbour Commissioners' (1929)
1945	Photograph	Shows relationship of store to Harris St, CSR, Goodlet & Smith	Matthews(1982:100)

A further insight into what was probably the same building was provided by the Sydney Harbour Trust Commissioners(1929:8): 'Old stone store, Pyrmont – This building is a property at the end of Harris Street, Pyrmont, which was acquired from Goodlet and Smith, Limited, and it has been reconstructed for use as a wool store. Electric light and power, and two electric hoists were installed'. The building may have served other purposes before becoming a woolstore.

iv. Conclusions

The move of woolstores to Yennora was initiated by Dalgetys in the late 1960s. The woolstores there were built in 1971(Anon,). 'Soon all five Sydney woolbrokers had relocated themselves into the 50 acres[20.2ha] of ground-level storage provided in that suburb'(Matthews, 1982: 74). 'In the late 1960s the [woolstore] buildings fell into disuse …'(Maritime Services Board, 1984:49). The link of Pyrmont peninsula with the wool trade was broken, bequeathing several magnificent buildings to future generations.

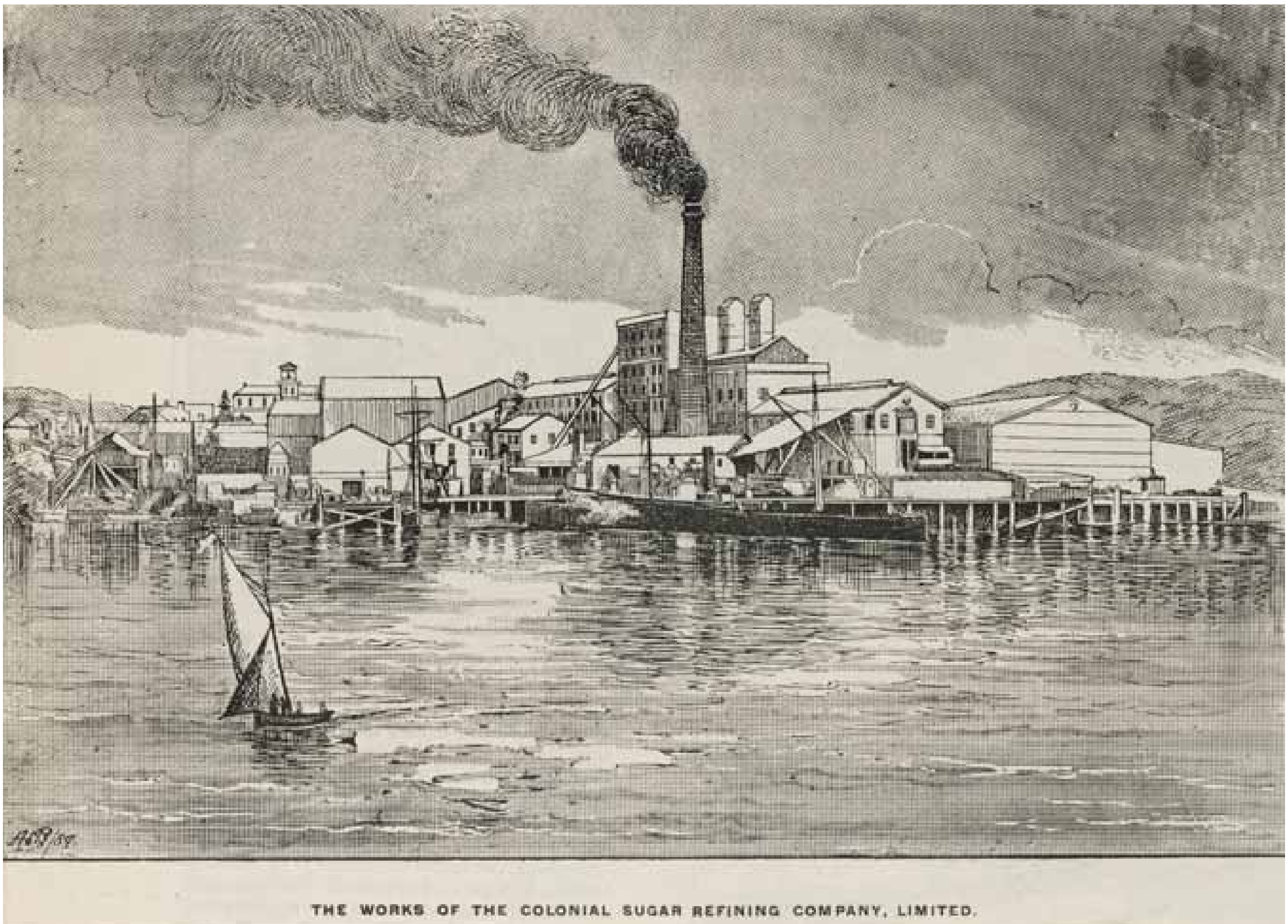
l) Colonial Sugar Refining Co Ltd (CSR)

Mention should be made also of this company, as the largest industrial employer, largest landholder, and industry longest-resident on Pyrmont peninsula!

According to Matthews(1982:57), CSR purchased land from the shipbuilding Chowne Brothers and the adjoining block of G. Allen in 1875: 'five acres in all … The original refinery took two years to build out of locally quarried stone …'. At its peak, the establishment had three distinct activities: the production of sugar, golden syrup and molasses; the distillation of alcohol and rum; the production of caneite boards.

An engaging sketch of the CSR works was published on page 18 of the 25 July 1889 issue of Illustrated Sydney News(Figure 5.7.13)

Figure 5.7.13: Works of the Colonial Sugar Refining Co. Ltd, Pyrmont, 1889 (SRL TN115: Illustrated Sydney News, 25 July 1889, p18)



During WWII, CSR had some 450 employees, by 1983 it employed 600 people (Fitzgerald & Golder, 1994:122). CSR wound down its operations in Pyrmont in 1992. By the mid-1990s its total land holding was about 11.7ha(CMPS&F Environmental, 1994), which it sold to Lend Lease Corporation in 1996, for the Jackson's Landing development – much of which is now in place.

5.7.5 General conclusions

According to Linge(1979:716):

> *'The first hundred years of European settlement in Australia can be summarised as being a period of 'industrial awakening' … the years 1889 and 1890 marked the end of a period of rapid industrial growth and formed a turning point in several other respects. Public companies with multiple branches were beginning to play a more significant role; governments were taking initial steps to expand exports by organising and subsidising certain processing industries; overseas investors were becoming interested in the potential offered by meat processing, timber-milling and other activities; the community was demanding effective legislation to improve working conditions, to prevent the abuse of youngsters, apprentices and female workers, and to control pollution and other kinds of industrial nuisance; employee and employer groups were being formalised and recognising that their problems and the solutions transcended political boundaries; new technology was emerging which – like the reticulation of electricity and the extension of*

the telephone systems – was to have a profound effect on the organization of industry and the society in which it operated; and the climate of opinion in New South Wales was moving towards the acceptance of protection and thus, in turn, enhancing the possibility of federation. In short, by the end of this period, the 'colonial' era of manufacturing was being replaced by some of the trappings of a modern industrial society. Spatially, too, the late 1880s saw the emergence of new forces: capital city firms were becoming more directly involved in non-metropolitan industry; 'decentralisation' had appeared as a live issue in country areas; manufacturers were beginning to seek sites in the outer suburbs of the larger centres; and companies were emerging with productive capacity in more than one colony. Although, of course, Federation was a significant event in its own right, the main effect from an industrial point of view was to reinforce or retard structural and spatial trends that were already in evidence ten to fifteen years earlier.'

The industrialisation of Pyrmont peninsula formed a link between the nascent industries clustered in the immediate precincts of Sydney town with the industries of modern Australia located in Sydney's middle and outer suburbs. As noted by the Sydney Harbour Foreshore Authority(2009): 'By the late 1830s Sydney was expanding, with the centre of the burgeoning town moving southwards along George Street. This expansion and subsequent shifting of the town centre saw additional land reclamation in the Darling Harbour and Brickfield Hill areas from 1838'. These areas became the industrial centre of the emerging metropolis but, as the city's growth continued, these industries too had to find new locations. While Pyrmont peninsula contributed greatly to the industrial needs of the colony for many decades, requirements again outgrew the available resources, and the industries moved to suburbs still further out, leaving behind them a substantial legacy of social and ecological dislocation'.

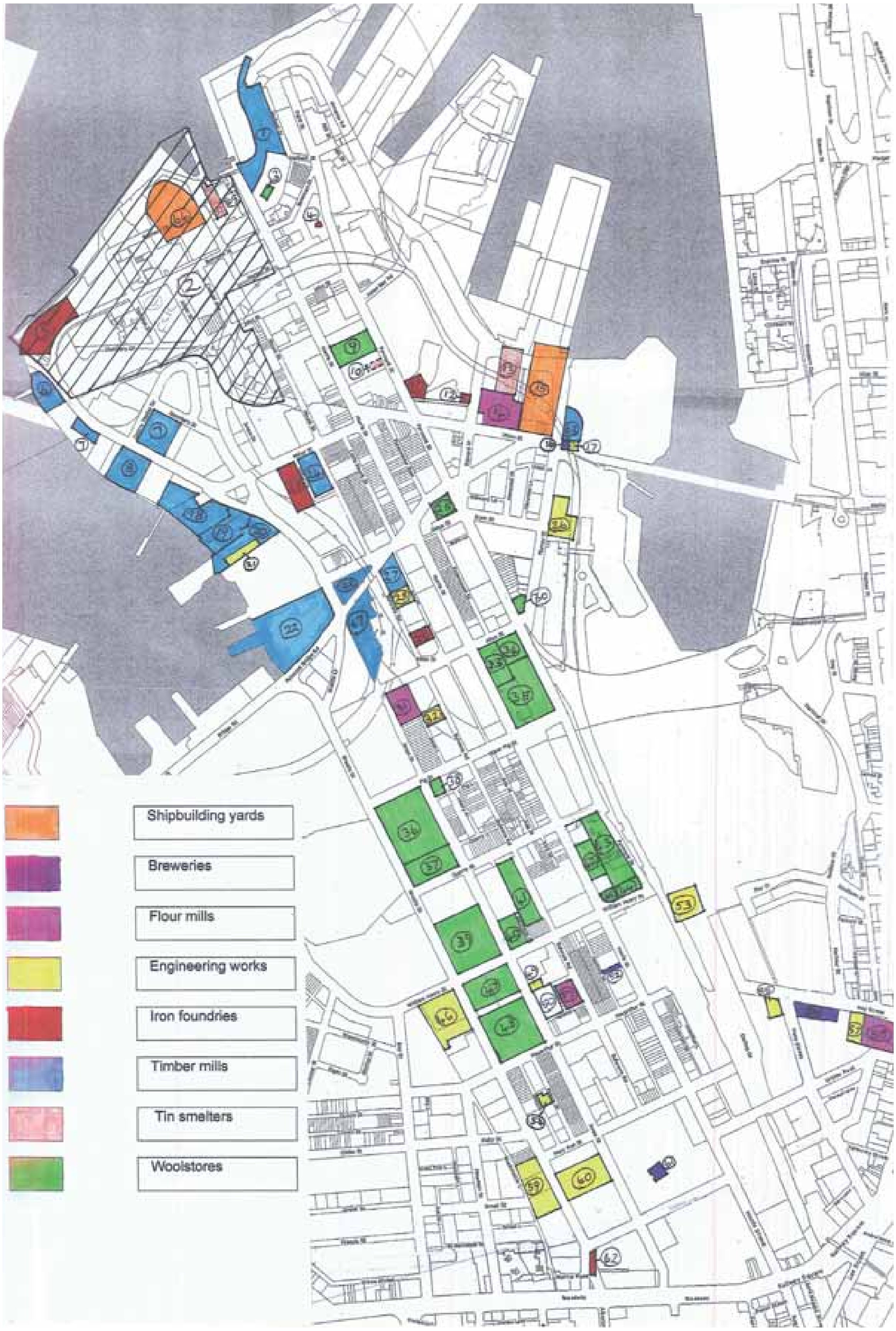
The course of the industries described above is roughly charted in Table 5.7.5.

Table 5.7.5: <u>Time spans of selected industries on Pyrmont peninsula</u>

Industry	Time span
Shipbuilding	[1840] - 1890
Breweries	1845 - 1890
Flour mills	1845 - 1992
Engineering works	1855 - 1929
Iron foundries	1861 - 1937
Timber mills/joinery works	1869 - 1986
Tin smelters	1874 - 1892
Wool stores	1883 -1936

It can be seen that the industrialisation of Pyrmont peninsula began in the early/mid 1840s. Apart from the tin smelters, most industries remained on the peninsula for at least 50 years, several for over a century. There was, however, a gradual shift over time from traditional industries like brewing, flour making, shipbuilding, working with iron towards such activities as tin smelting and wool storage. Timber mills survived well into the industrial decline phase of Pyrmont peninsula, and long after most other industries had moved to suburbs further out from the city.

Figure 5.7.14: Locations of some industrial and commercial establishments on Pyrmont peninsula



Legend

1. Goodlet & Smith site, established at Elizabeth Macarthur Bay between 1869 and 1910.
2. Colonial Sugar Refining(CSR) Co. Ltd. began its land purchases in 1875, and sold its accumulated properties on the peninsula in 1996.
3. John Kellick's Woolstore, which operated at least between 1888 and 1907, perhaps to 1929.
4. Unnamed iron foundry, illustrated by Matthews(1982), possibly belonging to Morgan Mainwaring; operated on this site between about 1899 and 1910.
5. City Ironworks operated at this site between 1865 and 1937, the site presumably being acquired by CSR at about this time
6. Cowlishaw Brothers relocated to this site from White Bay, Balmain in about 1906, eventually moving to Concord in 1928.
7. Wallis and Sons moved to Abattoirs Road in 1903, where they remained until 1936 when they relocated to Annandale.
8. Austral Timber Co. was first listed at this site in 1898, and remained here for some fifty years before moving to Glebe.
9. Schute, Bell, Badgery & Lumby's Woolstore, which is still used today.
10. Approximate location of John Higgin's Tin Smelter, which he operated between 1877 and 1885.
11. Apparently one of Morgan Mainwaring's iron foundries.
12. William Hargreaves operated an iron foundry at 2 Marian Street between about 1863 and 1899.
13. Pyrmont Tin Smelter, erected by Thomas Mort and partners, this tin smelter operated from 1874 to at least 1885.
14. The Anchor Flour Mills of Fielder Gillespie were built in 1920 around the New Yorker Hotel, which still stands in Union Street today. The mills ceased operation in 1990, the site being redeveloped in its present form.
15. John W. Russell bought land from William Barnett, the original purchaser of Blocks 7-9 in the first sale of the Macarthur Estate. Russell established his shipyard quickly, becoming the second shipbuilder on Pyrmont peninsula. He operated at this site for almost forty years, until 1875.
16. Pyrmont Brewery, established in 1880, was liquidated seven years later.
17. Pyrmont Bridge Ironworks, operated by Bladen & Crocker from at least 1875. The site was acquired by D&W Robertson in 1882, still as an ironworks.
18. Allen Taylor & Co. Ltd. opened their works at Blackwattle Bay in 1896; the company remained there until 1940, when it relocated to Rozelle.
19. Holdship Timber Co. Ltd. established itself in Pyrmont about 1919, moving to Mascot in 1949.
20. E. & E. Ellis Ltd. were located at Blackwattle Bay between 1907 and 1927, when they relocated to Rhodes.
21. Blackwattle Ironworks, established at Blackwattle Bay by D.&W. Robertson in 1885, where it apparently remained only until 1888.
22. Saxton & Binns acquired this site in 1901 and operated there until about 1963,
23. Triggs & Marr had an iron foundry at this site between 1888 and 1901.
24. A. Wallis & Sons first established in Pyrmont at this site, where they operated a cedar timber mill between 1888 and 1902.
25. F.L. Barker Woolstore was built in 1893 and remains in use today.
26. Atlas Engineering Works were at this site at least between 1878 and 1886., now occupied by the Ibis Hotel.
27. Charles Thomas Saxton was a timber merchant at this site between 1885 and 1901.
28. Robert Tulloch & Co. established the Phoenix Ironworks at this site in 1883, where they remained until about 1920 by which time they had a new works at Rhodes.
29. William Taylor operated the Paragon Foundry on this site, probably between 1883 and 1914.
30. Hill Clark & Co. Woolstore was probably the smallest self-contained woolstore built on the peninsula. Constructed in 1888 it remains in use today albeit much marred by an access ramp to the Western Distributor.
31. Initially the Ultimo Roller Flour Mills of Stephen Freeman from the late 1890s, the establishment was acquired by Edwin Davey in 1900. His company operated the Chanticleer Roller Flour Mills there until 1992.
32. The Seaforth Ironworks of George Bowman Mackenzie were here at least during the early/mid 1890s.
33. Pitt Son & Badgery Woolstore No1 fronts onto Harris and Allen Streets. Built in 1906, the store continues to be refurbished for various purposes.
34. Pitt Son & Badgery Woolstore No2 fronts onto Pyrmont and Allen Streets. Built in 1921, it too remains in use today.
35. Goldsbrough Mort Woolstore is among the most iconic buildings of its time. Initially built in 1883, the store burnt down in 1935 and was reconstructed in 1936 in essentially its present form.
36. Winchcombe Carson No.1 Store, built in 1893, and now the Ultimo Centre.
37. Commonwealth Wool and Produce Store No.1, built in 1899, still in use today
38. Winchombe Carson No.2 Store, built in the 1880s, once fronted Jones and Fig Streets but was demolished by the Department of Main Roads in 1974 for the Fig Street underpass. Site now incorporated into park.
39. Commonwealth Wool & Produce No.2

40. Australian Wool Brokers & Produce Co.
41. Country Producers' Store, built in 1912, engulfed by a huge fire in 1978. Part of the Burlinson Gardens were built on the site.
42. Australian Mortgage Land and Finance(AMLF) Co. No.4 Woolstore
43. AMLF Co. No.1 Woolstore: Built in 1909 between Bullecourt Lane and Pyrmont Street. Destroyed by fire in 1992, becoming the site of residential units and the Ian Thorpe Aquatic Centre.
44. AMLF Co. No. 2 Woolstore
45. AMLF Co. No. 3 Woolstore
46. G. & C. Hoskins acquired this site in about 1904, which they probably retained until the company moved to Port Kembla in 1929.
47. New Zealand Loan and Mercantile Store, built in 1906. Burnt down in 1947 and rebuilt. Now known as 'The Hub'.
48. John Bridge Woolstore, built in 1895 with additions in 1910/11(or 1919?) and 1924. Became Farmers & Graziers No.1 Store. Meriton Apartments converted the building to residential use between 1996/8. Now known as 'Dalgety Square'.
49. Souter & Martin operated a foundry and ironworks at this site from 1884 to 1901.
50. Farmers' and Graziers' No.2 Store, the last woolstore built in Ultimo and now used by Kennard's for self-storage.
51. White Rose Flour Mills, which occupied the site between 1925 and 1963, at which time the company relocated to Homebush.
52. The Anglo-Australian Brewery operated at this site between 1882 and 1890. The site is now incorporatede into the southern end of a large grey-and-white building at 549 Harris Street.
53. Davy & Co. had their Atlas Ironworks at this site at least during the early/mid 1870s.
54. Souter & Martin established the Globe Foundry at 17 McKee Street, probably by 1888. While a foundry appears at this site in maps of the time, street numbering suggests a site further south towards/in the UTS Day Care Centre.
55. Morris Brothers first established an engineering/blacksmithing works at this site in 1880, where they remained at least to 1886.
56. The Castelmaine Brewery was founded by a Victorian partnership in 1870. It experienced mixed fortunes, merging with the Australian Brewery in 1950, the latter being wound up voluntarily in 1906
57. G.&C. Hoskins: This appears to be their first site in Ultimo, where they set up business in 1876.
58. The Victorian Steam Mill was established on this site by John Terry Hughes in 1845. It remained there, under various names, until 1908, when it was demolished to make way for the new (Paddy's) Vegetable Market.
59. Morris Brothers expanded out of Haymarket to this large site in Ultimo in 1887. They apparently remained here at least until 1912. The site is now occupied by the 'Scientific Motor Body Works'.
60. G.&C. Hoskins established their second operation, their first in Ultimo, at this site in about 1889. They apparently retained the site for some 40 years, when they moved to Port Kembla.
61. D'Arcy Burton operated his Parramatta Brewery out of the basement of Ultimo House for sometime in the mid-1840s.
62. John Lutton & Sons established their Phoenix Foundry at this site about 1892, but their Sands' listing there was only for some five years.
63. Goodlet & Smith opened a joinery works here in 1879.
64. The Chowne Brothers and Robert Thompson were the original purchasers of Portion Numbers 35 and 36 in the second Macarthur land sale in 1840. They sold these lands to CSR in 1875.
65. Low & Meeks operated the Australian Tin Smelting Company briefly on this site between about 1874 and 1880.
66. William Grant had a boilermaking, engineering and iron shipbuilding business on this site between about 1879 and 1899.
67. A.C. Ingham & Co.

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In 1983, City Council Planners wrote: 'More than half of the Pyrmont peninsula area has been lying fallow as vacant industrial land for the past three decades'(City Planning Department, 1983). Yet another transition in the history of Pyrmont peninsula had run its eventful course.

5.7.6 Ecological considerations

A) Introduction

Contaminants from industry on Pyrmont peninsula entered the surrounding environment in every way – air, land and waterways. The extent of this contamination, and its ecological consequences, are reviewed here.

B) Water pollution

According to Taylor et al.(2004:233): 'Port Jackson is the most contaminated New South Wales estuary and is one of the most polluted harbours in the world'. These authors determined contaminant concentrations in sediment cores collected at 12 different locations in Port Jackson; sites of particular interest in the present context were Cockle, Blackwattle and Rozelle Bays. They estimated that the impacts of industrial contaminants in these bays were low in 1860, moderate in 1880, and high by 1917.

With respect to Blackwattle Bay, Taylor et al(2004:241) noted that: 'The onset of sediment contamination … occurred between 1866 and 1876. This interval is up to 30 years later than the earliest known industrial activity in the region, but closely approximates the period of rapid increase in metal usage in the catchment. Concentrations of Cu[copper], Pb[lead] and Zn[zinc] increase markedly after 1936 and highest Zn and Pb concentrations correspond to the mid-1950s'.

Due to several reclamations of Darling Harbour/Cockle Bay(p. 502/507), contaminant readings were obtained only since 1960, so that insights into the historical contamination of this waterway have been lost.

It may not be surprising that Blackwattle Bay also has high concentrations of modern chemicals, particularly the organochlorine compounds aldrin, dieldrin, total chlordane and DDT. High levels of polychlorinated biphenyls(PCBs), which have been used principally as liquid insulators in high voltage transformers, are also present(p.39).

It is also clear that contamination of Port Jackson has not stopped(Johnston, 2009:6): 'The flow of toxins to the harbour has slowed in recent decades … But stormwater still carries heavy metals and other pollutants'. Both Darling Harbour and Blackwattle Bay are among those sites considered of the 'highest priority' with respect to their sediment pollutant concentrates.

Blackwattle and Cockle Bays have heavy contaminant loads because they are:

- close to the sources of contamination
- mantled in muddy sediments which have an affinity for pollutants
- poorly flushed by tides and currents(Birch & Taylor, 2004:1)

The sources of the contaminants were considered to be various. Stormwater runoff was important in transporting contaminants into the harbour(especially in the southern central region of the harbour). Contaminants likely derived from road surfaces, contaminated sites, illegal dumping and reclaimed lands 'present at the backward ends of many embayments'(p.2). Road surfaces are likely a contemporary and ongoing source of pollution. Other sources may largely be due to events associated with the early industrialisation of Pyrmont peninsula.

According to Birch & Taylor(2004:2): 'Sediment quality guidelines developed overseas suggest that concentrations of many of the chemicals analysed in large parts of the harbour during the current investigation exceed levels at which adverse biological effects may be expected. However, the predictive ability of these interim guidelines has yet to be validated and this assessment is only indicative'(p.2).

C) Air pollution

The second major consequence of the industrialisation of Pyrmont peninsula was air pollution: 'By the 1860s industry in Sydney had grown to such an extent that air pollution was a huge problem so much so that the NSW Parliament in 1866 enacted a law for " … abating the nuisance arising from the smoke of furnaces"[The Smoke Nuisance Abatement Act].. The Local Government Act of 1919 also gave local municipalities the … "power to control and regulate furnaces and chimneys, and the emissions of smoke"'(Anon, 2009).

Writing in 1875, Dr John Dunmore Lang commented: ' … the city of Sydney, covered no longer, as of yore, with a thin transparent cloud of whitish smoke, curling slowly upwards from its numerous wood fires, but with a regular blackish cloud of the smoke of Newcastle coal … occupies a considerable portion of the field of vision'(p. 183).

The fuel needs of Sydney were for a while met by firewood, but by 1850 52,000 tons of coal were being mined in Newcastle, mostly for consumption in Sydney(Coward, 1988:193). 'It is probable that industries and later, railway engines(which were converted from wood to coal burners by 1861) rather than households in Sydney directly consumed the lion's share of coal'(p.194).

Edward Deas Thomson tabled a private member's bill for abating 'the smoke nuisance' in the Legislative Council in December 1862(ibid, 194). It was not until 1 July 1866 that the Smoke Nuisance Abatement Act came into force.

By the turn of the century, a major new source of air pollution on Pyrmont peninsula had emerged: 'The [Railway Commissioners] built a central coal-burning power station at Ultimo near Darling harbour. Its furnaces were fired in 1899. It was to be a major source of air pollution for seven decades' (Coward, 1988:199). By 1904, Pyrmont power station was in operation 'less than a mile from the Railway Commissioners' Ultimo power station' while 'By

1914 central Sydney held four thermal power stations'(ibid, p.200). 'These four stations, concentrated in central Sydney, thus discharged increasing quantities of smoke, gases and grit into the atmosphere'(ibid, p.200).

Coward(1988:200) summed up the situation at the turn of the century well:

> *'Factories(generating their own steam or electric power) and local electric lighting plants combined to increase smoke in Sydney at the turn of the century. Collectively they created a public nuisance. Once established, enterprises could not be removed. Left to themselves factory owners displayed no great interest in diminishing the smoke from their enterprises. (Indeed government-owned enterprises, like the printing works and the Railway Commissioners' Ultimo power station, were permitted to evade their responsibilities under the legal fiction that 'the Crown could not bind the Crown'). Yet people were offended by smoke. The New South Wales government did not see it as its responsibility to regulate factory smoke(or other pollutants). Nor was it under any compulsion to do so. Smoke and other air pollutants were not the subject of central government regulation and inspection through the Department of Public Health until 1961. Mitigation of this nuisance was thus left to individual municipalities. As factories were concentrated in the City smoke nuisance was a special problem for the City Council'*

So the smoke problem remained, now the responsibility of the City Council: 'In November 1901 the City council campaigned against excessive industrial smoke. It warned the owners of 89 smoky chimneys to diminish the nuisance' (ibid, p.202). Some years later, another attempt was made to resolve the issue, this time at State-level:

> *'In September 1904 residents and businessmen organised a meeting to protest at smoke pollution from the Strand Electric Lighting Co. It was agreed that the local grievance illustrated a City-wide complaint … In the Assembly, estate agent E.C.V. Broughton MLA for Sydney(King division) also urged amendment to the law. It was necessary to minimise "the serious discomfort and loss caused to the citizens of Sydney through the smoke nuisance by the large factories and electric lighting stations in the very centre of the city … In the city the loss in the shape of damage to property and deterioration of goods daily caused by the smoke nuisance is simply appalling. Science seems to have failed to grapple with the trouble.'(ibid, p.202).*

The smoke problem was widely experienced by the early 1900s. Writing on 24 August 1903, 'Artois', for example, noted: 'There is scarcely a suburb and not a single portion of the city where the atmosphere is not polluted with smoke during a part of the day. Even the harbour is not exempt, ferry boats and steamers of every class adding their quotum generously.'(SMH, 25 August 1903, p.8).

A few days later, 'Pro Bono Publico' noted: 'Passing through the streets one cannot help noticing huge volumes of thick black smoke issuing forth from the chimney stacks of factories within the city bounds, that must inevitably be very injurious to people suffering from pulmonary complaints …'(SMH, 1 September, 1903, p.7).

For the residents of Ultimo and Pyrmont, the 'smoke nuisance' was clearly an enduring affair. Matthews(1982:70) described complaints about soot and smoke on 10 August 1939. In the Sydney Morning Herald of 5 December 1950, H.J. Willings of Pyrmont commented:

> *'At the moment …Pyrmont power-house is belching a better and bigger smoke barrage over the city.*
>
> *This increased nuisance is particularly noticeable in Pyrmont by a thick oily deposit on buildings, windows, and furnishings. With a favourable wind it can be found as a fine black film on paint work well up the North Shore line.*

Do people realise what will occur when the new installations at Pyrmont, rapidly nearing completion, are in full blast? There is no doubt the smoke result will be twice as bad, and probably experienced over a much wider area'(SMH, 5 December 1950, p.2).

An article in the Sydney Morning Herald of 10 January 1975 noted:

'Pollution from Pyrmont power station is a disgrace and should be stopped, according to local residents.

'[Since industrial trouble in the Newcastle area] *the extra workload has brought a large amount of white ash falling from the four chimneys on to the streets and houses below.*

'Mr Lloyd Summers, of Union Street, Pyrmont, said yesterday that the pollution was so thick "it's almost snowing"…

"All the footpaths around here are white with ash"(p.3).

Ron Harvey, a long-time resident of Jones Street, Ultimo, commented in respect of the Ultimo powerhouse: 'Before any people around here would wash you'd always go out and see what smoke was coming out of the chimney. If it was white smoke you'd wash, but if it was black smoke you wouldn't … because all your sheets and your whites used to get dirty'(City West Development Corporation and Margaret Park, 1997:48).

The 'smoke nuisance' thus affected the residents of Ultimo and Pyrmont for a century or more.

D) Solid waste

'Sydney's first population did not generate much waste, and so waste disposal was not an issue for Aboriginal people … But the new population that settled there from the late 18th century created more garbage. They could not escape their waste. They tended to accumulate and discard more, and disposed of it haphazardly'(Curby & Macleod, 2003:21).

It was not until the Sydney Corporation Act, 1850, that solid wastes were collected in any systematic manner. According to Curby & Macleod(2003:21) 'In what should have been one of the world's most beautiful cities, household waste was allowed to pile up in backyards and common courtyards'. The industrialisation of Pyrmont peninsula during this period compounded the problem, due to the solid wastes of the growing number of factories. The wastes were used to fill low-lying areas but, probably more commonly, to reclaim land from Port Jackson.

The haphazard nature of waste management changed dramatically with the outbreak of bubonic plague in Sydney in 1900(Coward, 1988:204). Darling Harbour was an initial centre of the disease. While the epidemiology of the disease was still much debated, the Department of Public Health issued a leaflet which noted: 'Plague is a fever; like other fevers it is aided in its attack by filthy surroundings, and probably the infection is fostered by filthy heaps of neglected and putrefying material, and by filthy earth. Very great and special pains must therefore be taken by householders to thoroughly cleanse their houses internally, their yards, their gutters, and their drains(ibid,:208/9). The ensuing panic led to demands that the Government resume all privately-owned wharves, this leading to the creation of the Sydney Harbour Trust.

A contractor, Mr McCredie, was appointed to the cleaning task. His inventory of material removed from Darling Harbour precinct included 28,455 tons of garbage taken to sea in punts and 25,430 tons of garbage burnt on site: 'Many Councils debated whether to increase their garbage disposal service from once or twice weekly, to twice, three or four times each week'(ibid:210).

Despite the emphasis on cleansing early in the plague outbreak, it was only when attention shifted to controlling rats that the outbreak started to subside. Despite confusion on the underlying dynamics of the plague, the garbage disposal policies of Councils came under scrutiny. The City Council's tip at Moore Park 'was to be closed and all city garbage [was] to be taken to sea from 19 March[1900]'. Pyrmont was one of the two loading points.

An outcome of the episode was the construction of a garbage incinerator at Moore Park, which began operations in 1902. A second incinerator was built at Pyrmont in 1910, to be replaced in 1936 by one designed by Burley Griffin. As Fitzgerald(1992:268) pungently noted: 'And so the incinerator came to Pyrmont, an area already stigmatised in the eyes of many as the city's sink. Its operations added more pollutants to the atmosphere already degraded by the output of the city's powerhouses and several large factories'.

5.8 Land Reclamation

5.8.1 Introduction

Land reclamation has been defined as: '… the winning of dry land from large water bodies such as the sea, rivers, estuaries and wetlands of different kinds … Another way in which one can consider reclamation is as the advance of the urban littoral[shoreline] frontier, the expansion of development into areas formerly permanently or periodically under water'(Hudson, 1996:3). For Pyrmont peninsula, land reclamation has primarily affected estuarine waters and wetlands.

Recognition of the relationship between sedimentation and land reclamation in Port Jackson took time. Hyacinthe de Bougainville noted, during a visit to Sydney in winter/early spring 1825: 'The streets are not paved and the red dust rising from them is most unpleasant, especially in times of drought; for the same reasons, they are very muddy in wet weather'(Rivière, 1999:49). Bougainville surmised: 'Sydney Cove fills up each day with sand at such a fast rate that soon it will be necessary to create a new harbour to the [west] of the point on which is situated Dawes Battery, in Cockle Bay'(p.51).

The problem was still evident almost half a century later: 'Last heavy rains I observed the quantity of material swept into the harbour through the shore; the stream reaching from the Fort [Macquarie] more than half way across the harbour. Tons of mud and material must have been in a few hours washed into the harbour, to be removed at heavy expense'(Sadleir, 1871:3).

In a more reflective account, Stephenson & Kennedy(1980:103) noted:

> *'In that spongy topsoil and in the porous sandstone subsoil were natural storages of fresh water that the removal of the trees and shrubs and smaller plants would quickly deplete. Soil erosion was not understood by the pioneers, who, bred in the lore of damp islands, believed that "springs" of fresh water were perennial.*
>
> *'Nor could they understand that the clearing of the trees and the "underbrush", and the cultivation with spades and hoes of the shallow topsoil, would cause that loosened topsoil to be washed away by heavy showers of rain, leaving the sandstone subsoil exposed. So British settlement in the Vale of Sydney quickly destroyed the "spring" of fresh water and the fertility of the soil – two of the principal features that had caused Governor Phillip to decide to form the settlement there.'*

According to Aplin(1988:24): 'Reclamation began almost immediately after the settlement[Sydney] was established, but on what must have been a private, ad hoc basis'. The maps of Roe(1822) and Florance(1834) show no evidence of developments along the eastern foreshore of Pyrmont peninsula. Basire's(1837) 'Plan of Sydney with Pyrmont', however, foreshadowed extensive reclamation of Pyrmont Bay. Although this particular subdivision plan was not implemented, all those properties fronting the bay between John and Murray Streets were depicted as wholly or partly based on reclaimed land. Barlow(1839, 1840) showed a jetty in front of the Bunn property but otherwise no alteration of the peninsula foreshore(except at the southern end of Darling Harbour, where Dickson had built a dam to create a storage pond for supplying his steam engine(s) with fresh water).

Just two years later, Baker(1842) recorded the substantial development of the Pyrmont foreshore, with seven jetties and evidence of land reclamation. By 1856 at least nine portions fronting Pyrmont Bay had jetties, and substantial land reclamation was evident.

Official sanction for the filling in and reclamation of land with frontage to a harbour or river in New South Wales was provided by the Crown Lands Alienation Act of 1861. This Act was assented to on 18 October 1861. Its ninth clause states that:

> *9. The Governor with the like advice may authorize any proprietor of land having frontage to any harbour or river to fill in and reclaim any land adjoining thereto and lying beyond or below high-water-mark or to erect a wharf or jetty upon or over the same and on payment of an adequate money consideration to be determined by appraisement for the unimproved value of the land such land or any land which may already have been reclaimed shall become vested in fee simple in such proprietor and may be granted to him accordingly Provided always that no such reclamation shall be authorized which shall be calculated in any way to interrupt or interfere with the navigation of such harbour or river or with the rights or interests of adjoining proprietors and Provided also that the intention to grant such land shall have been previously announced in the Gazette for four consecutive weeks before such land is granted in fee simple*
>
> (NSW Government Gazette, 18 October 1861, Volume 2, Number 232, Page 2196)

On an order from the NSW Legislative Assembly, dated 20 December 1863, all applications to reclaim land in the City of Sydney, with frontage to the Harbour, and associated correspondence, were listed for 1862 and 1863(NSW Legislative Assembly, 1867/68). Thirty-three applications were received over the two years of which five were on Pyrmont peninsula – including three in Pyrmont Bay and one on the Harris Estate. More generally, almost half were for properties fronting Darling Harbour. This initially slow response to the Act gained momentum, and an 1896 return prepared for the Minister for Works showed that 706 acres(285.7 ha) had been, or was being, reclaimed from the harbour: 'A good deal of this new land, Mr. Young states, has been utilised for parks and other public purposes … This land mostly consisted of offensive swamps and unhealthy foreshores'(Anon, 1896).

With respect to practicalities, applicants were required to reclaim to a limit-line of extension determined by the Engineer-in-Chief for Harbours and Rivers. This requirement ensured that as reclamation progressed across different properties an acceptable new shoreline was produced.

At European settlement, the catchments of Cockle and Blackwattle Creeks were well vegetated and the quality of the water in these creeks would have been high. Land disturbance from the clearance of vegetation in the catchments followed by use of the land initially for agriculture and then for urban development would have considerably accelerated erosion rates and produced large sediment flows in each creek. Coupled with the disposal of raw sewage, abattoir wastes etc, Cockle Bay/Darling Harbour and Blackwattle Bay would have received increasing levels of both sediment and nutrients until measures were introduced to limit these flows.

There is some evidence that in agricultural areas erosion and sedimentation were most severe in the first 3-4 decades after European settlement (Starr, 1989). In the study area, though, erosion would have been ongoing due to urbanisation. Both bays would have been substantially affected by sedimentation when the Crown Lands Alienation Act was introduced, more than 70 years after European settlement; Clause 9 of the Act could thus have been in part a response to the increasing sedimentation of Port Jackson.

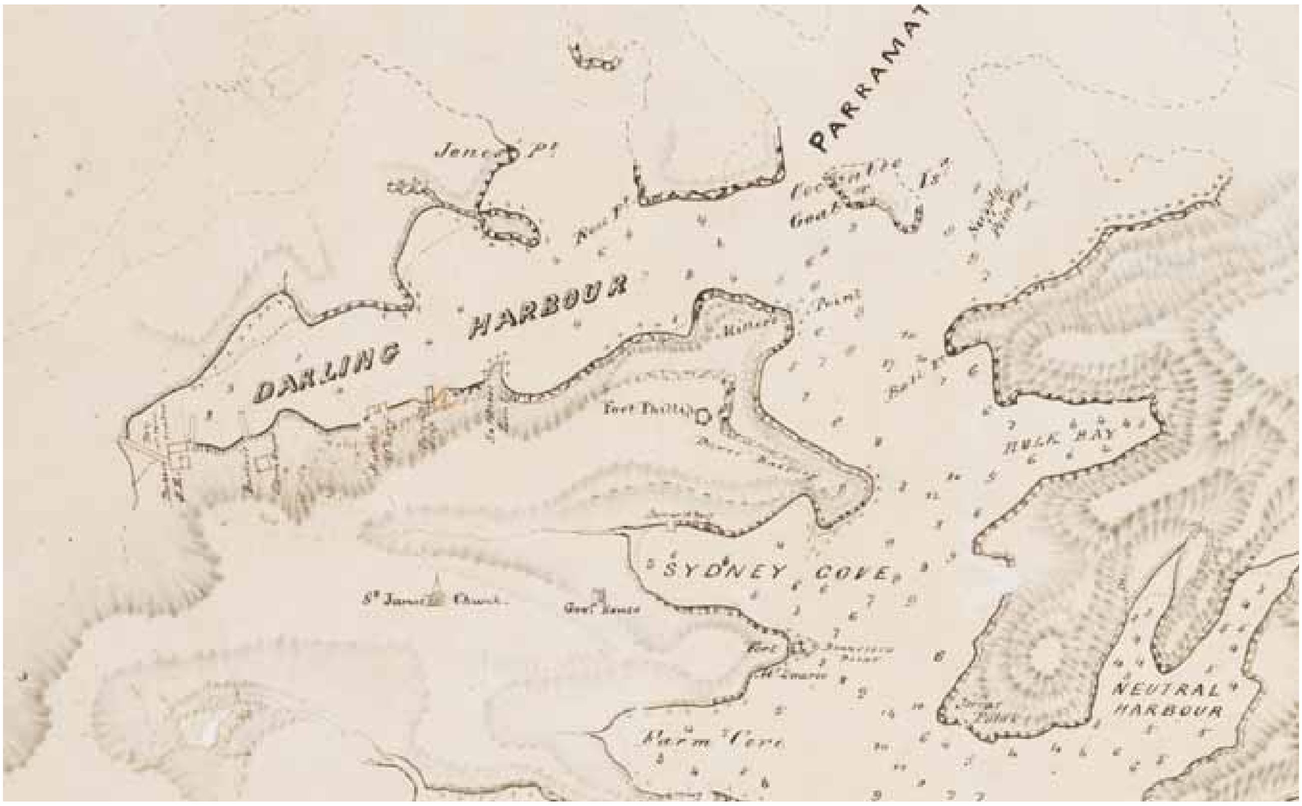
Reclamation around Pyrmont peninsula was complex and occurred over more than a century. It involved private individuals, companies and government instrumentalities, often in that order, with early reclamations incorporated into later ones. Land reclamation was usually supplemented by wharf or jetty construction.

This account describes early reclamation along the foreshores of the Macarthur and Harris Estates. Relevant information was obtained mostly from the NSW Government Gazette, as is acknowledged in the tables. This information was most usefully contextualised by a 'Plan of Pyrmont'(Anon, 1892), which showed the extent of the individual Macarthur Estate reclamations.

5.8.2 Darling Harbour

The reclamation of this water body began early in settlement, when John Dickson established the first steam-powered flour mill in Australia. Dickson arrived in Sydney in October 1813, and built his mill on the eastern side of (then) Cockle Bay, towards its head. To provide fresh water to the steam engine, Dickson built a dam across the mouth of Cockle Creek(Fig. 5.8.1). Both mill and dam were completed in 1815. The location of the dam in Darling Harbour, its relationship to Dickson's mill and to Sydney town more generally was well-illustrated some 20 years later by Thomas Florance(Figure 5.8.1).

Figure 5.8.1: Florance, T., 1834, *Detail from* Port Jackson, New South Wales [chart](ZM2 811.15/1834/1; digital order no. a928865)



SHFA(2008a) elaborated on these events: ' … from around 1813 onwards, the swampy marshlands of the Cockle Bay headwaters began to be dammed and used for industrial purposes. By 1815, John Dickson's damming works at Cockle Bay led to the formation of Mill Pond, which provided freshwater for Dickson's Steam Mill constructed two years previously in 1813. The Mill Pond later serviced other steam mills in the area, including Barker's Mill, erected in 1823'. According to Young(1988:192), the Mill Pond had been reclaimed by 1836, but a source used by Godden Mackay(1993:49) suggested that 'the former Mill Pond had nearly been completely filled in by 1855'. Contemporary maps support the latter view. Indeed, a NSW official publication shows a considerable area of Darling Harbour below Dickson's dam silted up by 1857(Anon, 1857).

The first planned reclamation in Darling Harbour probably occurred during construction of the Darling Harbour Branch Line, which began about February 1854(Hagarty, 2005:234). This entailed construction of an embankment across a small bay off the main harbour. Spoil came from construction of the Sydney Terminus of the main Sydney-Parramatta railway, which was built from about June 1854 to April 1855(Hagarty, 2005:241). A witness before the Select Committee on the 'Railway through Ultimo Estate'(NSW Legislative Assembly, 1864:223) commented that building the embankment 'took a long time and many thousand loads before any impression could be made at all; it seemed all to waste in the water'. Asked by the Solicitor for the Petitioners (Harris Estate): 'Was any retaining wall built to prevent the earth from washing into the harbour?', the witness replied: 'No, that was what they ought to have had; there was a great deal of material, wasted there at that time'. Similarly, Charles Langley noted that: ' … a great deal of this embankment has washed into the harbour, and filled the harbour up'(Ibid:217).Later maps indicate that the waterbody isolated from Darling Harbour by the railway embankment remained at least until 1868. Indeed, the waterbody was still evident in the Gibbs & Shallard aerial view of Sydney, 1879(Figure 5.9.6).

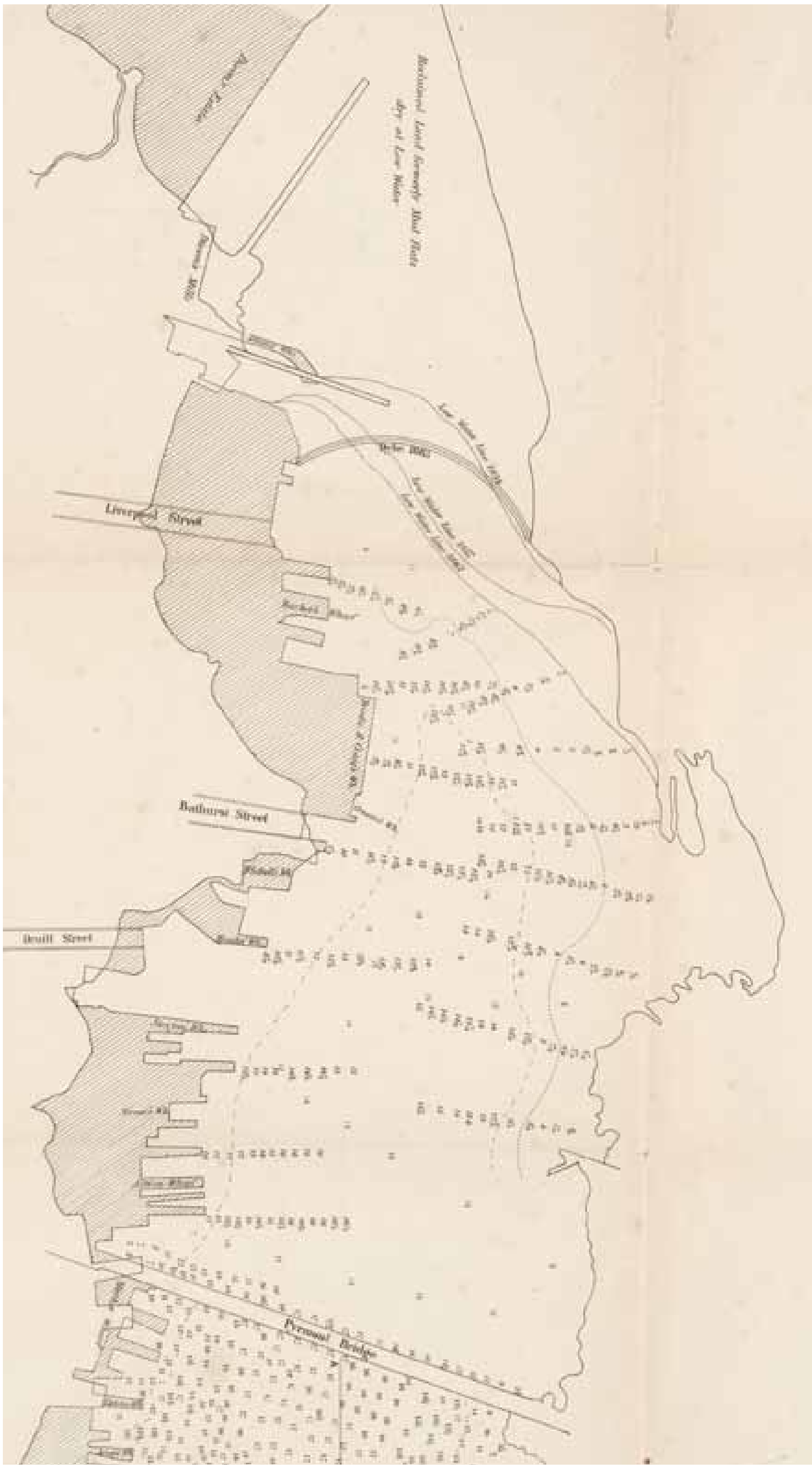
Figure 5.8.2 illustrates this phase in the reclamation of Darling Harbour. The view is over the harbour. Urbanising Balmain forms a background, in front of which is Bunn's cottage, partly obscured by a promontory with the cutting for Darling Harbour branch line along its base. What appears to be a large mound of earth in the left mid-ground, below the promontory and at the head of Darling Harbour, was presumably generated by the construction work at Sydney Terminus and was awaiting construction of the embankment to carry the branch line alongside the harbour. The tower on the right-hand side of the sketch was built by Robert Hancock in the 1840s opposite the Benevolent Asylum, roughly where Quay Street joins George Street today.

Figure 5.8.2: West, E., Terry, F., Martens, C. et al., 1822/59, Colonial Sketches: an album of views of Sydney and NSW, Folio 1b: [Approach to Sydney Terminus showing Darling Harbour, Pyrmont & Balmain], dated 25 January 1856(DL PXX 30/1b, Digital Order No. a1572003)

Ongoing siltation led to discussions in parliament on the desirability of reclaiming land at the head of Darling Harbour(and Blackwattle Bay)(SMH, 20.4.1864:4). Speakers noted that inhabitants of the area were suffering much inconvenience from the present state of Darling Harbour and concerns about the health of inhabitants were raised.

An informative chart of Darling Harbour was prepared by the Harbour Commissioner in 1866(Figure 5.8.3). Dickson's Mill Pond is shown in the south-eastern corner of the harbour, separated by extensive mudflats from the low water line of 1854. By this time, use of three wharves had been lost to sedimentation. The rapid silting of the harbour is evident from the progressive low water lines of 1854, 1857 and 1862 respectively. Extensive reclamation had also occurred by 1866 along the eastern shore of Darling Harbour, as is evident from the hatching. The chart also shows that a dyke was constructed across Darling Harbour by 1865, a little south of Liverpool Street. This dyke is shown on Hunt and Stevens' Map of the City of Sydney(1868). It intersected the Ultimo shoreline of Darling Harbour where a map by Woolcott and Clarke(1854) over a decade earlier had indicated a 'proposed bridge', suggesting that an initiative of this kind had been in mind for a while.

Figure 5.8.3: Harbour Commissioners, 1866, Plan of Darling Harbour, Sydney, Surveyor-General's Office(ML Q912.9441/11)



Sedimentation problems in Darling Harbour remained unresolved, and a Select Committee was established by the Legislative Assembly on 16 February 1864 in respect of Darling Harbour and Blackwattle Bay(Anon, 1863/64). It was noted that the Harbour was silting up very fast. Whether to fill did not seem in contention, but there were two points of view. One was to fill the harbour to Liverpool Street, the other to Bathurst Street. It was intended that silt from dredging the harbour would be used to fill 'at the back'. The Committee proposed 'to have the whole of the water frontage devoted to wharfs'(p.1094), and it was noted that reclamation to Liverpool Street would generate about 25 acres(10.1ha) of land(p.1096). The City Engineer proposed a 'circular wharf' with, at this stage, an extension of the railway up the eastern shore of the harbour to Miller's Point. The City Engineer believed that his Council could best do the reclamation: 'Because all our spare earth and rubbish could be thrown in to fill it up'(p. 1098).

A Commission of Inquiry was established by the Government on 19 December 1865 'to make a diligent and full inquiry into the present condition of the Harbour of Port Jackson, and particularly into the changes which have taken place in the depth of water in various parts of it; to investigate into the causes of the shoaling of the water, and generally into the effect produced by the sewerage of the city being conveyed into the harbour'(Harbour Commissioners, 1866:4).

The Commissioners submitted their final report on 19 April 1866(Harbour Commissioners, 1866). They concluded, in part, that 'As regards Darling Harbour, both the surveys and the evidence given before us clearly shew that the most rapid and serious shoaling has been and is still taking place'(p.5). In respect of the causes of this shoaling: 'All the witnesses agree that the shoaling is mainly attributable to the vast quantities of silt and rubbish washed down from the streets, either directly or through the sewers'(p.8). The role of the City Corporation[Council] came in for particular criticism: 'In getting rid of the street rubbish in the cheapest manner, they have found a convenient receptacle in the harbour, and have, as it were, converted it into a large cesspit; this doing enormous injury to that which is the most valuable possession of the citizens' (p.8).

Samuel Elyard captured the condition of Darling Harbour, probably in the mid/late 1860s, in his painting 'Darling Harbour(Figure 5.8.4). This northerly view of Darling Harbour from Ultimo shows the extent of sedimentation of the waterway at that time. On the peninsula side, the dirt road is Pyrmont Street and the house with the Norfolk Island pines is Bunn's Cottage. The coastline was low-lying and sandy up to the inlet just south of the cottage, where it became rocky at least to Pyrmont Bridge. The land on the peninsula had been cleared of native vegetation and was grassed with rocky outcrops interspersed through it. Three animals, probably horses, are grazing in the paddock nearest the artist. The large building on the city side of the harbour, with two floors, each with five windows/openings, could be Dickson's mill; the image resembles that provided by Weatherburn(1985:2).

Although the painting is not dated, it is similar to one of Blackwattle Swamp(DG V*/Sp. Coll/Elyard/1) dated 1868 and another of a view across Johnstons Bay(DG XV*/Sp.Coll/Elyard/18) dated 1865. It may be that Elyard's 'Pyrmont Series' were all painted during the mid/late 1860s.

Figure 5.8.4: Elyard, S., nd, Darling Harbour (DG XV*/Sp Coll/Elyard/3; Digital Order No. a1528107)

Management of siltation in Darling Harbour continued with the construction of an Iron Wharf in 1874, further down Darling Harbour towards Pyrmont Bridge(Figure 5.9.3). At its eastern end, the new wharf more or less butted onto Liverpool Street, while the wharf as a whole extended some way up Pyrmont peninsula at its western end: 'This was the first substantial wharfage on the western side of the Harbour and was conveniently located close to the railway to enable its use'(SHFA, 2008b).

By the early 1890s, the desirability of reclaiming more of Darling Harbour was again on the Government's agenda, this time in relation to the replacement or removal of Pyrmont Bridge. The debate was wide-ranging and included proposals to remove both Pyrmont and Glebe Island bridges and to further reclaim Darling Harbour(Anon, 1894a&b). One suggestion, by Darley(1894:7), was that the 'sandhills to the eastward' could be used to fill the harbour, by way of a branch line. One estimate of cost for a new Pyrmont Bridge was £220,000. The Minister of Works even suggested that it might be better 'to fill up the whole of the water beyond Pyrmont Bridge to the head of Darling Harbour than to expend a quarter of a million in money in constructing a new bridge … a railway could be run across it to Circular Quay'(Darley, 1894:6). Such a project would have created 38½ acres(15.6ha) of land, but would have resulted in a considerable loss of wharfage. It would also have required some 2,586,000 tons of fill, mostly from Sydney harbour. Others opposed the removal of Pyrmont Bridge(Anon, 1894c). The Public Works Committee of Parliament held its final meeting on the proposed Darling Harbour reclamation on 25 June 1894, to consider its report to Government. In the event, this coincided with a proclamation to dissolve parliament(Anon, 1894d).

A reconstituted Parliamentary Standing Committee on Public Works(Pyrmont Bridge) recommended on 6 December 1894 that the (then) present Pyrmont Bridge be removed and a timber bridge with steel swing span be built in lieu. The Lieutenant-Governor duly assented to the proposal, on 2 December 1897. The current Pyrmont Bridge was opened to traffic on 6 September 1900, at a cost of £112,500. Within a decade, there were again proposals to remove the bridge(Sydney Harbour Trust Commissioners, 1910:7).

During 1916, the Sydney Harbour Trust Commissioners 'were approached [by the Railway Commissioners] with a view to allowing the southern portion of Darling Harbour to be filled up with the spoil from the City Railway tunnels … [A scheme was developed which] provides for the reclamation of the whole of the southern end of Darling Harbour as far as Bathurst-street. Along this new front, and as an extension of Bathurst-street, a wide roadway(100 feet) will be formed, following the Pyrmont shore as far as Jones Bay … On the frontage of the reclamation jetties will be erected … When the scheme is completed it is considered that no necessity will exist for the Pyrmont Bridge, which has always been a serious hindrance to navigation, and its removal is favoured by the Railway Department, the Harbour Trust, and the Public Works Department'(Sydney Harbour Trust Commissioners, 1917:3).

Although the Railway Commissioners made a start on this reclamation with spoil from the City Railway tunnels, work ceased during 1917/18. According to Carew(2002:7) in 1918: 'Sydney Harbour Trust entered into agreement with Department of Railways to reclaim southern end of Darling Harbour to develop a goods yard, subsequently referred to as the 1918 agreement'. However, several years later the Commissioners reported 'very little progress has been made with the reclamation at the head of Darling Harbour'(Sydney Harbour Trust Commissioners, 1924:2). It was not until 1925/26 that 'The reclamation of the head of Darling Harbour has kept pace with the activities of the Trust in the vicinity'(Sydney Harbour Trust Commissioners, 1926:2). Reclamation and wharf construction had reached the stage in 1927 whereby a road linking Bathurst Street with Pyrmont across the reclaimed area was possible; this led to vigorous lobbying by the Harbour Commissioners for the removal of Pyrmont Bridge and the establishment of a Special Committee of Government to inquire into the matter(Sydney Harbour Trust Commissioners, 1927:4).

The Special Committee favoured removal of Pyrmont Bridge, and also proposed a raised roadway from Bathurst Street to Fig Street which, in turn 'would be regraded and connected with another overhead roadway across Wentworth Park, taking up eventually with Bridge road'(Sydney Harbour Trust Commissioners, 1928:2-3). The Harbour Commissioners reported the near-completion of the reclamation in 1929(Sydney Harbour Trust Commissioners, 1929:8). According to Oakes(1999:209): 'Spoil from the excavation of the City Underground railway … essentially defined the waterfront we have in Cockle Bay today'.

However, the Trust had apparently accepted that Pyrmont Bridge was to stay, as they did not raise the matter again. Its successor, the Maritime Services Board of NSW, was to renew calls for the bridge's removal some fifty years later(in 1979)(Engineering Planning Sub-Branch, Maritime Services Board of NSW, 1980).

5.8.3 Macarthur Estate

It is convenient to consider reclamation along the peninsula foreshore of the Macarthur Estate in five sections.

A) Union Street to Murray Street

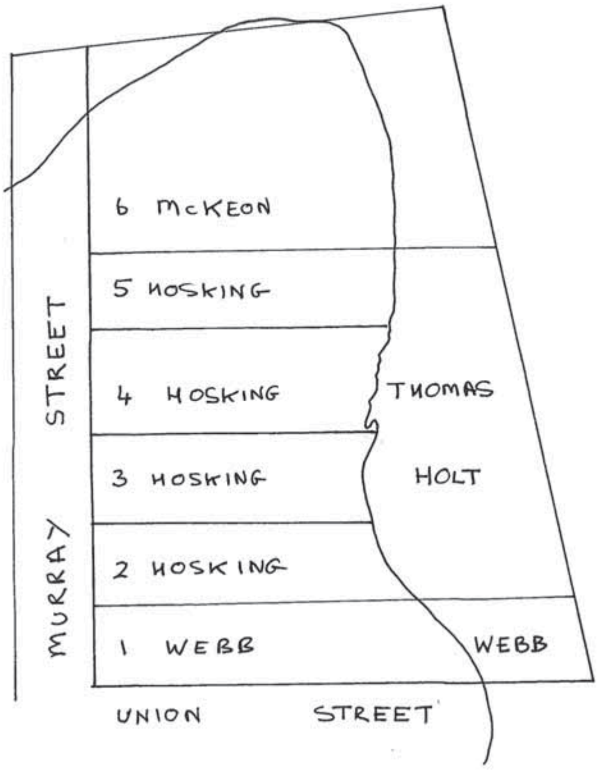
This section extended from the southern boundary of the Pyrmont Estate, at Union Street, northwards around the southern head of Pyrmont Bay to Murray Street. It contained 6 portions from the first subdivision of Macarthur's Estate in 1836. Reclamation of the foreshores of all these portions appears to have occurred, on the information collated(Table 5.8.1), between about 1871 and 1881. The reclamations are shown in Figure 5.8.5.

Table 5.8.1: Early reclamations: Union/Murray Streets, Pyrmont

Macarthur Portion No.	Known holders	Initial portion size[5]	Area reclaimed a.r.p[1]	Area reclaimed m^2 (10^3)	Date of gazettal[2] First	Date of gazettal[2] Final	Reclaimed by	Source[3]	Registration No.[4]
6	Humphrey McKeon W.H. Christie	0.2.9							
5	John Hosking Thomas Holt	0.1.20	0.2.26	2.68	20.1.1871		Thomas Holt	v1871/1, n18, pp168-169	70-4801
4	John Hosking Thomas Holt	0.1.18							
3	John Hosking Thomas Holt	0.1.16							
2	John Hosking Thomas Holt	0.1.21							
1	William Webb	0.1.26			4.1.1881		William Webb	v1881/1, n5, p30	80-17136

Notes:
1. Acre, rood, perch
2. Refers to date when application was first or last published in the NSW Government Gazette
3. Refers to year, volume number, issue number and page on which application appears in Gazette
4. Unique identifier given to applications by the Department of Lands
5. From 'Table of Contents of Pyrmont', Frame 20, Macarthur Papers vol.98(ML CY2291)

Figure 5.8.5: Early reclamations: Union/Murray Streets, Pyrmont



Thomas Holt's reclamation in front of four of the six blocks in this section was eventful. While his application to reclaim was successful, it was subsequently revoked by the Department of Lands and Holt was asked by letter to surrender the deed to the Crown(Macarthur Papers, Frame 112(ML Macarthur Papers A4244-1, CY 1719). Refusal was linked to a plan to extend the Darling Harbour Branch Line to the southern point of Pyrmont Bay. In his response, Holt pointed out that he had already sold the land to Messrs Goodlet & Smith on 22 November 1872 (Frame 113). He also noted that Major Christie, holder of adjoining land to the North, had been allowed to purchase his water frontage from the Government, reclaim it and sell it to a Mr Billyard. In a letter dated 24 April 1874, the Department of Lands noted that Goodlet & Smith had been called upon to surrender the land in question(Frame 114). A further letter, dated 16 November 1874, from the Department of Lands(Frame 122) noted that the matter had been referred to the Crown Solicitor.

B) Pyrmont Bay

Reclamation of Pyrmont Bay was well underway by the time Wells(1850) prepared his 'Plan of the City of Sydney'. Wells showed eleven wharves and jetties into the bay, some associated with substantial land reclamation. One of the land-holders fronting Pyrmont Bay, Thomas Smith, had acquired Reuben Uther's allotments as a second owner. In 1849, he 'applied in the normal way for permission to reclaim certain lands in Pyrmont Bay, to enable him to carry out a wharf'(Anon, 1869); his problem was that the wharves and jetties built by some land-owners ignored the rights of others. The Government apparently made a decision that year that use of Pyrmont Bay by proprietors whose land fronted the bay should be determined by a series of converging lines. By this device, all proprietors would have an equal share of the bay's waters for reclamation, jetty building, etc; the idea was proposed by James Macarthur. Reuss & Browne(1856) overlaid the situation at that time on a map of the bay with converging lines to the designated limit of reclamation (Figure 5.8.6). The map clearly shows the encroachments of some developments on the waters of others. It also shows the house 'Western Lea'(see p. 432).

Figure 5.8.6: Reuss & Browne, 1856, Adjustment of water frontages [Pyrmont Bay](ML M4/811.1739/1856/1)

Almost two decades later, in September 1867, Smith presented a petition to the Legislative Assembly in regard to the extension of his waterside property (Anon, 1867). The Assembly agreed to a proposal by Mr Tunks: 'That a select committee be appointed, with power to send for persons and papers to consider and report on the petition of Mr Thomas Smith …'. The Select Committee duly reported back to the Assembly, and its deliberations were ordered to be printed on the 3 April 1868. Smith advised James Macarthur in July 1865 that he had deposited more than 2500 cartloads of material on his water frontage(ML Macarthur Papers, vol.98, p.93c).

Table 5.8.2: Early reclamations: Pyrmont Bay

Macarthur Portion No.	Known holders	Initial portion size[5]	Area reclaimed		Date of gazettal[2]		Reclaimed by	Source of information[3]	Registration No.[4]
			a.r.p.[1]	m^2 (10^3)	First	Final			
29	Thomas Day	0.2.8	~0.1.18	1.5			Unauthorised reclamation	Anon(1892)	
28	William Webb Edward Davis John Morrison	0.1.38	0.1.18$^3/_4$	1.5		before 27.3.1885	Trustees of the Macarthur Estate		
27	P.H. Valentine Thomas Hart(Bank of Australia) William Read *alias* Mulhall William Hughes William Webb	0.1.29	0.1.26$^3/_4$	1.7		after 27.3.1885	Trustees of the Macarthur Estate	v1885/1, n133, p2090	85-4388 (SP 2028)
26	Edward McRoberts Mort Henry White William Webb	0.1.15	0.1.29	1.7	5.8.1879	7.8.1883	Trustees of the Macarthur Estate	v1883/3, n329, p4235	79-5143 83-11987
25	John Neale	0.1.9	2.1.3	9.2	4.1.1881	13.10.1882	William Webb	v1881/1, n5, p30 v1882/4, n412, p5450	80-17137 82-10615 (SP 80-784)
24	James Gaull J.G. Collins Thomas Hart(Bank of Australia) William Webb	0.1.7							
23	James Gaull J.G. Collins Hart(Bank Australia) William Webb	0.1.6							
22	J.G. Collins Hart(Bank Australia) Webb	0.1.9							
21	William Sawyer William Webb	0.1.12							
20	William Sawyer William Webb	0.1.17							

Macarthur Portion No.	Known holders	Initial portion size[5]	Area reclaimed		Date of gazettal[2]		Reclaimed by	Source of information[3]	Registration No.[4]
			a.r.p.[1]	**m²** (10³)	First	Final			
19	George Coke Henry Smythe Thomas Smith	0.1.22	1.2.6	6.2	21.3.1876	29.6.1877	William Alison	v1876/1, n89, p1146 v1877/2, n206, p2510	75-8581 77-3487
18	Henry Smythe Thomas Smith	0.1.28							
17	Thomas Swindells Thomas Smith	0.1.35							
16	Thomas Swindells Thomas Smith	0.2.1							
15	Reuben Uther Thomas Swindells Thomas Smith	0.1.35							
14	Reuben Uther Thomas Swindells	0.1.39							
13	John Kellick William Alison	0.1.9							
12	John Kellick William Alison	0.1.13							
11	John Kellick William Alison	0.1.16							
10	Edward McRoberts Waxhuizen	0.1.25							
9	William Barnett John W. Russell	0.1.27							
8	William Barnett John W. Russell	0.1.25							
7	William Barnett John.W. Russell	0.1.33							

Notes:

[1] Acre, rood, perch

[2] Refers to date when application was first or last published in the NSW Government Gazette

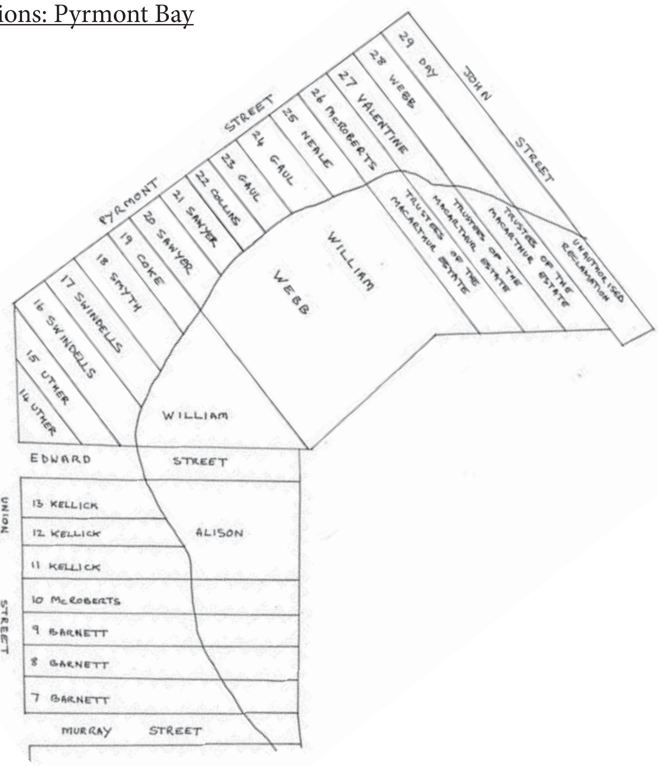
[3] Refers to year, volume number, issue number and page on which application appears in Gazette

[4] Unique identifier given to applications by the Department of Lands

[5] From 'Table of Contents of Pyrmont', Frame 20, Macarthur Papers vol.98(ML CY2291)

Others were also to reclaim Pyrmont Bay between 1877 and 1885(Table 5.8.2). The Trustees of the Macarthur Estate filled the bay to the limit of reclamation laid down by the Engineer-in-Chief for Harbours and Rivers, in front of the original Macarthur portions 26-28. William Webb did the same southwards in front of portions 20-25. In a letter, dated 1 July 1865, by Thomas Smith to James Macarthur the former noted that William Alison: ' … is now living at Pyrmont, and who a short time ago returned to the colony and purchased a mortgage which he held upon Mr Killick's property here fronting the Bay, of 3 allotments and is now in possession on the opposite side of Edward Street, close to where I reside'. Indeed, William Alison successfully applied to reclaim land in front of portions 11-19, straddling Edward Street, in March 1876 and was permitted to reclaim such in June 1877. These reclamations are shown in Figure 5.8.7. The history of reclamation of land in front of portions 7-10 has not been established.

Figure 5.8.7: Early reclamations: Pyrmont Bay



Two other applications for reclamation were made in respect of Pyrmont Bay, but their outcomes are unknown:

In 1878, John Morrison applied to reclaim land from Pyrmont Bay in front of his property (GG v1878/4, n359, p4581). Morrison was an owner of Portion 28 of the Macarthur Estate(Anon, 1892), and is presumably the pattern maker who then lived at 10 Pyrmont Street, An application almost a decade later by the Trustees of the Macarthur Estate in respect of this same property was successful.

Robert Cox, probably the merchant living at 55 Pyrmont Bridge Road, applied to reclaim and purchase land in Pyrmont Bay in 1885(GGv1885/2, n264, p4040). The description accompanying his application suggests that the land was at the southern end of the bay

C) Darling Island

At settlement, Darling Island was about 3 acres 25 perches(1.28ha) in extent and located some 27 metres offshore from Pyrmont peninsula at high tide. At low tide it was probably connected to the peninsula by mudflats.

It seems likely that the first move to reclaim land around Darling Island was taken by John Macarthur when he hired Samuel Thompson in 1840 to link the island to the peninsula by a 'stone mound'(Fitzgerald & Golder, 1994:28). By 1855, the Australian Steam Navigation Company had expanded its shipyards onto Darling Island(Matthews, 1982:110) and retained Charles Saunders to level part of the island for a patent slipway. The material so removed was probably used to reclaim land at the south end of Jones Bay.

Table 5.8.3: Early reclamations: Darling Island

Macarthur Portion No.	Known holders	Initial portion size[5]	Area reclaimed		Date of gazettal[2]		Reclaimed by	Source[3]	Registr-ation No.[4]
			a.r.p[1]	m^2 (10^3)	First	Final			
6	Thomas Cooper Makinson	0.2.16	1.1.21	5.6	29.1.1884		Trustees of the Macarthur Estate	1884/1, n45, p687	84-1746
7	George Green	0.2.14							
-			2.1.6	9.3	19.5.1885	27.4.1888	Trustees of the Macarthur Estate	1885/2, n203, p3221 1888/2, n263, p2978	85-4484 (SP 926) 88-3224 (SP 1937)

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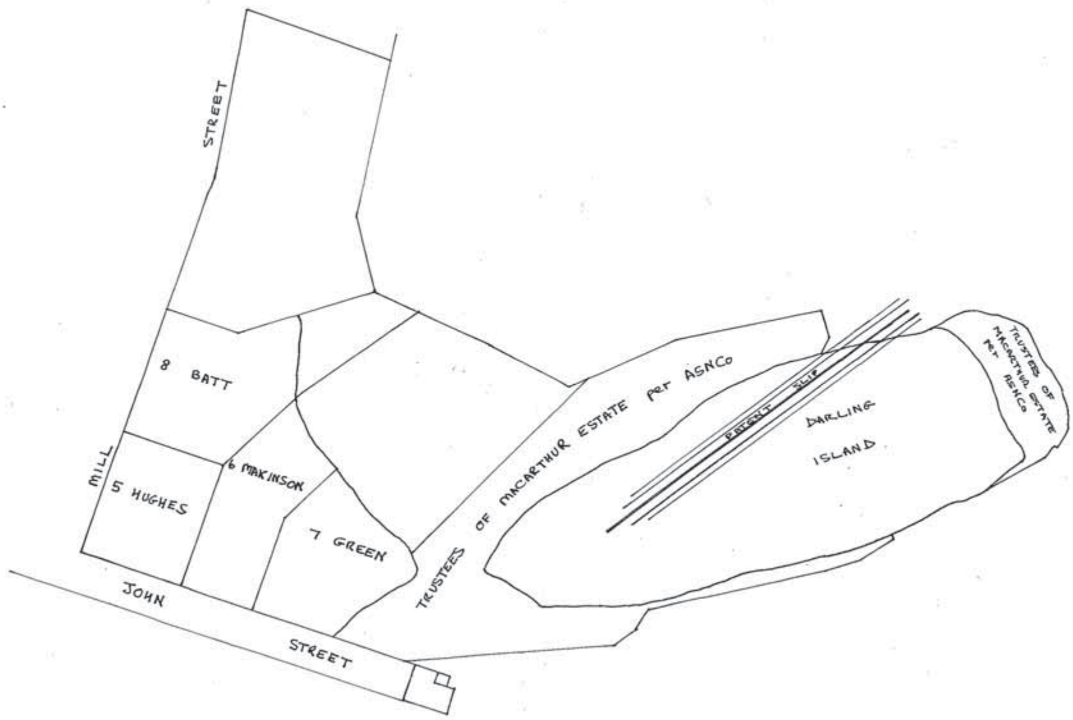
4. Unique identifier given to applications by the Department of Lands
5. From 'Table of Contents of Pyrmont', Frame 20, Macarthur Papers vol.98(ML CY2291)

Additional source of information:

Macarthur Papers, Sketch map of Darling Island, with reclamations, Vol. 98, Pyrmont Estate 1832-1870, Reel CY 1719, p.135/ frame 106.

Reclamation of the waters around Darling Island continued during the 1880s(Table 5.8.3), prior to its acquisition by State Government on 4 June 1889. The island was almost trebled in size – to 8 acres 1 rood and 37¾ perches (3.43ha) - and substantially connected to the peninsula. The extent of the island before and after these reclamations is shown in Figure 5.8.7, with details of each reclamation.

Figure 5.8.8: Early reclamations: Darling Island



Further reclamation around Darling Island occurred in the late 1890s: 'The "island" is being considerably enlarged, heaps of stone, rubbish, and ashes being tipped both from the land and from punts into the harbour for reclamation purposes'(Anon, 1899a). And again, 'punts are to be seen driving back the water by means of huge deposits of debris, stones, and ashes'(Anon 1899b). These developments are shown in Figure 5.8.8.

D) Jones Bay

Reclamations in the waters of Jones Bay are detailed in Table 5.8.4. Unlike those for Pyrmont and Elizabeth Bays, the reclamations were mostly by individuals rather than the Trustees of the Macarthur Estate. They were also for lesser areas, especially than those in Pyrmont Bay and around Darling Island; perhaps the waters in Jones Bay were deeper and so less amenable to reclamation.

Table 5.8.4: Early reclamations: Jones Bay

Macarthur Portion No.	Known holders	Initial portion size[5]	Area reclaimed		Date of gazettal[2]		Reclaimed by	Source of information[3]	Registration No.[4]
			a.r.p.[1]	m^2 (10^2)	First	Final			
8	Edward Flood Edward C. Batt	0.2.27	0.0.37$^4/_5$	9.6					
9	Edward Flood and others	0.2.27	0.0.25	6.3	23.10.1883	1.7.1887	Bishop of Sydney	v1883/4, n436, p5717 v1887/3, n367, p4275	83-9015 (SP 966) 87-6499
			0.0.12$^1/_2$	3.2	10.2.1885	14.11.1887	William Stevens	v1885/1, n54, p1043 v1887/4, n639, p7658	84-26351 (SP 1816) 87-13176
			0.0.11	2.8	1.11.1881	19.10.1883	Edward Flood	v1881/4, n437, p5626 v1883/4, n429, p5640	81-19047 83-12956 (SP 975)
			~0.0.11	2.8			Unauthorised		
10	Edward Flood M.E. Roberts	0.2.27	0.0.18$^1/_2$	4.7	4.11.1881	18.5.1883	John Shand	v1881/4, n442, p5672 v1883/2, n212, p2774	81-19063 83-5691 (SP 869)
			0.0.15	3.8	15.7.1881	3.1.1883	William McRitchie	v1881/3, n278, p3665 v1883/1, n4, p22	81-10588 82-14963 (SP 1057)
			0.0.5$^1/_2$	1.4	9.6.1882		William McRitchie	v1882/2, n227, p3097	82-8078 (SP 82-1195)
			0.0.11$^1/_4$	2.8		20.7.1883	Dugald Robinson	v1883/3, n307, p3908	83-4190 (SP 1161)
11	Robert Bourne Thomas McCredie	0.3.14	~0.0.37	9.4			Unauthorised reclamation		
12	George Chisholm Thomas Smith	0.2.36	(0.0.36$^3/_4$)	9.3			Not reclaimed		
13	Thomas Harpur William Grant W.H. Christie	0.3.13	0.0.19$^1/_2$	4.9			Trustees of the Macarthur Estate(and Robert Grant)		

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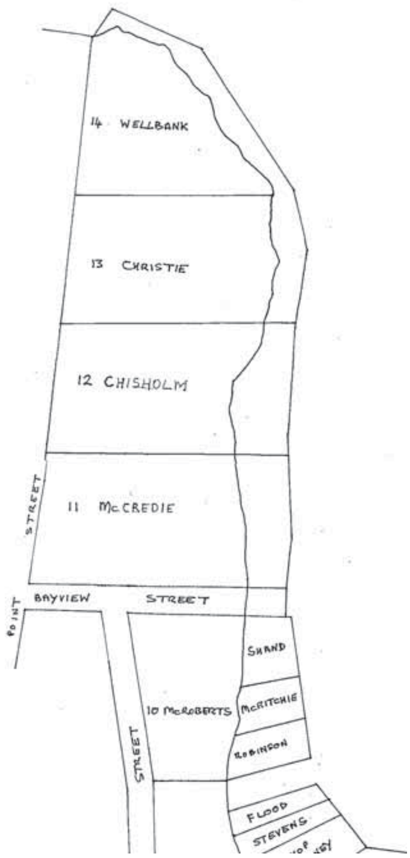
Figure 5.8.9 shows the physical relationship of the known reclamations in Jones Bay.

Figure 5.8.9: Early reclamations: Jones Bay



E) Elizabeth Macarthur Bay

Eleven portions of the original Macarthur Estate subdivision fronted on to Elizabeth Macarthur Bay between Pyrmont Point and the Pyrmont Estate boundary with the Harris Estate. The frontages of all these properties were reclaimed between 1878 and 1888(Table 5.8.5).

Table 5.8.5: Early reclamations: Elizabeth Macarthur Bay

Macarthur Portion No.	Known holders	Initial portion size[5]	Area reclaimed a.r.p.[1]	Area reclaimed m^2 (10^2)	Date of gazettal[2] First	Date of gazettal[2] Final	Reclaimed by	Source of information[3]	Registration No.[4]
28	John McCarthy Charles Coucher Mrs Wellbank	0.3.6	$0.0.29^1/_2$	7.5	24.6.1884	23.10.1888	Trustees of the Macarthur Estate(for Hugh Chambers)	v1884/2, n293, p4034 v1888/4, n660, p7440	84-10409 88-9577 (SP 1529)
27	Robert Roberts James Alexander Goodlet & Smith	0.3.32	0.1.9	12.4	18.11.1881	23.10.1888	W.W.Billyard for Trustees of the Macarthur Estate	v1881/4, n468, p5920 v1888/4, n660, p7440	81-20046 88-9575 (SP 744)
26	Archibald Smith Oswald Harley Goodlet & Smith	1.0.3							
25	W.B. Simpson Goodlet & Smith	0.3.36	(0.0.14) $0.1.7^1/_2$	(3.5) 12.0	15.10.1878	24.6.1885	(W. Simpson) Trustees of the Macarthur Estate per McCredie and others	(v1882/1, n33, p403) v1878/4, n326, p4209 v1885/2, n256, p3874	78-10076 85-8711 (SP 77-255)
24	Thomas McCredie	0.3.6							
23	G.P. Slade F.A.C. Foster John Morrison	0.3.6							
22	John Kellick Andrew -Wordsworth Henry Hawkins	0.2.10	0.0.39	9.9					
Harris Street	City of Sydney Corporation		~0.1.0	10.1	6.8.1880		City of Sydney Corporation	v1877/3, n250, p2978 v1880/3, n320, p4056	77-5358 80-7405
33	George Chisholm Samuel Cook Thomas Holt Smart	0.2.4	$0.1.30^1/_2$	17.8		19.11.1878 13.4.1880	Samuel Cook Samuel Cook	v1878/2, n361, p4637 v1880/2, n126, p1731	78-12099 78-12100 80-4584
34	D.P. Aitchison George Coke	0.2.29	0.1.22	15.7	11.5.1877	16.12.1879	Messrs A.S. Low & Meeks for Trustees of the Macarthur Estate	v1877/2, n156, p1905 v1879/4, n445, p5550	76-9676 79-15112
35	Thomas Chowne H.R. Chowne Robert Thompson	0.3.23	0.2.35	29.0	2.12.1881	24.2.1888	Colonial Sugar Refining Co on behalf of the Trustees of the Macarthur Estate	v1881/4, n496, p6204 v1888/1, n129, p1441	81-21108 88-263 (SP 446)
36	Thomas Chowne H.R. Chowne Robert Thompson	1.3.6							

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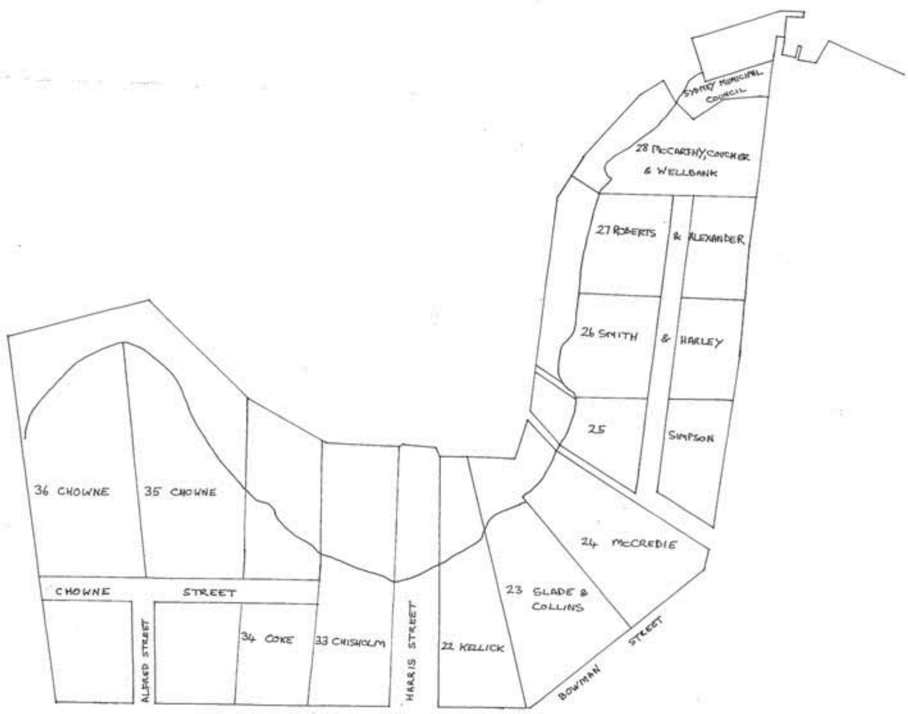
Reclamation was primarily by the proprietors or trustees of the Macarthur Estate, except for those on either side of Harris Street. This street was extended by the City of Sydney Corporation. Sometimes the trustees acted in association with property owners/lessees – J. Hurley and Hugh Chambers, for instance. In all but (possibly) one instance, the reclamations were subjected to the official gazettal process. In one case – the reclamation in front of the Thomas Chowne properties – gazettal took six years to complete.

Reclamation usually increased the property areas by 50% or more. As with Pyrmont Bay, but in contrast with Jones Bay, the rather large reclamations suggest that Elizabeth Macarthur Bay was relatively shallow at the time of reclamation.

Figure 5.8.10: Early reclamations: Elizabeth Macarthur Bay'



Recently, the Sydney Harbour Foreshore Authority(SHFA, 2003) estimated that the former Water Police site at Elizabeth Macarthur Bay extended over 1.824 hectares, about half of which was reclaimed land.

Figure 5.8.10 shows the physical relationships of the different reclaimed areas to each other and to the land portions they fronted.

5.8.4 North-western Pyrmont peninsula (Harris Estate)

Land reclamation offshore from the Harris Estate occurred mostly under the aegis of the NSW Government and its instrumentalities, both in Darling Harbour and Blackwattle Bay. The exception was that part of the estate on the shoreline between the embankment across Blackwattle Bay(Glebe or Blackwattle Bridge) and the Macarthur Estate boundary, namely the north-western part of Pyrmont peninsula.

Table 5.8.6: Reclamations: North-west Pyrmont peninsula(Harris Estate)

Portion No.	Known holders	Area reclaimed		Date of gazettal[2]		Source of information[3]	Registration No.[4]
		a.r.p.[1]	m^2 (10^2)	First	Final		
1	William H. Harris	0.0.27 $^3/_4$	7.0	27.8.1880	3.4.1883	v1880/3 n349 p4409 v1883/2 n126 p1731	80-9269 83-1879 (SP 214)
2	Colonial Sugar Refining Co Ltd.	0.3.17	34.7				
3	William H. Harris	0.1.13	13.4		11.11.1891	v1891/6 n710 p8886	91-6623 (SP 90-76)
4	John Harris	0.1.11	12.9	15.11.1889		v1889/4 n609 p8147	89-9167 (SP 88-208_
5	Matthew Harris	0.3.13	33.6				
6	Matthew Harris	1.3.30	78.4		10.9.1889 19.12.1890	v1889/3 n467 p6198 v1890/6 n729 p9658	89-9142 90-11524 (SP 1321)
7	Matthew Harris	0.1.21 $^1/_2$	5.4				
8	John Harris	3.2.21 $^1/_2$	147.1	29.12.1882		v1882/4 n533 p6864	82-19460 (SP 1403)
9	F. Buckle & Sons	0.0.30 $^1/_2$	7.7				
10	George Harris	2.2.29	108.5	22.4.1881	3.6.1887	v1881/2 n164 p2283 v1887/2 n319 p3682	81-4556 8703703 (SP 998)
11	George Harris	0.1.5 $^1/_4$	11.4	14.4.1881		v1881/2 n159 p2199	81-4556

Notes:

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3. Refers to year, volume number, issue number and page on which application appears in *Gazette*
4. Unique identifier given to applications by the Department of Lands

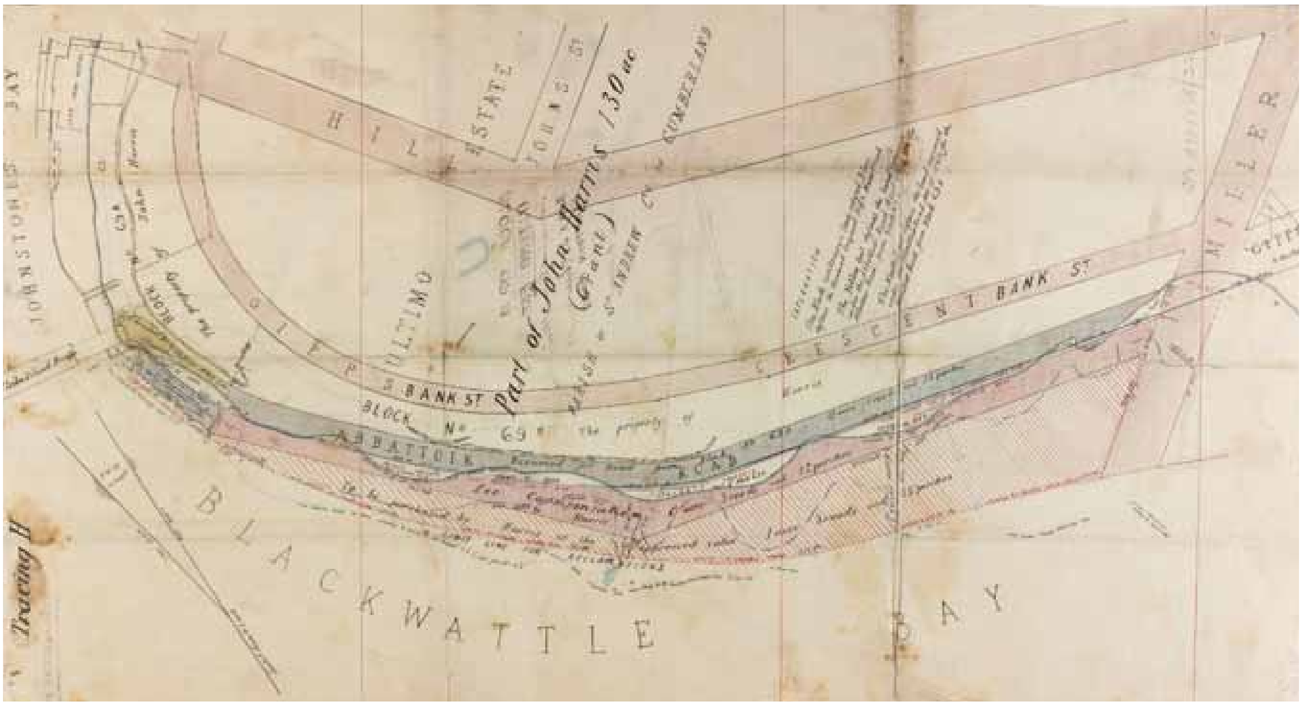
Additional source of information:

Department of Lands, 1970, Parish of St Andrew, County of Cumberland, 2nd edition, Sydney, The Department.

The shoreline in this part of the Harris estate had been subdivided into eleven portions. Over the decade or so between the early 1880s and the early 1890s land was reclaimed in front of each of these portions(Table 5.8.6). The beneficiaries of this process were particularly members of the Harris family. As in the Macarthur Estate, the opportunities for reclamation were less around the exposed north-western point of the peninsula compared with the more sheltered bays on which the Fish Markets and other concerns now reside.

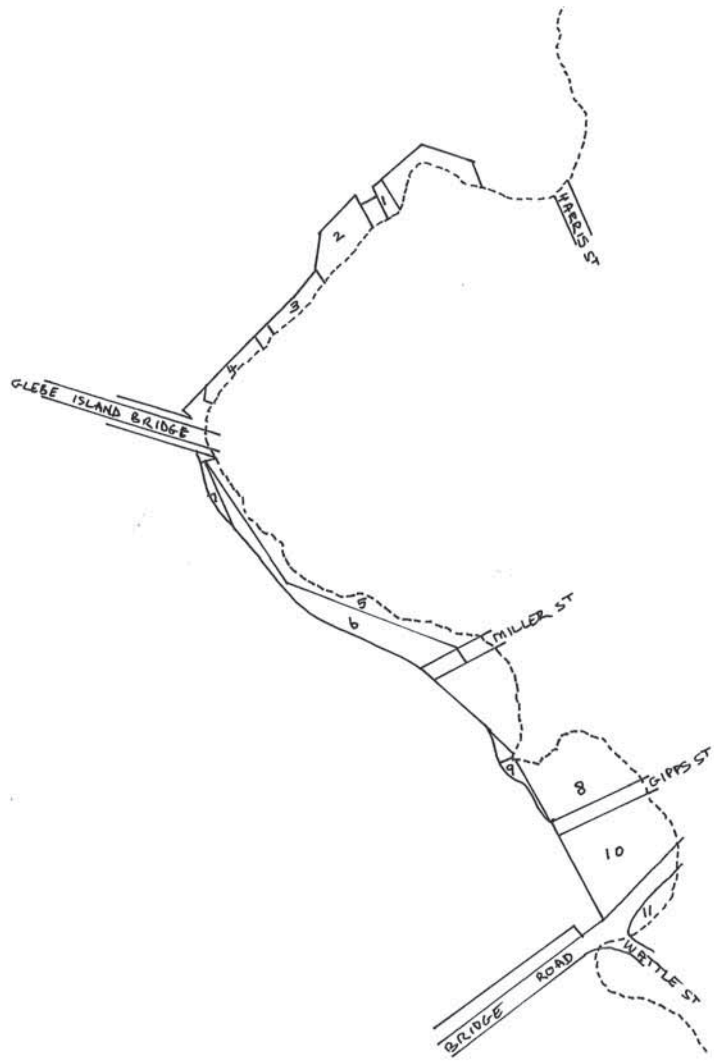
Reclamation had been complicated by a decision 2-3 decades earlier to resume part of this section of the Harris Estate to construct a road to the abattoirs being built on Glebe Island at that time. Clause 2 of the Act to facilitate this development (the "Abattoir Road Act of 1860") made it clear that the Governor was granting those whose land was crossed by the Abattoir Road 'authority to fill in and reclaim the Land below high-water mark adjoining their own Land respectively … to an extent equal to the intended width of the said Road (that is to say thirty-three feet) and like authority to erect thereon or thereover any wharves or jetties …'(GG v1860/3, n127, pp1293-4). The downstream consequences of these considerations are evident from Figure 5.8.11.

Figure 5.8.11: Anon, nd, [Reclamation and other considerations in that portion of the north-western shoreline of Pyrmont peninsula between Miller Street and Glebe Island Bridge](ML SP 811.1738/22)



The relationships of each reclaimed area to the original high water mark of this part of Pyrmont peninsula are shown in Figure 5.8.12.

Figure 5.8.12: Reclamations: North-west Pyrmont peninsula (Harris Estate)

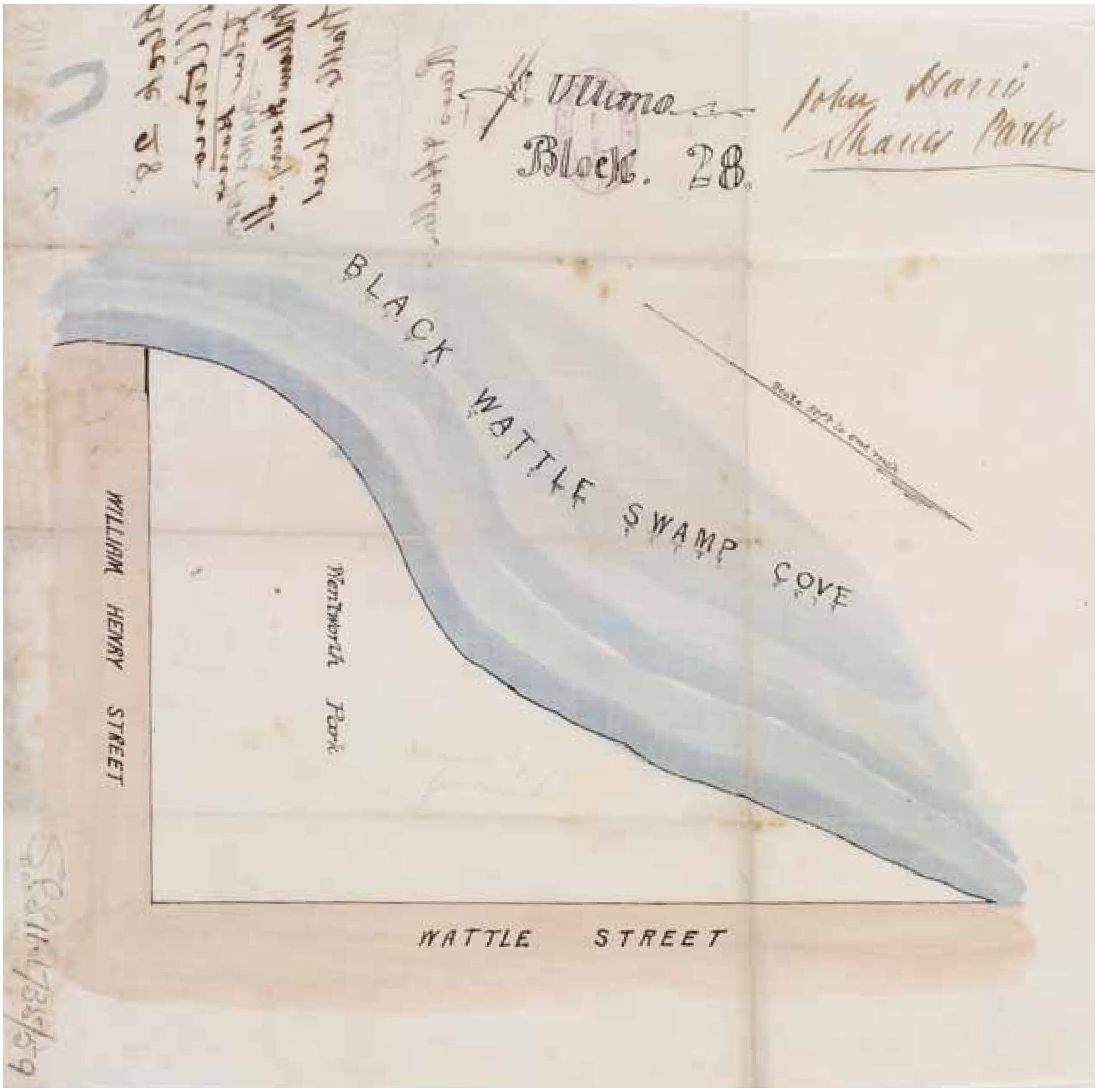


5.8.5 Blackwattle Bay

Ironically, prior to its reclamation Blackwattle Bay and, more particularly, its creek were a source of fresh water to a distillery and to parts of Sydney town: 'As the town[Sydney] increased, wells were multiplied, and the rivulets falling into other parts of the harbour were laid under contribution, particularly the copious stream running into Blackwattle Swamp …'(Smith, 1869:95). The Sydney Gazette(vol.22, no.1061, p.2) of 18 March 1824 commented: 'As we have had but little rain since July, water has been scarce in town; but then it should be gratefully remembered what a providential supply Black-wattle Swamp furnishes in the most dry season. It would be well, and a subject that deserves the consideration of the monied inhabitants of Sydney, to build a reservoir or tank at this spot'. Again, in September 1827, it was noted: 'Preparations are rapidly making for conveying fresh water into town by means of pipes from Black-wattle swamp, under the superintendence of Mr. Busby(Anon, 1827).

It is also worth noting that Wentworth Park existed before the reclamation of Blackwattle Bay. Figure 5.8.13 is a sketch of Block 28 of the Ultimo Estate, as defined in 1859. It appears to have been drawn by Reuss & Halloran, presumably before reclamation began in 1872. It appears that Wentworth Park existed as a small sliver of land sometime between 1859 and 1872, possibly earlier.

Figure 5.8.13: Reuss & Halloran, [1859] Subdivision plan for Block 28, Ultimo Estate(ML SP 811.1735/59)



Government initiatives to reclaim whole bays in Port Jackson began in late 1862, with an Act to reclaim and improve land in Woolloomooloo Bay(GG v1862n185pp2013-2015). From maps of the time, it appears that the embankment across Blackwattle Bay and its associated bridge were built by the Pyrmont Bridge Company in 1857/58. The causeway was an embankment of fill with rock rubble protection to the slope facing Johnston's Bay.

Debate on the reclamation of Blackwattle Bay began in the NSW Legislative Assembly on 16 November 1871, when the Blackwattle Bay Land Reclamation Bill was introduced and read for the first time(SMH, 16.11.1871, p2). Need for reclamation had been recognised by the Government for some considerable time, for sanitary reasons. Indeed, numerous meetings had been held in Glebe due to the nuisance of the bay and deputations had been before

Government to seek reclamation. According to one member of the Assembly, such was the state of the bay: 'As to water-frontage, there was no such thing. It was one mass of mud, and no boat or punt could get within reach of the land'(SMH, 24.11.1871, p2). There was already considerable sedimentation from the Blackwattle Creek catchment. This is clearly evident from Samuel Elyard's 'Pyrmont', painted in 1868(Figure 5.8.14).

Figure 5.8.14: Elyard, S., 1868, Pyrmont, 1868 (DGV*/Sp Coll/Elyard/1; a1528108)

This view of Blackwattle Swamp was painted only a few years before reclamation of the lands south of the embankment in the middle of the painting was started, later to yield Wentworth Park. Sedimentation from Blackwattle Creek catchment was considerable, supporting extensive reed beds in the swamp. While the Pyrmont peninsula side of the swamp appears completely cleared of native trees and shrubs, the Glebe side is still substantially vegetated. A rough track wends across pastureland on the right side of the swamp. According to maps of the time, this track reached Parramatta Road at Darling Street(now Bulwara Road). It may have been used to cart sandstone blocks to sites along Parramatta Road, such as the University of Sydney. In the background, behind the embankment, is Glebe Island still largely untouched by quarrying. The abattoirs are visible. Behind Glebe Island is Rozelle and Balmain, still with only limited development. The first Glebe Island bridge is visible.

The Bill gave Government the power to sell the reclaimed lands by public auction, and for land owners to seek compensation for loss of water frontage as a result of the reclamation. The Government's stated aim was to improve the sanitary condition of the Swamp through reclamation(SMH, 1.12.1871, p2). Some members of the Assembly expressed the view that Government should sell only enough of the reclaimed land to cover its costs, and set aside the remainder for public recreation.

The initial Government view was that not all the land above Glebe(Blackwattle) Bridge would be reclaimed, and that the bridge would open to any vessels of 'reasonable burden' to pass through. There was also an intention to extend the sewer then emptying into Blackwattle Bay beyond the bridge. The Bill received its second reading, without amendment, on 30 November 1871.

The Bill was read a third time on Friday 1 December 1871, passed, and sent to the Legislative Council(SMH, 2.12.1871, p2). It was received into the Council on 7 December 1871(SMH, 7.12.1871, p2). During its second reading in Council, mention was again made of the desirability of setting aside some of the reclaimed lands for public recreation purposes(SMH, 14.12.1871, p2). Proposals centred on setting aside one-tenth of the reclaimed lands for public recreation, at that time believed to be ten acres. A motion to this effect was put and passed. At Council's next session, it was noted that the area to be reclaimed would be something less than forty acres(16.2ha), rather than the one hundred acres(40ha) initially advised. After spirited debate, a motion to set aside one-fourth of it(i.e. 10 acres - about 4ha) for public recreation was passed(SMH, 15.12.1871, p2).

The Bill's compensation clause was also strongly debated by members, some believing that there was no water-frontage only mud and that the Government was providing a service to everyone. This view was reinforced in later sessions of the Council. For example, one member observed: 'Here there was nothing but fetid black mud, sending forth mephitic exhalations, calculated to produce nothing but typhus fever and suchlike maladies. To reclaim this dreary and pestilential waste must be a most desirable and sanitary measure'(SMH, 15.12.1871, p2). Again, 'the stench was often so dreadful that [I] was compelled to go round by the way of Parramatta-street'(SMH, 21.12.1871, p3).

The Bill was read for a third time in Council on Wednesday 20 December 1871(SMH, 21.12.1871, p3), and returned to the Legislative Assembly with amendments. Here, the Bill was read for a second time on 18 June 1872, and an order was made that it be printed(SMH, 19.6.1872, p2). On the 9 August 1872, further consideration of the Blackwattle Bay Land Reclamation Bill lapsed due to dissolution of Parliament prior to an election(SMH, 10.8.1872, p2).

The Bill was re-introduced into the Legislative Assembly on Thursday 5 December 1872, when it was read a first time(SMH, 6.12.1872, p2). It differed from its predecessor in that appraisements of the likely compensation to land-owners were proposed before reclamation, rather than compensation being settled after the event(SMH, 31.1.1873, p2). Only a few people anyway would benefit – the proprietors of the Ultimo Estate, Lyndhurst College, the Bishop of Sydney, and some other person – and it was likely that they would favour reclamation perhaps without even going to arbitration. One member of the Assembly insightfully observed that the reclamation would simply cause sedimentation to occur in once-deeper waters. The matter of setting-aside one-fourth of the reclaimed lands for public recreation was again raised, and the Bill was read a second time.

At its sitting on Friday 7 February 1873(SMH, 8.2.1873, p5), the Assembly agreed that any proceeds from sale of the reclaimed lands be applied to 'the purchase of Blackwattle Bridge and Causeway and Pyrmont Bridge Company's Roads, between Pyrmont Bridge and Camperdown'[These assets were eventually handed over by State Government to the Councils of Sydney, Glebe, and Camperdown by proclamation of the Governor on 6 and 12 July 1878(viz. GG v1878/3n208p2733].

The amended Bill was read a third time on 11 February 1873 and sent to the Legislative Council(SMH, 12.2.1873, p.). The President of the Council reported receipt of the Bill for concurrence the next day, and the first reading was moved. The wisdom of including a compensation clause in the Bill was again debated, as was the matter of how much of the reclaimed lands should be set aside for public recreation – several members believing that it all should(SMH, 20.2.1873, p2). The Bill was read a second time. The Government later agreed that ten acres(one-quarter) of the reclaimed lands would be reserved(SMH, 28.2.1873, p2). The Bill was read a third time on 5 March 1873 and returned to the Legislative Assembly without amendment (SMH, 6.3.1873, p2).

The Blackwattle Bay Land Reclamation Act 1873 was assented to by His Excellency the Governor, in the name of Her Majesty, on 26 March 1873 and published as a supplement to the NSW Government Gazette(v1873/1, n72, pp935-7) of Friday 28 March 1873.

A Public Notice was issued by the Engineer-in-Chief for Harbours and Rivers on 2 July 1873 notifying for general information 'that Rubbish and Materials excavated from foundations may be discharged at the head of Blackwattle Bay, between high and low water mark'(GG v1873/2, n168, p1866). A Notice from the Department of Public Works, dated 18 November 1873, advised that: ' … the Secretary for Public Works has authorized the sum of one shilling being paid for every load of quarry rubbish, materials excavated from foundations of buildings, or other sound filling, containing not less than 24 cubic feet[0.66m^3], deposited at the head of Blackwattle Swamp, at such places as may be pointed out by the Engineer-in-Chief for Harbours and Rivers at his office'(GG v1873/2n262p3190).

In advice to the Legislative Assembly on 14 October 1873(SMH, 15.10.1873, p2), the Government stated that the reclamation of Blackwattle Swamp began in January 1872 and that, at the time of this advice, about one-fifth of the swamp had been filled. About 33,525 tons of silt had already been deposited and about 354,100 tons was yet to be deposited. It was expected that the work would be completed in about four years(1877) and over three-quarters of the vote for £10,000 remained(SMH, 15.10.1873, p2).

In the Legislative Assembly on 12 November 1873(SMH, 13.11.1873, p2), it was noted that there was a 'serious nuisance arising from the city sewer, which deposits upon the swamp the sewage of a large portion of the city …'. The Government confirmed that it was aware of the problem, but 'had not seen its way as yet to bringing pressure on [the Sydney Corporation] to deal effectively with this matter'(SMH, 13.11.1873, p2).

In answer to further questions from the Legislative Assembly, the Government advised that £12,234.5s.3d had been paid for the reclamation to date, that a basin of 6.5 acres(2.6ha) was proposed within the reclamation, and that about £16,200 would be needed for completing the reclamation and construction of the dyke around the basin(SMH, 4.3.1874,p.2).

The reclamation of Blackwattle Bay entered a new phase in March 1878, when the Government obtained leave to bring in a bill to amend the Blackwattle Bay Land Reclamation Act of 1873; the bill was brought in and read a first time(SMH, 30.3.1878,p2). The Blackwattle Bay Land Reclamation Act Amendment Bill was required as the reclaimed lands had become saturated with sewage, and 'should be reserved for recreation and sanitary purposes generally … The report of the sanitary commission showed that the best thing to do with the land would be to reserve the whole of it.(Cheers). He[Mr Farnell] had therefore introduced a bill with that object'. Some members felt that the same thing should have been done for all the harbour foreshores from thirty years ago. The second reading of the bill was agreed to without dissent(SMH, 18.4.1878, p.3).

The President of the Legislative Council reported receipt of a message from the Legislative Assembly transmitting the new bill for the concurrence of Council(SMH, 26.4.1878, p2), and the bill was read a first time. A second reading took place on 8 May 1878(SMH, 9.5.1878, p3). The bill passed its final stages in the Legislative Council on 9 May 1878, without amendment (SMH, 10.5.1878, p3). A message was received from the Governor on 16 May 1878 that his Excellency had assented to the Blackwattle Bay Land Reclamation Act Amendment Bill(SMH, 17.5.1878, p.3). The Blackwattle Bay Land Reclamation Act Amendment was gazetted on 18 May 1878(GG v1878/2n149p1991). A cumulative resumption of 3 acres 2 roods and 35 perches(about 1.5ha) was made on 9 September 1884 to finalise the boundary of Wentworth Park and to provide 'a road around the said Park'(GG vol.1884/3, no.461, p.6067). The park was proclaimed on 10 November 1885(GG 1885/4, no.530, p.7218).

Figure 5.8.15: Reclamation of Blackwattle Bay (NSW Department of Lands, 1937)

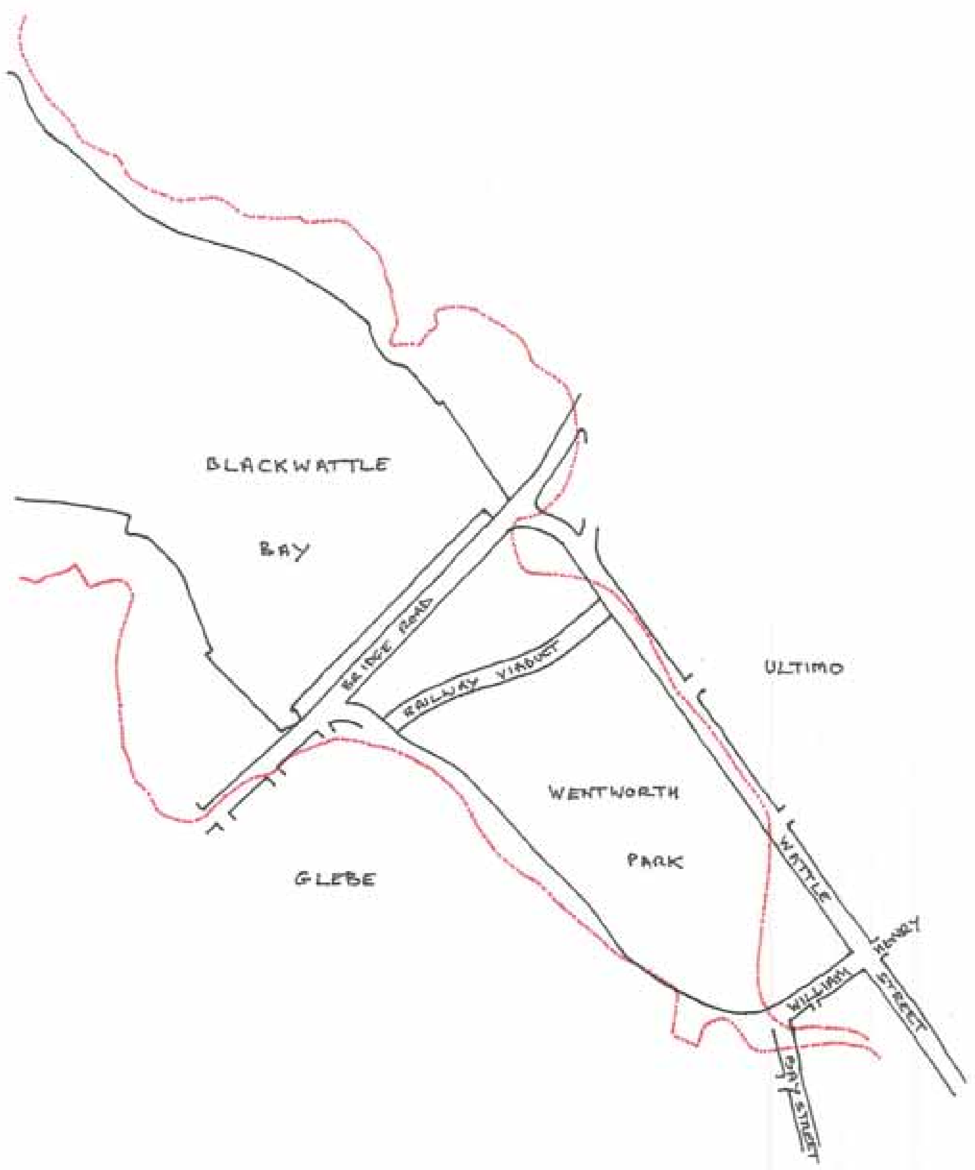


Figure 5.8.15 shows the land of Blackwattle Bay at reclamation (original shoreline in red) overlaid by recent structures.

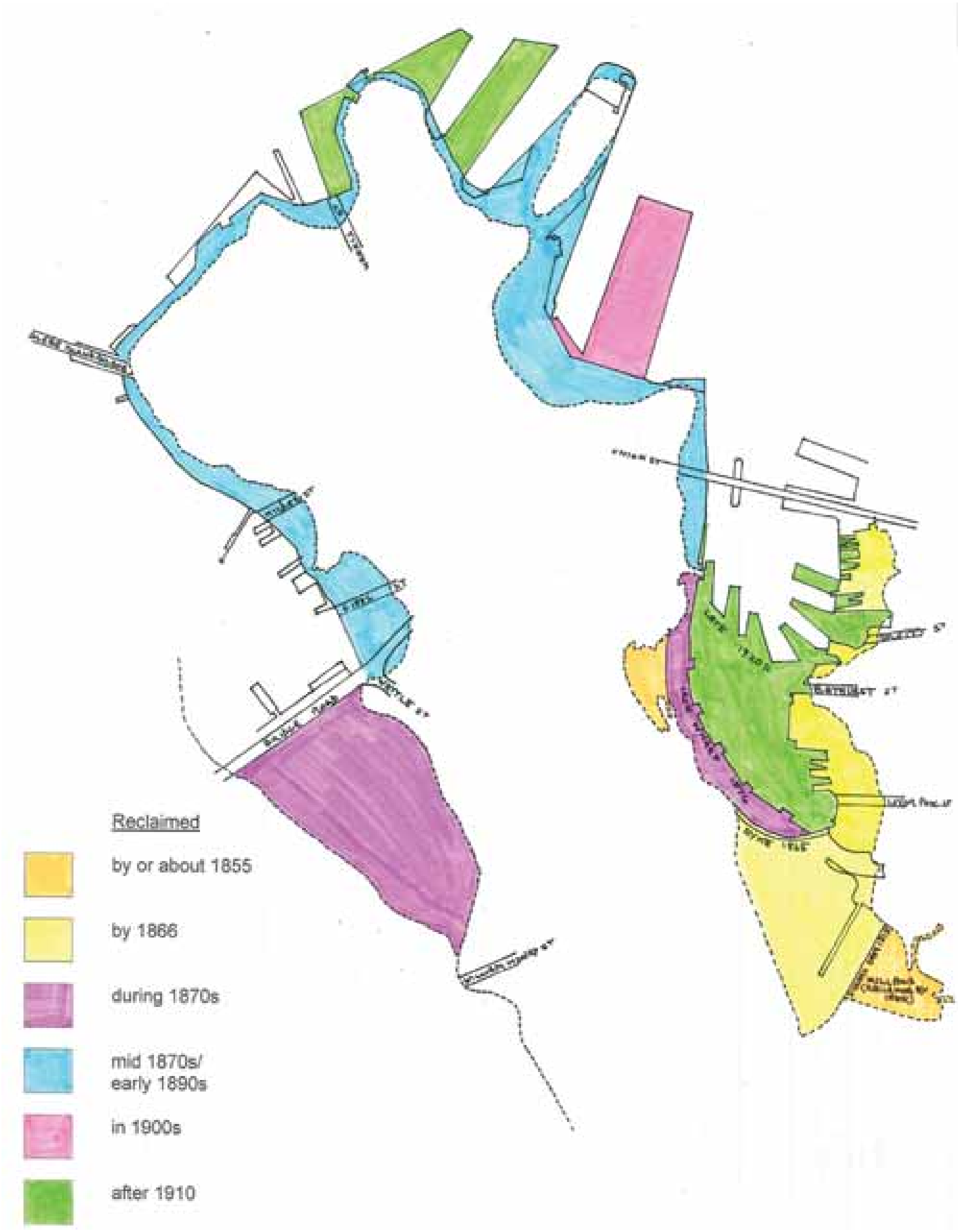
After this initial creation of today's Wentworth Park, at least two additions were gazetted. They were of land between Cowper and Bay Streets at the southern end of the Park, and together added 1 acre 34 perches and 32 perches(57.2x102 m2) respectively to the Park(GG v1884/2, n283, p3937 and 1884/3, n346, p4799). Almost a decade later, however, these lands and more – amounting to 1 acre 3 roods and 32 perches(78.9x102 m2) – were removed from the park for sale(GG vol.1893/1, no.87, pp.1229/1230(11 February 1893)).

It is of interest that, during excavations of the new station at Central, 'there being more than sufficient earth for this purpose, a large quantity was taken to Prince Alfred Park, and used to fill up a big depression which marked the course of a stream which, at one time, ran through Chippendale and emptied into Black Wattle Bay'(Foster, 1921:82).

5.8.6 Conclusions

This account partially documents the early reclamations around Pyrmont peninsula. Their cumulative impact on the foreshore is shown in Figure 5.8.16. Before, during, and after these reclamations various structures were built – wharves and jetties especially – which effectively extended further the peninsula into its surrounding waters. These activities became progressively the province of large companies and, more especially, the State Government and its instrumentalities as the Port of Sydney was extended from Darling Harbour around the foreshores of Johnston's Bay to Balmain. Among the more recent was a reclamation for the Anzac Bridge Eastern Pylon adjoining Bank Street(Maunsell, 2005).

Figure 5.8.16: Cumulative reclamations around Pyrmont peninsula



5.8.7 Ecological considerations

Hudson(1996:116/120) identified three key impacts of land reclamation on the littoral environment:

- Damage to/loss of littoral ecosystems
- Alteration of water body hydrology and hydraulics
- Loss of amenity

Hudson briefly summarised possible ecological consequences of land reclamation on littoral ecosystems as follows:

> *'Wetlands provide major habitats for a wide variety of flora and fauna, including birds, mammals, reptiles and amphibians but especially fish and shellfish … Throughout the world, many species of fish spend at least part of their lives in coastal wetlands, and other valuable marine creatures go through their entire life cycles there. The large quantities of organic matter generated in wetlands, particularly among the extensive root system of mangrove forests, form a rich protected substrate in which a variety of organisms live. These serve as a food base for marine flora and fauna, some of which, crabs and oysters for instance, may be directly harvestable. While some commercially important fish live in wetlands, many more spend part of their life cycle there, especially for breeding and spawning and during early growth. Many other salt-water fish are indirectly dependent on coastal wetlands which produce nutrients on which they feed out at sea. Wetlands are thus valuable as 'sources, sinks, and transformers of a multitude of chemical, biological and genetic materials', and their function as natural processors of waste products have earned them their description as 'the kidneys of the landscape'*(Mitch & Gosselink, 1986:3).

All this gives some idea of the enormous ecological damage which is caused by reclamation, especially when it involves landfill for urban development'.

Hudson detailed the adverse ecological consequences of various reclamation strategies – floating fills such as walkways and mooring facilities, submerged fills such as dredged materials and urban/industrial waste, or pile-supported fills such as wharves, jetties and buildings. Speaking generally, he noted:

> *'Most obvious is the destruction of fish and wildlife habitats and the disruption of the ecological balance of a water body and its environs. The diminution of water surface area and volume reduces a water body's ability to moderate the local climate, including the generation of sea and land breezes, thus increasing the possibility of air pollution. Similarly, a water body, reduced by reclamation, may lose its capacity to maintain adequate oxygen levels and assimilate waste, adversely affecting the ecology and contributing to problems of water pollution. The latter may be further exacerbated in marine inlets such as estuaries when reclamation significantly reduces the tidal prism that flushes out wastes.'*

Hudson(1996:119/120) overviewed the hydrological and hydraulic consequences of land reclamation as follows:

> *'In enclosed bodies of water(such as lakes, estuaries and bays) reclamation, particularly where it involves the loss of extensive shallows and fringing wetlands, can have serious effects on the character and behaviour of waves and currents. A reduction in the area of an enclosed water body may reduce wave amplitude by shortening fetch, but constriction of channels by reclamation tends to amplify waves and tides and increase current velocities. Sometimes, the increased scouring caused by accelerated flows has the beneficial effect of reducing silting in navigation channels but, equally, there may be harmful erosion, and dangerous*

currents and waves may jeopardize ships and other craft. By changing the configuration of the shoreline, reclamation can not only divert current flows but may also alter wave refraction patterns, possibly resulting in the concentration of wave energy on some shores. Furthermore, coastal reclamation, by removing extensive areas of shallow water and littoral vegetation which are capable of absorbing and dissipating the force of storm waves, can increase the destructive power of rough seas. Reclamation does not necessarily increase the velocity of currents and heights of waves, however, and the extension of land into the sea or other aquatic area can create areas of stagnant water which may have undesirable consequences such as silting and pollution.'

In respect of amenity, Hudson(1996:120) noted:

'All over the world, land reclamation has played a major role in the reduction of the aesthetic, recreational and scientific value of the shore. Reclamation has destroyed thousands of kilometres of natural coastline, much of it of very high landscape quality; it has buried beaches and infilled inlets formerly used for recreational purposes including bathing, boating and fishing, and it has degraded and obliterated wetlands formerly enjoyed by naturalists'.

All three of these consequences of land reclamation find resonances on the Pyrmont peninsula.

Figure 5.8.16 shows the original high water mark around Pyrmont peninsula, and the progressive and complete alienation of the foreshore from estuarine habitat to mercantile purposes over about a century. Intentional infilling of Darling Harbour started in the early 1850s, with construction of the Darling Harbour Branch Line. Successive waves of reclamation reduced this water body to a third or less its original size. Perceived to be of considerable economic benefit at the time, these activities left a resource essentially devoid of ecological value.

While ecological degradation of Blackwattle Bay was underway well before its reclamation began, the reclamation process took only some 5 years to complete. But, like Darling Harbour, loss of the headwaters of Blackwattle Bay would have been at great ecological cost. The effects would have extended well beyond the bay itself, into Port Jackson and probably beyond.

Although the littoral zone around the head of Pyrmont peninsula would have been less ecologically valuable than that of the two adjoining bays, such values as there were would have been largely lost during the reclamation process.

Now that the Port of Sydney has mostly moved elsewhere, there is an opportunity to regain some of the important ecological functions once provided by waters around Pyrmont peninsula. The littoral interface of Pyrmont peninsula will likely remain an issue of community concern, as sea levels rise and as efforts are made to recover some of the huge losses in ecological amenity from past actions. The ensuing debates should consider particularly the ecological merits of the hard engineering approaches of the past – such as revetments and sea-walls – which so characterise the shoreline of Pyrmont peninsula today – with the soft engineering approaches to coastal protection increasingly adopted today. Emerging engineering methods and coastal management practices better reflect the greater ecological knowledge and sensitivity we possess today. They should feature much more in the future development of Pyrmont peninsula and its littoral zone.

5.9 Railway/wharf construction

5.9.1 Introduction

According to Stephenson(1966:206): 'for the first twenty-two years of settlement at Sydney, the hill slope frontage of Cockle Bay, being too steep for cart traffic, remained uninhabited, uncleared of its trees, shrubs, ferns, and wildflowers, and unsurveyed'. According to Shaw(1949:310): 'The first wharf in Darling Harbour(then called Cockle Bay) was a Government one built by Macquarie, who on February, 1811, instructed that vessels arriving "from the Hawkesbury, Parramatta, or Kissing Point" and all private produce(except fish and grain) were to go to the new "Market Wharf and not to the Hospital Wharf as heretofore …" … The first private wharf in Darling Harbour was erected close to and soon after the Market Wharf, and was known as "Macarthur's"'. By 1822, permanent jetties existed in Cockle Bay, and by 1854 Darling Harbour had 20 private wharves. As early as 1826 it was noted that Darling Harbour 'must become the principal harbour within the heads of Australia'(Anon, 1826). An era of wharf construction took place after responsible local government was gained in 1856(Andrews, 1986:71). 'From the 1850s to the 1890s, many privately owned wharves were built along the foreshore of Darling Harbour, chiefly by shipping companies engaged in the Australian coastal trade' (Stephenson, 1966:208). Also in the period 1860/1900: ' … floating docks, iron works and repair slipways proliferated around Darling Harbour – Pyrmont …'(Andrews, 1986).

For a little over a century Darling Harbour, Pyrmont peninsula more particularly, was the hub of a major global port, that of Sydney. The unfolding events well illustrate the complex dynamic between economic, social, political and technological forces and their ecological consequences. The outcomes did not seem anticipated by the key players. The whole episode well illustrates the difficulties associated with notions of sustainability.

5.9.2 Darling Harbour Branch Line

A) The first railway

Railways were mooted in New South Wales from 1833 'just three years after the first successful public steam locomotive powered railway commenced operation running between Liverpool and Manchester'(Hagarty, 2005:23). In 1845 'The Australian Railway Company' was formed and called a public meeting on 26 January 1846, chaired by John Macarthur(Hagarty, 2005: 24/25; SRA, 1996). In early 1848, a petition was presented to the Legislative Council, seeking the construction of railways in New South Wales by private enterprise. Council referred the matter to a Select Committee, which gave qualified support to the proposal in a report of 6 June 1848(ibid:35). By mid-1848 Government had announced its support for the creation of railways, and by late October that year 'The Sydney Tramroad and Railway Company', later 'The Sydney Railway Company', had published a prospectus for share subscriptions for a line between Sydney and Parramatta(SRA, 1996: Hagarty, 2005:39). Railway location and design began in December 1848. A branch line to Darling Harbour was proposed in 1852, although the first mention of it by the Sydney Railway Company was in its Eighth Report(12 July 1853). It was 'an extension across Parramatta Street to the navigable water on the western side of Darling Harbour'(p.3). Charles Cowper, President of the Company's Board, was instructed to 'interview the owners of the Pyrmont and Ultimo Estates "for their reaction"'(Hagarty, 2005:140). James Wallace, the Company's Engineer-in-Chief, arrived from England on 9 July 1852(SRA, 1996) and had a plan for the Darling Harbour branch line prepared by March 1853. This plan is shown by Hagarty(2005:156). Wallace envisaged that the line would link Sydney Terminus to the harbour after passing through the Harris Estate (Hagarty, 2005: 140/141).

Cowper wrote to the Government on 16 May 1853 asking 'for approval to fill a shallow part of Darling Harbour for a wharf …' associated with the proposed line(Hagarty, 2005:154). The Government proclaimed the Darling Harbour branch line on 13 September 1853, and the Company formally announced its intention to construct a branch line to Darling Harbour in the Sydney Morning Herald of Saturday 17 September 1853. It was signed by Francis Merewether, the NSW Auditor General, and stated in part:

> *'Notice is hereby given that the said Company intend to make a Railroad, commencing at the proposed terminus of the Sydney Railway in the Cleveland Paddock, crossing Parramatta-street near the Benevolent Asylum, passing the Harris Estate, and terminating at a point in the Ultimo Estate on Darling Harbour nearly opposite to Bathurst-street, as shown in the plan to be seen at the Railway Company's Office. ..*
>
> *Dated the thirteenth day of September, in the year of our Lord one thousand eight hundred and fifty-three.*
>
> FRANCIS L.S. MEREWETHER
> President of the Company.

Government approved reclaiming some 5 acres(2 ha) of the harbour in early November 1853, provided 'arrangements can be entered into with neighbouring proprietors for extinguishing of their claims to water frontage'(ibid:161). The intention was to fill a small bay just south of Mrs Bunn's cottage, which would deny water access for three or four tenant farmers(ibid:161). The fill would be excess material from cuttings along the line and from extensive excavations required to level the main terminal area at Sydney(ibid:234). It also included spoil from construction of the Parramatta line(Oakes, 2001:24). The filled bay would provide most of the proposed goods yard area in the first instance.

Financial difficulties led to the mortgage of the railway to the Government on 28 July 1853(Hagarty, 2005:155). The first meeting of the new board after the commissioning of the three Government directors was held on 4 August 1853. This interim arrangement lasted two years, until a Deed of Transfer was signed on 3 September 1855, through which the property of the Sydney Railway Company was handed over to the Commissioner for Railways.

On 13 September 1853, Merewether advertised the Company's intention to 'make a Railroad, commencing at the proposed Terminus of the Sydney Railway, in the Cleveland Paddock, crossing Parramatta-street, near the Benevolent Asylum, passing through the Harris Estate, and terminating at a point in the Ultimo Estate, on Darling Harbour, nearly opposite to Bathurst-street …'(Merewether, 1853).

The delay in obtaining agreement to pass through the Harris Estate and the formality of the Government's proclamation to allow land purchase had worried the contractor, William Randle: 'Without approval he could not begin transporting spoil from the Sydney terminal site to the area of mudflats allocated for the actual goods terminal by rail. Finally, instead of waiting for approval … [Randle] proceeded to plan the work required to join the goods yard to the main line'(ibid:231). By 17 January 1854 the land purchases for the branch line had been negotiated with one exception(ibid:162). In all, 15 acres 3 roods and 39 perches (6.47ha) were acquired. This land extended 'from Parramatta Street for the distance of 1,540 yards[1408 metres] in a north-easterly direction through property known as the Harris[Ultimo] Estate varying in width from 99 feet[30.1m] to 590 feet[179.8m] thereabouts … The portion commences at High Water Mark on the southern boundary of Mrs Bunn's land …'(Sydney Railway Company, January 1854:). Construction of the branch line started around February 1854(Hagarty, 2005:234).

Delays in the overall process also concerned the Sydney Railway Company, which stated in its Ninth Report(17 January 1854) that: 'The formation of the station on Darling Harbour and of the branch line leading to it, and the compensation to be given for the land required for these objects, will involve an estimated expenditure of £69,000, which cannot be postponed without great loss to the Company because the soil removed from the cuttings at Cleveland Paddock is required to form the embankment [for] the Darling Harbour Branch and the two works must therefore proceed simultaneously'(p.3). It appears from Figure 5.8.2 that the two works did not proceed simultaneously, and it was necessary to stockpile materials from the Sydney Terminus at the head of Darling Harbour until such time as they could be used to construct embankments along the branch line.

After some debate, it was agreed there should be three bridges over the Branch line. The main one was to take the line under (then) Parramatta Street. By November 1853 a temporary bridge to carry traffic during construction was nearing completion and 'as soon as the street is barricaded off the navvies will commence cutting through'(Hagarty, 2005:161). Construction was mainly from the Darling Harbour end as there were large quantities of suitable stone both on the railway reserve and from private quarries in Pyrmont(ibid:232). The bridge was completed in 1855. It is still under Railway Square, over 150 years later, although it has been extended on both sides(ibid:411). It is the oldest railway bridge still in use in New South Wales(SHFA, 2007c).

A second bridge, which took the line over Ultimo Road, is believed to have been constructed in the 1850s; it was wooden. It was the subject of a letter from John Harris to the Secretary for Public Works dated 22 July 1874, in which he stated inter alia: 'The Ultimo Road is 66 feet wide and the bridge is only about 16 feet …'. This letter spawned a flurry of correspondence, including a petition from 191 residents of Ultimo, Pyrmont, Glebe and Balmain in support of widening the Ultimo Road bridge. In December 1876, it was agreed that the road under the bridge would be widened and lowered 'to meet the increasing traffic of the neighbourhood', but that approval of the Sydney Corporation would be needed. It was eventually agreed that the bridge have a span of 66 feet. The bridge was to be made of wrought iron plates from England, to be supplied by G.H. Royce & Co. The girders were landed on Darling Harbour Wharf late 1879/early 1880, where they were found to be defective. It appears that the bridge was finally constructed sometime in mid/late 1880(NSW Legislative Assembly, 1881). The bridge has classic revival inspired cast iron columns and mid 19th century sandstock brick abutments: 'Both [bridges] are assessed individually as historically rare, scientifically rare, archaeologically rare and socially rare'(SHFA, 2007c).

A third bridge provided local access at 62 chains(1247 metres) along the line(Hagarty, 2005:411). Later maps show this bridge just south of Quarry Street(e.g. Hunt & Stevens, 1868). They also show a fourth bridge over the line a little north of (then) Ann Street. It seems likely that this is the bridge noted by Hagarty(2005:408) as being approved for construction on 13 November 1854. Construction of the bridges and culverts on the Branch line were contracted to William Randle(Rae, 1864). Maps indicate that the Quarry and Mary Ann Street bridges lasted at least until 1888, and that a new bridge linking William Henry and Pier Streets had been built by 1895.

Several contemporary paintings show the branch line early in its existence. Of particular note, is an 1859 painting 'Pyrmont from Barker's Mill'(ML 1426), attributed to William Harvey Christie or, more likely, Mrs Steadman Christie (http://www.daao.org.au/main/read/1602). This remarkable view of Pyrmont peninsula from between Liverpool and Bathurst Streets, shows the new railway line from across Darling Harbour. A steam engine is pulling seven wagons, possibly filled with coal or ballast, towards Sydney Railway Terminus. The engine is painted red, perhaps indicating that its copper boiler was still untarnished.

Both Henry Lloyd(1863), in 'Darling Harbour, Sydney, from Ultimo'(DL PX 42f16) (Figure 5.9.1), and Samuel Elyard(1867), in 'Darling Harbour from Harris Street(ML DGV*Spec.Coll/Elyard/18)(Figure 5.4.8), show the railway line about a decade after construction. Lloyd particularly shows the line cutting across the small bay south of Mrs Bunn's Cottage on a considerable embankment. The 1865 Trigonometrical Survey of the City of Sydney located this water body at the eastern end, and mostly north of, Fig Steet(City Engineer, Sydney Municipal Council, 1865). Lloyd's watercolour shows the line arching to the right, before terminating close by the water's edge. Sandstone has been quarried beyond the embayment and probably also from the quarry in the foreground, presumably to provide ballast for the railway. More generally, Mrs Bunn's cottage is seen on the far-left, and in the mid-ground of, the painting, while the first Pyrmont bridge spans Darling Harbour. Elyard provides a more distant perspective, from Harris Street, and particularly shows the intrusion of the railway embankment between Darling Harbour and the modest homes of the tenant farmers. It too shows the truncation of the small bay south of Mrs Bunn's cottage.

Figure 5.9.1: Lloyd, H.G., 1857/58, Sketches of New South Wales, vol.1, folio 16: Darling Harbour, Sydney, from Ultimo'(DL PX 42/16)

A series of photographs taken in the mid 1860s/early 1870s(ML PX 162) provides a view of the line from across Darling Harbour. The line ran close to the water's edge, particularly in its southern section, while the embankment was across the bay for much of its northern section. The photographs also show a rock pile at the end of the line, possibly intended for the wharf area mentioned by Randle.

By late 1854, the NSW Legislative Assembly and the Governor-General had passed legislation for Government ownership of railways, and shortly thereafter three Railway Commissioners were appointed(Hagarty, 2005:179). Due to cost overruns, it was agreed on 2 April 1855 that construction of all goods sheds and sidings be deferred. Notwithstanding this, in late August 1855, the Chief Commissioner advised the other Commissioners that he had asked Wallace to estimate the cost of a jetty at Darling Harbour(ibid:200).

The Sydney-Parramatta railway was opened with much fanfare on 26 September 1855, at which time: 'The Branch line to the water on the western side of Darling Harbour was still "being finished"'(Hagarty, 2005:208). Oakes(2001) noted that the branch line opened at the same time as the main line between Sydney and Parramatta. According to Matthews(1982:110) the line was not completed until 1856. It is clear, though, that the full project – which included construction of a terminus – was overtaken by events and never completed(see pp.539/540).

B) Compensation

Several parties with interest in the Harris Estate quickly announced their intention to seek compensation from the Sydney Railway Company in respect of the proposed line. The Company accordingly triggered the arbitration procedure defined by the relevant legislation, and announced that it would apply to two of Her Majesty's Justices of the Peace on 8 December 1853 'to nominate and appoint three able practical surveyors' to adjudicate the matter(Ebsworth, 1853).

By July 1854, the compensation awarded to the Proprietors of the Harris Estate had been fixed at £2,769 by the valuators appointed by the Court of Petty Sessions(Sydney Railway Company, July 1854:3). This was considered inadequate by the Harris family, and led to protracted arguments with Government. On 15 October 1862, Mr Stewart presented a petition in the Legislative Assembly by the trustees of the will of the late John Harris, complaining of having been insufficiently compensated for land taken from the Ultimo Estate for railway purposes(SMH, 16.10.1862). The petition led to a Select Committee being established by the Legislative Assembly, appointed on 15 September 1863, to examine the matter(NSW Legislative Assembly, 1864). The petitioners and their representatives appeared before this Committee, which continued its deliberations until handing down its report on 8 June 1865. The Committee, in a progress report, acknowledged that 'a most serious grievance' existed and, in its final report recommended 'the immediate and favourable consideration of the Government' in this matter. An amount of £34,382.1s.8d. was recorded a decade later, of which £25,000 went to the Ultimo Estate(Railway Commissioners, 1876).

C) Petitions

In 1861, the Directors of Pyrmont Bridge Company petitioned the Legislative Assembly, complaining at non-completion of the 'Pyrmont Railway Terminus' to the first Pyrmont Bridge, opened on 17 March 1858(NSW Legislative Assembly, 1861a:529). They offered to complete the railway themselves, or to provide funding to that end. They urged the Assembly to complete the terminus as soon as possible and make it available for public use.

In November 1861, 611(later 626) 'Inhabitants of Sydney and its neighbourhood' petitioned 'the Honorable the Legislative Assembly of New South Wales, in Parliament assembled':

- *'That the Pyrmont Railway Terminus was an important feature in the original design of the Great Southern and Western Railways, that is, of the Railways connecting the Metropolis with the Interior of the Colony*
- *That, therefore, your Petitioners feel peculiarly aggrieved at having for many years been deprived of the convenience which its completion would secure to them, and to the public generally*
- *That the construction of this Terminus with its associated Wharf, by enabling railway trucks and other carriages to come alongside the harbour, will greatly promote the easy and economical transit of the imports and exports of the Colony*
- *That the large sum of money already laid out on the Darling Harbour Line is at present so much of the public funds uselessly expended, or wasted, and must remain so until the aforesaid Terminus is completed and in operation*
- *That this line was laid down and constructed as it at present exists, long before the constitution of the*

Pyrmont Bridge Company, and your Petitioners respectfully submit ought, in justice to all concerned, to be completed without reference to any arrangement with that Company, such as has been alluded to in Parliament

- *That the completion of the Pyrmont Terminus will bring a large population within an easy walking distance of the Railway, thereby materially relieving the pressure of the traffic along the existing lines of access thereto*
- *That while that Terminus will afford very important accommodation to the goods and passenger traffic of the Southern and Western Railways at the present time, the growth of the city will cause the said Terminus to occupy a more and more central position as time passes on*

With reference, therefore, to the past, the present, and the future, your Petitioners pray that your Honorable House will, without delay, take such steps as may appear best calculated to lead to the speedy completion of the aforesaid most important public work.

And your Petitioners will ever pray, &c.'
(NSW Legislative Assembly, 1861b)

In 1862, a petition to the Legislative Assembly with 66 signatures was raised, asking that the line be extended 300-400 yards further north to the first Pyrmont Bridge(NSW Legislative Assembly, 1862).

Writing to Sir Edward Macarthur on 21 June 1864, Thomas Smith noted: 'I am also desirous of informing you that as there has been lately some money voted by the Legislative, for the improvement of Darling Harbor, I have had within these ten days past, both personal interviews & written communications with the Minister for Public Works, to induce the Government to bring the Great Southern and Western Railway Terminus to the foot of your Union Street, at Pyrmont'(ML Macarthur Papers, A 4244-1(CY1719), pp.85-86).

On 1 November 1866, Dr Lang presented a third petition to the Legislative Assembly with 211 signatures requesting the connection of the Great Southern and Western Railway[Darling Harbour Branch Line] with the Harbour of Port Jackson(Anon, 1866b). The petition was put again the next day, and passed(Anon, 1866c). Essentially the same petition was put before the Assembly as a formal motion on 11 December 1866, with 239 signatures, and passed(Anon, 1866d)(Figure 5.9.2).

Figure 5.9.2: Connection of Great Southern and Western Railway with Port Jackson (Petition – certain inhabitants of Sydney) (ML Q328.9106/4: in NSW Legislative Assembly, Votes and Proceedings, Session 1866, vol.2, p.437)

1866.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

CONNECTION OF GREAT SOUTHERN AND WESTERN RAILWAY WITH PORT JACKSON.

(PETITION—CERTAIN INHABITANTS OF SYDNEY.)

Ordered by the Legislative Assembly to be Printed, 11 *December*, 1866.

To the Honorable the Legislative Assembly of New South Wales, in Parliament assembled.

The humble Petition of the undersigned Inhabitants of Sydney, in the neighbourhood of Darling Harbour,—

HUMBLY SHEWETH:—

That the extraordinary delays that have taken place in connecting the Great Southern and Western Railways with the Harbour of Port Jackson, have materially diminished the railway revenue; largely increased the public expenditure for freight and railway plant; prevented, to a great extent, the produce of this Colony from being transmitted to the metropolis, and the imports arriving in Sydney from being at once dispatched to the country districts; and have further been the means of raising up a gigantic claim on the part of the Harris family against the Government.

2nd. That had the Ultimo Estate branch line never been commenced, or had it been completed without delay, all property in the vicinity of Darling Harbour would have been greatly enhanced in value, and the Ultimo Estate would be at this moment a highly improved and important populous portion of the city.

3rd. That on the contrary, all property connected with Darling Harbour is now depreciated in value, the harbour itself rapidly filling up, and property becoming an unprofitable waste and a blot on the face of the city.

4th. That had the original design been carried out, the Government would have obtained for about £3,000, according to the valuation of the arbitrators, 14½ acres of land; whilst the terminus, stipulated in the official valuation to be built thereon, would have produced incalculable good, and shipping of any burden might now be loading and discharging at the railway jetty in Darling Harbour.

5th. That the plan, which your Petitioners understand with wonder and concern has been lately contemplated, of constructing a wharf at the head of Darling Harbour, inside Pyrmont Bridge, can never meet the requirements of the Colony; but will, if carried out, be in contravention of the Evidence taken before the Select Committee appointed by your Honorable House, and involve an enormous foolish lavish expenditure of public money—more ridiculous than the Pitt-street Tramway, as it is evidently cheaper and better to take the railway to deep water unobstructed, than to take deep water to the railway, with the bridge to obstruct every approach.

6th. That Petitioners would humbly yet earnestly point out that it is highly desirable no further delay should take place; that the original design of the Sydney Railway Company (which is far better than any yet proposed), where practicable, should be adhered to; and that, consequent on the change of circumstances, a branch line should be constructed from the Ultimo terminus to the nearest suitable part of Sydney Harbour, easy of access and with the necessary depth of water.

7th. That the failure of the Pitt-street Tramway; the inconvenience of the conveyance of railway plant and goods through crowded streets, to say nothing of the danger, are unmistakable arguments in favour of the immediate completion of the Darling Harbour railway line.

8th. Your Petitioners, therefore, humbly pray that your Honorable House will take the above premises into your favourable consideration; and your Petitioners, as in duty bound, will ever pray.

[*Here follow* 239 *Signatures.*]

[*Price,* 3*d.*] 564—

D) Future directions

The Legislative Assembly Select Committee into 'Railway through Ultimo Estate' set the compensation issue(B. above) in the much wider context of a future direction for the Darling Harbour Branch Line. It exhaustively questioned witnesses about this more general matter. Witnesses held diverse, often conflicting, views, but the Committee gained considerable insight into its broader concerns.

The Committee followed several lines of inquiry with its witnesses, in particular:

- The Pitt-street Tramway, installed in 1861, should be extended to run between the Railway Terminus at Redfern and the wharves at Circular Quay, with an upgrading of the rails so that steam engines rather than horse-drawn vehicles could haul both goods and passengers along the line. This option would take advantage of the storage facilities already at Circular Quay, but Edward Flood considered this option impractical as it would mean widening Pitt Street and traversed a populous part of Sydney(NSW Legislative Assembly, 1864:245). According to Thomas Holt, it would block up and destroy the general trade of the street, and 'would not be half sufficient for the traffic which will be caused by the opening of the Southern and Western lines of the railway in a few years(ibid: 244).
- Extension of the railway line from Redfern up the east side of Darling Harbour, to either Market Wharf or Miller's Point(ibid:240), to relieve congestion at Redfern(ibid:238). These would be more central locations (ibid:237), but the amount of private property which would have to be resumed was seen as an obstacle(ibid:240).
- Implementation of original plan, with construction of a good terminus on 7.5 acres just south of Bunn Cottage and with access from Harris Street. Most witnesses viewed this option as a 'folly' and 'mistake'. Witnesses argued that the original plan was no longer an option as the water in Darling Harbour was now too shallow(e.g. ibid:227) and sedimentation was continuing. As the first Pyrmont Bridge had now been built(1858), this limited access into Darling Harbour to coastal vessels of less than 600-700 tons(NSW Legislative Assembly, 1865: 825).
- Anyway, reclamation of Darling Harbour to Liverpool Street was now underway (see p.540), with the prospect that a road could link Pyrmont peninsula directly to the city. The terminus would then be on reclaimed land, not the Harris Estate, but problems with Pyrmont Bridge and sedimentation would remain. The Engineer-in-Chief of the Railways, John Whitton, raised the difficulty of rail access onto the reclaimed land(ibid:825).
- Extension of the branch line to Pyrmont Bridge or, more particularly, McEwans Point, later Major Christie's Point, at the southern end of Pyrmont Bay. Views polarised over this option: 'There would be nothing more disastrous to the future interests of the railway than cutting it off from communication with the water … I have not the slightest doubt myself that a very large mineral traffic will be done on the line at some future time'(Edward Owen, in NSW Legislative Assembly, 1864:238). The costs of this option were very high though, as it was believed it would require paying high compensation to the Harris Estate(some disputed this) for not implementing the initial plan, and also the purchase of Pyrmont Bridge by the Government so that merchants would no longer pay a toll, land acquisition, construction of the railway further north, and of a jetty some estimated would need to be 300 feet long to accommodate ocean-going vessels. This option would capitalise on the existing investment in the branch line, estimated at £45,000(ibid:239), but another £251,000 would be needed to carry the line to deep water, excluding land purchase(ibid:242). Concerns were expressed by the Committee especially on the worth of such a venture to the country(ibid:242). On the other hand, Thomas Holt, a former Director of the Sydney Railway Company, believed that a great increase in traffic could be expected

from Goulburn and Bathurst as new lines opened up(ibid:243). John Whitton, though, baulked at the high cost. Mr Lyons: 'So that your opinion is that the sooner we get rid of this railway the better?' Whitton: 'I think so'(ibid:235).

- This was the final option and seemed the one favoured by the Select Committee initially. According to Charles Langley, the builders of the branch line: 'could not have injured the [Harris] property more, anyway they could have gone to work. They have cut off all the water frontages; they have destroyed all the streets and made they culs de sac[Thomas, Mary Ann, William Henry, Macarthur, Quarry, Fig and Allen Streets were all closed to the water], - they have injured the whole property incalculably'(ibid:230). To restore the land to the Harris family would entail extensive earthworks: Mr Stewart: 'The removal of the embankment and filling in of the cuttings would be a very serious expense?' Charles Langley: 'It would cost an immense deal of money … it would cost thousands upon thousands to clear up the harbour and make this as it was when they meddled with it'(ibid:230). Another consideration was that the 'population has gone beyond the property': settlement of the dispute might have unduly delayed subdivision of the Ultimo Estate(ibid: 229). Charles Langley estimated that compensation to the Harris Estate could be £60,000.

The deliberations of the Select Committee are interesting in view of the immense complexity of the issues and the high levels of uncertainty surrounding most of the options. The strategies eventually adopted by Government through to the end of the century were all identified and in large measure qualitatively and quantitatively examined by the Committee. In effect, their deliberations with witnesses produced the elements of a strategic document relevant for the next 35 years or so.

5.9.3 Darling Harbour Goods Yard

A) Introduction

Despite the best endeavours of the local inhabitants and the Pyrmont Bridge Company, the Branch Line remained essentially unused until the mid-1870s. Initially nothing was done to build the extensive goods sheds, wharves and road access to create the goods yard intended to serve shipping and the City of Sydney(Hagarty, 2005:208). Instead, a goods shed was located near to the Sydney Passenger Station at Redfern(ibid:260/342). As a result, the only use made of the Branch line was to transfer rails from ships to the main Parramatta line(ibid:342), and small amounts of timber and coal(Oakes, 1999:205).

On 25 April 1873, the Commissioner for Railways gave notice that 'His Excellency the Governor, with the advice of the Executive Council, deems it expedient to make and complete certain conveniences in connection therewith'(Anon, 1873a:1215). The notice advised that this required the taking of certain lands. This notice was duly re-published on 20 May(Anon, 1873b:1456), and on 23 June 1873 the land resumption was confirmed(Anon, 1873c:1788; Anon, 1873d:1846). The land resumed was 2 acres and 38 perches(0.9ha) in extent, and was required for duplication of the branch line referred to in C. below.

In about 1874, the Government voted £25,000 towards the purchase of land, laying of sidings, and erection of wharves and sheds at Darling Harbour.

B) Iron Wharf

An iron wharf was built across the head of Darling Harbour in 1874(Figure 5.9.3). Its installation entailed considerable reclamation of the harbour's headwaters, which occurred in 1874 'with fill from the removal of a hill in Sydney Station yard'(National Trust, 1984). The wharf was 384 metres long, had nine berths comprising five jetties, each 18.2m long, and four berths of 73 metres; it was constructed at a cost of £50,000(Anon, n.d.; National Trust of Australia, 1984). The wharf was built in England and assembled at Darling Harbour(Johnson & Parris, 2008:124).

Figure 5.9.3: Anon[after 1874] [Iron Wharf, Darling Harbour] (ML SPF/844; Digital Order No. a089844)

An idea of the scale of the structure can be had from Figure 5.9.4. The wharf stretched from about where Liverpool Street reached the harbour in a huge arc to perhaps 150 metres south of Bunn cottage on Pyrmont peninsula.

Figure 5.9.4: Brodie, A., 1874/75, Alexander Brodie – photographs of Sydney and the Blue Mountains, Folio 6: Darling Harbour from St Phillip's Church[with view of Pyrmont Bridge](ML PXA 777/6)

Construction of the wharf had been foreshadowed during hearings of the Select Committee on the Pyrmont Bridge Bill some twenty years earlier. On 28 November 1854, the Surveyor-General of the Colony, Sir Thomas Livingstone Mitchell D.C.L., received several questions put to him by the Committee's Chairman G.R. Nichols and the Chief Commissioner of Crown Lands, as follows:

- Nichols: 'Do you think it desirable that the head of Darling Harbour should be formed into a Circular Quay, and at the place where the tidal stream flows up and down should be filled in? Nothing could be more desirable in my opinion'.
- Nichols: 'Do you think it desirable for sanitary purposes? I think it in every way desirable; as well to prevent the influx of matter into the harbor, as for sanitary purposes'.
- Commissioner of Crown Lands: 'Do you not think that the formation of a Circular Quay at the head of Darling Harbour would be very advantageous to the merchantile interests of the place? Most undoubtedly; it is the most desirable finish that could be made to that Cove'.
- Nichols: 'And it would recover a very considerable area of highly valuable ground? Yes, if drained properly, highly valuable. I speak the more positively upon this subject, for I believe that in order to preserve our excellent harbour some general measure must be adopted for encasing all its numerous shores; and unless something be done the harbour will be filled up. The honorable gentleman opposite, (the Chief Commissioner for Crown Lands), must be aware that every brickfielder deposits half-an-inch of sand somewhere in the harbour'.

(NSW Legislative Council Votes & Proceedings, 1854, volume 1, pp. 1325-1329)

Sir Thomas anticipated the Sydney Harbour Trust 'encasing all its numerous shores' by some 50 years!

The following account of the Iron Wharf appeared in The Sydney Illustrated News of 30 January 1874(Anon, 1874):

'The illustration on our front page[Figure 5.9.5] *shows that portion of Darling Harbour recently reclaimed by Government, and the new lattice work quay erected for the accommodation of second class shipping. Some few years ago that space of ground seen in the centre of the picture, and covered at present with substantial houses, was completely submerged by water at high tide, which flowed past groups of unhealthy looking mangrove trees as far up as where the Castlemaine Brewery now stands. By dint of continual*

deposition of rubbish from the city, the water was made to recede some hundreds of yards, and the present wharf having been resolved upon by Government, the structure was commenced and carried out as far as is represented in our engraving. The price obtained for the reclaimed land must have helped considerably towards the expenses of both building the wharf and deepening the harbour in its vicinity, while what remains unsold will, no doubt in a few years, return an ample profit upon all the outlay incurred. The wharf supports are cast iron cylinders of substantial make, and the rest of the work consists of wrought and cast iron mixed, with the exception of the floor, which is to be of durable timber … the Darling Harbour Wharf will be used principally for shipping and unshipping cargoes of coal and produce from ports along the coast'.

Figure 5.9.5: Anon, 1874, Darling Harbour extension – showing the new Iron Wharf (SRL T115: Sydney Illustrated News, 30 January 1874, p.1)

DARLING HARBOUR EXTENSION—SHOWING THE NEW IRON WHARF.

Figure 5.9.5 shows the new Iron Wharf, yet to be backfilled for access. It is possible that the cutting through which the train is passing was also levelled at this time. The bridge just south of Quarry Street is also shown, with a capacity for a second line. The locomotive in the sketch is an 0-4-2 mixed traffic engine designed by James McConnell and built by R. Stephenson & Co. at Newcastle-upon-Tyne. In all likelihood, it was No. 7 locomotive of the Southern Railway, described as being in good working condition and employed mainly on Darling Harbour coal trains(Commissioner for Railways, 1879:24). The next year the engine and tender were recorded as: 'In safe working order, and employed mainly running Darling Harbour coal trains. This engine will at an early date be stopped from running and not again brought into use on our lines, as it is in want of extensive repairs, which, under the circumstances of the engine being too light for our traffic, it will not be desirable to carry out'(Commissioner for Railways, 1880:38). Locomotive No. 7 thus had a working life of some 25 years.

According to West, Engineer-in-Chief, Department of Harbours and Rivers, the Iron Wharf never did much trade: 'One reason is that a great deal of space is required behind these wharfs for shunting and other work. The Railway Department could not afford to give up this space for shipping purposes, therefore the wharfs are not utilised as they might be if there were more space … There is no room for putting out and sorting of the cargo, owing to the shunting of traffic at the back of the wharf. The Department cannot allow trucks to stand out the back of the wharf to any extent'(West, 1892:975/6). Further, there was only some 20 feet(6.1m) of water above Pyrmont Bridge, which limited access to smaller boats. The overall consequence was that the Iron Wharf was used for domestic trade, rather than the coal trade for which it had been constructed. The wharf could not handle large mixed cargoes (ibid:977).

The Iron Wharf was still in use in 1914, although finger wharves proposed to be built out from it were outlined on maps of this time(Sydney Harbour Trust Commissioners, 1914).

'Though regarded as one of the great achievements of the industrial age it was cut from its supports in 1926 and dumped into the harbour, where sections still remain'(Johnson & Parris, 2008:125); parts of the structure were uncovered in 1985, during redevelopment of Darling Harbour for the bicentenary.

C) Line duplication

Views differ on when the Darling Harbour branch line was duplicated between the Sydney Station and Darling Harbour. Oakes(1999:207) reported Forsyth's view(1983) that duplication took place in 1881. A detail from the Gibbs, Shallard & Co.(1879) aerial view of Sydney(Figure 5.9.6) tends to support this view. A single line extends from Sydney Terminus to Mrs Bunn's cottage in this illustration, passing the waterbody isolated from Darling Harbour during construction of the line. The Iron Wharf is in use, while two lines branch off the main line at the southern end of the waterbody to a curved storage shed.

Figure 5.9.6: Detail from Gibbs, Shallard & Co,, 1879, Sydney, aerial view, 1879, Gibbs, Shallard & Co. (ML XV1/1879/2; Digital order no. a2419001)

On the other hand, Anon(nd) dated duplication of the Cleveland Street Junction to Darling Harbour line as having occurred in 1874. This date relates better to construction of the Iron Wharf and railway goods yard. It also better explains the rapid increases in staffing and total revenue from Darling Harbour which occurred from 1875(Table 5.9.1). An 1879 map of Sydney shows duplication of the branch line, construction of the Iron Wharf, and installation of the goods yard south of the wharf(Sands, 1879).

Table 5.9.1: Staffing and Revenue of Darling Harbour Station

Year	Total Staff	Total Revenue		
		£.	s.	d
1872/4	-	-		
1875	6	6,146	11	9
1876	5	12,693	17	4
1877	11	21,220	8	3
1878	25	64,307	8	3
1879	53	114,582	19	6
1880	91	151,697	2	8
1881	124	187,458	17	11

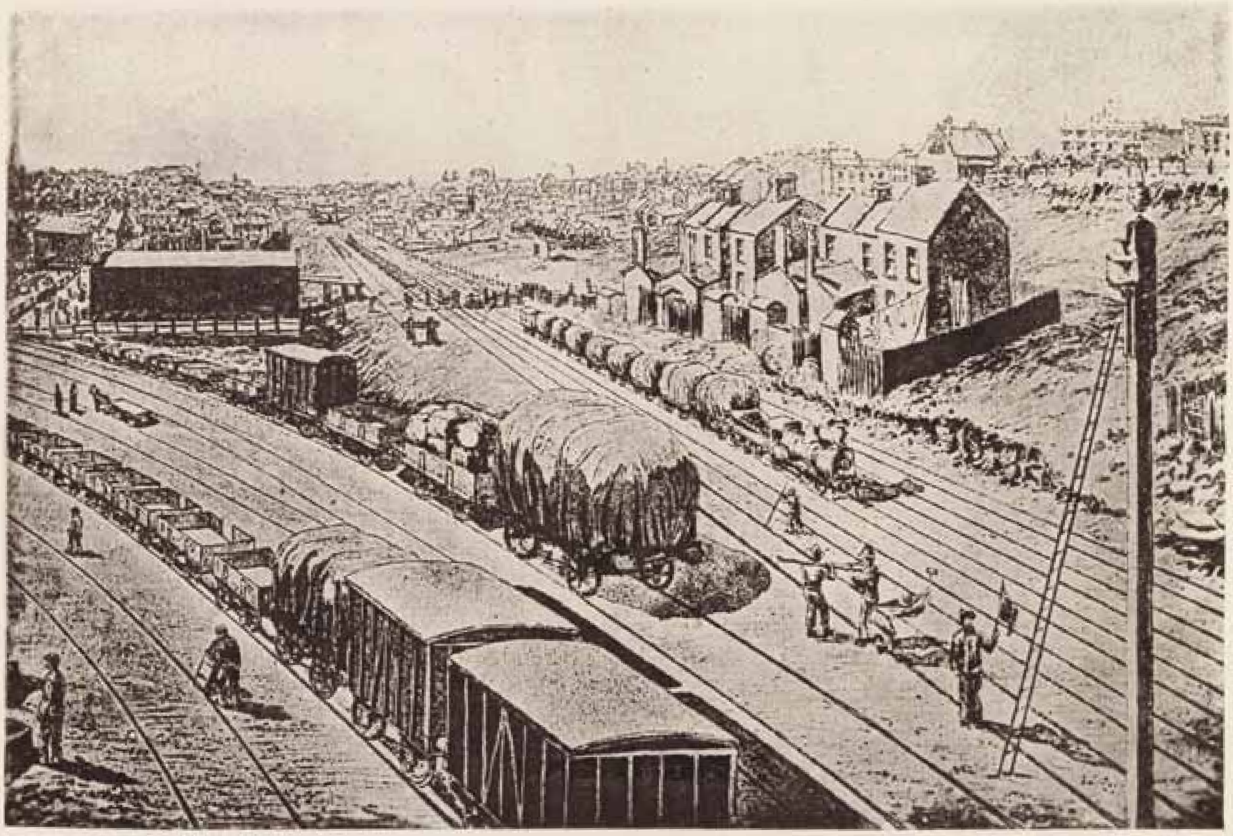
The line still ended at the Railway Goods Station, well short of Pyrmont Bridge. It was not strictly a duplication, in that for some distance the new lines ran to the west of the original line – further into Ultimo Estate. This would have entailed removing more sandstone which, perhaps, was also used to partly reclaim the low-lying land behind the Iron Wharf.

D) Darling Harbour goods yard

Despite the acquisition of land for the Darling Harbour Goods Station at the time of the original land purchases, construction of the facility did not occur until about 1875. It was built largely on some 31 acres(12.5ha) of reclaimed land south of the Iron Wharf(National Trust of Australia(NSW), 1984), instead of the land set aside for this purpose in 1855. In 1876, a siding 1544 feet(470m) long was built alongside the Iron Wharf. Line A sidings 2,026 feet(617.5m) were built adjacent to the first siding also in that year(Rae, 1876). In 1878, goods offices were built and 10- and 5-ton cranes erected on the wharf (Commissioner for Railways, 1879: Appendix p.12). More sidings were laid in 1879(Commissioner for Railways, 1880: Appendix p.12). The basic configuration of the goods yard was quickly established, and is well described by the National Trust of Australia(NSW), 1984).

In 1877/78, due to severe congestion at Sydney Station, the trade in hay/straw/chaff for horses and then wool was progressively moved to Darling Harbour Railway Goods Yard (Anon, nd). The yard was opened on 8 November 1878, and was established for inward goods by 1881 and for outward goods by 1891(Anon, 1902:7; National Trust of Australia, 1984). According to Oakes(2001:25/26) firewood was initially the main commodity handled. Upgrading and extension of the goods yard continued between 1880 and 1885, considerably enhancing the storage and shunting capabilities at Darling Harbour. Nonetheless, the Commissioner for Railways in his 1884 Report was moved to note that: 'The accommodation at Darling Harbour should be extended without delay. At this dull season it scarcely affords facilities for the conduct of business, and when the Illawarra and Northern lines are brought in, I am confident that it will be found altogether insufficient'(p.25).

Figure 5.9.7: NSW Legislative Assembly, 1884, Darling Harbour Railway-crossing: from Hay to Harris Street, (Darling Harbour Railway: high level bridge across, Railway Reports and Papers, 1883-4, No. 72(ML DSM/Q385/N, opp. P.14)



DARLING HARBOUR RAILWAY-CROSSING,
FROM HAY TO HARRIS STREET.

By late 1881 all inwards traffic to the City of Sydney was being transferred to Darling Harbour. All inward traffic in 'other minerals'(mostly shale) was also diverted to Darling Harbour in 1881(Anon, nd). The wool traffic grew rapidly and by 1891 a 323-metre wool shed had been built in the goods yard(Oates, 2001:26). By 1891/92 the goods yard covered 31 acres(12.5ha) and contained 8 miles(12.8km) of sidings(National Trust of Australia(NSW), 1984).

E) Line extension to Pyrmont Bridge

In an insightful article on 14 June 1881, The Sydney Morning Herald noted: 'According to the plan submitted by the Government last session, the official design is to make the east side of the Pyrmont peninsula the wharf of the future. The design, however, was only broached in part. If it is to be carried out the railway will not terminate at the bridge, but will be carried on to the Point, and terminate in a deep water jetty, and perhaps also be carried further to the west round the Pyrmont shore, and possibly across to Balmain. If Sydney Cove is thus to be practically superceded by Darling Harbour, then the Government ought to deal with the matter, not by little bits, creating future difficulties for itself and its successors, but comprehensively, and should resume at once all the land that is likely to be wanted in the wide sweep of its plan'(p.4).

This article may have been inspired, for the same day the NSW Government Gazette carried a notification of the resumption of lands from the existing railway lines west to Pyrmont and Murray Streets and north from William [Henry] Street to Pyrmont Bay(Anon, 1881a&b).

While this resumption was not as bold as advocated by the Sydney Morning Herald, it totalled 12 acres and 3 roods(5.16ha). It included Murray Street Public School, Mrs Bunn's cottage, the Atlas Company's works, the road immediately west of Pyrmont Bridge, Messrs Goodlet & Smith, and 'the whole of the property round to the Murray-street wharf'(Figure 5.9.8).

This initiative of Government essentially adopted the scheme proposed by James Wallace at the start of the Darling Harbour Branch Line scheme, some 28 years previously, and finally responded to petitions by inhabitants of Sydney almost twenty years earlier.

Nonetheless evidence from maps(e.g. NSW Department of Public Works, 1887) suggests that the railway did not reach Pyrmont Bridge until sometime in 1886/7. It is also clear that some of the affected properties were not demolished for some time. Murray Street Public School, for example, remained until 1914, although the Railways Department resumed a section of its playground in 1885(Matthews, 1982:47). Likewise, Mrs Bunn's cottage was shown on maps at least to 1903.

Figure 5.9.8: Anon, nd(d), Sydney from Pyrmont, N.S.W. (ML SPF/1064; digital order no. a325064)

F) Conclusions

The cumulative effect of these developments is shown in Figure 5.9.9. Their success is clear from Table 5.9.2. Between 1878 and the 1950s Darling Harbour Goods Station was NSW Railway's main general cargo station(National Trust of Australia, 1984). These developments provided the groundwork for a much larger set of initiatives that unfolded well into the twentieth century.

Figure 5.9.9: Elaboration of Darling Harbour Branch Line, 1873-1886

5.9.4 Start of export trade

A) Introduction

An export trade in general goods started at Darling Harbour in 1875. It extended to coal and other minerals(mostly shale) in 1876 and to wool in 1878(Table 5.9.2). This trade increased rapidly into the next century, driving the development of Pyrmont as a major part of the Port of Sydney. With the opening of the Hawkesbury River railway bridge in 1880, coastal sea-trade gradually declined(Stephenson, 1966:209), placing more emphasis on exports.

Table 5.9.2: Movement of commodities through Darling Harbour, 1875-1925

Year	General Goods(tons)		Coal(tons)		Other minerals(tons)		Hay/straw/chaff*		Wool(bales)	
	outwards	inwards	outwards	inwards	outwards	inwards	outwards	inwards	outwards	inwards
1872/4	0	0	0	0	0	0	0	0	0	0
1875	48	35,196	0	0	0	0	0	0	0	0
1880	27,889	126,313	837	6,529	107	27,322	495	7,143	878	152,538
1885										
1890	64,770	403,531	9,843	27,394	n/a	n/a	1,757	9,581	3,332	373,449
1895										
1900	255,100	407,275	12,188	167,004	37,121	25,869	655	179	19,163	358,536
1905	321,354	662,520	17,228	315,578	24,659	38,702	771	148	9,715	443,867
1910	477,322	849,701	16,664	405,217	12,062	57,672	775	139	6,246	719,469
1915	598,118	772,923	4,052	541,413	14,006	174,065	2,365	2,202	7,071	690,200
1920	636,788	992,297	1,778	652,855	15,038	142,444	2,153	157	12,273	645,932
1925	618,126	1,911,120	326	679,509	24,601	148,437	130	249	7,224	804,858

* Truckload

The emerging railway/wharf system had to cope with the transition from sail to steam, with its attendant rapid increase in ship size. The transition was accompanied by fundamental changes in the storage, management and handling of goods, which happened as the underlying technologies quickly evolved.

These radical and rapid shifts in practice, coupled with a fast-growing traffic in export goods, were played out initially on the wharves of Pyrmont, and then beyond: 'In the 1890s, some of the wharves were enlarged for overseas vessels, especially for the loading of wool, and larger wharves were built also at Pyrmont, Glebe Island, and Balmain, in conjunction with the extension of railroad sidings'(ibid:209). The history of Pyrmont peninsula during the twilight decades of the nineteenth century and well into the twentieth century was largely influenced by these dramatic events: 'The complex of wharves and piers at Pyrmont, with twenty-one berths for large vessels, many of the wharves with railroad sidings, makes this the most densely concentrated industrial and mercantile shipping zone along all the foreshores'(ibid:210). McCauley, Conran & Briger(1983b) noted: '1890-1900 saw massive wharf constructions alienating much of the resident area of the waterfront[in Pyrmont] where many dwellings were demolished for industry'.

B) The coal jetties and timber wharves

The next significant extension of Darling Harbour was north of Pyrmont Bridge, and incorporated the former Goodlet and Smith's property at the southern end of Pyrmont Bay into the growing harbour. Figure 5.9.10 is a view of the first Pyrmont Bridge with railway lines in place, and was probably taken in the early 1890s.

Figure 5.9.10: Pyrmont Bridge, Darling Harbour/ photographer unknown [View of Sydney across Pyrmont Bridge] (ML SPF SPF/Sydney – Harbour & Islands – Darling Harbour (12); Digital order no. a1528571)

Two coal jetties were built together with a linear timber wharf linking them to Pyrmont Bridge. Cumulatively, this project cost £21,226.8s.9d.(Darley, 1892:969). In August 1890, a proclamation by the Governor directed that Union Street, Pyrmont be lowered 'in order to connect the rails in Darling Harbour Goods Yard with the new jetties on the northern side of the bridge, the estimated cost of which will not exceed twenty thousand pounds'(Anon, 1890). The jetties were opened on 29 September 1890, close to the 35th anniversary of the railway. The first coal was shipped on 12 May 1891(Anon, 1902:7), and the jetties were connected to the Darling Harbour Branch Line that year(Eardley, nd, Aplin & Storey, 1984:68).

It soon emerged that the cranes installed on the coal jetties were inadequate to the task. The first crane was commissioned in May 1891(Brentnall, 1892:1007). A second followed quickly: 'I sent a third to Cockatoo Island, but we very soon had to put that one up also and the three have been kept busy ever since'(Darley, 1892:978). The cranes were stationary, and ' … not in a position to compete with modern steamers'(Brentnall, 1892:1007). The cranes were not tall enough to load coal into the steamers, especially at high tide, nor could they reach to the other side of these ships. As a hold was filled, the ship had to be moved along the wharf to provide access to the next. Movable cranes were advocated to overcome these limitations, but these were not yet(1892) available in Sydney. The coal jetties remained in operation until the 1950s, when two large coal wharves were completed at White Bay(Eardley, nd). They routinely handled a quarter-million tons a year from about 1901 rising to half a million tons or more from 1907.

Shortly after this project was completed, a timber wharf was constructed between the Iron Wharf at the head of Darling Harbour and Pyrmont Bridge. From cartographic evidence, the relevant part of the Pyrmont waterfront had been 'straightened' during 1887/8 prior to construction. This appears to have required some reclamation and the removal of a small headland. In 1892, the new wharf had been 'hardly taken out of the contractor's hands …'(Darley, 1892:977). It was about 1,500 feet(457.2m) long(Jackson, 1892:983), but had not yet been linked into the rail system. As with the Iron Wharf, the usefulness of this timber wharf was limited by the availability of space to manage cargoes, and the depth of water in front of the wharf. There was considerable discussion about its utility for loading shale, which had to be loaded by hand. This would release all the wharfage then available(1892) north of Pyrmont Bridge for coal handling.

The movement of coal inwards through the goods yard increased rapidly during the 1880s.

C) Outwards Goods Sheds

In early August 1891, a large goods shed was opened just south of Pyrmont Bridge/Union Street, to handle 'outwards' goods at Darling Harbour(Anon, nd). It was 845 feet(257.5m) long and fitted with hydraulic cranes. The shed was initially intended for the hay/straw/chaff traffic, but this latter reverted back to Sydney Goods Station at this time.

A few years later, certainly by 1897, a second 'outwards' goods shed was constructed between the first and the recently constructed timber wharf; it was 850 feet(259m) long.

5.9.5 Darling Island

A) Early developments

It was initially intended to develop Darling Island 'as containing 10 building allotments, with a street through the centre of the island'(ML Macarthur Papers, vol.98, frame 74). The island was purchased from ASN Co, in the late 1880s by a syndicate whose members included:

- E.C. Batt
- S.T. Rodd
- Major John Mitchell Purves
- Robert Smith, Acting Crown Solicitor(Rounding, 1892:1010)

The first three individuals were principals of Batt, Rodd & Purves, property auctioneers, estate agents and valuators, 88 Pitt Street. According to George McCredie(McCredie, 1892:1002), Smith left the syndicate sometime before the Island was sold to the Government; he became the syndicate's solicitor.

It is unclear just when ownership of the site was transferred from ASNCo to the syndicate. ASNCo ceased to operate on Darling Island sometime in 1887 (pp 456/7) and it appears that the island was levelled that same year(see below). Matthews(1982:56) clearly stated that the site was sold to a private syndicate, presumably the above, on 27

July 1895, but this seems at odds with the following information.

A bird's-eye view of Sydney, prepared by Hill(1888), shows Darling Island cleared of structures, levelled, and with moorings for six sailing ships.

The syndicate started to create a modern wharfage facility for large steamers on the Island. To this end, Robert Saunders, a leading Pyrmont quarrymaster(see p. 411), was employed to level the Island(Irving, 2006). Cartographic evidence indicates that this had been done by 1887. It appears that much of the sandstone was dressed for construction purposes, the whole operation costing the syndicate £29,977(McCredie, 1892:1000). The syndicate used some of the sandstone blocks to build a retaining wall along the western side of the Island, with some also used on the northern side, and a little on the eastern side. These structures brought the development to the limit of the syndicate's freehold, and it was then intended to construct wharves all round the Island to the extent that Government would allow. More of the stone was to be used to build a very large structure, fitted with freezing rooms for meat and a wool warehouse for dumping purposes; it was to cost £100,000. Another building was to be constructed at a cost of £80,000, near John Street. It was to be used both as a wool store and bond. Both buildings were to be constructed with stone won from the site. Two ships – a steamer and a sailer – had already used the embryonic facilities before they were purchased by Government.

The scheme was vitiated when the syndicate's request to have Darling Island linked to the Darling Harbour Branch Line was declined(McLachlan, 1892:1025). The Railway Commissioners recommended purchase of the Island to Government, and the land was resumed by notification published in the Government Gazette on the 4 June 1889 '… for and in connection with the providing of wharfage accommodation for the berthing, loading, and discharging of vessels …'(Anon, 1889a). It appears that a large quantity of stone was sold while the contract was under preparation, and removed from the Island(McCredie, 1892:1002).

A resolution was put in the NSW Legislative Assembly in May 1889 that Darling Island be purchased for not more than £135,000(Barling, 1892:961). The actual payments were:

Table 5.9.3: Purchase of Darling Island

	Principal	Interest			Total		
	(£)	£	s	d	£	s	d
Robert Smith	115,000	955	6	8	115,955	6	8
Elizabeth Onslow	20,000	975	7	0	20,975	7	0
Grand Total					136,930	13	8

By the 18 September 1889, the interest was £20,380.4s.3d.(NSW Legislative Council, 1893). Documentation on the Government acquisition of Darling Island, from October 1888 to June 1889, was assembled for the Legislative Assembly(Anon, 1889a).

At the time of purchase, the Island had an area of 8 acres 1 rood and 37¾ perches(3.34 ha)(Anon, 1889c).

B) The 1892 Standing Committee

Extension of Darling Harbour freight handling onto Darling Island was highly contentious at the time, and led to hearings of the NSW Parliamentary Standing Committee on Public Works in 1892. Nineteen witnesses appeared before the Committee, with representatives both from relevant Government bureaucracies and harbour users.

The Committee was asked to report on 'the expediency of extending the railway to Darling Island, the construction of wharfage accommodation at that place, the reclamation of certain foreshores around Darling Island, and the resumption of land in connection therewith'(NSW Parliamentary Standing Committee, 1892:955). In doing this the Committee exhaustively reviewed all the Government facilities then available at Darling Harbour, and thoughtfully questioned witnesses on the potential of these facilities to meet foreseeable demands on the port.

The Standing Committee concluded, inter alia, that:

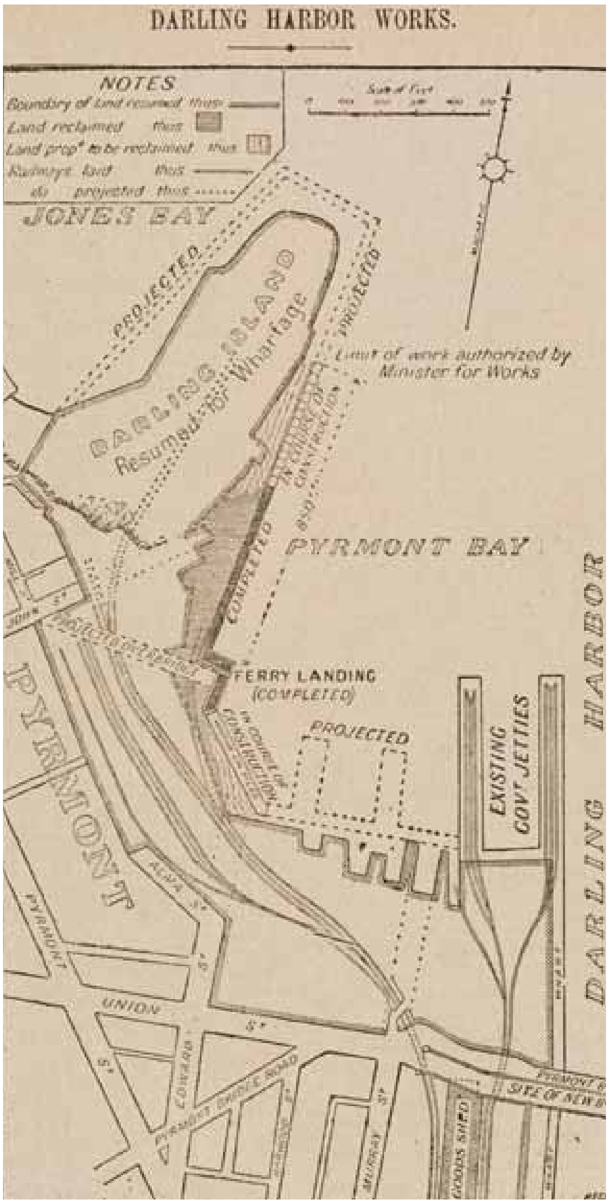
- 'the question of utilising Darling Island in the public interest has not been fully and properly considered'
- 'provision for the shipment of wool or of wool and coal from Darling Island, the main purpose for which the proposed improvements at the Island appear to have been recommended, is not at present necessary'
- 'the proposed improvements at the Island are premature, and may be postponed'(ibid:957)

Overall, the Committee resolved ' … that it is not expedient the proposed works should be carried out … '(ibid:955): 'This decision, if endorsed by the Legislative Assembly, will leave Darling Island in its present condition for some time. Being the property of the Government, and of considerable value for railway and wharfage purposes, it must eventually be properly utilised. It does not appear to be necessary that it should be brought into use at present, and the postponement of the proposals for its improvement will give opportunity for further consideration of the scheme which has been the subject of this inquiry, and for the adoption of a design for works of a character more suitable and comprehensive. The postponement of the work which has been before the Committee will also allow of trade increasing and the best mode of utilisation determined upon before any large expenditure is added to that already incurred in the purchase of Darling Island'(ibid:959).

C) Construction of Darling Island wharves (Wharves 12-15)

Construction of the wharves on Darling Island was started by the Public Works Department in August 1897(Sydney Harbour Trust Commissioners, 1903a:16). Andrews(1986:72) noted that a stone wall wharf was started on the Island about 1897, while Eardley(nd) noted that a stone wall wharf was extended onto Darling Island in 1897. The railway was also extended onto the Island in 1897(Eardley, nd; Anon, 1897a&b). The Island's three berths, Nos 12, 13 and 14, were opened for general traffic in January 1900; they initially handled firewood, coal, shale, timber and wheat(Oakes, 2001:28). Construction of a concrete wharf was underway in 1901, and was expected to be completed in January 1902(Sydney Harbour Trust Commissioners, 1902:38). Construction was completed by June 1902: 'the wharfage accommodation at Darling Island will be amongst the finest in the port'(Sydney Harbour Trust Commissioners, 1903a:17). The greater part of the Island was transferred from the Harbour Trust to the Railway Commissioners on 24 December 1902(Sydney Harbour Trust Commissioners, 1903b:35). The Railways Department continued to enlarge the system of sidings on Darling Island at least to 1910. A sense of the scale of this project can be gained from Figure 5.9.11, which shows the works completed by early 1899, and those extant at that time.

Figure 5.9.11: Anon, 1899, Darling Harbour Works: Darling Island (SRL BN215: Daily Telegraph, 18 January 1899, p.4)



The construction of Darling Island wharfage acknowledged the growing size of ships, especially with the advent of steam, and the need for larger storage and handling facilities to service them.

5.9.6 Other developments

By early 1902 the total wharf frontage at Darling Harbour, Pyrmont and Darling Island was 12,550 feet(3,825 metres)(Anon, 1902:7).

A) New Pyrmont Bridge

The new Pyrmont Bridge was opened to traffic on 28 June 1902. It was the outcome of a process which started in 1891 with a design competition(NSW Government Gazette, 1891). One requirement was: 'for continuing the Bridge on spans to the east side of Murray-street to enable the railway traffic to be carried underneath'. In this respect, it was noted that: 'A short piece can, if necessary, be removed off the end of the long Railway Goods Shed'! Designs were to be submitted in early January 1892, with a first prize of £700.

B) Double-deck Goods shed

A double-deck goods shed on the western side of Darling Harbour was opened in 1921(lower level) and 1923(upper level); it was 304.8 metres long and is now the site of Harbourside Carpark and the Novotel(Oakes, 2001: 28/29).

5.9.7 Sydney Harbour Trust

A) Introduction

In his evidence to the NSW Parliamentary Standing Committee in 1892, the Hon. Ebenezer Vickery, MLC, foreshadowed the formation of a Sydney Harbour Trust 'to take a comprehensive and masterful view of the whole subject of wharf accommodation'(p.1017). It was almost a decade before this happened.

The Trust was established directly in response to an outbreak of bubonic plague in Sydney in 1900, and was to have a transformative effect on the development of Sydney Port. According to Andrews(1986:72): 'Raw sewage running into the bay at Darling Harbour and the unmade condition of many private wharves at the land end led to a huge increase in the rat populations and the resultant bubonic plague which ravaged the city in 1899-1900 gave the Government the opportunity to resume the wharves'. The Sydney Harbour Trust Bill was passed by Parliament on 25 October 1900, and assented to on 11 February 1901. All wharves in Darling Harbour were resumed by the Government on 3 May 1900, and the initial role of the Trust was to establish conditions under which the plague would not re-occur(which it did, in 1901).

A second role was well stated in the Trust's Official Handbook(Sydney Harbour Trust Commissioners, 1924a:21): 'Up till the year 1901 the wharves, with a few exceptions, were practically in private hands. They were constructed to meet the requirements of individual owners. There was no system of laying out the foreshores'.

A third role, quickly identified by the Commissioners, was to establish an income flow for Government through wharfage rates. The Commissioners were initially coy about what was to become their most significant role: 'The Commissioners do not consider it advisable to carry out any great reconstruction scheme at enormous cost, upon which interest would not be forthcoming for many years to come, but everything needful will be done in the direction of providing for the growing requirements of the trade of the Port as they arise, and of remedying insanitary conditions which may still exist(Sydney Harbour Trust Commissioners, 1902:17).

In the event: 'Between 1901 – 1954 the Trust and [its successor] the Maritime Services Board undertook considerable wharfage reconstruction and dredging at Woolloomooloo, Walsh Bay, Darling Harbour and Pyrmont. Reconstruction took the form of narrow finger wharves at right angles to the shore, and marginal wharf development parallel to the shore'(Maritime Services Board, 1993:7).

B) Pyrmont Bay wharves

During 1905/6 designs were prepared for a jetty 1000 feet(305m) long and 150 feet(45.7m) wide, to be erected in Pyrmont Bay, between the coal jetties and Darling Island(Sydney Harbour Trust Commissioners, 1906:14). Five hundred feet(152.4m) of the jetty – also known as the New Railway Jetty – were constructed starting in early July 1905. The first pile was driven on 1 August and the last on 30 November 1905. The jetty was intended mostly for wheat handling, and the first train delivery of wheat was made to the jetty by 22 December 1905(Sydney Harbour Trust Commissioners, 1906:14). Some 1,410 cubic yards(1,078m^3) of rock were removed from the eastern side of the jetty during construction, to provide enough water for the ships that would use it.

C) Jones Bay wharf

The Eleventh Report of the Sydney Harbour Trust Commissioners (1911/12:23) noted that: 'In order to provide extra berths for overseas vessels, it was decided to construct two extensive piers in Jones Bay west of Darling Island; and for this purpose the frontage from the Naval Stores to Pyrmont Baths was resumed … a good start has been made with the rock excavation. Expenditure to end of year, £101'.

According to the Sydney Harbour Trust Commissioners(1914): 'The stone filling which forms the central roadway of the main jetty has been carried out to the full length of 1,200 feet[366m] …'(p.2). Considerable amounts of rock were required for this stone filling and in road formation(Table 5.9.4)

Table 5.9.4: Rock excavated from cliffs behind Jones Bay Wharf

Year ending 30th June	Volume of rock excavated	
	Cubic yards	Cubic metres
1912	36,380	27,814
1913	29,500	22,554
1914	70,049	53,556
1915	33,962	25,965
1916	24,200	18,502
1917	34,548	26,413
Total	**228,639**	**174,807**

In 1916, some 3,500 cubic yards(2,676m^3) of subaqueous rock were also excavated(Sydney Harbour Trust Commissioners, 1916:17), with another 3,000 cubic yards of such rock removed during the year to 30 June 1917. The rock was tipped into the reclamation areas. Also 'the railway cutting has been carried through into Darling Harbour Railway Yards, and the rock levelled down for the roadway leading to Pyrmont Street[presumably Jones Bay Road]'(ibid:17). According to the Sydney Harbour Trust Commissioners (1917:16) in respect of Jones Bay: 'Work was suspended in the quarries in May last. Up to this time, 34,548 cubic yards(26,413m^3) of spoil and rock were removed and utilised for road formation and filling in the jetties'. By 1918 it was noted that 'All the quarry work, amounting to some 18,400 cubic yards(14,068m^3), has been completed'(Sydney Harbour Trust Commissioners, 1918:16).

More than 230,000 cubic yards(175,848m^3) of rock were taken from adjoining cliffs as fill for the jetty and for road making, between 1911 and 1917, while another amount was removed from Jones Bay to render it accessible to shipping. It appears that the railway lines linking Jones Bay wharf to Darling Island were largely in place by mid 1918. Subaqueous rock was still being removed from in front of Jones Bay wharf in 1920(Sydney Harbour Trust Commissioners, 1920:13).

Andrews(1986:74) expressed the view that: 'In the process [of constructing Jones Bay Wharf] Jones Bay disappeared', a situation which remains with us today.

According to the Sydney Harbour Foreshore Authority(2007d): 'The Jones Bay Wharf, Berths 19-21 … is of exceptional cultural significance as a remarkable port structure, whose size and classical modular structure make it a landmark for Pyrmont and Sydney Harbour. It is now a rare and intact example of early twentieth century wharf construction and is unique in the Sydney region for its very early use of reinforced concrete … This together with the use of steel lattice columns, riveted steel girders, bow-string steel trusses, and hardwood, all in combination, make it a highly innovative structure for its time … No other wharfage group displays the full range of facilities as is at the Jones Bay Finger Wharf … It has supported a variety of uses … handling millions of tonnes of goods and providing employment for hundreds of stevedores … It was one of the staging points for Australian troops leaving for combat in the Second World War and also the point of entry into Australia for many migrants after the Second World War'.

'Jones Bay Wharf Berths 19-21 were constructed during the period 1911-1919. Work was sporadically interrupted by material and labour shortages during World War I. The jetties were constructed between 1911 and 1917 and the wharves between 1914-1919. The constructing authority was the Sydney Harbour Trust … In 1991 the Jones Bay Wharf was declared surplus to government requirements …'.

D) Pyrmont Point (Wharves 22/23)

Three hulks were moored in Jones Bay in 1909, the year in which the Sydney Harbour Trust Commissioners(1909:6) opined that: 'the time is rapidly approaching when much more extensive wharfage accommodation will have to be provided to meet the growing needs of the Port. The requisite facilities may be obtained in Jones' Bay, Blackwattle Bay, and White Bay, and the question of further resumptions in these localities should be seriously considered'. The Port of Sydney was about to spill out of Darling Harbour and into Johnstone's Bay!

Wharves 22 and 23 were under construction through 1913 and 1914 and, by 1916, wharf 22 and part of wharf 23 had been completed. By 1917: 'Two railway tracks of standard gauge have been partially laid on the eastern side of this jetty[with wharves 22/23] … The ballasting and general filling in of this jetty has not been completed owing to all quarry work in the vicinity being temporarily suspended'(Sydney Harbour Trust Commissioners, 1917:16). It was also noted that: 'The main 100 feet roadway on the shore ends of the above jetties[Jones Bay and Pyrmont Point] is still under construction, the works for the year being confined principally to the southern end, where connection has been made with the Darling Harbour railway yard'(p.16).

Completion of the wharves was set back due to subsidence of the bay bottom, carrying away piles(Sydney Harbour Trust Commissioners, 1919:15), although construction of the roadway was essentially complete in that year. Work continued on the wharves during the 1920s(Aussie Heritage, 2007).

E) Elizabeth Macarthur Bay (Wharves 24/25)

The Goodlet & Smith property fronting the eastern side of Elizabeth [Macarthur] Bay was acquired by the Sydney Harbour Trust in the year ended 30th June 1928, and the old buildings were demolished; provision of new wharfage for the overseas shipping trade was underway that year(Sydney Harbour Trust Commissioners, 1928). Construction of the wharves commenced in April 1928(Sydney Harbour Trust Commissioners, 1930). In 1929, the Commissioners advised that 'A commencement was made on the extensive excavation work which is necessary in connection with the provision of roadways and approaches to [Berths 24/25 Pyrmont, which front Elizabeth Macarthur Bay] 49,632 loads of material having been removed by the end of the year'. Work on the wharves was closed down entirely in March 1930, due to the trade depression(Sydney Harbour Trust Commissioners, 1930).

The extension of wharf 24 to link up with wharf 23 was completed by mid-1953(Maritime Services Board, 1954:23), and the wharf itself was completed in 1955(Maritime Services Board, [1956]:23). In the latter year also, the roadway at the rear of wharves 23, 24 and 25 was completed[now Pirrama Road]. The completion of wharf 25 in the mid 1950s coincided with the collapse of coastal shipping(SHFA, 2003:13).

5.9.8 Wardell Road line

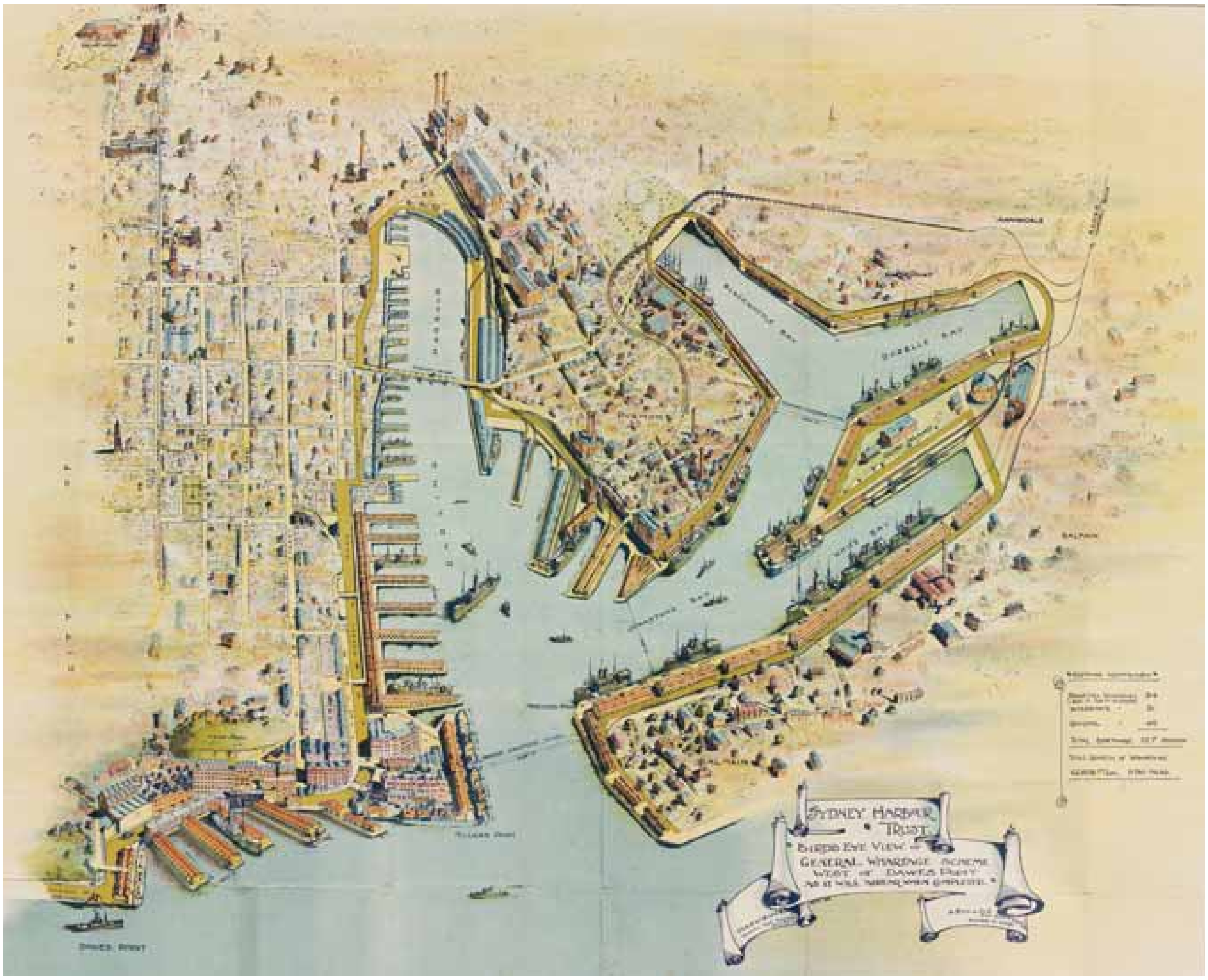
Proposals for the construction of lines only for goods trains were put to the Parliamentary Standing Committee on Public Works on 4 February 1910 (Oakes, 2001:43). This led to construction of the Wardell Road Loop Line between Dulwich Hill and Darling Island. An early indication of the route of the loop line was given by the Sydney Harbour Trust Commissioners in the map accompanying their report for the year ended 30 June 1914. The Wardell Road to Rozelle section was opened on 29th May 1916(Eardley, n.d.), the section across Wentworth Park was built in 1919(Godden Mackay, 1990b:14). The track had been laid from Darling Island to Harris Street by mid-1921(Sydney Harbour Trust Commissioners, 1921). The Rozelle to Darling Island section was opened on 23rd January 1922(Oakes, 2001:56). There were sidings to Shell(on Blackwattle Bay), Edwin Davey's Flour Mills, Council's Wattle Street Depot(1922), Pyrmont Power Station, Gillespie Flour Mills, and the Pyrmont wharves(Fitzgerald & Golder, 1994: Oakes, 2001:57).

While location of the goods line was intended to take advantage of a site already cleared of houses for a proposed road near the CSR premises at Elizabeth Macarthur Bay(Eardley, n.d.), its construction nevertheless entailed razing a large area of housing east of Harris Street (Eardley, n.d.). A notable casualty was Rose Cottage, or Dayswood, on John Street(p. 433).

5.9.9 The turning point

The Sydney Harbour Trust Commissioners had ambitious plans for the harbour. A bird's-eye view of their intentions was published in 1912(Figure 5.9.12), showing the port extending through Blackwattle, Rozelle, White and Johnston's Bays almost to Simmons Point in East Balmain. To lessen shipping hazards, two 'subaqueous' tunnels were proposed – one between Balmain East and Miller's Point, the other to replace Glebe Island Bridge. The Commissioners had for the moment given up their battle to remove Pyrmont Bridge also! So confident were they, that the map of the scheme was titled: ' … as it will appear when completed'!

Figure 5.9.12: Sydney Harbour Trust, 1912a, Bird's-eye view of general wharfage scheme west of Dawes Point as it will appear when completed, Sydney, The Commissioners (ML Z/M2 811.15/1912/1)



By 1915 the Sydney Harbour Trust Commissioners were urging the government to resume the foreshores of Johnston, Blackwattle and Rozelle Bays as areas for future expansion, but the outbreak of WWI intervened (Anglin Associates, 1990:26).

Agitation for further growth continued. By 1927: 'The lineal feet of wharfage of the port[Sydney] was 62,872. Engineer-in-Chief predicted that a further 51,600 lineal feet would be required by 1956, but in actual fact by 1956 lineal feet of wharfage had slightly decreased to 61,413'(Anglin Associates, 1990:28).

Wheat for export began leaving from Glebe Island rather than Pyrmont in 1922(ibid:27). By 1930, coal-loaders were being built at White Bay to replace Berths 1-4 at Pyrmont. Conversion of wharves 12, 13, 14 at Pyrmont from wheat loading to general cargo/passenger use began in 1937 although it was still incomplete by 1945. A transition from bagged to bulk cargoes was occurring in 1957, again altering the dynamics of port structure and operation.

An aerial photograph at about this time graphically shows the extent to which the wharves and railways imposed on Pyrmont peninsula(Figure 5.9.13). Darling Harbour Goods Yard was now fully developed. The port fully occupied the eastern flank of the peninsula, subsuming Darling Island. Wharfage encased Pyrmont Point into Elizabeth Macarthur Bay – visible at the head of Harris Street on the photograph's left-hand margin.

Figure 5.9.13: Anon, 1935/48, Australia from the air(Sydney suburbs) (ML PXE 731/1588, Neg.No.153)

In 1936, State Government replaced the Sydney Harbour Trust with the Maritime Services Board(MSB), with an extra responsibility to regulate navigation in the State's waters.

By the early 1960s, 13,500 trains were entering and leaving Darling Harbour goods yards each year. Expansion continued and by the mid-1960s the yards occupied 56 acres(22.7 ha), contained 30 miles(48km) of track, and employed a thousand men to handle 18,000 trains, 2.5 million tons of inward freight and 1.1 million tons of outward freight yearly(Oakes, 2001: 29/30). Passenger trains seldom used the tracks, except for troop movements in WWII. Steam was progressively replaced by electric and diesel engines.

In 1975: 'MSB made a major decision involving the zoning of the foreshores of Sydney harbour below high water mark into areas to be preserved or retained in their natural state, maintained in their present condition or to be used for further development of waterfront facilities'(Anglin Associates, 1990:38). In 1985: 'MSB had begun procedures to transfer reclaimed land on Sydney Harbour assessed as suitable for use as parkland or open space to the control of local councils. The objective was to provide greater access for the general public [to] the harbour foreshores'(ibid:40).

In its 1982/83 Annual Report, the Maritime Services Board announced that the redevelopment of wharves 19-23 Pyrmont was being planned: 'As part of the redevelopment, the existing five berths will be replaced by one 300 metre long general cargo berth … The redevelopment of Pyrmont will make a significant contribution to the overall efficiency of the Port of Sydney'(Maritime Services Board of NSW, 1983:23).

Figure 5.9.14: Anon, nd, Railway yard, showing Darling Harbour, (ML Government Printing Office 2-51885; digital order no. 2_51885)

It was intended to retain water access to the victualling yards on Darling Island but to form a continuous wharf area from that canal westwards around Pyrmont Point to the wharf alignment at Harris Street. The project would have created a 300-metre long general cargo berth, a 150 metre by 50 metre single-span storage shed, and 7.6 hectares of pavement with associated drainage, services and lighting(Maritime Services Board of NSW, 1984:4).

The project required some 460,000m^3 of fill and would have eliminated Jones Bay. Fill was to be obtained as follows:

- By cutting back the cliff line to a new alignment fronting Bayview Street: 180,000m^3
- Usable material excavated from in front of the new wharf faceline: 80,000m^3
- Fill to be imported, e.g. from city building sites: 120,000m^3

The proposal acknowledged the shift to containerisation in the 1960s, by creating a huge storage area for containers behind the berths of what is now Jones Bay, Pyrmont Point and Elizabeth Macarthur Bay.

This proposed redevelopment of berths 19-25 Pyrmont was deferred during 1983/84 'pending an additional assessment of the project which is to be undertaken following the reconstruction of the Board'(Maritime Services Board of NSW, 1984:21). Within a year, the reconstructed board had outlined a strategic plan for future port needs(Maritime Services Board of NSW, 1985). The plan took a regional perspective, by developing proposals also for Botany Bay, Newcastle and Port Kembla, but nonetheless noted that: 'The Board is clearly on the right course in preparing plans to upgrade the general cargo facilities at Darling Harbour and Pyrmont'(p.iii).

A few years later, the Maritime Services Board(1986:14) acknowledged that: 'Vigorous campaigns have been waged by residents of Pyrmont … in opposition to proposed port-related developments in their area' and that 'Residents have campaigned for dedication of several parcels of port land as waterfront parks'(p.15).

Resident aspirations were opposed by a broad coalition of the Labour Council of NSW, the MSB unions, Maritime and Waterfront Unions, the Australian Chamber of Shipping and the Association of Employers of Waterside Labour(Working Party on Port of Sydney Strategic Development Needs, 1986). They wanted an expansion of the area devoted to port usage in Sydney: 'Unions see the expansion of Pyrmont as presenting the best opportunity for development within the Port'(p. 23). It was suggested that the loss of the southern Darling Harbour area to the Darling Harbour Authority should be compensated for, without cash, by the transfer of the Pyrmont Power Station to the MSB.

By 1991, berths 7-10 and 17-25 Pyrmont had been closed to shipping and 'these underutilised assets' had been returned to the community: 'The Authority has rationalised operations at Pyrmont to berths 12-16 only, for dedicated cargo and passenger use'(Maritime Services Board of NSW, 1991).

In 1993, the NSW Treasury agreed to pay $36.4 million to the MSB to compensate 'for MSB lands at Pyrmont, all of which will be incorporated into the City West development'(Maritime Services Board, 1993:12).

5.9.10 The Final Phase

'The decision to develop the north shore of Botany Bay as a second port [for Sydney] was made by the Askin government in 1969. Over the period 1945-1965 there had been significant changes in the pattern of shipping. Vessels had become larger, the amount of cargo loaded onto/discharged from vessels in port had increased, the nature of the cargo had changed, cargo was being handled in standard units(pallets) and cargo handling had changed greatly (e.g. use of forklifts) … the introduction of containerised cargo transformed the nature of land and port facility requirements and transport needs(Maritime Services Board, 1992c:2-6). The first container vessel entered Sydney harbour on 3 April 1969(Anon, 1979). 'The first [roll-on/roll-off] berth in Port Jackson was No 7 Darling Harbour [which] … was opened in August 1964 …'(Andrews, 1986:79).

Askin's decision was reviewed by the Wran government in 1976(the Simblist Inquiry) which recommended that only Stage 1 of the 1969 Development Plan be constructed. Accordingly, the bulk liquids berth opened in 1978 and the container terminals opened in 1979 … and 1982'(Maritime Services Board, 1993:9). Dry bulk handling was to be consolidated at Glebe Island. These initiatives would release 'obsolete wharfage for alternate uses – e.g. Blackwattle Bay and CSR site …[and ensure that] all of Pyrmont will be available for the City West development'(p.16). The first terminals became available at Port Botany in the late 1970s(Maritime Services Board, 1986:10): 'In 1969/70, 20% of Sydney's general cargo was containerised. By 1984/85 the proportion had grown to 70%'.

As early as 1971, a City Council assessment of Darling Harbour had proposed its redevelopment as a Bicentennial Park, an initiative taken up by the State Government under Neville Wran(Irving, 2006:71). By the mid-1970s, Darling Harbour comprised empty warehouses and seldom-used rail tracks(www.darlingharbour.com/uploads/documents/Chronological_History_of_Darling_Harbour.pdf).

The Engineering Planning Sub-Branch of the Maritime Services Board(1980), in its 'Port Jackson Future Improvement Discussion Paper No.1', whilst insisting that 'Port Jackson should be maintained as the primary port for Sydney'(3.5.4), also noted that 'Road freight movements are causing particular concern in the community at large'(3.5.3.5) and 'The natural scenic appeal and amenity of Port Jackson will continue to bring demands for improvement of public access to the foreshores and for rights to launch and operate pleasure craft in the port area generally'(3.5.3.7). In an act of bravado, the authors reflected on whether 'strong and positive action by the Board here and now could precipitate an early decision re Pyrmont Bridge[for its removal] and abandonment of any thought of using the area for an exposition[Expo '88 to celebrate the bicentenary]'(7.12.3). It was noted that City Council wished to convert the area entirely for public recreation and residential purposes: 'If a concentration of residential development takes place in the short term there is likely to be stiff opposition to any plan of the Board to improve the port area'(7.12.4).

Darling Harbour goods yard closed on 26th October 1984. Track lifting was underway by 4 November 1984 and, by January 1985, all that remained was the wrought iron frame of the wool shed(Oakes, 2001:59) The Darling Harbour recreation complex was completed in 1988, and extends over some 54 hectares(Irving, 2006:71).

The Maritime Services Board(1992b) noted: 'Pressures to accommodate regional growth have been influential in exacerbating the conflict between residential uses and the port areas, particularly around Sydney Harbour'(p.3-1). Air quality concerns were forcing port growth away from Sydney towards Wollongong and Newcastle. Increasing public access to the foreshores of Sydney Harbour has been supported by both Liberal and Labor State governments in recent years. The City West Urban Strategy cites access to the waterfront as a basic planning principle for development in Pyrmont and other foreshore areas within the strategy area'(p.3-2).

It also observed that: 'Substantial redevelopment of Pyrmont is expected to occur within the next ten years. CSR is keen to redevelop its land at Pyrmont for residential purposes as part of the City West development … The waterways around Sydney are becoming ever more popular for recreation and public transport purposes. … The potential for direct conflict between recreational boating and the port in Sydney Harbour mainly arises in Johnstons Bay and Darling Harbour … The main competitors for waterfront land at Sydney Harbour other than residential and open space are mixed commercial and tourist developments such as those proposed at Pyrmont and Walsh Bay'(pp.4-1 to 4-3).

One of the last engines to grace the rails of a Pyrmont wharf(No 13) was the Flying Scotsman on 16th October 1988. Passenger trains visited the same wharf for the last time on Monday 13th August 1990(Oakes, 2001:60). The line between Ultimo Road Signal Box and the Edwin Davey and Sons Flour Mill was closed on 5th April 1993. Special trains ran the remaining tracks through the mid 1990s(Oakes, 2001:61). By November 1996, most of the track for the light rail project had been laid along the formation of the goods line. This system opened in August 1997 and was extended from Wentworth Park to Lilyfield on 13th August 2000.

5.9.11 A different focus

The Darling Harbour Authority was established by the Wran government in 1984: 'In 1985-86, the redevelopment of Darling Harbour moved into its full-scale construction phase and the task of establishing Australia's largest urban redevelopment project was well under way'(Darling Harbour Authority, 1986). Its task was to transform a 54 hectare site at Darling Harbour, to provide Sydney 'with a whole new dimension and the heart of that new dimension is scheduled to be established, open and operating in 1988, the year of the Bicentennial'(p.10). Demolition of the former goods yard began in 1984 and reconstruction started in May 1985.

The next major initiative was the Sydney Regional Environmental Plan No.26 – City West, which applied to Pyrmont/ Ultimo, lands fronting Johnston's, White and Rozelle Bays, and the Central – Erskineville/Macdonaldtown section of the railway network(NSW Department of Planning, 1992). The Plan was publicly exhibited between December 1991 and end-February 1992. Its focus was on creating a mixed living and working environment, the development of educational establishments, to promote the use of Sydney Harbour for leisure and recreation, and to maintain the operation, concentration and rationalisation of Sydney Harbour as a commercial port.

The Maritime Services Board became the Waterways Authority on 1 July 1995, under the Ports Corporatisation and Waterways Management Act 1995. The Sydney Regional Environmental Plan(REP) No 26 City West – Bays Precinct was re-exhibited in early 1997, with an expectation of gazettal in late 1997.

<u>Sharing Sydney Harbour,</u> published in 2000, took an even broader view, being the NSW Government's <u>Vision and Regional Action Plan</u> for the whole harbour. There were four themes to the vision:

- <u>Natural harbour</u>: with a healthy, sustainable environment on land and water
- <u>Urban harbour</u>: with a high quality urban environment
- <u>Working harbour</u>: with a prosperous, working waterfront and an effective transportation corridor
- <u>People's harbour</u>: being a culturally rich, accessible, active place for people(NSW Department of Urban Affairs & Planning, 2000:19)

5.9.12 Land resumptions

Land resumptions on Pyrmont peninsula relating to the Port of Sydney were enduring, dynamic and complex. Starting in 1853, they continued at least until 1928 and, along the way, changed the eastern shoreline of Darling Harbour for ever. The information provided here has been gathered from various sources, and reflects several snapshots in time. Reality was considerably more complex, with lands being resumed, sometimes re-vested in other authorities, other times returned to private ownership. The task of describing these diverse transactions is difficult, and has been only partially achieved here. Nevertheless, the information provided in Table 5.9.5 and Figure 5.9.15 reasonably reflects the main flow of events over some 75 years.

Table 5.9.5: Major railway-related land resumptions/reclamations on Pyrmont peninsula

Period	Year	Initiative	Area resumed/reclaimed		Running total(ha)
			a.r.p	hectares	
1850s	1853	Land resumed from Ultimo Estate	14.2.0	5.9	5.9
1870s	1873	Land resumed for duplication of railway line	2.0.38	0.9	6.8
	1874	Land resumed for sidings, erection of sheds/ wharves			
	1874	Reclamation of Darling Harbour/construction of Iron Wharf	[15.2.3]	[6.3]	
	1874	Total railway system	31.0.0	12.5	12.51
Early 1880s	1881	Land resumed to Pyrmont Bay	12.3.0	5.16	
Late 1880s/ 1890s	1889	Darling Island resumed	8.1.37 3/4	3.43	
	1891	Total railway system			23.62
	1896	Land resumed between Murray St North and Darling Island	[11.3.33]	[4.84]	
1900s	1907	Land resumed between Quarry Lane and William Henry Street	[3.3.29]	[1.59]	
Early 1910s	1911/12	Land resumed between John Street and Pyrmont Point	5.3.0	[2.3]	
Late 1910s		Mostly construction of the Wardell Road Line	[22.2.15]	[9.14]	
1920s	1916/1929	Land reclaimed for extension of Darling Harbour Goods Yard	[18.2.1]	[7.49]	
Late 1920s	1928	Land resumed in Elizabeth Bay	6.0.20	2.48	
		Total railway system			**~51**

Notes

1. 'By 1891/92 the goods yard [at Darling Harbour] covered 31 acres[12.5ha] (National Trust of Australia, 1984:47)
2. (Anon, nd)

The early history of land resumption for the Darling Harbour branch line is unclear. The Chairman of a Select Committee of the Legislative Assembly, established 'To inquire into and report upon the petition of Mr. J. Harris and others, relative to the railway through the Ultimo Estate …' observed: 'It appears to your committee that, as far back as 1853, 14 $^{1}/_{2}$ acres of land were taken from the Harris family …'(SMH, 20.4.1864:5).

By 31 December 1876, the amount of land taken was reported as 15 acres 3 roods 39 perches(6.4ha)(Rae, 1877:43), rising a year later to 16 acres 2 roods and 38 perches(6.67ha)(Commissioner for Railways, 1878). This latter figure seems to have been accepted as the basis for later acquisitions.

The next major land resumptions took place in 1881, when 12 acres and 3 roods(5.15ha) of land between Macarthur Street and the southern tip of Pyrmont Bay were acquired. This acquisition made possible construction of the railway to Pyrmont Bridge by sometime in 1886/7 and to Pyrmont Bay itself in 1890.

The 1881 resumptions reflected a commitment by the Government, almost three decades after the Darling Harbour branch line was first laid, to expand the Port of Sydney westwards into Johnston's Bay. They were soon followed by the purchase of Darling Island in 1889 and those lands linking the 1881 acquisitions to Darling Island in 1896. There was thus a major expansion of the port on Pyrmont peninsula between the early 1880s and the late 1890s.

These events were consolidated through the 1910s by the resumption of lands for construction both of the Wardell Road line between Rozelle and Darling Island and of the large wharves in Jones Bay and on Pyrmont Point. The land resumptions involved in these events overlapped a prolonged infilling of Darling Harbour to about its present state between the mid 1910s and late 1920s.

The westerly extension of the Port of Sydney across Pyrmont peninsula concluded with the resumption of lands fronting the eastern shoreline of Elizabeth Macarthur Bay in 1928.

Overall, it is estimated that more than 50 hectares - or half a square kilometre – of Pyrmont peninsula was alienated for railway purposes between 1853 and 1928.

Figure 5.9.15: Major port-related land resumptions/reclamations on Pyrmont peninsula

5.9.13 Conclusions

The era of Pyrmont peninsula as part of the Port of Sydney began in 1852 and ended with the closure of Darling Harbour goods yard on 26 October 1984; it lasted more than 130 years. Slow to gain momentum, construction of the Iron Wharf as an interface between land(railways) and water(shipping) in 1874 began a change process of considerable scale and dynamism. Over the ensuing 50 years, this interface consumed the entire eastern shoreline of Pyrmont peninsula. Cancer-like, the Sydney Harbour Trust Commissioners envisioned their domain spanning the entire foreshore of Johnston's Bay to the tip of Balmain peninsula. Their intent was thwarted by technological change. From the early 1920s facilities were shifted out of Pyrmont, as the confines of the peninsula increasingly failed to satisfy emerging technological needs. A vocal community also began to challenge the prevailing orthodoxy. The terminal phase was signalled by the failure of the Maritime Services Board to instal a huge container terminal on Pyrmont Point; collapse followed quickly. Today, but few relicts remain of this truly remarkable phase in the peninsula's history.

5.9.14 Ecological considerations

A) Introduction

Construction and operation of the port facilities on Pyrmont peninsula had large and sustained ecological consequences. While the impact of the railways was primarily on the landform of the peninsula, that of the wharves was primarily on the harbour. These two major elements of the overall port are considered separately below, for their impacts on the peninsula's ecology.

B) Terrestrial impacts

Carpenter(1994), in a comprehensive consideration of the environmental impacts of railways, commented: 'Although the concept of 'environment' was not then identified, people in 1850 were already aware and writing about the noise and emissions of trains and the disruption of railway construction. Land acquisition and intrusion by railways had been a source of contention since before 1830'(pp.4/5). Although writing in a European context, Carpenter's observations doubtless applied equally to the development of rail facilities on Pyrmont peninsula.

Carpenter(1994:6/7) defined the broad-ranging economic, social, ecological and environmental impacts of railways as shown in Table 5.9.6.

Table 5.9.6: Environmental impacts of railways (based on Carpenter, 1994:6/7)

Category	Direct impacts	Secondary impacts
Economic and transport benefits/impacts	Faster, convenient rail services for passengers and freight	Effects on other transport systems
Social impacts	Jobs, housing, facilities	Equity/inequity Public perception Public participation
Noise and vibration	Disturbance at lineside and near terminals	Property values Visual impacts of noise barriers
Air and water pollution	Diesel engines Accident risks	Power stations Changes to drainage
Visual impacts	Obstruction Intrusion	Views from trains
Construction impacts	Disturbance by dust, noise and traffic	Disposal of spoil Transport of materials
Energy use and climate change	Depends on efficient use of fuels	Depends on sources of energy
Material assets	Manufacture of rolling stock and equipment	Disposal of old equipment Land reclamation
Land use in general	Land-take: in long strips of undervalued resources	Partition or severance of resources
Residential land	Property loss	Communities, roads
Commercial land	Production loss	Factory complexes
Agriculture	Production loss	Farms
Nature conservation	Loss/disturbance of habitat	Wildlife corridors
Cultural heritage	Loss of historic features	Historic units or related groups
Amenity	Land-take	Paths, golf links, playing fields, etc
Scenic landscape	Intrusion: modifications to features	Effects on distant active land-forms

Fitzgerald & Golder(1994) considered some of the social consequences of the Darling Harbour railway system – its beneficial effects on employment(p63) and industrial development(p65), loss of housing stock, especially in respect of the Wardell Line(p80), industrial accidents(p95). Visual impacts were also considerable – the obstruction of views by railway structures, the clash or blend of railway infrastructure and trains into the wider peninsula landscape, the effect of railway-associated activities on relaxation, work, play etc (Carpenter, 1994:184 et seq)

Environmental impacts of the Darling Harbour railway complex were also likely considerable. Carpenter(1994:177) listed the adverse impacts of railway-related air pollution as:

- nuisance – smell of fumes, layers of dirt, reduced visibility because of smoke
- health hazards
- damage to materials, buildings, agricultural production, land and water resources

These may have been both local and regional in extent.

Ecological impacts of the Darling Harbour railway complex would have been evident especially in the construction phase. They would have included changes to landform, disturbance to soil, issues around waste disposal, interference with ground water, destruction/degradation of habitat, release of hazardous materials and other contaminants, water pollution, winning of ballast, disposal of excess materials(especially into low-lying areas), changes to natural drainage, barriers to wildlife movement. More specifically, construction of the railway along the edge of Darling Harbour would have resulted in a considerable loss of riparian vegetation – probably wetlands as well as mangroves, attendant loss of fish breeding habitat and biologically productive areas more generally, creation of a permanent barrier for some species between terrestrial and aquatic habitats, introduction of a generally hostile element(ballast) into the ecological landscape, changes to natural systems drainage, extensive sedimentation.

Fitzgerald & Golder(1994:40) also commented: 'The railway line itself was environmentally and economically disastrous for the [Harris]estate. It was carried along the shore by cuttings and embankments which isolated roads like Fig and Quarry Street from the waterfront. The thin strip of land between the line and the water was unusable, because soil washing down from the embankments had turned it into a 'kind of slime'. Land on the other side of the railway was not much better; since the line was virtually useless[for many years] the railways department did not maintain the culverts which were supposed to drain the embankments, so that the land below them was regularly flooded. People were literally swept out of their houses in wet weather.'

These effects cumulated as the railway system was extended to the tip of the peninsula.

C) Aquatic impacts

The waterways of Darling Harbour, Johnston's Bay and Blackwattle Bay fronting Pyrmont peninsula were greatly altered as the latter was incorporated into the Port of Sydney. About half of the natural foreshore of Sydney Harbour has been replaced by seawalls(Blockley, 2007:409). Huge wharves, some more than a third of a kilometre long, were constructed into the waters of the bays, while dredging was needed to create and maintain navigable waterways. When wharves were built over seawalls the effects on biota were compounded.

Seawalls tend to greatly simplify the land-water interface and, in doing so, greatly lessen biodiversity. This need not be so, and excellent manuals are now available which advise on improving the ecological value of seawalls(e.g. Department of Environment and Climate Change, 2009). Wharves, especially if built on piles, can create habitats for biota which may not have existed – or been much more limited – before. Especially with large structures, the large areas of shade created can modify the associated biota(Blockley, 2007).

Studies on the ecological effects of dredging in Botany Bay have shown that 'species composition and total species richness altered following dredging, [although] community structure remained similar … The faunal changes which were noted in dredged areas were largely explainable in terms of alterations in sediment character and/or wave distribution following dredging'(State Pollution Control Commission, 1979:37). It was found that 'dredging has permanently altered the environment of the study area. Large areas in the study area which were previously sand are now muds or silty sands(ibid:35). It is probable that similar effects would have resulted from dredging the waters around Pyrmont peninsula.

It is likely that the waters off Pyrmont peninsula once supported large seagrass beds: 'dredging and land reclamation have altered the fish habitats [of Botany Bay] in several ways including the reduction of seagrass, shallow sand and deep sand areas and the increase of deep muddy habitat. Some species are likely to be affected negatively and others positively'(Federal Airports Corporation, 1993:6). Also in Botany Bay, seagrass beds were especially important as a nursery area for juveniles of fish and shellfish species, *Zostera*[seagrass] beds being particularly important'(ibid:6).

The cumulative impact of Sydney harbour's structures and maintenance regimes on the ecology of the waters off Pyrmont peninsula have been huge. The legacy left by this period in the peninsula's history may be so systemic that recovery will be gradual and, in many respects, impossible without human intervention.

5.10 Urban consolidation

5.10.1 Introduction

The people of Pyrmont peninsula have experienced dramatic changes of fortune over the last century, as described by the following authors:

1890s:	'In the 1890s, Pyrmont and Ultimo were thriving industrial suburbs with a combined population of 19,177'(Powerhouse Museum, 2005:3)
1891:	… by 1891 Pyrmont and Ultimo had become the most densely populated area in NSW'(Powerhouse Museum, 2005:3)
1920:	'By 1920 Ultimo-Pyrmont was fully developed but since that time there has been a steady deterioration in the industrial activities of the area'(McCauley Conran & Briger, 1983b:4)'
Late 1950s:	O'Brien(1987) noted of Pyrmont: 'The area became known as Sydney's "Sink" and it bred people to match. As late as the 1950s, it was said that if you hadn't lost all your teeth by age 13, you weren't a real Pyrmont lad'
Early 1960s:	'There could hardly be a locality in Sydney which has suffered as much as Ultimo/Pyrmont during the last twenty years. Rapid changes in transportation and goods handling technologies have caused the incursion of freeways and the redundancy of large facilities surrounding Darling Harbour. The city markets and the railway goods yard itself have been rendered obsolete and their relocation has left large tracts of derelict real estate in their wake' (McCauley Conran & Briger, 1983a:7)
Late 1960s	Developments from the late 1960s saw the wool handling industry shift from Ultimo-Pyrmont to Yennora(McCauley Conran & Briger, 1983b:3)
1960s/early 1970s:	There was a "browning effect" in Darling Harbour, Pyrmont and Ultimo … due to rusting of sheds etc(Pentecost, 1987:2)
1974:	'Due to the obsolescence of the Darling Harbour Goods Yard, the 1974 Sydney Area Transportation Study recommended the phasing out and relocation of their rail distribution functions and that the vacant Yard be sold for residential and commercial purposes' (McCauley Conran & Briger, 1983b:18)
1978:	'The prevailing atmosphere of Pyrmont was that of a forgotten decayed inner suburb'(Stapleton, 1983:2)
1980s:	'By the 1980s the area had experienced a serious decline in industrial and maritime activity as industries moved out or were superceded'(Department of Housing, 1994)
1984:	'Residential development [at Pyrmont] is currently limited to scattered pockets of old houses, some of which are dilapidated and some of which have been restored or better maintained, including a substantial Council flat at Ways Terrace'(Maritime Services Board, 1984:46)
1989:	'In early 1989, a cabinet subcommittee was appointed to oversee the preparation of the City West Urban Strategy' (NSW Department of Planning, 1990)
2004:	'In 2004, the Pyrmont-Ultimo area is a place renewed (OxleyLearning.org, 2009)

Massive changes in the employment base of the peninsula were reflected in a declining population, from some 30,000 people at the turn of the twentieth century to a low of 1586 in 1981. Almost 95% of the peninsula's population had left in just 80 years(Table 5.10.1).

Table 5.10.1: Population changes on Pyrmont peninsula

Year	Total
1890	19,000
1891	19,177
~1900	30,000
1953	5,000
1966	4,914
1971	2598
1976	2,013
1978	<2,000
1981	1,586
1986	2,631
1990	~3,200
1991	3,132
1994	3,000
1996	8,000
2001	10,949
2002	11,624
2003	12,584
2004	12,764
2005	14,000
2006	17,579
2021	26,000(est)

Sources:

City of Sydney website; CMPS&F Environmental, 1994; McCauley Conran & Briger, 1983b; Maritime Services Board, 1984; Department of Urban Affairs & Planning, 1996; The Point News, 1997; Powerhouse Museum, 2005; Turnbull, 1990:320; City Residential Monitor No. 39.

5.10.2 Revitalisation

Revitalisation of the peninsula started in the early 1980s, and has been even more startling than its decline. By 2006, there were 17,579 people living on the peninsula, approaching 60% of the peak in about 1900. This transition can be tracked through the construction of residential units on the peninsula (Table 5.10.2). In 1980/81, Meriton built the first residential buildings on the peninsula since Ways Terrace was built by City Council in 1916.

Table 5.10.2: Unit construction on Pyrmont peninsula

Figure number	Street number	Street Name	Name of apartments	Date of completion	Number of units
11	79-93	John Street			8
1	313 -333	Harris Street	Darling Harbour	1980	156
3	35-53	McKee Street	Wentworth Court	1981	28
2	2	Kelly Street	Blackwattle House	1984	13
4	61-65	Macarthur Street	Eaton Court	1986	77
12	344	Bulwara Road Hackett Street	Tivoli Gardens	1986	98
7	392	Jones Street/267-317 Bulwara Road	Burlinson Gardens	1987	188
10	1-19	Allen Street	Headingley	1988	78
5	73-85	Harris Street	Dept of Housing	1989	12
8	36-52	Mount Street	Dept of Housing	1989	23
6	528-538	Jones Street		1990	50
14	99-101	William Henry Street		1992	3
15	460-490	Jones Street/ 333 Bulwara Street	Casa Mia	1992	177
16	134-164	Bulwara Road	The Darlington	1993/96	205
17	52-54	Bay Street	Bay Street Mews	1994	13
18	318	Harris Street	Darling Court	1995	30
19	120-122	Saunders Street	Bayview Waters	1995	250
20	225-233	Pyrmont Street	Pyrmont	1995	64
21	558	Jones Street/24-50 Mary Ann Street	The Charlotte	1995	59
9	346-348	Bulwara Road	City West	1995	12
22	2-26	Wattle Crescent	Parkview Towers	1995	225
23	50-70	Murray Street	One Darling Harbour	1995	107
24	231-245	Harris Street	The Pyrmont	1995	137
25	247-261	Harris Street	Pyrmont Court	1995	98
26	320-490	Pyrmont Street	Goldsbrough Mort	1995	506
27	8-14	Ada Place		1996	16
28	9-15	Macarthur Street	Dept of Housing	1996	40
29	54-64	Macarthur Street	City West	1996	32
30	199-223	Pyrmont Street		1996	108
31	185-211	Broadway	Uni Lodge	1997	588
32	24-40	Cnr Harris & Bowman Sts		1997	68
33	223-229	Harris Street	City West	1997	61

Figure number	Street number	Street Name	Name of apartments	Date of completion	Number of units
34	120-140	Pyrmont Street	The Mirage	1997	224
35	137	Murray Street	City West	1997	14
36	17	Jones Street	City West	1997	27
37	17-21	Pyrmont Bridge Road	City West	1997	45
38	1-5	Harwood Street	Harbour's Edge	1997	96
39	1-9	Pyrmont Bridge Road	Sydney Harbourside	1998	50
40	107-109	Harris Street	The Village	1998	8
41	109-133	Point Street	The Point	1998	76
42	372-428	Wattle Street	Dalgety Square (Stage 2)	1998	98
43	149-197	Pyrmont Street	The Paragon (Stage 1)	1998	87
44	117-125	Murray Street	The Phoenix (Building No 1)	1998	41
45	127-129	Murray Street	The Phoenix (Building No 2)	1998	18
46	45-55	Harris Street	John Street Square	1999	71
47	372-428	Wattle Street	Dalgety Square (Stage 2)	1999	209
48	149-197	Pyrmont Street	The Paragon (Stage 2)	1999	87
49	1-27	Murray Street	The Gateway	1999	89
50	15	Jones Street	City West	1999	24
51	102	Miller Street	The Palladium	1999	280
52	2-10	Quarrymaster Drive	Tara	1999	66
53	82	Mary Ann Street	Powerhouse(has 38 City West units)	1999	95
119	1-27	Murray Street	The Gateway	1999	92
54	2-12	Smail Street	The Mark	2000	60
55	26	Saunders Street	The Venetian	2000	65
56	25	Kelly Street		2000	24
57	2/2B	Mill Street/ 10 Point Street		2000	6
58	29/31	Mountain Street		2000	21
59	104	Miller Street	Richmont	2000	123
60	6	Mount Street Walk	Rum Store	2000	13
61	3	Harris Street	The Elizabeth	2000	44
62	32-34	Bunn Street	Arena	2000	90
63	36-42	Refinery Drive	Regatta Wharf	2000	159

Figure number	Street number	Street Name	Name of apartments	Date of completion	Number of units
64	2-14	Bunn Street	The Sienna	2000	38
65	55-67	Jones Street/ 288-304 Wattle St	Acacia Towers	2000	98
66	2	Jones Bay Road/ 24 Point Street	Watermark Tower	2000	65
67	531-533	Harris Street	Alla Court	2000	7
120	54-66	John Street		2000	63
68	43	Murray Street 73 Pyrmont Bridge Rd		2000	9
69	13	Jones Street		2000	40
70	31-51	Refinery Drive/ 66 Bowman Street	Fleetview	2000	146
71	18-20	Allen Street	AE	2001	39
72	170	Pyrmont Street	Rodos	2001	7
73	16-30	Bunn Street	Memphis	2001	44
74	56-58	Bay Street	Q	2001	31
75	29	Refinery Drive/ 60 Bowman Street	Tablet House	2001	12
76	24	Point Street	Pavilion	2001	124
77	211-221	Harris Street	The Bauhaus	2002	138
78	25	Pirrama Street	Macarthur	2002	7
79	288-304	69-71 Jones Street/ 308-310 Wattle St/ 12 William Henry St	Acacia Gardens		301
80	6-10	Wattle Street	City West	2002	57
81	15	Pirrama Road/2-8 Point Street	The Promontory	2002	74
82	49-81	Point Street	Quay Point	2002	48
83	26	Point Street	Plaza	2002	124
84	24-32	Refinery Drive	Reflections	2002	78
85	17-29	Mount Street		2002	8
86	22	Point Street	Watermark Terrace	2002	21
87	19-27	Cadigal Avenue	McCaffrey's Hill	2003	165
88	646	Harris Street		2003	49
89	14	Quarrymaster's Drive/ 42 Saunders St	The Clifton	2003	63
90	147-159	Broadway/ 54-80 Mountain St	The Quadrant	2004	433
91	22-36	Mountain Street	Fusion	2004	83

Figure number	Street number	Street Name	Name of apartments	Date of completion	Number of units
92	513-519	Wattle Street		2004	7
93	14a	Quarrymaster Drive	City West	2004	25
94	15-27	Refinery Drive	The Escarpment	2004	20
95	24	Pyrmont Bridge Road/ 104 Pyrmont St	Pinnacle	2004	16
96	131-133	Murray Street	The Atlas	2004	12
97	1-11	Jones Street/ 45 Bowman St	The Distillery	2004	122
98	1-11	Jones Street/ 8 Distillery Drive	The Quarry	2004	92
99	4	Tambua Street	Refinery	2004	17
100	48a	Pirrama Road/ Darling Island Rd	Darling Island	2005	108
101	424-460	Harris Street	Bullecourt Place	2005	217
102	320-384	Harris Street	M Central	2005	168
103	56	Bowman Street	The Cooperage	2005	38
104	35	Bowman Street	Knox on Bowman	2006	24
105	369-385	Wattle Street/ 17-19 Macarthur St	Ultimo View	2006	58
106	84	Harris Street		2007	8
107	44-48	Wharf Crescent	Saunder's Wharf	2007	27
108	849-855	George Street	Taragon Central	2007	88
109	2-50	Bowman Street	Evolve	2008	46
110	56/56a	Pirrama Road	Sydney Wharf (Wharves 9 & 10)	2008	104
111	56	Harris Street/ 88 John St	City West	2008	81
112	54	Harris Street/135 Point St/3 Scott St	M North	2008	35
113	485-511	Wattle Street	Merchant Square	2009	145
114		Tambua Street	Stonecutters	2009	107
115	90-98	Upper Fig Street 211-219 Bulwara Rd	Greenbank	2010	35
116	6	Distillery Drive	Sugar Dock	2010	117
117		Distillery Drive	Silk	2011	NA

Sources:

Hillier, S., 2008, City of Sydney Council, pers.com.

MacMahon, B., 2001, The architecture of East Australia, Stuttgart, Edition Axel Menges.

Pell, R., 2009, Lend Lease, pers.com.

Perkins, R., 2009, City West Housing Pty Ltd, pers.com.

Sydney City Council, City Residential Monitor, Sydney, The Council(Nos. 14-39)

This information can be summarised as follows:

Table 5.10.3: Residential units completed in Pyrmont/Ultimo, by year

Year	Units completed
1981/91	655
1992	180
1993	205
1994	13
1995	1476
1996	192
1997	535
1998	378
1999	921
2000	1008
2001	257
2002	856
2003	277
2004	810
2005	493
2006	96
2007	221
2008	408
2009	252
2010	35
2011	NA

While unit construction peaked during the decade 1995/2005, over 1,000 units have been or will be built between 2006 and 2011.

Bounds et al(2000) and Bounds & Morris(2005) have interpreted this remarkable transformation of the peninsula as due to the confluence of several factors:

- A political will to encourage urban consolidation: 'In June 1978, the Civic Reform Council [of Sydney] launched its own Ultimo-Pyrmont-Haymarket plan aimed at increasing the population from 2,000 to 10,000 …'(Bounds et al, 2000:43). According to Bounds & Morris (2005): urban consolidation 'did not really begin in earnest until it was legislated for in 1987 … In the early 1990s, it received a massive capital injection from the Federal Labor government under the Building Better Cities programme - $278 million was allocated, of which a significant proportion went to Pyrmont Ultimo … The City West Development Corporation was set up in September 1992 to encourage and control the development of Pyrmont Ultimo'(pp 181/182)
- A reversal of societal attitudes to inner-city living: 'Over the last two decades … inner-city living has become highly sought after and increasingly is viewed as a more desirable location [than the suburbs]'(Bounds & Morris, 2005:181)
- A significant demographic shift from the traditional nuclear family to much greater numbers of couples without children, single-parent families, and single-person households(ibid, 2005: 183/184)

Further, high-density apartment living is viewed favourably by many Sydneysiders born overseas(ibid, 2005:184), while inner-city living is seen to provide access to better and more diverse services. Bounds & Morris(2005:185) concluded: 'The demise of heavy industries and the harbour economy in Pyrmont Ultimo cleared the way for the area to be recast by the real estate industry and the developers … A large number of Sydneysiders were looking for an exciting inner-city location near the city and harbour'.

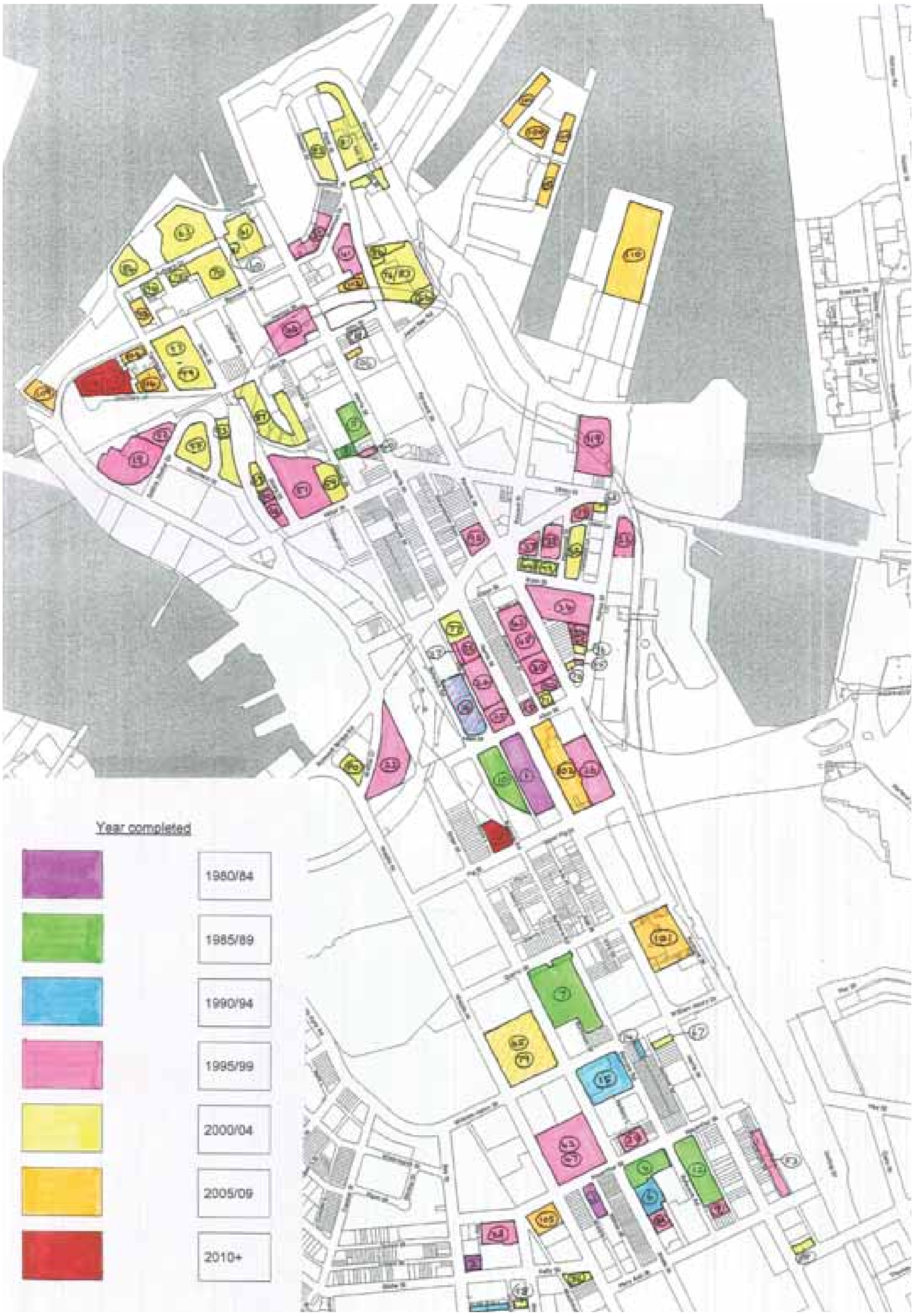
The processes underlying these remarkable transitions are also worthy of more abstract consideration. Pyrmont and Ultimo had been, since the late 19th Century, traditional working class suburbs. Employment was mostly local, in the huge railway goods yards, in the woolstores, on the wharves, and in numerous industrial concerns which peppered the two suburbs.

Technological change and growing regionalisation of industry and commerce, caused the economic reconstruction of Pyrmont peninsula, especially during the 1960s and 1970s: 'In Pyrmont Ultimo, the impact of economic restructuring was particularly intense'(Bounds & Morris, 2006:103). There was a massive loss in blue-collar jobs, accompanied by a dramatic decline in population as people sought jobs elsewhere. These changes were accentuated by the increasing desirability of suburban living.

The revitalisation of Pyrmont peninsula began in the early 1980s and gained momentum through the 1990s and into the new millennium. Active intervention by the State Government, jointly with corporate developers, the political marginalisation of anti-gentrification movements and the changing economics of inner-city investment saw the redevelopment of Pyrmont-Ultimo 'in earnest with the establishment of the Urban Development Authority the City West Development Corporation(CWDC) in October 1992 and by the end of the decade the area had become a high density and highly desired locality' (ibid, 2006:104); CWDC was a public-private partnership. This transition was supported by the growing importance of Sydney's CBD as a global financial, service, recreational and information centre.

The resultant gentrification of Pyrmont peninsula differs markedly from that of other inner Sydney suburbs – like Surry Hills, Redfern, Paddington. It was preceded by the peninsula becoming a brownfield site, marked by a massive exodus of blue-collar workers as the peninsula's economy became redundant primarily through technological change. The current population is a mix of a new middle and service class, many young people, a growing number of young families, and "empty-nesters" from outside the area(ibid, 2006:105). Accommodation has been built to attract this broad spectrum of residents, by developers like Meriton, Multiplex, Lend Lease, and the City West Affordable Housing Program – which aims 'to ensure that households with low to moderate income continue to live and work in Ultimo-Pyrmont' (NSW Department of Urban Affairs and Planning, 1996:iii). This latter 'recognised the desirability of maintaining a mix of socio-economic and ethnic groups in the area and that the area has traditionally been a source of low cost rental stock and is, and will continue to be, in close proximity to employment opportunities for low-income groups'(Bounds & Morris, 2006:106).

Figure 5.10.1: Residential units built on Pyrmont peninsula since 1980



The peninsula has also become a hub for the new telecommunication, information and education industries – with such organisations as Fox, Nokia, Ten and Seven networks, ABC, Optus@Home, Fairfax, 2SM, Quicken, News Interactive, American Express, University of Technology, Sydney Institute of Technology. Bounds & Morris(2006:107) believed that Pyrmont-Ultimo is an exemplar of 'second wave gentrification' 'in that it is an inner-city neighbourhood whose fortunes were directly tied to the restructuring of the global economy. The gentrification process was orchestrated by the local, state and federal government in collaboration with major developers as a part of an active policy of urban consolidation, the revitalisation of the inner city and the realisation of rustbelt government assets'.

This remarkable transition caused severe social dislocation in the peninsula community, described well by Fitzgerald & Golder(1994) and Hillier & Searle (1995). Waitt(2004:15) described the downstream consequences: ' … the emergence of Sydney's chic inner-city urban quarter [at Ultimo-Pyrmont] has also brought its own physical and symbolic barriers that effectively wall-out Sydney's least affluent residents from all but a passing curiosity. Pyrmont-Ultimo provides an example through which to examine the processes of social exclusion that occupy the social transformation of an inner-city precinct from urban dereliction to urban chic'.

The issue of exclusivity has been addressed in Ultimo-Pyrmont over time through the provision of affordable housing. 446 units have been provided at 12 locations over the last 25 years by City West Housing Pty Ltd(NSW Auditor General, 2008). This number will be boosted substantially with the signing of a Memorandum of Understanding between the City and NSW Government on 29 April 2008, allocating $260 million to the building of 'up to 700 new affordable, social and private housing units at Glebe-Ultimo'(Sydney Media, 2008). Clover Moore, City Lord Mayor, recognised this initiative 'as a vital component of achieving strong social cohesion, a high quality of life and a vital City's economy'(Moore, 2008). Further: 'We are aiming to develop new models of affordable housing which can be replicated around Australia. We want to ensure a healthy mix of accommodation types, not a segregated city with an increasing gulf between the haves and have-nots'(Sydney Media, 2008).

While such initiatives may be seen to address concerns of exclusivity, the problems of social integration are complex and systemic and will need to be addressed through diverse and ongoing initiatives beyond the provision of affordable housing.

5.10.3 Conclusions

Pyrmont, and to a lesser extent, Ultimo, can be seen as a huge experiment in contemporary urban living. From one perspective, it is the outcome of a highly successful public-private partnership, in the form of the City West Development Corporation. From a low of 1,586 people in 1981, the population of the two suburbs is expected to reach 20,000 by 2021; this is almost a thirteen-fold increase over 40 years. From another perspective, however, the consolidation of Pyrmont/Ultimo as executed may become a huge folly. Conceived with little environmental or ecological concern, building stock in Pyrmont especially may be ill-suited to the increasingly constrained world ahead of us. A planned and carefully structured transition of both suburbs, Pyrmont especially, in response to the challenges of global warming and ecological/environmental sustainability could become a major planning project for City Council and the two communities.

5.10.4 Ecological considerations

In an excellent and contemporary review of the environmental and ecological consequences of increasing urbanisation, Grimm et al (2008) made the following points:

- 'Within cities urbanization and suburbanization usually reduce both species richness and evenness for most biotic communities … Because the urban footprint extends far beyond municipal boundaries, urbanization may also reduce native species diversity at regional and global scales'(p. 759). Others express similar views(e.g. Troy, 1996; Paul & Meyer, 2001; McKinney, 2002). Indeed, McKinney(2008) reviewed 105 studies on the effects of urbanization on non-avian species and found that for all groups – mammals, reptiles, amphibians, invertebrates, and plants – 'species richness tends to be reduced in areas with extreme urbanization(i.e. central urban core areas)'(p 161).
- 'Urbanization also alters the species composition of communities. Within cities, biological communities are often dissimilar to surrounding communities as urban species become reshuffled into novel communities'(p. 759). In Ultimo-Pyrmont, for instance, dominant species like the Currawongs, Ravens, Noisy Miners, Rainbow Lorikeets and Australian Ibises form an unlikely avian community.
- 'At the global scale of diversity … cities are great homogenizing forces, where some "urban-adapted" species become common in cities worldwide, and a subset of native species, usually species adapted to edges, become locally and regionally abundant at the expense of indigenous species'(p. 759). Pandemic species found in Ultimo-Pyrmont include House Sparrows, Feral Pigeons, Starlings and Indian Mynahs while Magpie Larks, Magpies and Willy Wagtails are typical native edge species.
- 'In the longer term, urban environments act as a potent evolutionary force on population genetics and life-history traits of urban species'(p. 759). For example, the nesting of Rainbow Lorikeets in concrete structures around Ultimo-Pyrmont is a notable adaptation of this species to the scarcity of its traditional nesting sites in tree hollows.

These pressures on biodiversity are likely intensified by urban consolidation such as has occurred in Ultimo-Pyrmont. Favoured species can demonstrate remarkable and rapid adaptation to their changing environments in such situations.

Two human consequences of urban consolidation should be mentioned, specifically in the context of Pyrmont peninsula. Firstly, Waitt(2004) made the following observations about the rapid urban consolidation of Ultimo-Pyrmont:

- 'In place of variety, contrast and historic attachment, the commodification of inner-city lifestyles generates de-contextualization, sameness and blandness through apathy to the difference of place'(p.18). This outcome has been achieved by 'destroying a place's integrity by a repackaging process that dismissively rearranges social, environmental and historical resources into new patterns that might earn money and acceptance'(p.18).
- 'Ironically, the closeness to nature promised by viewing [water vistas] ultimately leads to the romanticized objectification of the water and a division between the viewer and the viewed. The romanticizing of 'natural' elements in bourgeois Anglo-Celtic Australia in the past has led to an understanding of nature as separate and distinctive from humans … Prioritizing water's aesthetic value over its functional uses and its definition as something natural, opposed to the city, paradoxically reinforces the boundaries between culture and nature along a binary divide'(p.35)

Waitt's insights suggest an endpoint is being reached in a gradual transition from the intense and intimate interaction of the first European settlers with the peninsula's flora and fauna to a widespread indifference and ignorance of the residual natural attributes of the peninsula. Whilst 'chic', this widening gulf between humans and their biophysical support systems leads to a dire prognosis 'for maintaining diversity and function of biological communities and their associated ecosystem services within and near cities'(Grimm et al, 2008: 759). Indeed, as societies globally urbanise, this indifference to nature assumes a planetary dimension and a heightened urgency for attention.

Secondly, the processes of urban consolidation as practised on Pyrmont peninsula generally entail:

- the removal of all soil from the site, and with it any remnants of the peninsula's native flora and fauna
- excavation of the underlying sandstone for car parking and other purposes, thus changing the peninsula's underlying form in perpetuity
- the eventual rehabilitation of the site after building, usually with imported soil
- the planting of the site usually with exotics or, less often, with native plants from elsewhere in Australia or not of local provenance

This extraordinary insensitivity of developers to place and ecology will, in time, be viewed as extreme vandalism.

An essential buffer against these processes can be provided by local government, which in conjunction with local communities can ameliorate the economic pressures for commodification. This role can be seen particularly in the creation of parks which increasingly are providing 'variety, contrast and historic attachment'. This is a vital role for local councils, but it is one which will need to encompass increasingly sophisticated ecological understandings if it is to withstand the homogenising forces of commerce.

In conclusion, the current phase of urban consolidation on Pyrmont peninsula may be seen as an endpoint in the growing divergence of humans from the natural environment of place. It flags an accelerating rupture in the inescapable reliance of humans on their biophysical environment for survival and, as such, signals an increasing vulnerability of societies to ecological collapse.

5.11 General conclusions

In the relative tranquillity of Pyrmont peninsula today, it is hard to imagine the extraordinary journey this venerable place and its occupants have made in the last 220-odd years. It started out as a fairly typical piece of Sydney sandstone bushland, but flanked by two productive estuaries, themselves headed by wetlands.

The ecological degradation of this sparkling resource began within days of European settlement at Sydney Cove and was largely complete by the early decades of the 20th Century. Perhaps the single greatest impact on the peninsula's ecology was the clearance of native vegetation for agriculture. This activity was well in hand on the Pyrmont Estate in two decades of European settlement, while the transition was much slower on the Ultimo Estate where John Harris lived as an English country gentleman, replete with deer, foxhounds, and grand social gatherings.

The ecological destructiveness of land clearance was greatly amplified and elaborated upon during the second half of the nineteenth century. Urbanisation became a significant change agent from the early 1840s, as Edward Macarthur capitalised on the value of his father's estate. Very early initiatives by John Macarthur notwithstanding, industrialisation also took hold on the peninsula in the 1840s and remained a major activity well into the 20th century. Its water, air, and solid waste pollution further degraded the peninsula's ecology.

Sandstone removal, long an activity on the peninsula, gained momentum with the arrival of Charles Saunders in Sydney in 1852 and, later aided by his son Robert, reached its apogee in the 1880s and 1890s. Land reclamation was changing the land-water interface by the 1870s, and the ecological values of this critical habitat would have been largely lost by the late 1880s/early 1890s.

The ecological degradation of urbanisation, sandstone quarrying, land reclamation and industrialisation was profoundly reinforced by the resumption of a huge swathe of eastern Pyrmont-Ultimo, to become the heartland of the Port of Sydney during the later decades of the 19th and for much of the 20th century.

The systematic destruction of ecology in favour of economy has been starkly played out on Pyrmont peninsula through the 220-odd years of European settlement. The peninsula may be an extreme example of what happens when 'progress', 'development', 'economic growth' take the box seats of society. Its sad descent into ecological oblivion should reinforce yet again the warning signals now wracking and traumatising our civilisation.

The turn-around which sustainability entails, must be systemic, and work at all levels and in all parts of a society, to succeed. Such a transformational event is unlikely, except in the most extreme circumstances, but it is well to prepare as best we can, for this moment must surely come. This is the essence of the final section of this report.

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Part 6

Flora and fauna of Pyrmont peninsula in 2008

6.1 General Introduction

Transitions on Pyrmont peninsula since 1788 have profoundly altered its ecology. It is doubtful whether any of the original land surface of the peninsula remains, except perhaps on the top of Distillery Hill. Otherwise, it is likely that the peninsula's land surface has been worked over, often several times, since European settlement.

There is, nonetheless, a relict flora and fauna which is most precious and worthy of conservation. There is also the exciting possibility of re-introducing plants and animals which once existed on the peninsula, as rehabilitation occurs.

Pyrmont and Ultimo are probably representative of the inner ring of Sydney suburbs in terms of the impact of urbanisation on their ecology. Their proximity to two major tertiary institutions favours their use for research into urban ecology and, more especially, into initiatives to improve current biodiversity.

6.2 Flora

6.2.1 Introduction

The flora of Pyrmont peninsula today is comprised of:

- a small number of species native to the peninsula which have survived the transitions since European settlement, or naturally recolonised the peninsula since
- a larger number of species which were once native to the peninsula and have been re-introduced through human agency, particularly in recent times
- an even larger number of species which have been introduced into Australia since European settlement and have since reached the peninsula

Taken together, these species have created a remarkably diverse flora, probably of the order of 250 species – or a third of the peninsula's flora at European settlement. Unfortunately, though, the introduced exotics mostly have little value to native Australian fauna, and compete with residual native plants for habitat.

The following account describes each of these three species groups. While these descriptions are incomplete, hopefully enough information is provided to reasonably apprise the reader of the current situation.

Only publicly accessible lands were surveyed to generate the information in this account. Access to privately-owned lands would likely further elaborate this account.

6.2.2 'Original' native species

A) Introduction

This section describes those species which have either survived on Pyrmont peninsula despite its many transitions, or which have re-colonised without evident human intervention. Distribution maps for these species are provided.

The information given for each mapped species has been obtained mostly from Carolin & Tindale(1994), Plantnet("The Plant Information Network System of the Botanic Gardens Trust"(http://plantnet.rbgsyd.nsw.gov.au/), or Australia's Virtual Herbarium(http://plantnet.rbgsyd.nsw.gov.au/avh.html).

Two fern species not native to Pyrmont peninsula have also been included, the Holly Fern *Cyrtomium falcatum* and the Fishbone Fern *Nephrolepis cordifolia*.

B) Species recorded

i. Skeleton Fork Fern - *Psilotum nudum*

Recorded from all mainland states of Australia, but mostly east Australia where it is rare away from coastal areas. Mostly found tufted in crevices of sandstone cliffs, sometimes epiphytic. Observed across the tip and along the eastern side of Pyrmont peninsula. Main populations are on Pyrmont Point and in John Street Square light rail station. Records further south are mostly of individual plants(except for the Hotel Ibis planter boxes, which support several plants) and are probably the result of the recent good growing season. This distribution indicates that prevailing winds on Pyrmont are mostly from the north-west.

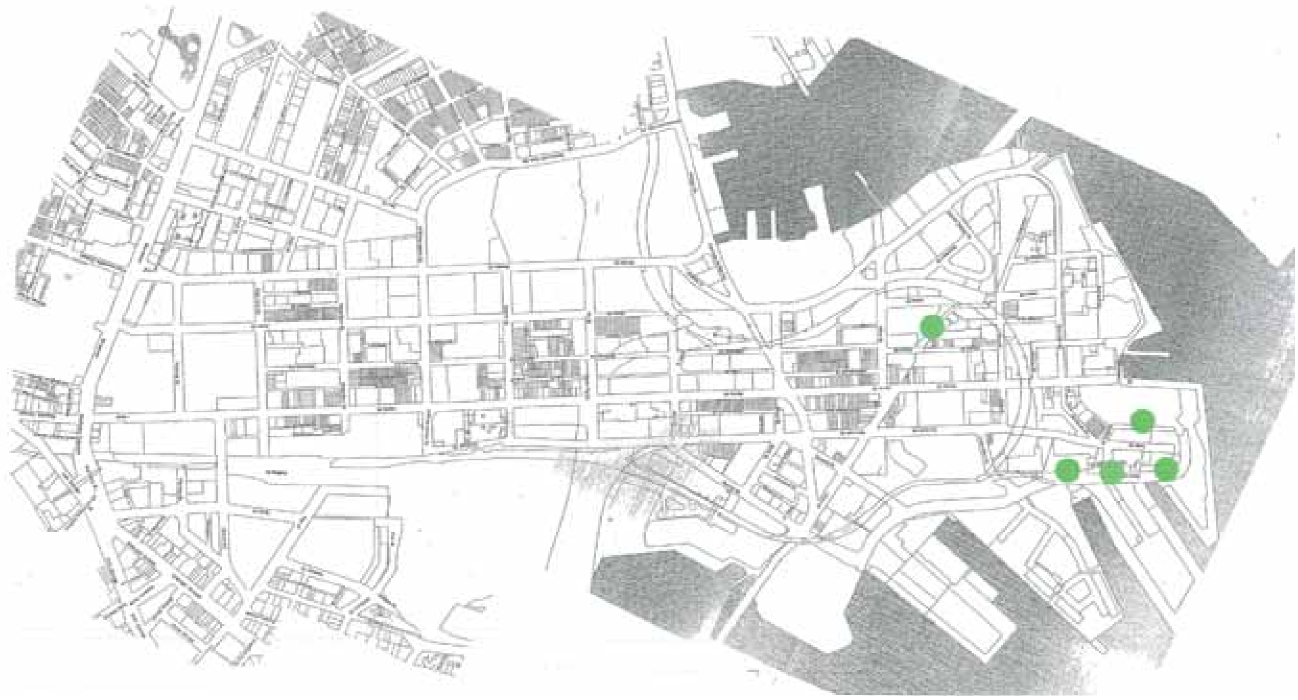
Figure 6.1: Records of Skeleton Fork Fern *Psilotum nudum* on Pyrmont peninsula

ii. Pouched Coral Fern - *Gleichenia dicarpa*

This species is widely distributed in moist places in eastern Australia, including parts of South Australia. Around Sydney is is found on sandstone cliffs, in swampy land, ti-tree scrub, rainforest margins and open forests (Carolin & Tindale, 1994:69).

On Pyrmont peninsula, this species occurs exclusively on cliff faces, particularly around Pyrmont Point but also in Jones Street Pocket Park.

Figure 6.2: Records of Pouched Coral Fern *Gleichenia dicarpa* on Pyrmont peninsula



iii. Bat's-wing Fern - *Histiopteris incisa*

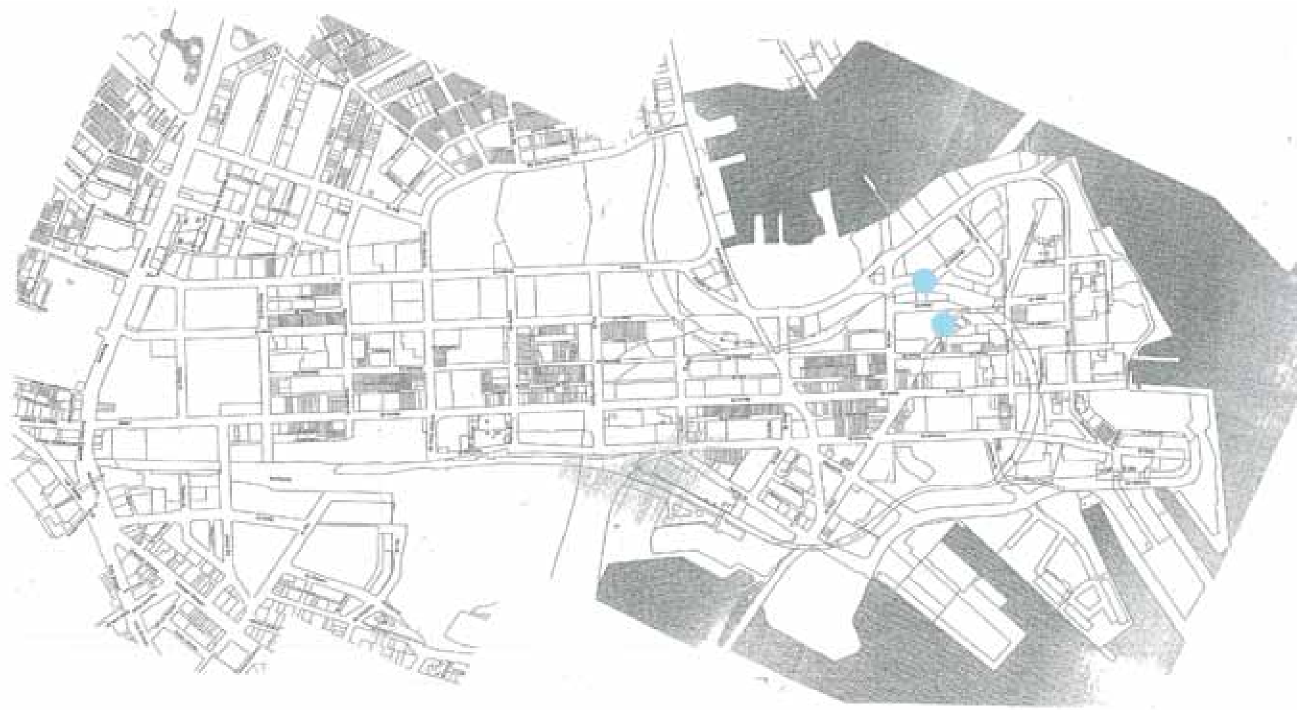
Widespread in eastern Australia, with more limited occurrence in south-western and central Australia and the Northern Territory. Prefers moist, sheltered situations. Particularly found in such locations on Pyrmont peninsula.

Figure 6.3: Records of Bat's-wing Fern *Histiopteris incisa* on Pyrmont peninsula

iv. Common Bracken - *Pteridium esculentum*

Occurs throughout eastern Australia, with outlying populations in the Northern Territory and south-western Australia. It would have been widespread on Pyrmont peninsula, but now survives only as a few small patches in central Pyrmont.

Figure 6.4: Records of Common Bracken *Pteridium esculentum* on Pyrmont peninsula

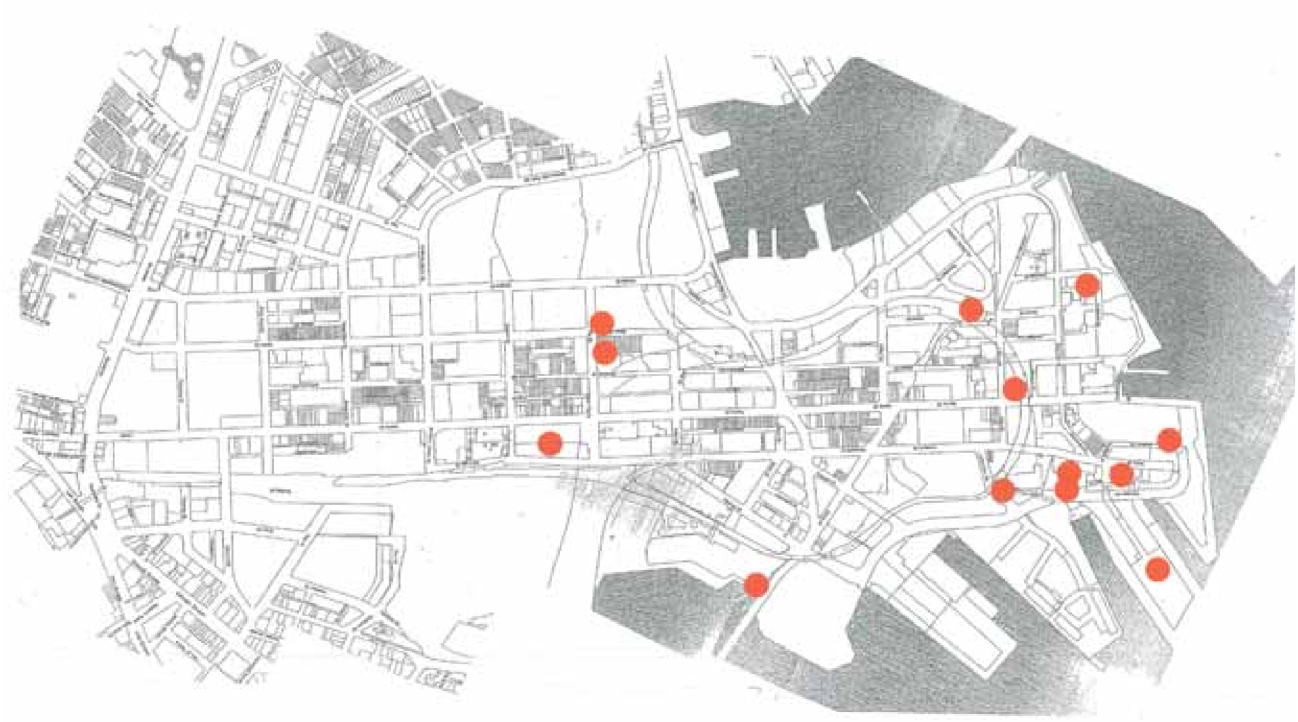


v. Maidenhair Fern - *Adiantum atroviride*

This species is closely related to the Common Maidenhair Fern *Adiantum aethiopicum*, from which it differs in details of its rhizome and leaves. *A. aethiopicum* has not been collected on the peninsula.

A. atroviride occurs in eastern Australia from Cape York to eastern Victoria, with outliers in the Northern Territory. It is well-distributed on the peninsula, favouring shady places on rock outcrops. It is thus found especially, but not exclusively, on the cliffs of Pyrmont.

Figure 6.5: Records of Maidenhair Fern *Adiantum atroviride* on Pyrmont peninsula



vi. Sickle Fern - *Pellaea falcata*

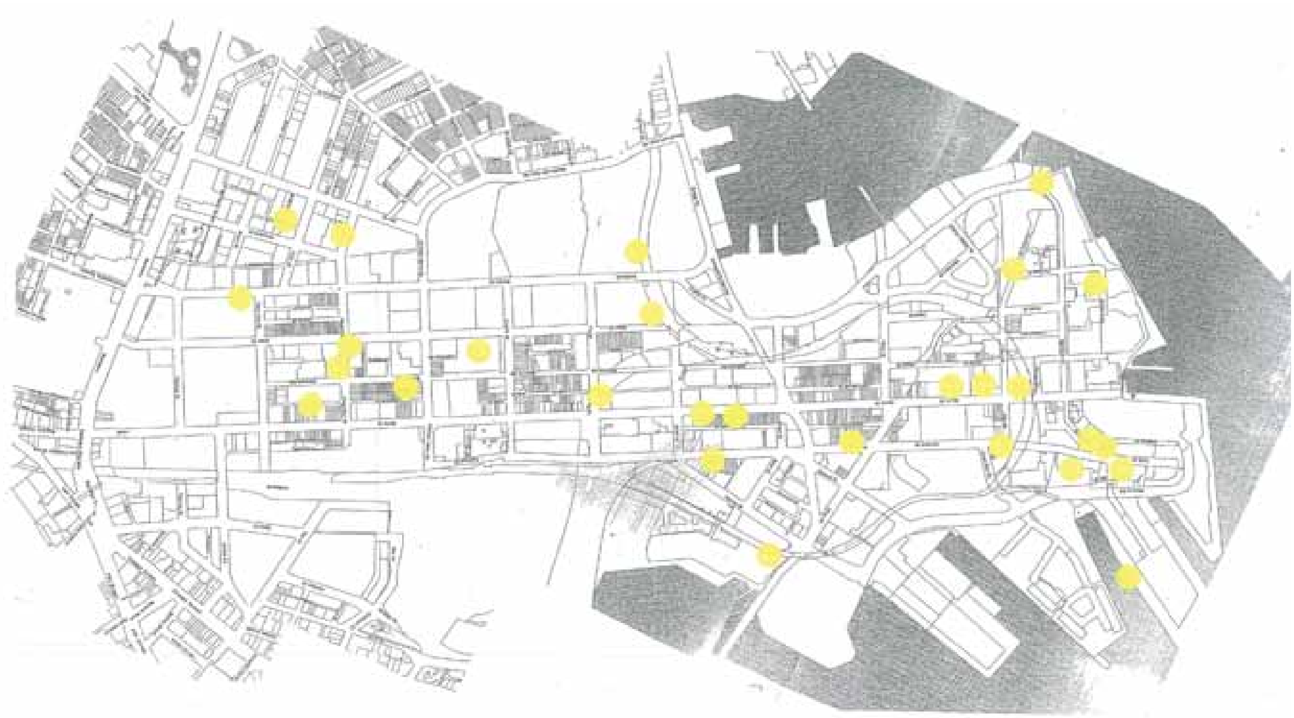
Widespread in eastern Australia from Tasmania to Cape York. This species occurs particularly on the coast and ranges in New South Wales, typically in rocky places. The commonest fern on Pyrmont peninsula, where it widely grows on brick buildings with a sandy mortar mix. It also occurs on sandstone cliffs and sometimes on the ground in moist shaded places.

Figure 6.6: Records of Sickle Fern *Pellaea falcata* on Pyrmont peninsula

vii. Fishbone Fern - *Nephrolepis cordifolia*

Occurs naturally north of the Clarence River to Cape York. Often cultivated, having escaped and become naturalised in the Sydney area. Widespread and frequent on Pyrmont peninsula, where is is the second commonest fern species and grows in various habitats from the wharves through to gardens and the sandstone cliffs.

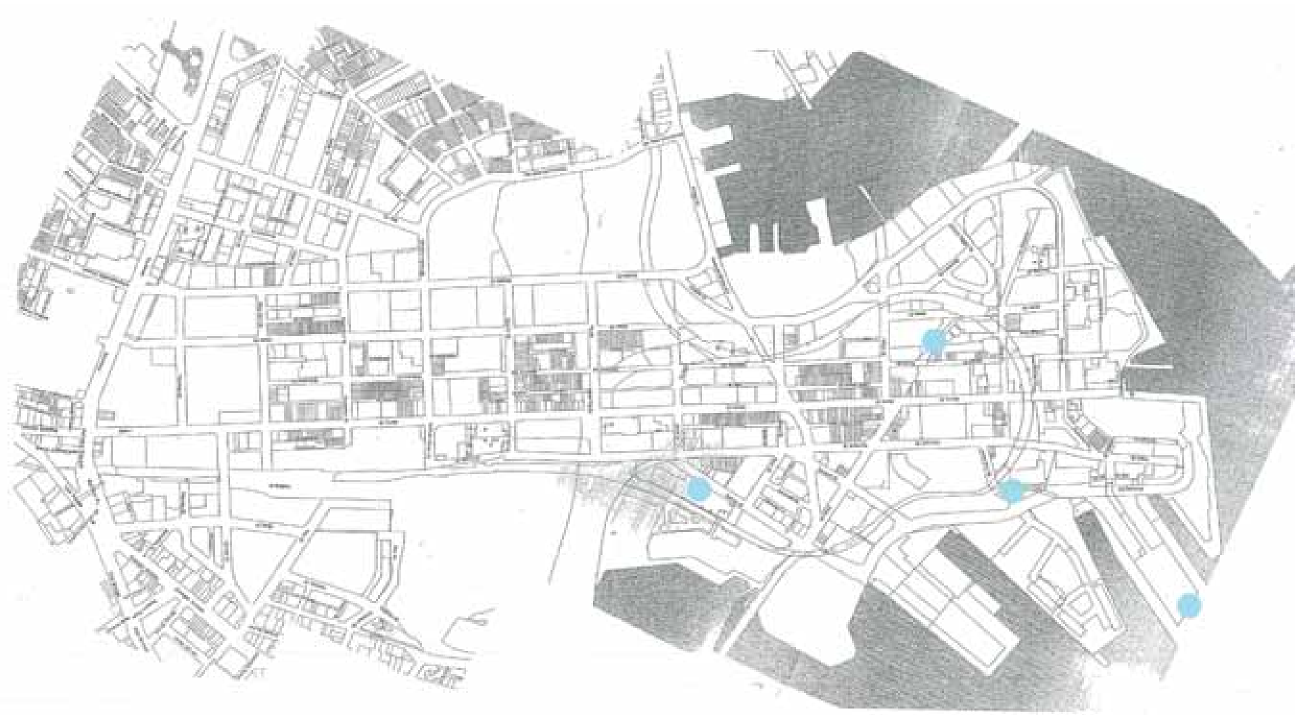
Figure 6.7: Records of Fishbone Fern *Nephrolepis cordifolia* on Pyrmont peninsula



viii. Holly Fern - *Cyrtomium falcatum*

According to Carolin & Tindale(1994:97), this species is a garden escape from coastal Sydney suburbs. It occurs mostly coastally from southern Queensland to Adelaide. It is a cultivar of a species native to Japan, Korea, and China. It is particularly common along the coastline of eastern Sydney. In Pyrmont, it is still scarce, occurring on cliffs in three locations and at the end of Jones Bay wharf. *These plants should be removed before the species becomes more widely established on the peninsula.*

Figure 6.8: Records of Holly Fern *Cyrtomium falcatum* on Pyrmont peninsula



ix. Port Jackson Fig *Ficus rubiginosa* and Moreton Bay Fig *Ficus macrophylla*

Both species have been recorded historically and currently on Pyrmont peninsula. Whether the Moreton Bay figs were native to the peninsula at European settlement is unclear. It is native to rainforest and around Sydney is found on the Illawarra escarpment and coastal plains(Fairley & Moore, 2000:62).

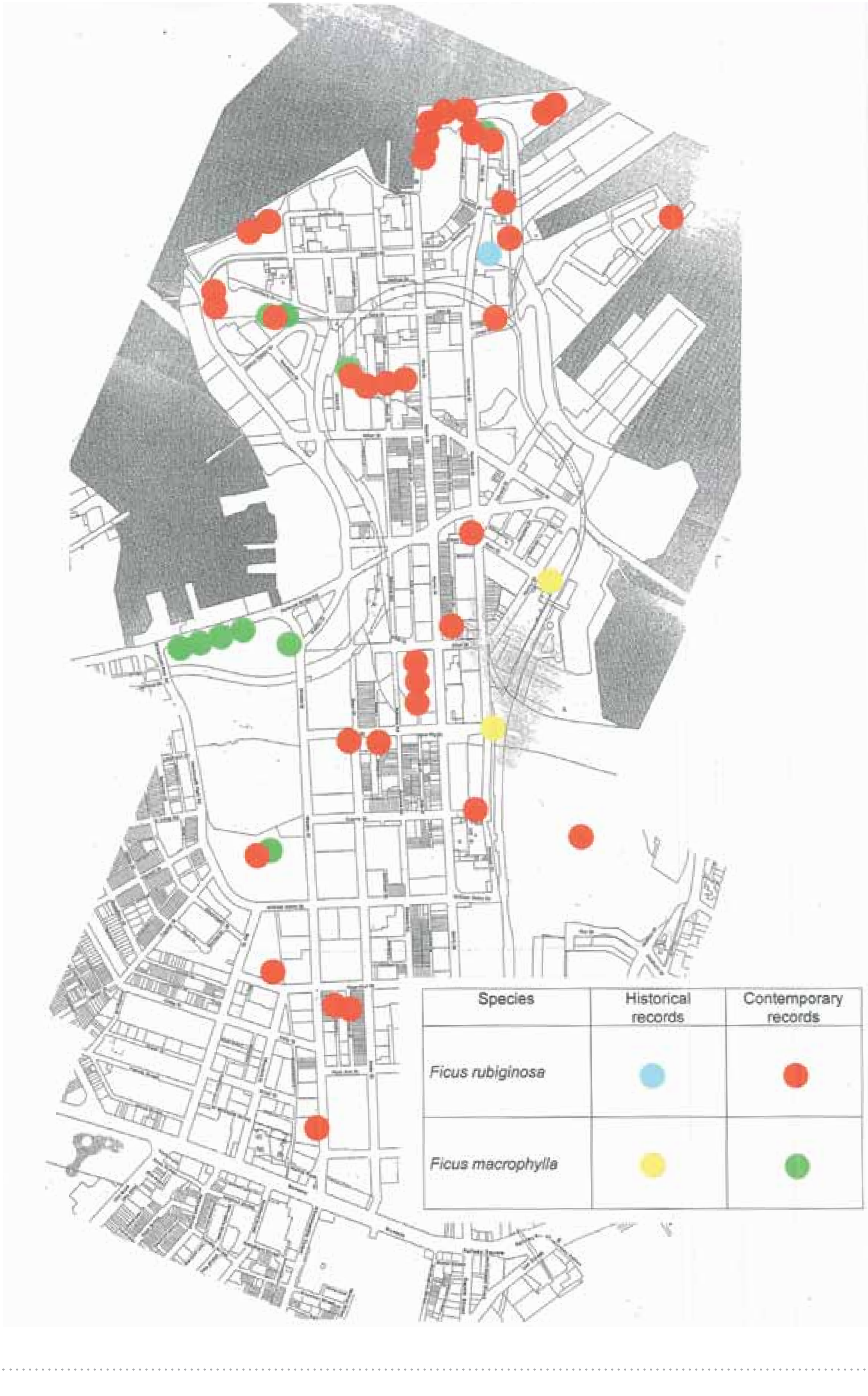
In contrast, the habitat of the Port Jackson Fig is: 'Gullies and rocky slopes, or on drier margins or rainforest'(ibid), and the species was probably widespread on Pyrmont peninsula at European settlement. Historical records of figs on the peninsula are listed in Table 6.1, while these and contemporary records are shown in Figure 6.9.

Table 6.1: Historical records of figs on Pyrmont peninsula

Year	Comment	Source
1806	'… a handsome collation ushered in the evening's festivity beneath the shelter of a spreading fig tree, whose waving foliage whispered to refreshing breezes'	Sydney Gazette, vol.4, no.197, p.2(21 December 1806
1865	'On 11 December 1865, Archbishop Polding, Sydney's first Archbishop, bought a block of the Macarthur Estate for £330. It was an attractive block, on the north-east side of the peninsula, a little down from St Bartholomew's. The ground sloped down to a sandy beach on Darling Harbour and it was liberally dotted with Port Jackson fig trees'	Matthews(1982:40)
1870	Moreton Bay Fig evident in the garden of Mrs Bunn's cottage, towards the Darling Harbour frontage	Fitzgerald & Golder(1994:41)
1870s?	Photograph shows two fig trees in the grounds of Mrs Bunn's cottage	Fitzgerald & Golder(1994:49)
19thC	'This street[Fig] terminated in a flight of steps at the Darling Harbour Good Yards, next to a landmark Moreton Bay Fig tree visible in 19thC photographs. Such trees were once common on Pyrmont peninsula'	Fitzgerald(1995:76)
1907	Photograph shows a large fig tree on Pyrmont Point, above the Pyrmont baths	Fitzgerald & Golder(1994:69)
1992	Moreton Bay Fig illustrated in turning circle at southern end of upper Mount Street	Fitzgerald & Golder (1994:120)
1994	The Port Jackson Fig is 'a species which is now so rare in Pyrmont that the odd survivors are classified as 'heritage items'	Fitzgerald & Golder(1994:13)
1995	Both the Moreton Bay Fig(*Ficus macrophylla*) and Port Jackson Fig(*Ficus rubiginosa*) nominated as street trees and plantings in Pyrmont	Department of Urban Affairs and Planning(1995)
Nd	"Where the Government Printing Works was that was a big paddock and that was where the Harris's used to live … Isn't that where Fig Street got its name – from the big fig trees in Harris's paddock?"	City West Development Corporation/Margaret Park (1997:49)

The News(Issue 27,p.3, November 2002)(ML Q919.441005/5) carried an article on the moving of 'a 100-year-old fig tree' to a new location north-west of 'The Station' at Jackson's Landing. The tree, which is still there, is a Hill's Weeping Fig *Ficus microcarpa* var. *hillii*. First described in 1891, this species is a native of north-east Queensland south to Yeppoon. It has been widely planted as a street tree in the peninsula's northern section. It is becoming naturalized, and will be a pest species in the future.

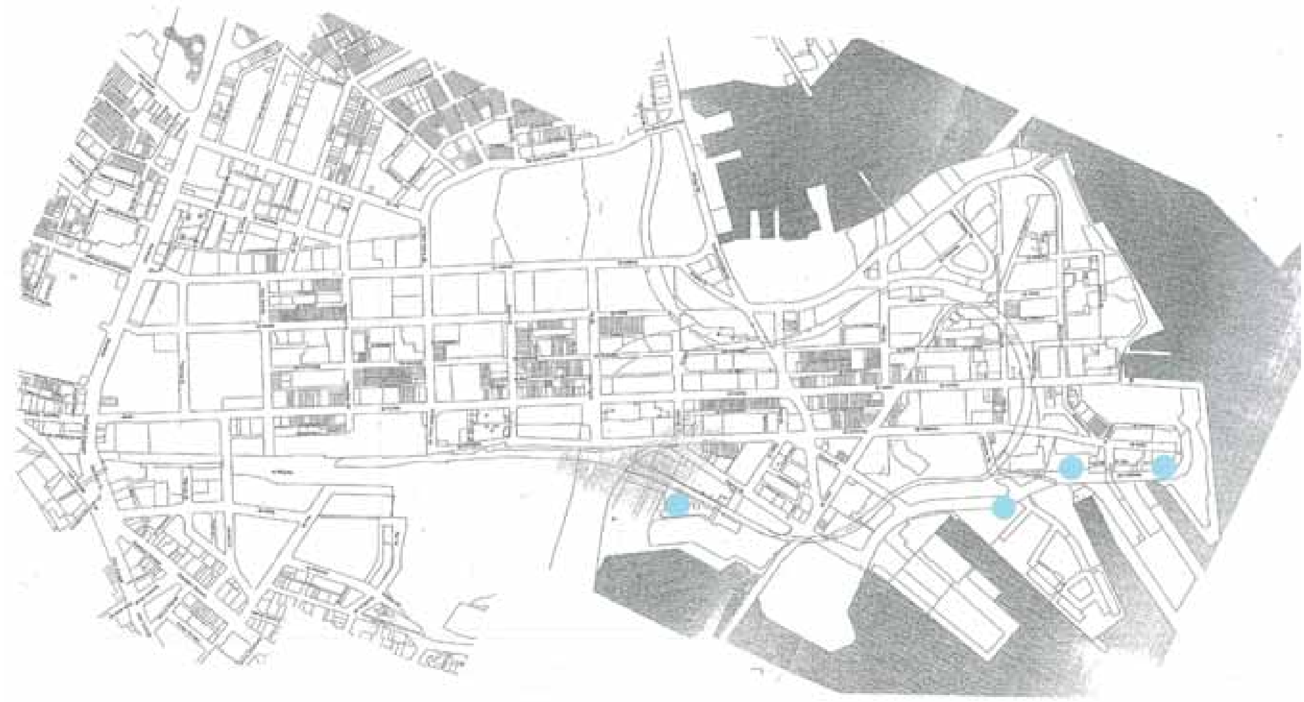
Figure 6.9: Records of native figs on Pyrmont peninsula



x. Australian Bluebell - *Wahlenbergia gracilis*

Recorded throughout most of central and eastern Australia. Widespread in many situations, chiefly on the coast, tablelands and slopes. Limited to the mowed areas on the north-eastern tip of Pyrmont peninsula.

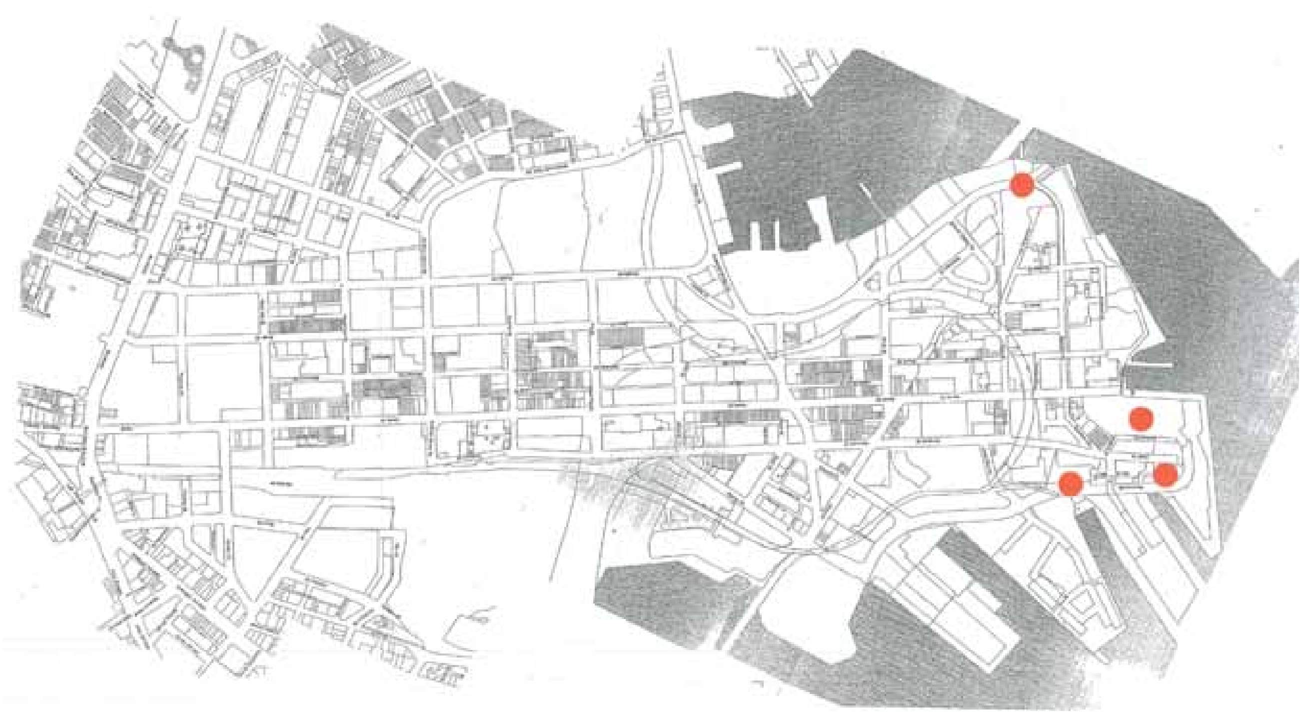
Figure 6.10: Records of Australian Bluebell *Wahlenbergia gracilis* on Pyrmont peninsula



xi. Angled Lobelia - *Lobelia alata*

A predominantly coastal species which ranges along the southern coastal zone of Australia, between south-west Australia and southern Queensland. It has a limited distribution on Pyrmont peninsula, occurring especially around Pyrmont Point but also on the cliffs facing the old Glebe Island bridge. It is found mostly on damp rock faces.

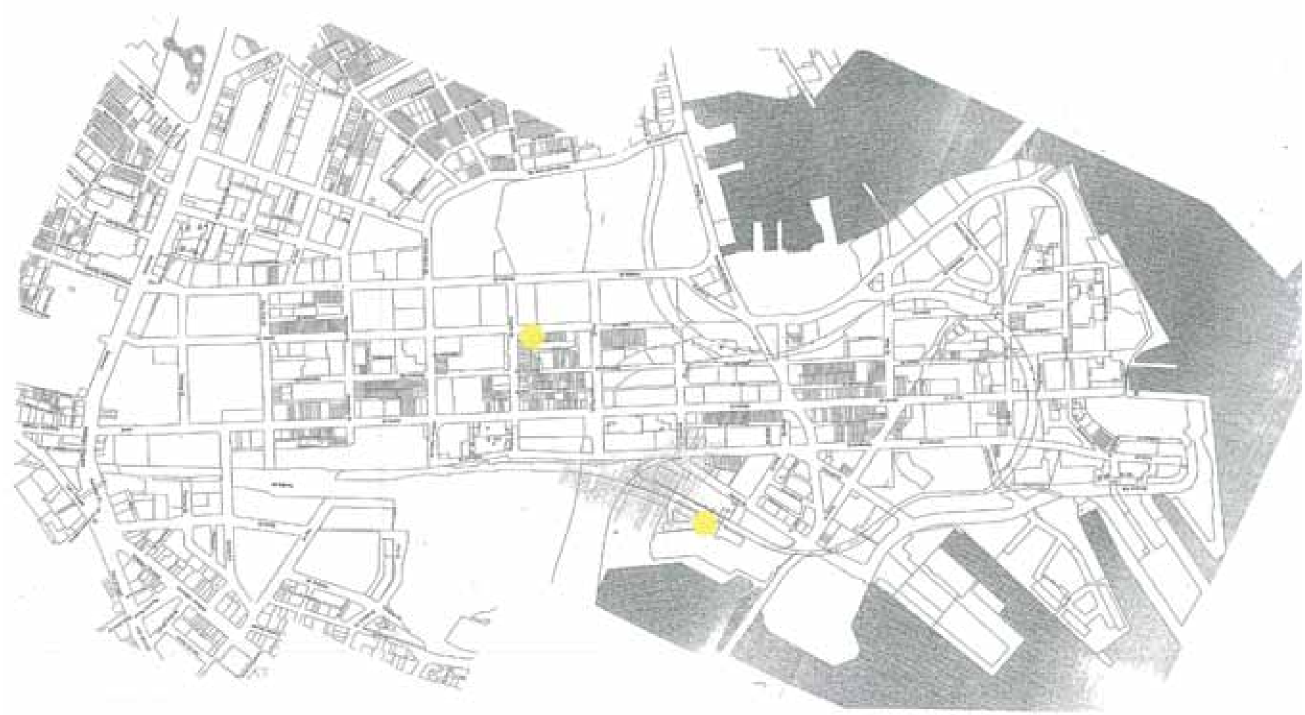
Figure 6.11: Records of Angled Lobelia *Lobelia alata* on Pyrmont peninsula



xii. Common Cotula - *Cotula australis*

This rather insignificant species grows particularly in grassy or mown locations on the peninsula. It is probably more widespread than current records suggest.

Figure 6.12: Records of Common Cotula *Cotula australis* on Pyrmont peninsula



xiii. Scurvy Weed *Commelina cyanea*

This species occurs through coastal New South Wales, more widely in Queensland, and into the Northern Territory. It is planted as an ornamental on the peninsula, and it may be that many, perhaps most or all, contemporary records are from this source.

Figure 6.13: Records of Scurvy Weed *Commelina cyanea* on Pyrmont peninsula

Additionally to the species described above, others are yet to be mapped including:

- Trim Shield-fern *Lastreopsis decomposita*
- Pittosporum *Pittosporum sp*
- *Cyperus mirus*
- Unidentified ferns: at least two fern species have been observed high on the Pyrmont cliffs, and are yet to be identified.

C) Discussion

Destruction of the original flora of Pyrmont peninsula was systematic and surprisingly thorough. Less than 20 native plant species now remain on the peninsula. Most of these are ferns, which have recolonised the cliffs created during sandstone quarrying or the construction of port facilities. Port Jackson Figs *Ficus rubiginosa* probably recolonised the peninsula from seeds carried by birds, while the Australian Bluebell *Wahlenbergia gracilis* and Common Cotula *Cotula australis* are native plants with the colonising attributes of weed species. It is unclear how Angled Lobelia *Lobelia alata* survived the multiple transitions in land use on the peninsula.

6.2.3 Re-introduced native species

A) Introduction

The re-introduced native species of one decade can easily become the remnant native plants of the next, so it is important that records of re-introductions be carefully maintained.

We are in an episode of major landcare activity in Australia today, and re-introductions of native species to areas in which they once grew are becoming significant. Table 6.2 lists those native species re-introduced to Pyrmont peninsula in recent times.

Table 6.2: Partial listing of native plants re-introduced to Pyrmont peninsula

Family	Botanical Name	Common Name
Ferns and fern allies		
Cyatheaceae	*Cyathea australis*	Rough Tree-fern
Adiantaceae	*Pellaea falcata*	Sickle Fern
Aspleniaceae	*Asplenium australasicum*	Bird's Nest Fern
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern
Cycads		
Zamiaceae	*Macrozamia communis*	Burrawang
Dicotyledons		
Apiaceae	*Actinotus helianthi*	Flannel Flower
	Platysace lanceolata	Shrubby Platysace
	Xanthosia pilosa	Woolly Xanthosia
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Cunoniaceae	*Bauera rubioides*	River Rose
	Callicoma serratifolia	Black Wattle
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea-Flower
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Ericaceae	*Epacris longiflora*	Fuchsia Heath
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
	Glochidion ferdinandi	Cheese Tree

Family	Botanical Name	Common Name
Fabaceae	*Acacia falcata*	Sickle Wattle
	A. linifolia	White Wattle
	A. myrtifolia	Red-stemmed Wattle
	A. stricta	Straight Wattle
	A. suaveolens	Sweet Wattle
	A. terminalis	Sunshine Wattle
	A. ulicifolia	Prickly Moses
	Dillwynia retorta	Eggs and Bacon
	Hardenbergia violacea	False Sarsparilla
	Kennedia rubicunda	Dusky Coral Pea
	Pultenaea linophylla	-
	P. retusa	Blunt Bush Pea
Goodeniaceae	*Scaevola albida*	Pale Fan-Flower
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Myrtaceae	*Acmena smithii*	Lilly Pilly
	Angophora costata	Sydney Red Gum
	Baeckia virgata	Twiggy Heath Myrtle
	Callistemon citrinus	Crimson Bottlebrush
	Calytrix tetragona	Common Fringe-Myrtle
	Corymbia gummifera	Red Bloodwood
	Eucalyptus haemastoma	Scribbly Gum
	E. pilularis	Blackbutt
	E. piperita	Sydney Peppermint
	Kunzea ambigua	Tick Bush
	**Leptospermum polygalifolium*	Lemon-scented Tea-tree
	L. trinervium	Slender Tea-tree
	Melaleuca nodosa	Ball Honey-myrtle
	M. quinquenervia	Broad-leaved Paperbark
	Micromyrtus ciliata	Fringed Heath-Myrtle
	Tristaniopsis laurina	Kanuka
Oleaceae	*Notelaea longifolia*	Large Mock-olive
Pittosporaceae	*Pittosporum revolutum*	Wild Yellow Jasmine

Family	Botanical Name	Common Name
Proteaceae	*Banksia ericifolia* subsp. *ericifolia*	Wadanggari
	B. integrifolia	Coast Banksia
	B. oblongifolia	Fern-leaved Banksia
	**B. serrata*	Old Man Banksia
	B. spinulosa var. *spinulosa*	Hairpin Banksia
	Grevillea sericea	Pink Spider-flower
	Hakea dactyloides	Finger Hakea
	H. sericea	Needlebush
	Isopogon anemonifolius	Broad-leaf Drumsticks
	Petrophile pulchella	Conesticks
Rubiaceae	*Pomax umbellata*	Pomax
Rutaceae	*Correa reflexa*	Native Fuchsia
	Eriostemon myoporoides	Native Daphne
	Zieria smithii	Sandfly Zieria
Sapindaceae	*Dodonaea triquetra*	Large-Leaf Hop-Bush
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell
Sterculariaceae	*Rulingia hermanniifolia*	Wrinkled Kerrawang
Thymelaeaceae	*Pimelea linifolia* subsp. *linifolia*	Slender Rice-flower
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Monocotyledons		
Arecaceae	*Livistona australis*	Daranggara
Doryanthaceae	*Doryanthes excelsa*	Gymea Lily
Juncaceae	*Juncus kraussii* subsp. *australiensis*	Sea Rush
Lomandraceae	*Lomandra longifolia*	Spiny-Headed Mat-rush
Phormiaceae	*Dianella caerulea*	Blue Flax-Lily
Poaceae	*Dichelachne crinita*	Longhair Plume-grass
	Echinopogon caespitosus	Bushy Hedgehog-grass
	Microlaena stipoides var. *stipoides*	Weeping Grass
	Themeda australis	Kangaroo Grass
Xanthorrhoeaceae	*Xanthorrhoea media*	Gulgadya

Sources of information:

E. Elenius

*Department of Urban Affairs and Planning(1999)
J. Broadbent

B) Discussion

Seventy-nine species - about 10% of the peninsula's likely flora at European settlement - have been re-introduced in the last decade or two, mostly through landcare activities but also as street and park plantings and, less often, in the grounds of private residences.

A few comments should be made on these activities:

- Landcarers are alert to the issue of local provenance. The principle is that populations of the one species change somewhat in their genetic make-up in different parts of their overall range. It is therefore preferable that specimens for planting be obtained from seed, cuttings etc collected as close to the place of planting as possible, so as to retain the genetic distinctness of local populations. The meaningful interpretation of this principle into practice is difficult, as little is known of the genetic variance in species.
- Use of closely-related species instead of the species known to have once occurred in a locality requires considerable care and research, especially if the natural ranges of the two species do not overlap. Such plantings risk hybrid speciation, in which a blurring of specific distinctions will occur.
- There is a major issue for landcarers in their ability to access stocks of those species once present at a locality, more so if local provenance is sought. There is a pressing need to bring a wider range of native plants into commercial and community nurseries. Because of the remarkable diversity of species which might once have occurred at a particular locality, it is unrealistic to expect any one nursery to retain a full range of those species. There is a case for cooperative arrangements between nurseries, such that their holdings complement each other.

6.2.4 Exotic species

A) Introduction

Some plants have a remarkable capacity to colonise rapidly over large areas. This ability has been greatly increased by the growing movement of humans and their goods globally, and by the intentional introduction of exotic species through horticulture.

When the process of human-mediated introductions of exotic plants into Australia began is unknown. Benson & Eldershaw(2007), for instance, noted that Cobbler's Pegs *Bidens pilosa* was among the plants collected by Banks and Solander at Botany Bay in 1770. Generally regarded as a native of South America, this species also occurs e.g. in New Guinea and Polynesia, and was collected by Robert Brown at Newcastle in 1804. Perhaps it was introduced to Botany Bay by voyagers before the British.

Robert Brown noted 29 introduced plant species around Sydney and Parramatta between 1802 and 1804: 'It is by no means certain that all 29 species had naturalised in 1804. They do, however, comprise the first records of the introduced flora of New South Wales, and thus of Australia' (Groves, 2002:627). Six of these species occur on Pyrmont peninsula today. Currently, 1564 taxa are believed naturalised in New South Wales(Groves, 2002:627) and 2733 species, subspecies and varieties in Australia as a whole (Lazarides et al, 1997).

Table 6.3: Partial listing of exotic plants on Pyrmont peninsula

Scientific name	Common name	Status on Pyrmont peninsula
Davalliaceae		
Nephrolepis cordifolia	Fishbone Fern	Widespread and common
Dryopteridaceae		
Cyrtomium falcatum	Holly Fern	Widely but sparsely distributed
Brassicaceae		
Brassica fruticulosa	Twiggy Turnip	Widespread and frequent
Lepidium bonariense	Argentine Pepperweed	Widespread and frequent
Caryophyllaceae		
Polycarpon tetraphyllum	Four-leaf All-seed	Darling Island
Polygonaceae		
Rumex sagittatus	Turkey Rhubarb	Widely but sparsely distributed
Persicaria capitata	Smartweed/Knotweed	Wentworth Park LR Station, cliffs facing Elizabeth Macarthur Bay
Chenopodiaceae		
Chenopodium album	Fat-hen	Darling Island
C. ambrosioides	Mexican Tea	Darling Island
Oxalidaceae		
Oxalis debilis var. *corymbosa*	Large-leaved Wood Sorrel	Present
O. corniculata	Yellow Wood Sorrel	Widespread and common
Onagraceae		
Oenothera indecora ssp. *bonariensis*	Evening Primrose	Wentworth Park LR Station
Cactaceae		
Opuntia vulgaris	Tree Pear	Rare, beside Clifftop Walk
Malvaceae		
Malva parviflora	Small-flowered Mallow	Wentworth Park LR Station
Abutilon grandifolium	Hairy Indian Mallow	Car park behind Govt. Printers
Sida rhombiifolia	Paddy’s Lucerne	Widespread but infrequent
Euphorbiaceae		
Euphorbia peplus	Petty Spurge	Widespread and frequent
Chamaesyce hirta	Asthma Plant	Widespread and frequent
Phyllanthus tenellus	Long-stalked Phyllanthus	Widespread in small patches
Ricinus communis	Castor Oil Plant	Widespread in small numbers

Scientific name	Common name	Status on Pyrmont peninsula
Fabaceae		
Acacia podalyriifolia	Queensland Silver Wattle	Planted on peninsula; native of SE Queensland and extreme north NSW, naturalised in Victoria and western slopes/coastal areas of NSW(Tame et al., 2001)
Lotus suaveolens	Hairy Bird's-foot Trefoil	Darling Island
Trifolium dubium	Yellow Suckling Clover	Pirrama Road Pocket Park
T. repens	White Clover	Widespread and common
Melilotus indicus	Hexham Scent	Wentworth Park LR Station
Medicago lupulina	Black Medic	Darling Island
M. polymorpha	Burr Medic	Widespread and common
Vicia sativa ssp. *sativa*	Common Vetch	Occurs patchily
Myrtaceae		
Lophostemon confertus	Brush Box	Widely planted as street tree, not naturalising
Platanaceae		
Platanus X acerifolia	London Plane Tree	Widely planted as street tree; naturalised in Melbourne, Swan River(W. Australia)(Groves, 1998), naturalising on Pyrmont peninsula
Ulmaceae		
Celtis occidentalis	Celtis	Widespread and common
Moraceae		
Ficus pumila	Creeping Fig	Widely planted and naturalising
F. microcarpa var. *hillii*	Hill's Weeping Fig	Occurs in NE Queensland south to Yeppoon; widely planted as a street and park tree on Pyrmont peninsula. Known to naturalise, e.g. Byron Shire
Urticaceae		
Parietaria judaica	Pellitory/Asthma Weed	Widespread and very common
Vitaceae		
Parthenocissus quinquefolia	Virginia Creeper	Occasionally planted, becoming naturalised
Sapindaceae		
Cardiospermum grandiflorum	Balloon Vine	Mount Street Car Park
Araliaceae		
Hedera helix	English Ivy	Widely planted, becoming naturalised
Apiaceae		
Ciclospermum leptophyllum	Slender Celery	Widespread and frequent
Foeniculum vulgare	Fennel	Wentworth Park LR Station

Scientific name	Common name	Status on Pyrmont peninsula
Oleaceae		
Olea europaea ssp. *cuspidata*	African Olive	Widespread, but patchily distributed
Ligustrum lucidum	Large-leaved Privet	Rare, in light-rail corridor adjoining Jones Street Pocket Park
L. sinense	Small-leaved Privet	Rare, in light-rail corridor adjoining Miller Street
Asclepiadaceae		
Araujia hortorum	Moth Plant	Widely but sparingly distributed
Asclepias curassavica	Red-head Cotton Bush	Rare, vacant block on Harris/ Bowman Streets
Gentianaceae		
Centaurium tenuifolium	Slender Centaury	Pirrama Road Pocket Park
Primulaceae		
Anagallis arvensis	Scarlet Pimpernel	Darling Island
Plantaginaceae		
Plantago lanceolata	Ribwort	Wentworth Park LR Station, Bank Street
P. major	Large Plantain	Cliffs facing Elizabeth Bay
Asteraceae		
Ageratina adenophora	Crofton Weed	Widespread and common
Conyza albida	Tall Fleabane	Widespread and common
Bidens tripartitus	Burr marigold	Convention Centre LR Station
B. pilosa	Cobbler's Pegs	Widespread and very common
B. subalternans	Beggars Ticks	Present on Darling Drive
Galinsoga parviflora	Potato Weed	Widespread in small numbers
Senecio madagascariensis	Fireweed	Pirrama Road Pocket Park
Chrysanthemoides monilifera ssp. *rotundata*	Bitou Bush	Rare, Western Distributor/ Allen Street junction
Gnaphalium coarctatum	Purple Cudweed	Darling Island
Taraxacum officinale	Dandelion	Widespread and common
Hypochaeris radicata	Catsear	Widespread and common
Sonchus oleraceus	Common Sowthistle	Widespread and common
S. asper	Prickly Sowthistle	Star City Park
Solanacaeae		
Solanum americanum	Glossy Nightshade	Widespread and common
**S. nigrum*	Black Nightshade	
Convulvulaceae		
Ipomoea indica	Blue Morning Glory	Rare, beside Mount Street steps

Scientific name	Common name	Status on Pyrmont peninsula
Scrophulariaceae		
Cymbalaria muralis	Ivy-leaved Toadflax	James Watkinson Reserve
Bignoniaceae		
Jacaranda mimosifolia	Jacaranda	Widely planted, naturalising
Verbenaceae		
Verbena rigida	Veined Verbena	Widespread but infrequent
V. litoralis var. *brasiliensis*	Coastal Verbena	Pirrama Road Pocket Park
Lantana camara	Lantana	Widespread and common, sometimes in large patches
Asparagaceae		
Protasparagus densiflorus	Asparagus "Fern"	Car park behind Govt Printers, Maybanke Centre
Alliaceae		
Allium triquetrum	Triquetrous Garlic	Widespread, but infrequent
Zingiberaceae		
Hedychium gardnerianum	Yellow Ginger	Planted as ornamental, naturalising
Cyperaceae		
Cyperus eragrostis	Umbrella Sedge	Pyrmont St Car Park
Poaceae(Gramineae)		
Bromus diandrus	Great Brome	Wentworth Park LR Station
B. catharticus	Prairie Grass	Wentworth Park LR Station/ National Maritime Museum
Vulpia myuros	Rat's Tail Fescue	Wentworth Park LR Station
Poa annua	Winter Grass	Widespread and frequent
Lolium perenne	Perennial Ryegrass	Wentworth Park LR Station
L. rigidum	Wimmera Ryegrass	Wentworth Park LR Station
Polypogon littoralis	Perennial Beardgrass	Widespread
Cortadiera selloana	Pampas Grass	Widespread and common
Ehrharta erecta	Panic Veldtgrass	Widespread and common
Eragrostis pilosa	Soft Lovegrass	Darling Island
E. mexicana	Mexican Lovegrass	National Maritime Museum
Eleusine indica	Crowsfoot Grass	Widespread but infrequent
Chloris virgata	Feathertop Rhodes Grass	Pirrama Road Pocket Park
Cynodon dactylon	Common Couch/Bermuda Grass	Widespread and common
Sporobolus africanus	Rat's tail Grass	Widespread and common
Digitaria ciliaris	Summer Grass	Widespread and common
Paspalum dilatatum	Paspalum	Widespread and frequent

Scientific name	Common name	Status on Pyrmont peninsula
P. urvillei	Vasey Grass	Pirrama Road Pocket Park
P. maximum var. *maximum*	Guinea Grass	Pirrama Road/Pyrmont Point Park
Setaria gracilis	Slender Pigeon Grass	Pirrama Road Pocket Park/ National Maritime Museum
Pennisetum clandestinum	Kikuyu Grass	Widely planted, naturalising
P. setaceum	Fountain Grass	Widely planted, widely naturalising
Cenchrus echinatus	Mossman River Grass	Pirrama Road Pocket Park
Rhynchelytrum(Melinis) repens	Natal Red Grass	Widespread and common

Sources of Information:

NB* Department of Urban Affairs and Planning(1999)

J.A. Broadbent

B) Discussion

Ninety-six exotic plant species have so far been identified from a partial survey of Pyrmont peninsula. It may be that this number will be doubled on completion of the survey, as Woollahra Municipal Council has reported 180 exotic species in its LGA(Woollahra Municipal Council, 2004:36).

6.2.5 General Conclusions

Table 6.4 provides an overview of the flora of Pyrmont peninsula in 2008.

Table 6.4: Composition of flora of Pyrmont peninsula in 2008

Category	No. species
'Original' native species	16
Re-introduced native species	79
Exotic species	96
Total	191

Over 190 plant species were recorded on Pyrmont peninsula in 2008, split more or less evenly between native and exotic species. An exhaustive survey of the peninsula's flora would, in all probability, disclose approaching 200 exotic species. Discounting re-introduced native species, more than nine in every ten plant species have been introduced to the peninsula from around the world, creating a veritable league of nations of plants on the peninsula! Even including planted native species, it is likely that every other species found today on the peninsula will be exotics. In terms of plant numbers rather than plant species, the incidence of exotic plants is very much higher.

6.3 Fauna

6.3.1 Mammals

A) Introduction

An unusual insight into the fauna, mammals especially, of Darling Harbour is provided by the Annual Reports of the Sydney Harbour Trust Commissioners between 1902 and 1919. The 'extent to which the Port is polluted' was noted in the 1902 Report, along with a note from the Engineer-in-Chief that 'Two scavenging boats were employed constantly removing dead animals and other offensive matter from the foreshores [of Darling Harbour]'(p.16). The collected animals were identified and taken to Goat Island 'to be burnt there …'(p.5).

Table 6.5 lists species presumed to be native, although 'Ducks' and 'Parrots' could include exotic species. The mammals were all collected in the first decade of scavenging. Whether 1910 represented the exhaustion of populations of medium/large mammals around the harbour, or whether it was no longer fashionable – or legal – to keep native animals is not known.

Table 6.5: Mostly native animals scavenged annually from Darling Harbour, 1902-1919(Annual Reports of the Sydney Harbour Trust Commissioners)

Year	Porcupine[1]	Native Cat[2]	Native Bear[3]	Opossum[4]	Squirrel[5]	Kangaroos	Wallabies	Flying foxes	Seal	Porpoise	Emu	Ducks	Albatrosses	Parrots	Sunfishes	Sharks	Stingrays	Eels	Lobsters	Snakes
1902+	0	0	0	0	0	3	0	3	0	0	0	0	0	25	0	2	0	0	0	0
1903	1	0	1	0	2	0	3	0	0	0	0	29	0	0	0	3	9	5	20	1
1904	0	0	0	0	0	0	8	0	0	0	0	0	0	9	0	1	3	5	0	0
1905	0	0	0	0	0	0	9	0	0	0	0	0	1	0	0	0	0	176	0	0
1906	0	0	1	1	0	0	1	0	1	0	1	0	0	14	1	0	0	0	0	0
1907	0	0	0	0	0	0	2	0	0	0	0	54	2	0	0	0	1	0	0	0
1908	0	0	0	0	0	0	1	0	0	1	0	54	1	0	1	0	0	0	0	1
1909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1910	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1911/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1918	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1919	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0

+ For period 31.12.01 to 30.6.02

1. Echidna
2. Quoll
3. Koala
4. Probably the Squirrel Glider *Petaurus norfolcensis*
5. Possibly the Greater Glider *Petauroides volans*

Table 6.6 lists species exotic to Australia, having been introduced to this continent mostly since European settlement. Commenting on the 1903 listing of animals collected by the scavenging boats, the Engineer –in-Chief noted: 'A glance at the list will show that a large percentage of the animals picked up must have been deliberately thrown into the water, many of them probably pets which have died on vessels at the various berths'(Sydney Harbour Trust Commissioners, 1903).

Table 6.6: Species exotic to Australia scavenged annually from Darling Harbour, 1902-1919(Annual Reports of the Sydney Harbour Trust Commissioners)

Year	Bulls, bullocks Cows, horses	Calfs	Pigs	Sheep	Goats	Monkeys	Dogs	Cats	Hares	Rabbits/Hares	Rats	Fowls
1902+	1	9	14	23	9	0	1260	1068	5	1620°	2524	1467
1903	0	26	59	45	33	0	2180	1169	127	733°	4056	1971
1904	1	13	29	20	9	1	2189	1034	7	200°	3517	1652
1905	0	10	33	11	13	0	1968	863	6	189°	3483	1100
1906	1	23	46	2	8	0	1744	938	35	366°	3653	1231
1907	0	7	40	7	4	2	1865	959	0	68	2873	1125
1908	0	3	30	19	9	1	1933	1004	0	153	2669	1426
1909	0	5	36	20	6	0	2074	779	0	86	2715	1284
1910	0	6	40	18	6	0	2098	812	0	20°	2241	1313
1913	3	12	39	21	1	0	653	691	0	10	2454	621
1914	1	7	31	24	6	0	682	592	0	3	3601	584
1915	0	7	17	10	0	0	748	517	0	0	2344	720
1916	0	0	9	16	3	0	936	682		0	3716	716
1917	2	1	11	9	1	0	732	453		0	2603	552
1918	1	0	9	9	0	1	709	415		4	2584*	380
1919	2	1	15	7	0	0	666	411		26°	3626	398

+ For period 31.12.01 to 30.6.02

- Rodents
- Rabbits only

Of particular interest here are the large numbers of dogs, cats, and rats. The dogs and cats were likely unwanted pets of the local populace, for whom the harbour was a convenient dumping place. One might suppose that much of Pyrmont peninsula at this time, at least, would have been hunted for food by these predators, and that any populations of native fauna on the peninsula at that time would have been much diminished by such predatory pressures – possibly sometimes to extinction.

Figure 6.14: Pile of rats *in* Views taken during cleansing operations in inner Sydney, 1900, Vol. 5
(Ml PXE 94/265: Digital order no. a147265)

Figure 6.14 shows a heap of about 600 rats, photographed in 1900 during the cleansing operations in inner Sydney following an outbreak of the bubonic plague in The Rocks. They are mostly Norway or Brown Rats *Rattus norvegicus,* a species believed to have originated from south-eastern Siberia and northern China, but now cosmopolitan in distribution. A solitary Water Rat *Hydromys chrysogaster*, with a large white tip to its tail, lies just above the rule. Brown Rats are successful predators of small mammals and birds(Watts 1995).

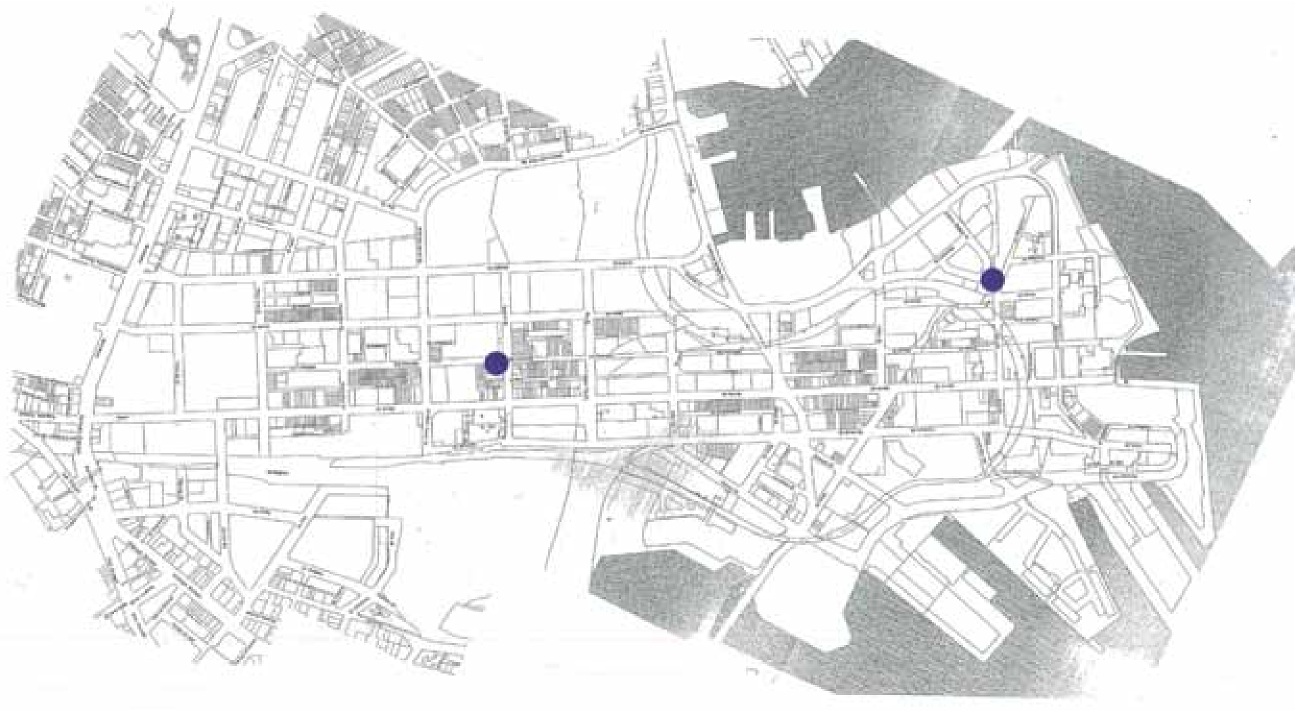
B) Species recorded

No trapping of small mammals was done. The following accounts are of species known through observation to be present on Pyrmont peninsula.

i. Common Brushtail Possum *Trichosurus vulpecula*

A long-term resident advised that this species once occurred around Bulwara Road, between Pyrmont Bridge Road and Miller Street, before urban consolidation took hold. Scats seen several times near the Quarry Street/Bulwara Road intersection suggest that the species still occurs in this part of the peninsula. An adult carrying young was seen in Quarrymaster Drive on 24 November 2009(D. Morrow, pers.com).

Figure 6.15: Records for Common Brushtail Possum *Trichosurus vulpecula* on Pyrmont peninsula



ii. Grey-headed Flying Fox *Pteropus poliocephalus*

Fruit bats or flying foxes are regular nocturnal visitors to fruiting figs or flowering eucalypts and paperbarks on Pyrmont peninsula. They come from the Royal Botanic Gardens, where their numbers vary between 5,000 and 30,000 at any one time(Wilson, 2008). Just over 13,000 fruit bats were believed present in the Botanic Gardens in early April 2008. Among these there were about 100 Black Flying-foxes *Pteropus alecto*, small numbers of which may also visit Pyrmont peninsula. Studies by Spencer et al.(1999) have shown that Sydney bats fly up to 17km each night to feeding sites.

iii. Water Rat *Hydromys chrysogaster*

The status of the Water Rat on Pyrmont peninsula is uncertain. The Australian Museum has a record of this species being collected on 1 June 1886 in "Pyrmont"(S. Ingleby, pers.com. to P. Geraghty, November 2006). Water Rats have been sighted at Ballast Point in recent times(Environmental Resources Management, 2003). Dr. Peter Banks has recorded the species widely but sparingly through Sydney, including several sites on Sydney Harbour and the Parramatta River(Donnelly & Maitland, n.d.). It is possible, but unlikely, that the species still occurs on Pyrmont peninsula.

iv. Black Rat *Rattus rattus*

This species originally inhabited only the Orient(probably Indo-Malayan region, and extending to southern China)(Long, 2003:189), but is now cosmopolitan. Long(2003:191) believed that Black Rats were probably introduced to western Australia by Dutch explorers in the early 17th Century. He considered, however, that they may not have become permanent until European settlements were established in the 1780s. Today, they occur on the coastal fringe around Australia, and in Tasmania. Biosphere Environmental Consultants(2001:23) noted that the Black Rat and House Mouse are now the dominant terrestrial mammals of North Sydney bushland reserves. They would likely occur on Pyrmont peninsula, although Brown Rats are much more evident to the casual observer.

v. Brown Rat *Rattus norvegicus*

Unlike the Black Rat, Brown Rats are 'mainly found near wharves and heavily developed coastal areas'(Long, 2003:185). They are very evident in photographs of rats caught during the bubonic plague in Sydney. They have also been observed several times, dead and alive, on Pyrmont peninsula. The available evidence suggests that they are widespread and numerous.

vi. House Mouse *Mus musculus*

Believed to have originated 'from an area near Iran and the USSR border in central Asia'(Long, 2003:202), but now cosmopolitan. Again, according to Long: 'Probably arriving with the First Fleet in 1788, if not before on Macassan ships, mice now occur Australia-wide …'(p.204). A dead individual was noted on Pyrmont Street at the back of the former Government Printers on 3 April 2008, but this species is likely widespread on Pyrmont peninsula.

vii. Red Fox *Vulpes vulpes*

A cosmopolitan species which occurs in Eurasia, North Africa and North America(Long, 2003:239). According to Long: 'Individual foxes were imported by hunt clubs in the first half of the nineteenth century for recreational hunting, but were unsuccessful… Newspaper accounts indicate that foxes were introduced as early as 1855 and that it is likely the first successful releases occurred in southern Victoria in 1871'. Foxes reached New South Wales by the 1890s. They may thus have resided on Pyrmont peninsula for a century or more.

Sightings and fox musk are mostly from the northern section of the peninsula (Tambua Street, Waterfront Park, Quarry Master Drive, lower Harris Street), and down the eastern side(Welcome Wall, Convention Centre). These observations suggest that one or more foxes may be resident on Distillery Hill or in the nearby railway easement.

viii. Feral Cat *Felis catus*

According to Long(2003:316): 'Cats have been in Australia since the earliest settlements by Europeans and may possibly have arrived with Dutch shipwrecks in the seventeenth century … They are now found throughout the mainland and on many offshore islands'.

Feral cats occur widely on Pyrmont peninsula, most especially along the light-rail easement and(at one time) around the former Terminus Hotel in Harris Street. Their effective management will be important to the survival of several native bird and reptile species on Pyrmont peninsula.

C) Conclusions

While the observations of the scavenging boats on Darling Harbour cannot be safely interpreted over a century later, it may be that large/medium-sized mammals mostly disappeared from the environs of Sydney early in the 20th century. Today two native mammals frequent Pyrmont peninsula with certainty, the Grey-headed Flying Fox and the Common Brushtail Possum. It is just possible, but improbable, that small numbers of Water Rats *Hydromys chrysogaster* remain on the peninsula.. The flying foxes are nocturnal visitors, feeding on the fig trees scattered across the place. They will be among the beneficiaries of recent plantings of figs, particularly in the new parks.

Otherwise the peninsula is home to large populations of introduced mammals – the Brown Rat especially. A small population of feral cats also exists, presumably derived from stray or discarded domestic animals.

6.3.2 Birds

A) Introduction

A survey of bird distribution on Pyrmont peninsula was started in December 2005. Fourteen zones were delineated between William Henry Street and Pyrmont Point, based on land-use considerations. Each zone was thoroughly walked at about monthly intervals and, at this stage of the project, qualitative estimates(e.g. common, frequent, rare) were made for the presence of each species observed. The walk-throughs were limited to publicly accessible lands, so that birds on privately-owned lands may have been missed.

From March 2006, the surveys were quantitative, the numbers of individuals of each species observed in each zone being recorded. These more-or-less monthly counts were concluded in February 2007, by which time ten sets of census data had been collected.

B) Species recorded

A detailed analysis of the results from the above-mentioned study will be given elsewhere. Table 6.7 contains summary statements for each species so far observed on the peninsula, based on the survey data. For a few species, records were taken from the literature or contributed by other observers, in which case acknowledgment is given.

Table 6.7: Bird species recorded on Pyrmont peninsula

Species	Status on Pyrmont peninsula
Australian Wood Duck *Chenonetta jubata*	Rare: Two Wood Ducks frequented the lake adjoining Tumbalong Park in Darling Harbour for most of 2006. Only one bird was observed in October/ November 2006, but had disappeared by the December count. The species has been seen(3.4.2008) on Darling Island, and occurs elsewhere around Sydney Harbour(e.g. the Botanical Gardens).
Pacific Black Duck *Anas superciliosa*	Uncommon: The main population of this species resides on the lakes adjoining Tumbalong Park and in the Chinese Gardens, with numbers ranging between 3-17 individuals. Periodically during the survey, 1-2 birds were seen off Pyrmont Point, especially around Jones Bay Wharf.
Chestnut Teal *Anas castanea*	Uncommon: 1-6 individuals were periodically observed between the Fish Markets and Jones Bay Wharf.
Tahiti Petrel *Pseudobulweria rostrata*	Vagrant: 'A sick Tahiti Petrel found swimming in Sydney's Darling Harbour … was probably cast off a containership on arrival'(Anon, 1998:8).
Darter *Anhinga melanogaster*	Vagrant: One observed on pile off tip of Darling Island in autumn 2006.
Great Cormorant *Phalacrocorax carbo*	Uncommon: Typically 1-2 individuals, but up to 6 once, observed off Pyrmont peninsula between Darling Harbour and the Fish Markets.
Little Black Cormorant *Phalacrocorax sulcirostris*	Uncommon: Up to 3 individuals of this species were seen periodically between Darling Harbour and the Fish Markets.
Pied Cormorant *Phalacrocorax varius*	Uncommon: 1-4 birds periodically seen off Pyrmont peninsula especially around Pyrmont Point and in Blackwattle Bay.
Little Pied Cormorant *Phalacrocorax melanoleucos*	Uncommon: 1-5 individuals periodically observed off Pyrmont Point and, less frequently, in Blackwattle Bay.
Australian Pelican *Pelecanus conspicillatus*	Uncommon: This species was recorded only from the Fish Markets and nearby. It might not visit Pyrmont peninsula if current practices at the markets change.

Species	Status on Pyrmont peninsula
White-faced Heron *Egretta novaehollandiae*	Uncommon: Seldom seen around Pyrmont peninsula. Usually a single bird or, less often, a pair. There is little suitable habitat for this species on Pyrmont peninsula, although it is found elsewhere on the shores of Sydney harbour.
Striated Heron *Butorides striatus*	Vagrant: An immature bird was seen along the foreshore of Waterfront Park on 17 June 2006. There is no suitable habitat for this species on the peninsula.
Australian White Ibis *Threskiornis molucca*	Common: Prior to the late 1970s, this species did not breed in the Sydney region. Its urbanisation has been phenomenal, with a count of 6300 birds in the Sydney region in November 2003. On the peninsula, the species is concentrated mainly at its breeding site in Darling Harbour, where at least 200 birds may occur. A subsidiary roost had formed in Wentworth Park by late March 2006, with a count of up to 83 birds in the park in mid-February 2007. Another roost and breeding site is located in palms and nearby trees along the Harris Street frontage of Sydney Institute of Technology. Individuals also occurred regularly at the Sydney Fish Markets, where 64 birds were recorded on 3 July 2006.
Nankeen Kestrel *Falco cenchroides*	Rare: Kestrels were seen on Pyrmont peninsula twice during the survey, on 27 March 2006 at the Bank Street Park site and on 25 April 2006 in Wentworth Park. These dates accord with comments by Le Souëf & Macpherson(1920) that the species is 'often in evidence over the city in autumn, but it usually does not stay long'.
Peregrine Falcon *Falco peregrinus*	Vagrant: An immature bird was seen on a crane during construction of the American Express building in Union Street, Pyrmont, on 21 December 2005.
Masked Lapwing *Vanellus miles*	Uncommon: This species is probably heard more often than seen. It usually occurs singly or in pairs, seldom in family groups. The clustering of observations around Wentworth Park and the north-west and north-east tips of the peninsula respectively suggest there could be 3 breeding pairs on the peninsula. The birds tend to nest on the gravelled roofs of some buildings but, sadly, the chicks often plunge to their death before learning to fly.
Silver Gull *Larus novaehollandiae*	Abundant: The largest breeding colony of this species near Sydney is off Wollongong, and many birds commute daily to Sydney. Smith & Carlile (1992) described a satellite breeding colony on barges and pylons in Rozelle Bay; these have since been removed. The authors also noted that: 'Roosting flocks more variable in size, with up to 10,000 birds recorded at roosts on containers and wharves at Port Botany and Pyrmont wharf'(p.35). In the present survey, most gulls were recorded around Darling Harbour/Cockle Bay, with counts of over 300 birds at times. Sydney Fish Markets were frequented by up to 130 gulls, and adjoining Wentworth Park once hosted over 200 gulls. Silver Gulls also frequent the waterfront between Darling Harbour and Blackwattle Bay. They occur only in low numbers in the settled parts of the peninsula.
Spotted Turtle Dove *Streptopelia chinensis*	Frequent: This introduced species is widely but sparingly distributed over the peninsula, with an overall count mostly between 40-66 individuals. Counting was probably biased because individuals congregated around a house in Bulwara Road, Ultimo(presumably to be fed), with up to 47 individuals once counted there!
Feral Pigeon *Columba livia*	Common: This species was observed all over the peninsula, with cumulative totals sometimes exceeding 250 individuals. Concentrations were noted in Darling Harbour and Wentworth Park, and in those parts of Pyrmont and Ultimo with older buildings.

Species	Status on Pyrmont peninsula
Crested Pigeon *Ocyphaps lophotes*	Uncommon: Flocks of up to 13 individuals were noted during the survey, their preferred locality being Wentworth Park. The species also occurred, mostly as individuals, sporadically at four other sites.
Superb Fruit-dove *Ptilinopus superbus*	Vagrant: An immature bird was photographed by Charles Perry at 66 Bowman Street, Pyrmont on 31 April 2007, having hit a window.
Little Corella *Cacatua sanguinea*	Uncommon: Small flocks of this species are sometimes heard flying over the peninsula.
Sulphur-crested Cockatoo *Cacatua galerita*	Uncommon: Individuals periodically visit the peninsula, usually with great fanfare!
Rainbow Lorikeet *Trichoglossus haematodus*	Common: While overall counts of this species only once exceeded 90 birds, the argumentative nature, restlessness, and screeches of this species seemingly magnify its presence. Although recorded throughout the survey area, concentrations were found in Darling Harbour and parts of Ultimo and Pyrmont with older buildings. This pattern of distribution probably reflects the availability of native food plants. The species breeds widely on the peninsula but, with a dearth of tree hollows, it appears to be nesting in artificial structures. Immature birds are sometimes creched in shrubs with dense foliage.
Common Koel *Eudynamys scolopacea*	Uncommon: This species arrives on the peninsula from mid-October. It is usually seen singly or in pairs, and was recorded from about half the survey area. It parasitises other birds, including miners, wattlebirds, figbirds and magpie-larks. Probably only 5 pairs visit the survey area annually, but their distinctive calls suggest a larger population.
Channel-billed Cuckoo *Scythrops novaehollandiae*	Rare: Like the Koel, this species signals its presence with a distinctive, raucous call. 4 sightings of this species were made during the survey. Its hosts include pied currawong and magpies.
Powerful Owl *Ninox strenua*	Vagrant: One observed in March 2007 cnr. Harris & John Streets (Hindmarsh, pers.com)
Tawny Frogmouth *Podargus strigoides*	Vagrant: An individual of this species was observed in Mount Street (Glenn Wall, pers.com).
Laughing Kookaburra *Dacelo novaeguineae*	Uncommon: The Kookaburra is unmistakable in both call and appearance. It was observed 6 times during the survey, mostly as single birds or pairs. It feeds on insects, reptiles, mammals and crustaceans, and usually nests in tree hollows. Limited suitable food and lack of tree hollows on the peninsula ensures that it is a transient species.
Sacred Kingfisher *Todiramphus sanctus*	Vagrant: One recorded on Anzac Bridge, Pyrmont on 24 February 2003 (Morris, 2006:293). Individuals have also been seen at Glebe (3.4.2000) and Lane Cove(3.9.1999)
Superb Fairy-Wren *Malurus cyaneus*	Rare: This iconic Australian bird is represented by perhaps 2-3 pairs on the peninsula. It is very much at risk of local extinction, because the shrubby growth in which it seeks protection from predators(especially cats) and finds food is being lost to development.
Red Wattlebird *Anthochaera carunculata*	Uncommon: This species is widely but sparingly distributed on the peninsula. There may be 3-4 breeding pairs in the survey area. Like the Noisy Miner, it favours plants like callistemons, banksias and hybrid grevilleas and, like that species, behaves aggressively towards small honeyeaters.

Species	Status on Pyrmont peninsula
Noisy Miner *Manorina melanocephala*	Common: This species is widely- and well-established on the peninsula, with total counts of 70/mid-80 individuals not unusual. It is an aggressive species, even harassing Ravens, and is known to scare off smaller honeyeaters from its territory.
Yellow-faced Honeyeater *Lichenostomus chrysops*	Vagrant: One bird was heard on 8 June 2006 in eucalypts. The species would once have occurred commonly on the peninsula during its autumn migration, with a smaller resident population.
White-plumed Honeyeater *Lichenostomus penicillatus*	Common: This species is widespread on the peninsula, where it favours the north-eastern parts from Pyrmont Point to Darling Harbour. Total counts never exceeded 20. There could be 7-10 breeding pairs in the survey area.
Eastern Spinebill *Acanthorhynchus tenuirostris*	Vagrant: An individual was feeding on hybrid grevilleas in Pyrmont Point Park on 20 June 2007.
Red-whiskered Bulbul *Pycnonotus jocosus*	Uncommon: This introduced species is widespread on the peninsula but usually only single birds or pairs are seen at a time. Total counts have not exceeded 10 birds; it is likely that 4-5 breeding pairs exist in the survey area.
Willie Wagtail *Rhipidura leucophrys*	Uncommon: An iconic and well-loved species which favours more open habitats. There may be only half a dozen breeding pairs in the survey area, mostly around Wentworth Park and the north-east of the peninsula. The species is at risk of local extinction.
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	Uncommon: Widely but sparingly distributed on the peninsula. It is not known to breed locally, although this would seem possible. Probably mostly a summer visitor. Populations on the peninsula are very low
Figbird *Sphecotheres viridis*	Uncommon: Mostly found in Wentworth Park, where it has been recorded year-round and could well breed. Very occasionally individuals or small groups visit elsewhere on the peninsula, especially around the Fish Markets.
Grey Butcherbird *Cracticus torquatus*	Rare: Its remarkable and beautiful song usually heralds its presence well before it is seen. Recorded just three times, each time in pairs and mostly as immature birds. Not known to breed on the peninsula.
Magpie-Lark *Grallina cyanoleuca*	Uncommon: This delightful, iconic species was recorded widely on the peninsula during the survey, mostly as single birds or pairs, less often as family groups. There are probably 6-10 breeding pairs in the survey area.
Australian Magpie *Gymorrhina tibicen*	Common: This familiar bird is found across most of the peninsula, and several nesting sites are known. Total counts during the survey were typically between the mid-teens and mid-twenties.
Pied Currawong *Strepera graculina*	Common: Recorded from every part of the peninsula, similar in numbers to the Magpie. Several nesting sites are known. Widely believed to take the nestlings of other species. Roost observed in trees beside Harris St between Macarthur and William Henry Streets.
Australian Raven *Corvus coronoides*	Common: Widely distributed across the peninsula, this species is known to breed locally. The resident population doubles or trebles during the winter months(April/June), probably supplemented by birds from the ranges west of Sydney.
House Sparrow *Passer domesticus*	Common: A widely but locally distributed introduced species. Most abundant around Darling Harbour. A sizable population also occupies Jones Bay Wharf. It shuns areas dominated by modern buildings, presumably due to a lack of nesting sites.

Species	Status on Pyrmont peninsula
Welcome Swallow *Hirundo neoxena*	Common: Widely but patchily distributed across the peninsula, with larger numbers around Darling Harbour, Jones Bay Wharf and the Fish Markets. Mostly a summer visitor, but with a small over-wintering population. Likely breeds widely on the peninsula
Tree Martin *Hirundo nigricans*	Common: At the start of the survey this species was found only around Darling Harbour and Jones Bay Wharf, where small numbers over-wintered. By September it was widely distributed across the peninsula and numbers had considerably increased. After breeding, numbers and distribution on the peninsula again diminished.
Silvereye *Zosterops lateralis*	Rare: More than any other species on the peninsula, the Silvereye is indicative of the changing fortunes of inner Sydney birds. Described by Le Souëf & Macpherson(1920) as 'perhaps the most numerous of our local native birds', there were only four sightings, of 1-3 birds each, in the entire survey. Now a transient species on the peninsula.
Common Starling *Sturnus vulgaris*	Common: Widespread but localised on Pyrmont peninsula, this introduced species favours older structures for nesting. Over one hundred individuals feeding in Wentworth Park on 13 December 2006, presumably from the surrounding suburbs.
Common Myna *Acridotheres tristis*	Common: This cosmopolitan species, introduced to Australia from the early 1860s, occurs widely across Pyrmont peninsula in moderate numbers. Breeding recorded from about half the zones surveyed, but would have likely been more widespread.

Fifty-one species have been observed on Pyrmont peninsula in recent times. Of these, 6(12%) are introduced species. Of the other 45 species, nine(20%) are considered vagrants and 6(11%) are rare. Another 20 species (44%)are regarded as uncommon. Ten native species, less than a quarter of the total, appear to have reasonable populations on the peninsula.

C) Discussion

The above observations can be assessed through comparison with:

- historic records
- listings from adjacent suburbs

i. Historic records

In 1920, Le Souëf & Macpherson reported a survey of the birds of Sydney: 'The district included in this survey is the city of Sydney and its suburbs, including two large parks, the Botanical and Zoological Gardens. The gardens and the parks are well within the city, and are surrounded by dwellings'(p.82). They recorded 76 species in this area, together with comments on the status of most. Table 6.8 summarises their findings, with the current status of each species on Pyrmont peninsula.

Table 6.8: Bird species of the City of Sydney in 1920, and current status on Pyrmont peninsula

Species	Comments	Status on Pyrmont peninsula
Hardhead *Aythya australis*	' … generally present, sometimes in numbers, in Centennial Park'	Absent
Pacific Black Duck *Anas superciliosa*	Found on ponds in Botanic Gardens and Centennial Park	Uncommon
Grey Teal *Anas gracilis*	'Sometimes hundreds … are to be seen in Centennial Park'	Absent
Chestnut Teal *Anas castanea*	'Sometimes hundreds round the islands' of Centennial Park	Uncommon
Hoary-headed Grebe *Poliocephalus poliocephalus*	In parks and Botanic Gardens	Absent
Australasian Grebe *Tachybaptus novaehollandiae*	Small family parties in the parks and Botanic Gardens	Absent
Cormorants *Phalacrocorax spp*	'Many hundreds of Cormorants come into Centennial Park to roost every night'. All four species noted	Uncommon
Nankeen Night Heron *Nycticorax caledonicus*	Small colony at Macleay House, Potts Point	Absent
White-bellied Sea-eagle *Haliaeetus leucogaster*	'A pair … live about Middle Harbour'	Absent
Brown Falcon *Falco berigora*	'One or two … in Taronga Park …'	Absent
Nankeen Kestrel *Falco cenchroides*	' … often in evidence over the city in autumn, but it usually does not stay long'	Rare
Baillon's Crake *Porzana pusilla*	Present in Centennial Park	Absent
Dusky Moorhen *Gallinula tenebrosa*	Found in Centennial Park/ Botanic Gardens	Absent
Eurasian Coot *Fulica atra*	Small flocks in Centennial Park, where it nests	Absent
Painted Button-quail *Turnix varia*	' … often to be found in the Sydney parks'	Absent
Black-fronted Dotterel *Elseyornis melanops*	' … around the ponds in Centennial Park'	Absent
Silver Gull *Larus novaehollandiae*	'a hundred or more birds' at Centennial Park. Also in Botanical Gardens	Abundant
Cockatoos and parrots	'No Cockatoos and Parrots are now resident about Sydney'. Sulphur-crested Cockatoos *Cacatua galerita, Galahs Cacatua roseicapilla* and Major Mitchell's Cockatoo *Cacatua leadbeateri* were released in the grounds of Taronga Park Zoo	Various

Species	Comments	Status on Pyrmont peninsula
Pallid Cuckoo *Cuculus pallidus*	'… arrive in numbers in September. They were especially numerous in 1919 … The birds only stopped about a fortnight, and then passed on, presumably going further south'	Absent
Fan-tailed Cuckoo *Cacomantis flabelliformis*	' a resident and quite a suburban bird …'	Absent
Shining Bronze-cuckoo *Chalcococcyx lucidus plagosus*	'… often to be seen in the city parks'	Absent
Southern Boobook *Ninox novaeseelandiae*	'… not as numerous as one would expect it to be, considering the amount of food it would be able to find. The reason is that probably no suitable nesting-places are available'	Absent
Barn Owl *Tyto alba*	Pair once lived in Taronga Park but were captured for the zoo	Absent
Tawny Frogmouth *Podargus strigoides*	'One or two pairs … live in the parks adjacent to the city. Two young birds were reared in Ashton Park in 1919	Vagrant
Laughing Kookaburra *Dacelo novaeguineae*	'… always in evidence in the suburbs … more numerous in the thickly-wooded grounds round the harbour than in the cleared areas such as Centennial Park. The birds breed regularly in Ashton Park'	Uncommon
Sacred Kingfisher *Todiramphus sanctus*	'… many take up their summer residence in the parks round the city, and make use of any white ants' nests in which to make their own home …'	Vagrant
Superb Lyrebird *Menura superba*	'A pair have survived on the shores of Middle Harbour, and still nest there, within two miles of the General Post-Office	Probably absent from the peninsula in 1788
Superb Fairy-wren *Malurus cyaneus*	'It is numerous throughout the suburbs even in comparatively small gardens. One family party sometimes visits the Darlinghurst goal gardens …'	Rare
Variegated Fairy-wren *Malurus lamberti*	'There are a few pairs … in the parks around the harbour'	Absent
Southern Emu-wren *Stipiturus malachurus*	'A few … survive close to the city in the well-protected grounds of the Coast Hospital'	Absent
Spotted Pardalote *Pardalotus punctatus*	'This is one of the most numerous of the wild birds where there are any eucalyptus or angophora trees about'	Absent
Eastern Bristlebird *Dasyornis brachypterus*	Occurs in the grounds of the Coast Hospital	Absent
White-browed Scrubwren *Sericornis frontalis*	'… found in many little gullies and secluded pockets of thick vegetation in the parks around the harbour'	Absent
White-throated Gerygone *Gerygone olivacea*	'… heard regularly in the early spring as the birds come along their journey south. A few pairs stay in the city parks and suburbs, and several breed in the eucalyptus breaks …'	Absent

Species	Comments	Status on Pyrmont peninsula
Brown Thornbill *Acanthiza pusilla*	'… inhabits the melaleucas, and is very local'	Absent
Yellow-rumped Thornbill *Acanthiza chrysorrhoea*	'… very common throughout the year, and will be met with in small flocks in almost any of the more open gardens and parks'	Absent
Striated Thornbill *Acanthiza lineata*	'… numerous in the eucalyptus and acacia areas, wandering about in small flocks and working each tree quickly and thoroughly'	Absent
Weebill *Smicrornis brevirostris*	'… not uncommon among the eucalypts and angophora trees'	Absent
Yellow-faced Honeyeater *Lichenostomus chrysops*	'The "Chickup" is numerous in Sydney wherever there are eucalyptus trees'	Vagrant
Yellow-tufted Honeyeater *Lichenostomus melanops*	'… common in some of the outlying suburbs …'	Absent
Brown-headed Honeyeater *Melithreptus brevirostris*	'… rather numerous in Taronga Park'	Absent
White-naped Honeyeater *Melithreptus lunatus*	'… often seen among the eucalypts in the parks'	Absent
New Holland Honeyeater *Phlidonyris novaehollandiae*	'… somewhat nomadic, and changes its habits according to the flowering seasons of the eucalypts and banksias … It is numerous in Centennial Park, and may be seen in dozens among the low coastal scrubs of the Little Bay Hospital'	Vagrant
Eastern Spinebill *Acanthorhynchus tenuirostris*	'This active bird is a resident, numerous in our gardens, but more especially those in the vicinity of parks'	Vagrant
Scarlet Honeyeater *Myzomela sanguinolenta*	'… arrives from the north in numbers in September, and a few take up their quarters in the city parks'	Absent
Jacky Winter *Microeca fascinans*	'…almost any bit of greenery will give shelter to the "Jacky Winter" '. 'One sees them in the parks and gardens and along the suburban roadways. … They are very tame, and will nest in close proximity to crowded paths'	Absent
Eastern Yellow Robin *Eopsaltria australis*	'wherever there is a bit of moderately thick bush in garden or park, one is sure to find the "Yellow Bob". … These birds are numerous in the harbour parks, and will establish themselves in a garden if there is sufficient cover available'	Absent
Eastern Whipbird *Psophodes olivaceus*		Absent
Varied Sittella *Daphoenositta chrysoptera*	'One can generally find them in the vicinity of the parks and larger gardens …'	Absent
Crested Shrike Tit *Falcunculus frontatus*	'… more numerous than one would suppose …. They mainly keep to the eucalyptus trees'	Absent
Golden Whistler *Pachycephala pectoralis*	'…. Sparingly present in Ashton Park, keeping to thicker gullies in the summer, but reaching out to the higher grounds and adjoining suburban gardens in the winter …'	Absent

Species	Comments	Status on Pyrmont peninsula
Rufous Whistler *Pachycephala rufiventris*	' … a good many appear to arrive from the north in September, and many stay in and around the city to breed …'	Absent
Grey Shrike-thrush *Colluricincla harmonica*	' … a very welcome resident, living sometimes in the larger gardens … It is quite local, and each pair seems to live in a comparatively small area'	Absent
Leaden Flycatcher *Myiagra rubecula*	'a rare visitor to Sydney'	Absent
Restless Flycatcher *Myiagra inquieta*	Seen during its migrations	Absent
Willie Wagtail *Rhipidura leucophrys*	'… They sometimes take up their quarters in odd corners of the city where there is a tree and a little open ground, and are not much disturbed by heavy traffic'	Uncommon
Rufous Fantail *Rhipidura rufifrons*	' … only pays fleeting visits to our parks and suburban gardens during its migration'	Absent
Grey Fantail *Rhipidura fuliginosa*	Resident species	Absent
White-winged Triller *Lalage tricolor*	' … can often be seen in the spring': nests	Absent
White-browed Wood-swallow *Artamus superciliosus*	'frequently breed in suburban gardens where they have plenty of room … they are uncertain in their appearances, and some years may not be seen at all'	Absent
Grey Butcherbird *Cracticus torquatus*	'There are generally a few of these carollers about the parks and gardens, but they do not seem to stay in one spot for very long'	Rare
Magpie-lark *Grallina cyanoleuca*	' … numerous throughout the city and suburbs, and will often be seen in small flocks walking over lawns and open spaces …'	Uncommon
Australian Raven *Corvus coronoides*	'They chiefly live in Ashton Park, but are often seen over the harbour and city'	Common
Red-browed Finch *Neochmia temporalis*	' … always present in Ashton and Taronga Parks and other places, where it nests freely, often close to crowded thoroughfares'	Absent
Diamond Firetail *Stagonopleura guttata*	'Often numerous in the comparatively open country of some of the outlying suburbs'	Absent
Misteltoebird *Dicaeum hirundinaceum*	' … frequently heard in trees bearing their food plant(Loranthus)'	Absent
Welcome Swallow *Hirundo neoxena*	' … very numerous in the city and suburbs … They nest in houses fronting busy streets … Many of them flock in autumn, making the Post Office and the Commonwealth Bank[Martin Place] their headquarters, and sometimes fifty or a hundred can be seen flying around there in the evening preparatory to migrating. Many, however, stay for the winter'	Common

Species	Comments	Status on Pyrmont peninsula
Fairy Martin *Hirundo ariel*	'… also a city dweller, though keeping more to the suburbs …'	Absent
Clamorous Reed-warbler *Acrocephalus stentoreus*	'a regular visitor to Centennial Park, and is plentiful in clumps of reeds'	Absent
Golden-headed Cisticola *Cisticola exilis*	'A couple of pairs … in a bit of swampy land in Centennial Park'	Absent
Silvereye *Zosterops lateralis*	'… perhaps the most numerous of our local native birds … In autumn they flock, and presumably a good many leave, but their place is probably taken by others from further south, for there are numbers with us all the winter'	Rare

Seventy-three of the species recorded by Le Souëf & Macpherson(1920) in the city of Sydney once occurred on Pyrmont peninsula. Of these, fifty-one(68%) are absent from Pyrmont peninsula today, and another 12% are rare or vagrant to the peninsula. Less than a fifth of the birds on Pyrmont peninsula today have populations somewhat similar to those in the city some 90 years ago.

In passing, an article titled 'Hungry Hawks', by S.A.O., should be noted. Written on 9 September 1927(SMH, no.27,981, p.10), it described the predations of Sparrow Hawks *Accipiter cirrhocephalus*, particularly on pigeon squabs around Bridge Street, Sydney: 'Sometimes, there may be two or three of them …'.

ii. Listings from adjacent suburbs

Two councils adjoin the City of Sydney and have harbour frontages – Leichhardt and Woollahra Municipal Councils. Leichhardt has a full listing of the birds in its area, while Woollahra has published an indicative bird list only.

106 bird species have been recorded within the boundaries of Leichhardt Municipal Council(Leichhardt Municipal Council, 2004); two vagrant species recorded on the peninsula do not appear on the Leichhardt Council listing(Tahiti Petrel and Superb Fruit-dove). Avian diversity in Leichhardt is thus over twice that on Pyrmont peninsula. The fifty-three native bird species listed by Leichhardt but not currently recorded for Pyrmont peninsula are listed in Table 6.9, roughly according to preferred habitat

Table 6.9: Native bird species observed in Leichhardt Council LGA, but not on Pyrmont peninsula

Water bodies	Woodlands/forests	Open country
Australasian Grebe	Whistling Kite	Black-shouldered Kite
Great-crested Grebe	Grey Goshawk	Australian Hobby
Wetlands	White-headed Pigeon	Richard's Pipit
Great Egret	Common Bronzewing	Galah
Intermediate Egret	Yellow-tailed Black Cockatoo	Eastern Rosella
Straw-necked Ibis	Musk Lorikeet	Fairy Martin
Royal Spoonbill	Australian King-Parrot	Red-rumped Parrot
Buff-banded Rail	Crimson Rosella	Coastal bays
Dusky Moorhen	Horsfield's Bronze-Cuckoo	White-bellied Sea-Eagle
Eurasian Coot	Yellow Thornbill	Crested Tern
Black-winged Stilt	Noisy Friarbird	White-winged Tern
Black-fronted Dotterel	Bell Miner	Common Tern
Azure Kingfisher	White-cheeked Honeyeater	Little Tern
Clamorous Reed-Warbler	Eastern Yellow Robin	Little Penguin
Heathlands	Eastern Whipbird	Grey Teal
Little Wattlebird	Restless Flycatcher	Tidal mudflats
New Holland Honeyeater	Rufous Fantail	Bar-tailed Godwit
	Spangled Drongo	Terek Sandpiper
	White-winged Triller	Sharp-tailed Sandpiper

Aquatic habitats in some form (water bodies, wetlands, tidal mudflats and coastal bays) were required by almost half of the listed species, while woodland/forest birds comprised over a third .

iii. Underlying trends

There are several broad trends behind the above observations, some of which have been occurring for a century or more. A review of the Australian Museum bird collection identified the following trends between 1900 and 2000 (Birds in Backyards, 2007):

- Parrot specimens increased from two species in 1900(both now extinct in the Sydney region) to 15 species in 2000. Species whose populations have increased include Sulphur-crested Cockatoos, Rainbow Lorikeets and King Parrots
- Only two exotic species were in the collection before 1900 – the House Sparrow *Passer domesticus* and the Spotted Turtle-dove *Streptopelia chinensis*. At least another eight exotic species are observed around Sydney today; on Pyrmont peninsula, there are four other species - the Common Starling *Sturnus vulgaris*, Common Myna *Acridotheres tristis*, Feral Pigeon *Columba livia*, Red-whiskered Bulbul *Pycnonotus jocosus*.
- Populations of large honeyeaters, like the Noisy Miner *Manorina melanocephala*, Red Wattlebird *Anthochaera carunculata* and Noisy Friarbird *Philemon corniculatus* have increased while those of small honeyeaters – such as the Regent, Fuscous, Scarlet, Tawny-crowned and Crescent Honeyeaters

were not recorded in 2000. It is suggested that the larger birds aggressively exclude smaller relatives from their territories

- Large carnivorous and omnivorous birds which appear to have increased in Sydney include the Grey Butcherbird *Cracticus torquatus*, Australian Magpie *Gymnorhina tibicen*, Australian Raven *Corvus coronoides*, Laughing Kookaburra *Dacelo novaeguineae* and Pied Currawongs *Strepera graculina*. All these species are now recorded commonly or periodically on Pyrmont peninsula. Two cuckoo species, the Common Koel *Eudynamys scolopacea* and the Channel-billed Cuckoo *Scythrops novaehollandiae* – which parasitise Red Wattlebirds and Pied Currawongs respectively - occur on the peninsula.
- There has been a marked decline of water-related bird populations in the inner city, Pyrmont peninsula especially
- There has also been a marked decline of raptors in the inner city, Pyrmont peninsula in particular, but also before the studies of Le Souëf & Macpherson(1920) in comparison with the situation on Leichhardt Council lands

iv. Urban species

Larson et al(2004) argue that close relationships between certain plants and animals on the one hand, and humans on the other, started to emerge about 1.0 to 0.8 million years before present. Specifically, humans have had an enduring relationship with the Rock Dove *Columba livia*, which inhabited cliffs when humans began living in caves, leading to a mutualistic benefit between the two species. Similar relationships would have emerged with other bird species, such as the House Sparrow *Passer domesticus* and Starling *Sturnus vulgaris*.

The Common, or Indian, Myna *Acridotheres tristis* may have a similar history. Believed to have originated from ancestors in Central Asia some 5 million years ago, the species occurs naturally throughout much of southern Asia and has been widely introduced elsewhere. It co-exists commensally with humans, a relationship which is likely as old as that of the feral pigeon.

Perhaps we should be more discriminatory in our attitudes to exotic species in urban environments. As Larson et al.(2004:178) pointed out: ' … we should be amazed at the wondrous adaptability and success of the organisms that were once endemic to rock outcrops and have so constantly associated themselves with us over hundreds of thousands of years'. When next we see pigeons on Queen Victoria's statue beside Town Hall, we might well remember that: 'Pigeons on statues think that they are sitting on cliffs near abundant sources of food'(p.177).

Maybe we should accommodate exotic species which occupy niches for which no native species will compete, although constant monitoring of such circumstances would be needed as native species too can adjust to new situations.

For Australian native birds, the phenomenon of urban environments is a very recent one, barely 200 years old. While some species seemingly maintain previous ways of existence in urban environments, others appear to be rapidly evolving to better utilise the new environments created by urbanisation. Candidate species would be the Peregrine Falcon, Rainbow Lorikeet and Australian White Ibis. The urban populations of such species would be interesting to compare behaviourally with their non-urban counterparts.

D) Conclusions

Fifty-one native bird species have been recorded on Pyrmont peninsula in the last decade, almost exactly 20% of the species believed to have inhabited the peninsula in 1788. With regard to native bird species, the avian diversity of the peninsula today is less than half (47%) of the adjoining municipality, Leichhardt, and about 60% that of the city of Sydney in 1920. Even these figures are optimistic, in that almost a third of the native species recorded for Pyrmont peninsula today are considered to be vagrants or rare.

Assuming, for the moment, that the avifauna of Pyrmont peninsula is isolated from adjacent populations, and that the minimum viable population needed for long-term survival is 100 individuals(the lowest figure suggested by Traill et al, 2007), then, optimistically, just seven native bird species on Pyrmont peninsula are likely to be sustainable over the long term: Australian White Ibis, Silver Gull, Rainbow Lorikeet, Noisy Miner, Australian Raven, and perhaps the Welcome Swallow and Tree Martin.

In reality, of course, Pyrmont peninsula is not isolated from surrounding suburbs, but it seems clear that it – like other parts of the city – relies heavily on immigration from outside to maintain its current bird diversity.

Unless there is a concerted effort by Council to:

- increase habitat for birds on the peninsula
- improve corridors for the movement of individuals from adjoining areas

it is predicted that avian diversity on Pyrmont peninsula will continue its overall trend since European settlement. Reversing this pattern of declining avian diversity in the future will require greater efforts to create habitat and improve movement corridors.

6.3.3 Reptiles

A) Introduction

Although skinks may often be seen on walls and pavements, and in reserves, in the less densely settled parts of Pyrmont peninsula, species diversity appears low. Only three species are commonly and widely seen, while small populations of another three species are known to occur on the peninsula.

Surveying for reptiles on the peninsula was limited to recording their presence in public spaces on warm sunny days and noting casual observations by others. A few night-time walks were made around the Maybanke Youth Centre, where geckos had previously been observed(G. Wall, pers.com.), and along the cliff-faces of the peninsula.

The following accounts are based on observations made during the study period and/or provided by others in the community.

B) Species recorded

i. Eastern Water Dragon *Physignathus lesueurii lesueurii*

Several individuals of this species may be seen around the pools in the Chinese Gardens. Presumably introduced to this location by humans, it is not known whether they are breeding there.

ii. Fence Skink *Cryptoblepharus virgatus*

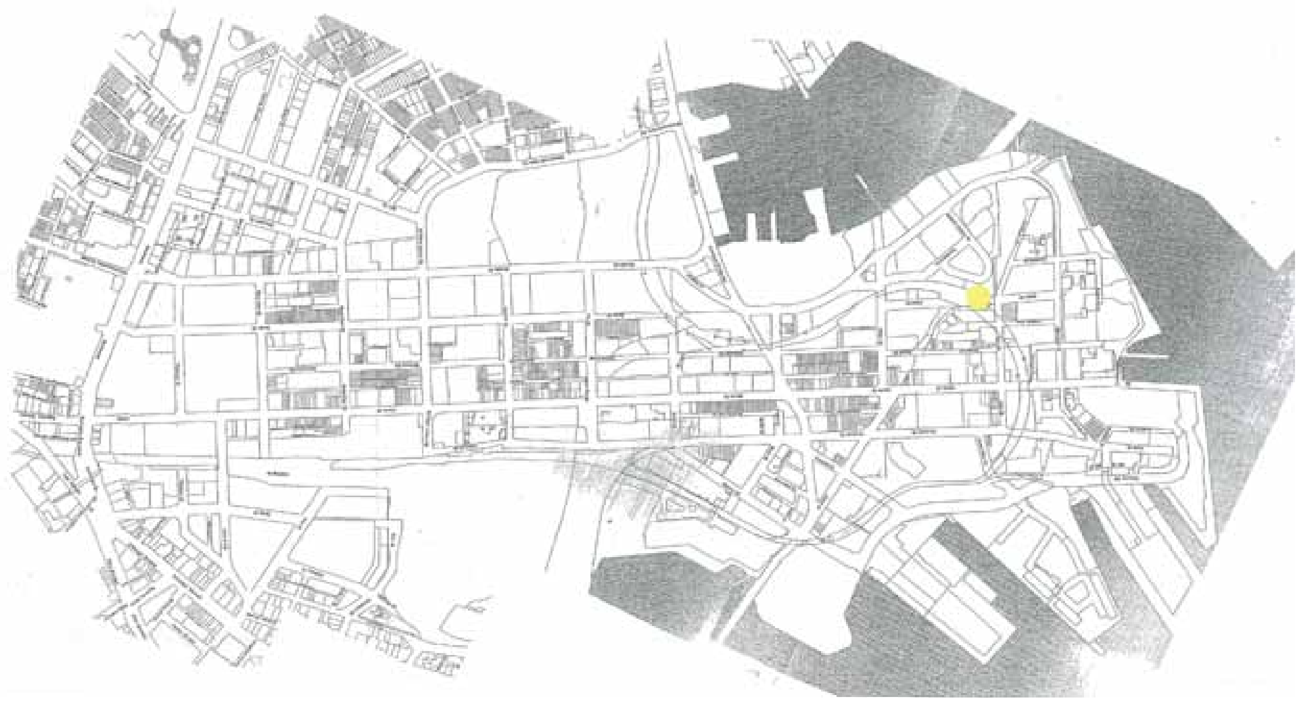
A small, active diurnal lizard typically seen on paling fences and brick walls on the peninsula. Readily distinguished from other skinks by broad dorso-lateral, cream-coloured 'GT' stripes running from above each eye to the base of the tail. Probably the most numerous and widespread reptile on Pyrmont peninsula, but mostly found in those parts with terrace or cottage-style homes. There could be at least two distinct populations, separated by Pyrmont Bridge Road. Other major roads(e.g. Harris Street) could further fragment the peninsula's population.

Figure 6.16: Records of Fence Skink *Cryptoblepharus virgatus* on Pyrmont peninsula

iii. Striped Skink *Ctenotus robustus*

Observed once where the light-rail corridor adjoins Jones Street Pocket Park, possibly its only location on the peninsula. Likely susceptible to predation by feral cats in that area.

Figure 6.17: Record of Striped Skink *Ctenotus robustus* on Pyrmont peninsula



iv. Delicate Garden Skink *Lampropholis delicata*

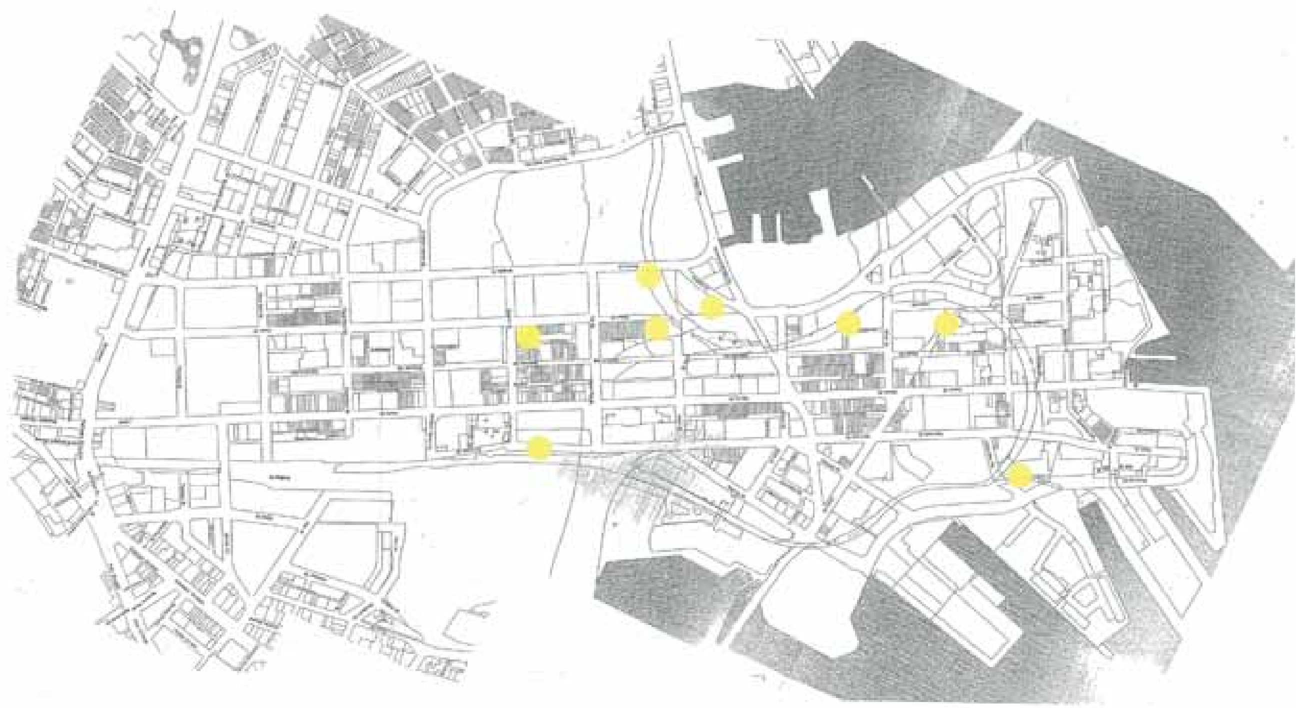
Records suggest that this species mostly occurs south of Pyrmont Bridge Road, with outlying populations towards the tip of Pyrmont peninsula. Typically a rich bronze-brown colour above with a coppery-coloured head, and with a brown lateral stripe from the side of the neck to the base of the tail. This lateral stripe is sometimes pale-edged on the upper side.

Figure 6.18: Records of Delicate Garden Skink *Lampropholis delicata* on Pyrmont peninsula

v. Common Garden Skink *Lampropholis guichenoti*

This species appears to be widely but sparsely distributed on Pyrmont peninsula. Most records are from the western side of the peninsula. The brown back is finely speckled with whitish, pale and dark brown scales. A broad, brown lateral stripe runs from behind the eye onto the tail, and is narrowly bordered above and below by a pale edge, the lower one usually more conspicuous. Somewhat larger and more heavily built than the Delicate Garden Skink.

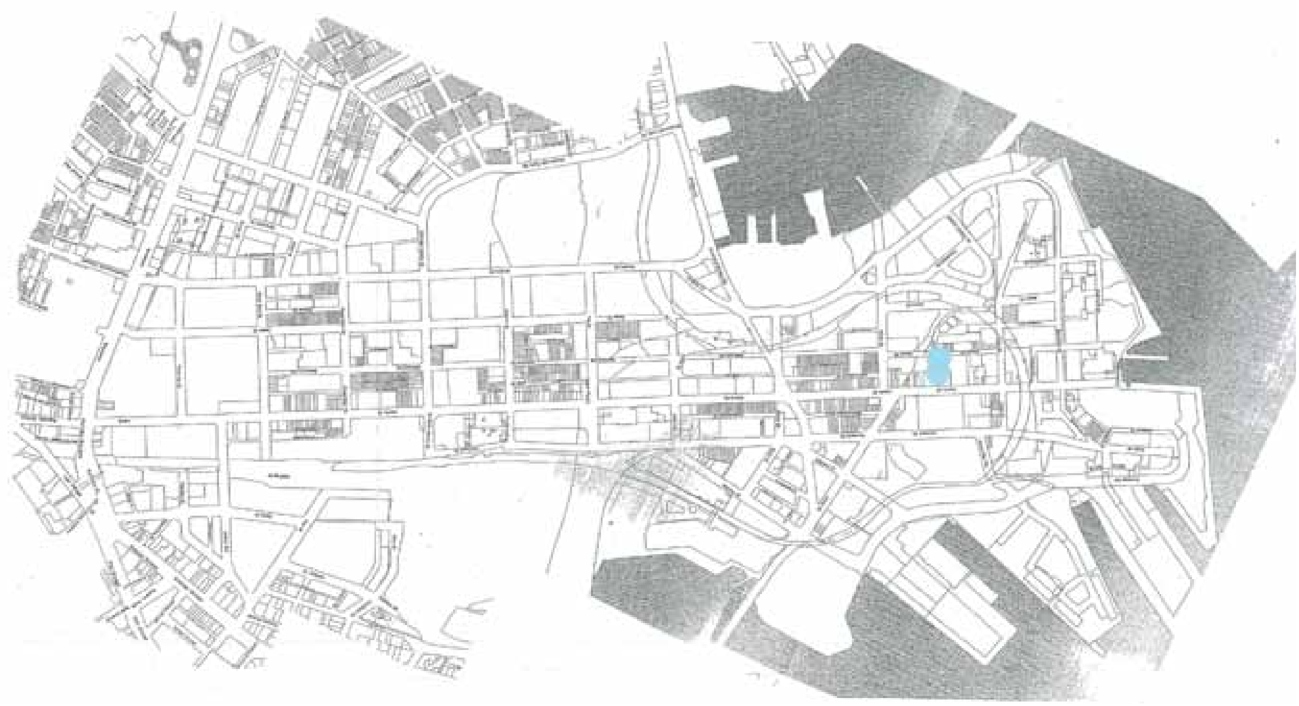
Figure 6.19: Records of Common Garden Skink *Lampropholis guichenoti* on Pyrmont peninsula



vi. Eastern Blue-tongued Skink *Tiliqua scincoides*

This well-known Australian lizard was not observed during the survey, but has been recorded at the Maybanke Youth Centre and in adjoining properties along Mount Street(S.Kelly, pers.com; B. Delaney, pers.com). A relatively slow-moving lizard which is vulnerable to household pets, dogs in particular. Although probably under-recorded in this survey, this species is likely at risk of extinction on Pyrmont peninsula.

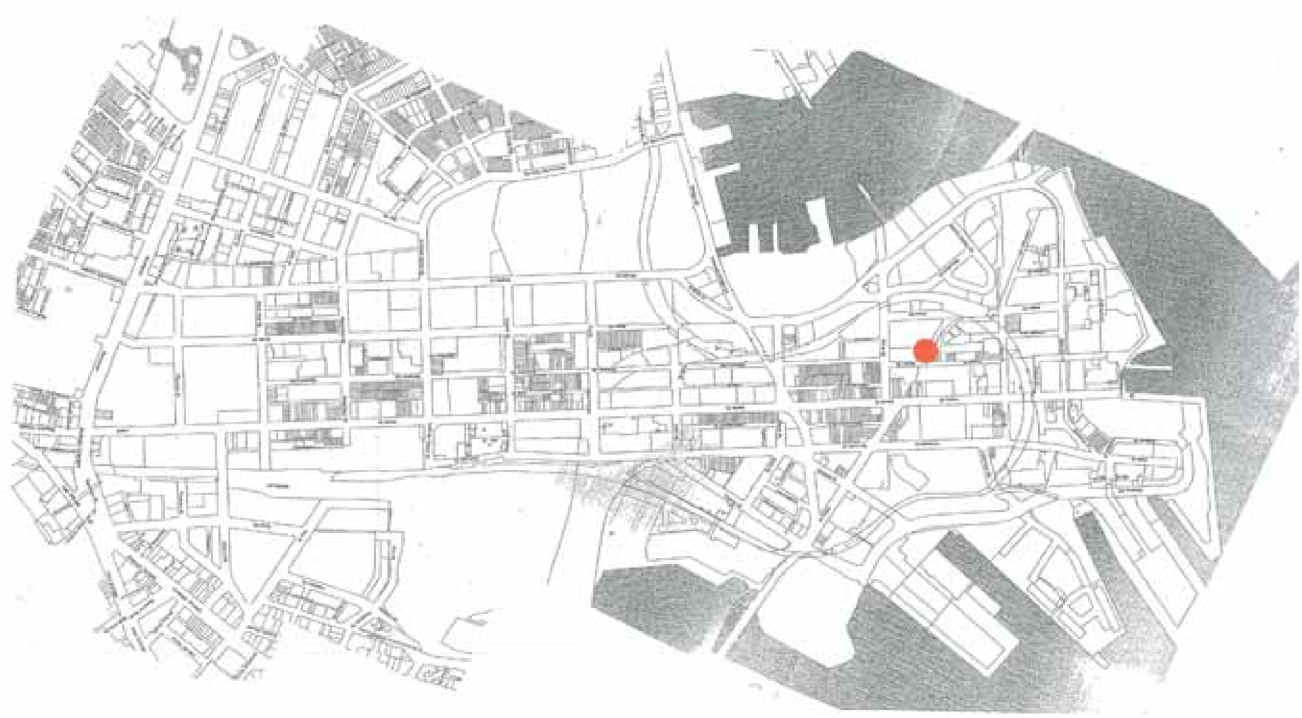
Figure 6.20: Records of Eastern Blue-tongued Skink *Tiliqua scincoides* on Pyrmont peninsula



vii. Weasel Skink *Saproscincus mustelina*

At present known only from the Jones Street Pocket Park area of Pyrmont peninsula. Both Cogger(1975) and Griffiths(2006) consider it to be common in suburban gardens, but probably is less so in urban areas. It favours moist locations and is considered as often crepuscular – being active especially at dawn and dusk(Griffiths, 2006: 91). The back and sides are usually similar in colour – light to reddish brown and heavily flecked. There is usually a short pale streak behind the eye, bordered with dark brown above. The tail is often distinctly reddish-brown.

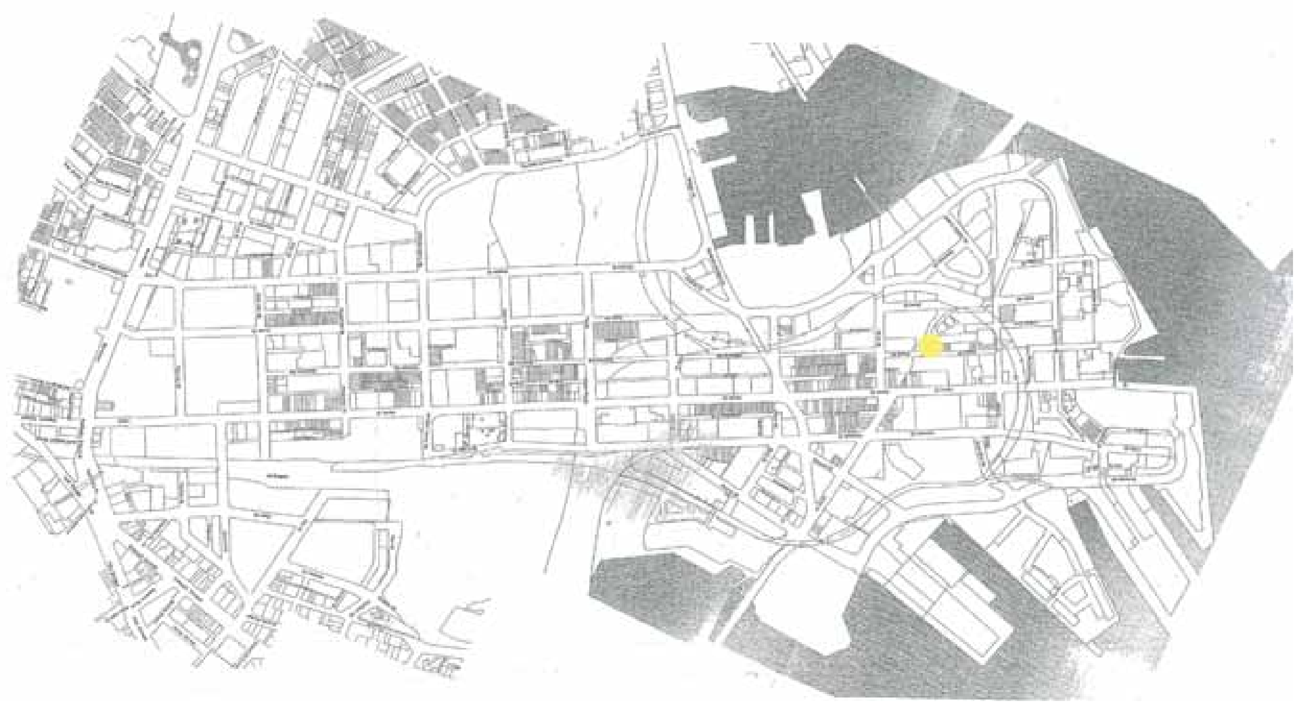
Figure 6.21: Record of Weasel Skink *Saproscincus mustelina* on Pyrmont peninsula



viii. Red-bellied Black Snake *Pseudechis porphyriacus*

Although not observed in this study, this species is reported to occur in rough vegetation near upper Mount Street(G. Wall, pers.com). It is distinguished from similar black snakes by its pink or red sides. This species may occur more widely along the cliff-tops, but is most likely at risk of extinction on Pyrmont peninsula.

Figure 6.22: Record of Red-bellied Black Snake *Pseudechis porphyriacus* on Pyrmont peninsula



C) Discussion

Table 6.10 lists the reptile species recorded for Pyrmont peninsula and those observed in recent surveys in Leichhardt and Woollahra LGAs. Cumulatively, the three Council areas support 16 reptile species, half of which still reside on Pyrmont peninsula. Reptilian diversity on the peninsula is thus similar to that in Leichhardt LGA, but only about half that in Woollahra LGA.

Table 6.10: Reptile species recorded on Pyrmont peninsula, Leichhardt and Woollahra LGAs

Species	Current status		
	Pyrmont peninsula	Leichhardt LGA (2004)	Woollahra LGA (1995)
Eastern Water Dragon *Physignathus lesueurii lesueurii*	+ (probably introduced)		+
Lesueur's Velvet Gecko *Oedura lesueurii*			+
Southern Leaf-tailed Gecko *Phyllurus platurus*			+
Fence Skink *Cryptoblepharus virgatus*	+	+	+

Species	Current status		
	Pyrmont peninsula	Leichhardt LGA (2004)	Woollahra LGA (1995)
Striped Skink *Ctenotus robustus*	+		+
Copper-tailed Skink *Ctenotus taeniolatus*			+
Eastern Water Skink *Eulamprus quoyii*		+	+
Greater bar-sided Skink *Eulamprus tenuis*		+	
Delicate Garden Skink *Lampropholis delicata*	+	+	+
Common Garden Skink *Lampropholis guichenoti*	+	+	+
Three-toed Skink *Saiphos equalis*		+	+
Weasel Skink *Saproscincus mustelina*	+	+	+
Eastern Blue-tongued Skink *Tiliqua scincoides*	+	+	+
Long-necked Tortoise *Chelodina longicollis*			+
Marsh Snake *Hemiaspis signata*			+
Red-bellied Black Snake *Pseudechis porphyriacus*	+		

Sources of information:

Leichhardt Council, 2004, State of the Environment Report, 2004, http://www.lmc.nsw.gov.au/environment/13/112318900_1631.html (accessed 12.4.2008).

Woollahra Muncipal Council, 2004, State of the Environment, 2004, Double Bay, NSW, The Council.

D) Conclusions

It is probable that the present survey much underestimated reptile populations, and perhaps diversity, on Pyrmont peninsula, as much preferred reptile habitat is on private property and inaccessible. A systematic survey should be done with the involvement of land owners so as to generate a more reliable view of local reptile populations and their distribution.

There is some evidence to suggest that the reptiles of Pyrmont peninsula occur especially in those parts with older building stock having individual gardens, and related reserves. It will be interesting to see whether the lands around newer, more intensive developments become recolonised by reptiles over time and, if so, by which species.

It is important to note that the contemporary diversity of reptiles on Pyrmont peninsula is best represented in Jones Street Pocket Park and adjoining open areas across the light rail line to the west and up to and including Maybanke to the east. Coupled with the high fern diversity on the cliffs in this area(see 6.2.2), the Park should be considered an 'Ecological priority area' under Proposal 19, Part 8.

It is probable that populations of even the common species of reptile on the peninsula are fragmented by heavily-trafficked roads. Some parts of such populations will thus be more prone to local extinction, with the prospect that re-colonisation will not occur.

With the development of appropriate habitat, all species in Table 6.10 could be successfully re-introduced to Pyrmont peninsula.

6.3.4 Frogs

A) Introduction

While no systematic searches for frogs were made, walks of the peninsula were done on warm evenings after substantial rain, particularly to detect frog calls. Advice from local individuals was that:

- frogs occurred in the deep cutting adjoining Jones Street Pocket Park before the tracks were repaired for use by the light rail(Glenn Wall, pers.com)
- a frog was observed on a balcony of 66 Bowman Street, Pyrmont (Charles Perry, pers.com)
- a frog was observed in the garden of 58 Bulwara Road(Mike Butler, pers.com)

These latter observations are believed to be of aquarium escapes, as there was no evidence of other frogs in the vicinity.

It is believed that there is no relict wild frog population now remaining on Pyrmont peninsula.

B) Discussion

The present situation on Pyrmont peninsula contrasts with that of adjoining municipalities and the Sydney Harbour National Park(Table 6.11).

Table 6.11: Frogs of localities nearby to Pyrmont peninsula

Species	Leichhardt Municipal Council	Woollahra Municipal Council	Sydney Harbour National Park
Dwarf Green Tree Frog *Litoria fallax*	-	+	-
Peron's Tree Frog *Litoria peronii*	+	-	+
Tusked Frog *Adelotus brevis*	-	+	-
Common Eastern Froglet *Crinia signifera*	+	+	+
Ornate Burrowing Frog *Limnodynastes ornatus*	-	-	+

Species	Leichhardt Municipal Council	Woollahra Municipal Council	Sydney Harbour National Park
Striped Marsh Frog *Limnodynastes peronii*	+	+	+
Spotted Marsh Frog *Limnodynastes tasmaniensis*	-	-	+
Red-crowned Toadlet *Pseudophryne australis*	-	+	-

Sources of information:

Location	Source
Leichhardt	Leichhardt Municipal Council(2004)
Woollahra	Woollahra Municipal Council(2004)
Sydney Harbour NP	NSW National Parks & Wildlife Service(2006)

C) Conclusions

It is possible, if unlikely, that small, isolated populations of frogs still occur on Pyrmont peninsula. It was determined earlier(Part 4.4.3) that 22 species of frogs would have likely inhabited Pyrmont peninsula at European settlement. Unsurprisingly, there has been a catastrophic decline in frog populations on the peninsula since 1788. Contributory causes would include land clearance, wetlands reclamation, construction of stormwater drains, feral predators, soil and water pollution, urbanisation.

An August 1998 survey of the (then) proposed extension of the inner west light rail from Wentworth Park to Catherine Street, Lilyfield detected the Eastern Banjo Frog *Limnodynastes dumerilii* at the latter stop(Anderson et al., 1998:10).

6.4 General discussion

'The transformation of land cover favors organisms that are more capable of rapid colonization, better adapted to the new conditions, and more tolerant of people than are many endemic, sensitive, locally specialized organisms. As a result, urbanizing areas often have novel combinations of organisms living in unique communities. Mixes of native and non-native species interact in complex, anthropologically driven successions, but with human participation, they also equilibrate into communities stable over time'

(Alberti et al., 2003)

'For a city as a whole, exotic generalists such as pigeons, starlings and sparrows can constitute 80% of the bird community in the summer and 95% in the winter'(Wetterer, 1997).

It was not possible to exhaustively detail the terrestrial plants and vertebrate animals of Pyrmont peninsula in the time available, and this should be a goal of ongoing work. It is likely that the residual native plants on the peninsula have mostly been detected and their current distribution reasonably described. Undetected native species may yet occur on private land or public land difficult to access. Particular cases of the latter are the upper reaches of the cliffs in Jones Street Pocket Park, alongside Clifftop Walk, around Distillery Hill, and along the Light Rail Corridor.

It is believed that the avifauna of Pyrmont peninsula has been reasonably documented. Fuller details will be published elsewhere and will, hopefully, be the basis for monitoring of avifaunal populations over time. It is likely that the herpetofauna of Pyrmont peninsula has been somewhat under-recorded. Some reptiles are difficult to observe, and trapping was not feasible due to high public usage of most areas of the peninsula. Trapping may be possible on public lands currently inaccessible or on privately-owned lands. The situation with mammals is similar, although it is unlikely that any small native mammals still survive on Pyrmont peninsula due to protracted land disturbance and large predator populations. Inquiries of pest control companies which operate on the peninsula might give some insights into rodent populations. These will likely be of introduced species, although the status of the Water Rat *Hydromys chrysogaster* on the peninsula remains unresolved.

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Part 7

Estuarine Ecology of Pyrmont Peninsula

Preface

This part of the report was commissioned from the Australian Museum Business Services, 6 College Street, Sydney, NSW 2010. The project team comprised:

Senior Project Manager:	Jayne Tipping
Project Manager/Report Author:	Pascal Geraghty
Scientific Review:	David James, Project Manager (Ecology)

The report, No. E06020, titled 'The Marine Ecology of Pyrmont Peninsula' was completed on 28 May 2007. The text has not been changed, apart from a few corrections and re-formatting to conform with the rest of the report.

Buller(2006:659) stressed the need to integrate the marine realm into urban ecology. He considered that the reasons why the advancement of our ecological knowledge of marine environments in urban areas is slow include:

- 'understanding the structure and functioning of marine ecosystems in urban areas is not fully recognised among the priorities of conservation biology'
- 'there is a clear-cut segregation between marine and urban ecology'

This report attempts to address both of these constraints in the context of Pyrmont peninsula.

7.1 Introduction

7.1.1 Improving the Ecology of Pyrmont Peninsula Project

The Pyrmont-Ultimo Urban Landcare Group (PUULG), together with Pyrmont Progress Incorporated (PPI), secured funding in September 2006 from the City of Sydney Council's Environmental Grants Program 2006/2007. These funds are being utilised to undertake literature research to identify practical strategies to improve the natural ecology of Pyrmont Peninsula. The research will include targeted documentation of both terrestrial and estuarine/marine flora and vertebrate fauna inventories, utilising baseline historical and contemporary records. This information will potentially facilitate the development of policy and implementation plans for ecological improvement of the Peninsula. It is envisaged that the outcomes of this project may represent a common model for consideration for other parts of the City of Sydney foreshore.

7.1.2 Historical use of Pyrmont Peninsula and surrounds

Over the course of the past 150 years the terrestrial environment of Pyrmont Peninsula, and in turn the surrounding marine domain, has been subject to increasingly invasive disturbances in the form of significant, consistent changes in land use. Pyrmont Peninsula was once cleared and harvested for timber, and subsequently transformed into agricultural lands. Pyrmont was quarried, beginning in 1853, supplying sandstone to build some of Sydney's landmark structures. Pyrmont also became a focus for intense industrial development and activity close to the city centre. More recently, Pyrmont and its surrounds have undergone harbour development works, land reclamation, and extensive residential/commercial development. The associated foreshore restructuring and removal of native vegetation (including riparian vegetation), together with resultant increases in erosion, sedimentation and polluted runoff, can account for the greatly altered, much impoverished state of the Pyrmont Peninsula terrestrial and marine ecology exhibited today.

During the early 1800s noxious industries were forced out of the Sydney Town (the current centre of the Sydney CBD) city centre and began to locate in the Pyrmont and greater Pyrmont region, the latter incorporating the catchments of Pyrmont's surrounding embayments(Ecological Engineering, 2003; Waterways Authority, 2002). Close to the city and surrounded by the deep waters of Port Jackson, Pyrmont Peninsula quickly became a centre for major industry, manufacturing and shipping. Such heavy industrial operations included tanneries, copper smelting, pig yards, boiling down and tobacco works(Ecological Engineering, 2003; Waterways Authority, 2002). The most significant industry, however, was the Government's Glebe Island Abattoirs operating in the 1850s, which further attracted industries such as soap factories and candle makers(Waterways Authority, 2002).

Major land reclamation occurred in the later 1800s within the greater Pyrmont region to accommodate industrial sites and create recreational areas (Waterways Authority, 2002). Such land reclamation works also permitted deeper water mooring berths, replacing early jetties(ibid). The foreshore of the greater Pyrmont region was developed for industrial uses in the late 1890s, with such uses including saw mills, soap factories and oil works (ibid). As a result the original foreshore edges have changed beyond recognition. By 1900, the area was providing Sydney with power for its lights and trams and was a major centre for the distribution of Australian wool, flour, milk, sugar and other foodstuffs. Reclamation of mangrove swamps in the early 1900s created land which now forms open space parklands(ibid).

The early 1900s saw further major industrial operations establish in the greater Pyrmont region, with the White Bay Power Station and grain storage facilities becoming operational between 1912 and 1920(NSW Department of Planning, 1993b). Industrial development of the greater Pyrmont region was further supported by the construction of the existing Glebe Island Bridge in 1901 and railway tracks through Rozelle linking to Pyrmont and Darling Harbour in 1919(ibid). In 1926, extensive wharfage for timber shipment with rail connections was built by the Sydney Harbour Trust(ibid).

The decline of the industrial significance of the greater Pyrmont region, otherwise known as the Bays Precinct, began after World War II in an era characterised by the relocation of industrial operations to larger sites in Western Sydney(Waterways Authority, 2002). Many of the old industrial sites became obsolete or underutilised, with the vacant foreshore land being regained for public recreation(NSW Department of Planning, 1993b).

One of the more significant operations to emerge in the Pyrmont area post WWII was the Sydney Fish Markets on Blackwattle Bay. During the 1960s the present Sydney Fish Markets site was occupied by a paper storage warehouse, as well as a Shell operated transport and fuel storage depot and service station(GHD, 2001). Following the burning down of the paper storage warehouse, the current Sydney Fish Markets building was constructed and the Sydney Fish Markets thus moved from Haymarket to Blackwattle Bay in 1966(ibid). The Sydney Fish Markets continue to trade in 2007.

7.1.3 Contemporary use of Pyrmont Peninsula and surrounds

As a result of the relocation of heavy industry from the Pyrmont area following WWII, the Peninsula and Bays Precinct exhibits a highly urbanised, largely residential/commercial character today, with the catchment of the greater Pyrmont region being predominantly impervious to water(Ecological Engineering, 2003).

The present-day landform and visual character of Pyrmont Peninsula and the wider Bays Precinct strongly reflects the historical port, rail and industrial use of the area. Former industrial and transportation infrastructure, such as elevated brick railway viaducts, truss bridges, Glebe Island Bridge and gantry cranes are evident throughout the greater Pyrmont region, reinforcing the past and present working, industrial nature of the area(NSW Department of Planning, 1993b). Pyrmont and the wider Bays Precinct is influenced by heavy and light industrial development on the foreshores, together with a mix of open space and minor residential areas(ibid). The early location of industry on the waterfront has resulted in a landscape of built forms and bold landmarks of cranes, loaders, chimney stacks and silos, highlighting the Pyrmont region as an industry arm of Sydney Harbour and a unique foreshore precinct(ibid).

Presently, Pyrmont and the Bays Precinct is dominated by the bulk and scale of former industrial structures, in particular, the Glebe Island grain terminal silos and the White Bay power station(ibid). Other areas such as White, Johnston's and Blackwattle Bays have previously been subjected to extensive cut and fill, associated with the development of the ports, and thus presently exhibit extensive flat areas adjacent to the water(NSW Department of Planning, 1993b, 2005). Wentworth, Jubilee and Harold Parks, located in the southern part of the Bays Precinct, represent large areas of land reclaimed from Blackwattle and Rozelle Bays for industrial and recreational uses(NSW Department of Planning, 1993b). In fact, much of the present day open space has been created by reclamation and land-filling(ibid). The western region of the Bays Precinct has retained former railway marshalling yards(NSW Department of Planning, 1993a).

In contrast to the industrial influences that have shaped the present-day character of Pyrmont Peninsula and the Bays Precinct, there also exists remnants of inner city terrace housing circa 1890s(ibid). This includes relatively basic late Victorian urban dwellings together with a number of small scale former hotels and shops(ibid).

7.1.4 Historical and Contemporary use of Pyrmont Peninsula's Waters and Sydney Harbour

Pyrmont's marine/estuarine environment has similarly accommodated significant activity since European settlement. Commercial fishing activities in the Sydney estuary, presumably including the Pyrmont Peninsula Study Area(PPSA), began with the arrival of the First Fleet (Henry, 1984). Fishing was carried out by the early settlers to supplement government food stores(ibid). Fish then became an article of commerce in Sydney by 1827(ibid). Commercial fishing subsequently persisted until early 2006 when the Sydney Harbour fishing closure was put in place by the NSW Department of Primary Industries on the basis of health and contamination concerns due to dioxin. Some of the commercial fishing fleet was once housed at Pyrmont, with the area then being used as a boat maintenance area(NSW Department of Planning 1993b). Presently the majority of Sydney's commercial fishing fleet berths are at the Sydney Fish Markets in Blackwattle Bay(ibid).

The PPSA has also endured a rich commercial shipping history. The White Bay/Glebe Island area has operated since the nineteenth century for water-based transport and industrial uses(ibid). It has been a multipurpose port for berths and storage owned and controlled by the State Government since 1901. It predominantly caters for container handling, break bulk cargo (timber, paper, motor vehicles and steel), dry bulk cargoes (cement, sugar, gypsum, soda ash and aggregates) and bulk liquid cargo. Today the area, including Darling Harbour, represents one of NSW's main gateways for such cargo, which is essential for the economic growth and development of the State.

Apart from the commercial operations, the waters of the PPSA precinct also provide for a variety of recreational users. These include small craft such as kayaks, sailing and motor boats and craft of the Glebe Island Rowing Club, situated in Blackwattle Bay(ibid). Also, recreational fishing is conducted at various locations around the PPSA, both from private vessels and land, especially from the parks on the southern shore of Blackwattle Bay(ibid).

The land and water-based uses of the Pyrmont Peninsula and its surrounds have impacted on, and continue to impact on, the area's marine ecology. The present document represents the marine ecology component of the Improving the ecology of Pyrmont Peninsula project. Owing to time and funding constraints the information presented is primarily the result of a desk-top based literature review, with fieldwork being outside the scope of the Grant.

7.2 Aims & Objectives

In addressing the marine ecology component of the Pyrmont Peninsula project, the main objectives are as follows:

- Document both a historical and contemporary baseline account of the ecology of the estuarine waters of the PPSA, focussing particularly on temporal change:
  - Provide information pertaining to the estuarine flora and fauna associated with the Pyrmont Peninsula;
  - Discuss natural and anthropogenic processes operating within the PPSA, both past and present, which have impacted on, or influenced, the ecology of Pyrmont's estuarine waters;
- Explore potential opportunities for, or constraints to, ecological improvement of Pyrmont's estuarine system; and
- Identify practical approaches/strategies/actions that the relevant authorities may adopt to improve the ecological quality of Pyrmont's estuarine environment.

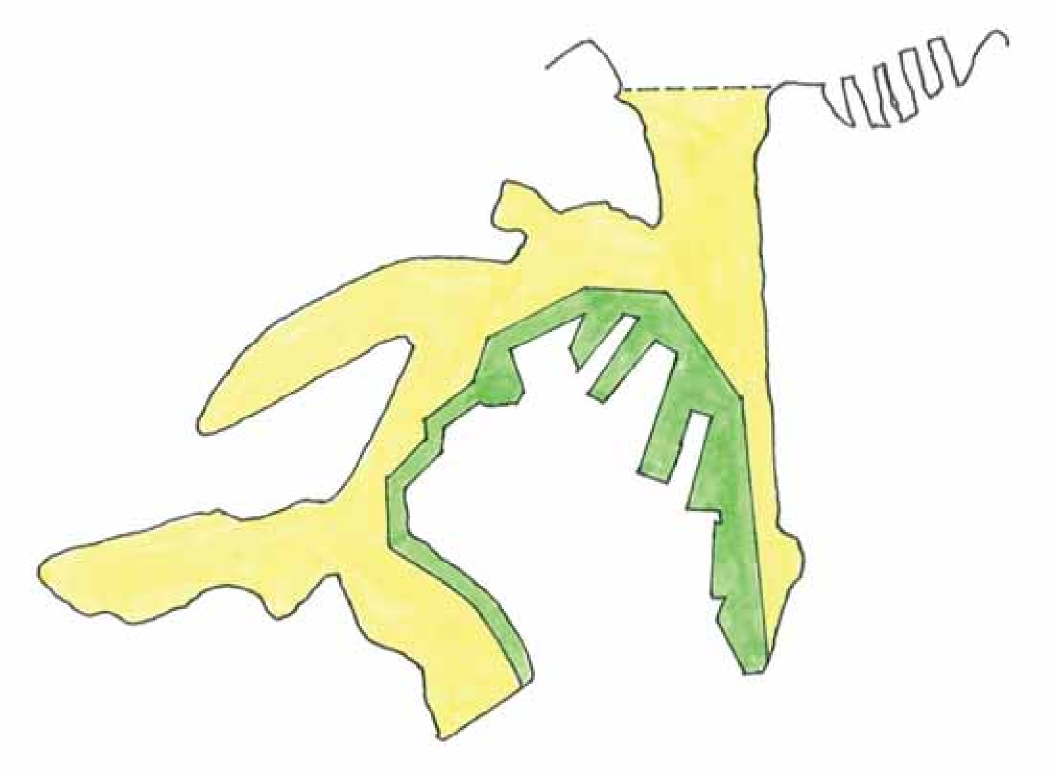
7.3 Study Area

For the purpose of this study, the 'Pyrmont Peninsula Foreshore' (PPF) is defined as the physical shoreface of Pyrmont Peninsula and the waters immediately surrounding it (Figure 7.1). The wider 'Pyrmont Peninsula Study Area' (PPSA) is defined as the PPF coupled with the waters of adjacent embayments – Blackwattle Bay, Rozelle Bay, White Bay, Johnston's Bay, Millers Point, Darling Harbour and Cockle Bay (Figure 7.1).

Figure 7.1 demonstrates that Pyrmont Peninsula exists within a large, tidally-driven, estuarine embayment headed by Simmons Point and Millers Point and composed of the numerous smaller bays mentioned. It is within this context that the PPSA boundary was determined. In order to accurately address the state of Pyrmont Peninsula's marine ecology, it is necessary to at least consider the entire, dynamic embayment as a whole on the basis that the condition of Pyrmont's marine ecology is a function of the processes operating within, and those impacting on, the greater embayment system. However, given that the embayment within which Pyrmont Peninsula exists is connected to, and is part of, the greater Sydney Harbour estuary system, it may be argued that the PPSA is also subject to processes operating on an estuary-wide scale, and thus should encompass the entire estuary in some specific cases.

Being part of the greater Sydney drowned river-valley estuary(Roy, 1982), the waters of the PPSA are, in essence, estuarine and thus will be referred to as such in the present paper. However it must be noted that, given that the overall freshwater influence of the Parramatta and Lane Cove Rivers is relatively low, and the Sydney estuary is fully tidal, the system is recognised as being marine-dominated(Henry, 1984).

Figure 7.1: Map showing the 'Pyrmont Peninsula Foreshore'(PPF) in green, and the 'Pyrmont Peninsula Study Area' (PPSA) in yellow



7.4 Methodology

The objectives of the present paper were achieved primarily by means of a desktop literature review, with a field investigation being outside the scope of works on the basis of funding limitations. While this approach permitted extensive and wide-ranging literary resources concerning areas of the PPSA to be accessed, it has prevented the discussion of present-day, Pyrmont Peninsula-specific flora, fauna and habitat assessments.

Historical and contemporary records for Pyrmont Peninsula and regions of the greater PPSA were obtained through:

- Liaison with the Australian Museum, City of Sydney Council, Wollongong University and the NSW Department of Primary Industries;
- Scientific journal database searches; and
- World Wide Web literature searches.

Reference text books were also utilised for general estuarine biological and ecological principles.

The resources listed above resulted in relevant articles being accessed from a broad range of scientific journals of varying focus, as well as extensive reports from State Government Departments (such as the EPA, NSW Public Works Department, NSW Department of Primary Industries, NSW Maritime, NSW Department of Planning, Sydney Water Corporation and the Waterways Authority) and environmental consultants (such as The Ecology

Lab, ERM, GHD and Ecological Engineering).

With regard to the estuarine fauna component of the present paper, results were restricted to records of teleost fishes and estuarine invertebrates from the PPSA, thus excluding estuarine/marine mammals and sea-birds. This was decided on the basis of the amount of information accessible relevant to the PPSA specifically. For fish and invertebrates, the Australian Museum records were the most comprehensive and thus the most meaningful. Due to the lack of a temporal and quantitative sampling design, however, discussion of temporal change was not possible for any faunal groups in the PPSA.

7.5 Habitat of the Pyrmont Peninsula Study Area

7.5.1 Substratum Composition

Literature documenting the historical and/or contemporary state of Pyrmont's estuarine environment, although very limited, consistently identifies a system profoundly degraded as a result of anthropogenic activity. This account is gleaned predominantly from information pertaining to areas of the wider PPSA, as opposed to information dealing with Pyrmont Peninsula specifically.

The physical estuarine habitat of areas of the PPSA is composed primarily of artificially created substrata(The Ecology Lab, 1986; 1987; 2004). The foreshore and intertidal habitats of much of the PPSA are composed of vertical and sloping sandstone and concrete seawalls, together with shores of broken rock(ibid). However, some small areas of naturally occurring intertidal mixed sandy beds (fine sand and silt particles) and rock platforms are also present(ibid).

Similarly, the subtidal habitats in the PPSA are composed largely of anthropogenic rubble, as well as deposits of sand, silt and organic matter concentrated at sources of terrestrial stormwater run-off(The Ecology Lab, 2004). At the base of the sandstone/concrete seawall at Blackwattle Bay, and extending several metres offshore are scattered sandstone rock, rubbish (buckets, crates, construction materials) and some natural rocky outcrops (ibid). Further offshore, the substratum of Blackwattle Bay is composed of a mix of sand, silt and shell grit and scattered debris with a gradient of increasing silt content further from shore. In Rozelle Bay the subtidal habitat consists of bluestone boulders and large items of rubbish, decreasing in density further offshore. Offshore from Glebe Point exists a small amount of rubble and small boulders as well as a large accumulation of organic matter and rubbish(ibid).

Extensive fill has also been identified in the offshore substratum composition in various regions of the PPSA. On the southern side of White Bay, fill of 9m depth overlies the naturally occurring estuarine sediment(NSW Dept. of Planning, 1993b). At the northeastern corner of Glebe Island and at Rozelle Bay, 15m and 8.5m of fill overlie the existing estuarine sediment respectively (ibid). The majority of the fill in the PPSA consists of demolition rubble and sandstone excavation from adjacent development sites(ibid).

7.5.2 Sediment and Water Quality

Extensive sampling of the Sydney Harbour estuary has demonstrated that the substratum sediments of the PPSA are heavily contaminated, this being the case for most of the bays on the southern side of Port Jackson(Birch and Taylor, 1999; Birch et al., 1999). Of particular relevance to the present paper are the sampling sites at Blackwattle Bay and Rozelle Bay. The sediments of these two embayment systems displayed elevated levels of the heavy metals zinc, lead and copper(Birch and Taylor, 1999; Birch et al., 1999). In this way, the health of Blackwattle and Rozelle Bays is considered to be poor to very poor (Ecological Engineering, 2003). Depending on the bioavailability of the toxicants, these observed heavy metal concentrations would almost certainly be significantly impacting on the health of the PPSA estuarine ecosystem (Birch and Taylor, 1999; Birch et al., 1999; Ecological Engineering 2003).

With regard to the water quality of the PPSA, Blackwattle Bay has once again been a sampling focal point. An Environmental Indicators Report prepared by Sydney Water Corporation(1997) reported that during dry weather, faecal coliforms, mean nutrients and dissolved oxygen levels were within acceptable ANZECC concentrations for maintenance of aquatic ecosystems. However, following a wet weather event the levels of these parameters all exceeded acceptable trigger values, with faecal coliform concentrations approximately five times greater than the standard for secondary contact recreation(ibid). Furthermore, Blackwattle Bay was found to accommodate high chlorophyll-a concentrations and algal blooms dominated by Chlorophyta (green algae), conditions symptomatic of excessive nutrients in an estuarine environment (Ecological Engineering, 2003). A qualitative study of Blackwattle Bay in 2003 confirmed a high level of nutrient enrichment, with most surfaces (sand, rocks, piles and calcareous skeletons) being covered with filamentous green algae (Ecological Engineering, 2003). Further investigations of water quality emanating from Blackwattle Bay have identified the embayment as consistently exhibiting turbidity levels in excess of the recommended upper ANZECC trigger values(ibid). A report by the NSW Department of Planning (1993b) reported high concentrations of greases and oils and other toxic elements present in water samples collected from Rozelle Bay, as well as high levels of litter congregating at the head of Blackwattle Bay.

7.6 Estuarine Macrophytes

Intertidal and subtidal vegetated communities are a significant component of all estuarine ecosystems(West et al., 2004). They fulfil a variety of important ecological functions, including primary productivity, provision of habitat and consolidation of sediments(Huisman, 2000; Ecology Lab, 2004; West et al., 2004). In addition, through the supply of resources such as food and shelter, these communities act as important nursery grounds for juvenile fishes and invertebrates, as well as habitat for adult fishes, crustaceans and molluscs (Dayton, 1985; Kennelly, 1991; Paxton & Eschmeyer, 1994; Steinberg & Kendrick, 1999; Huisman, 2000; West et al., 2004).

Studies conducted approximately two decades apart, between 1978 and 2000 (West et al., 1985; West et al., 2004), provide some indication of changes in the distribution and abundance of macrophytes in Sydney harbour over recent years, as discussed below. Unfortunately there are no earlier quantitative studies.

7.6.1 Estuarine Macrophytes in Sydney Harbour Estuary

Estuarine vegetated communities are present along much of the foreshore of the Parramatta River/Sydney Harbour drowned river valley estuary, and cover extensive portions of the estuary bed(West et al., 2004). These vegetated communities are typically comprised of estuarine macrophytes such as seagrass, saltmarsh, mangrove, kelp, and other marine macroalgae. The estuarine floral communities (seagrass, saltmarsh and mangroves) are typically associated with the harbour's intertidal and shallow subtidal, soft-sediment environments(Sumich, 1999; Huisman, 2000; West et al., 2004). Kelp and other macroalgae taxa, however, are largely associated with intertidal and subtidal rocky substratum(Sumich, 1999; Huisman, 2000; West et al., 2004).

NSW Fisheries mapped the distribution of these estuarine macrophyte-types from aerial photos taken in 1978 for the Parramatta River/Sydney Harbour estuary(West et al., 1985). This was done to provide a baseline against which to assess changes in the distribution and abundance of seagrass, mangrove and saltmarsh communities. Subsequently, West et al.(2004) mapped the distribution of these same vegetation types, with the addition of macroalgal kelp, from aerial photos taken in 2000.

A) Sydney Harbour Historical Records

The study by West et al.(1985), investigating the distribution of estuarine macrophytic communities within the Sydney Harbour estuary, found that all mangrove and saltmarsh communities occurred upstream (west) of both the Harbour Bridge and Middle Harbour's Spit Bridge and that their distributions are largely restricted to the upper reaches of the Parramatta River (including Homebush Bay) and Lane Cove River.

Seagrass occurrence in the estuary, however, exhibited an almost opposite distribution to that of the mangrove and saltmarsh stands(ibid). Seagrass beds, composed of mixed and/or monospecific stands of *Posidonia* sp., *Zostera* sp. and *Halophila* sp., were observed to occur predominantly in the lower-most portion of the estuary, that is, east of the Harbour Bridge, and within the Middle Harbour and Manly regions(ibid). Very little seagrass biomass was observed upstream of the Harbour Bridge(ibid).

B) Sydney Harbour Contemporary Records

The later study by West et al.(2004), which also sought to comprehensively map the estuarine vegetation of the Sydney Harbour estuary, reported that saltmarsh is only present in the upper-reaches of the Parramatta River channel. This saltmarsh is located exclusively on the southern shore of the river at, or upstream of, Homebush Bay(ibid). One small community was identified on the southern side of Duck River(ibid).

Mangrove forest was reported to occur in the upper-reaches and upstream embayments of Middle Harbour, and also along much of the banks of the Lane Cove River(ibid). The largest area of mangrove in the Sydney Harbour estuary, however, is located in the upper-reaches of the Parramatta River, most of which is on the southern shore(ibid).

Almost all of the kelp identified in the Sydney Harbour estuary was mapped east of the Harbour Bridge(ibid). More specifically, the kelp was reported to be found in the marine-dominated, lower-most reaches of the Parramatta River, lower Middle Harbour, North Harbour(Manly) and Harbour entrance regions, primarily in association with east-exposed headlands, intertidal rock platforms, subtidal rocky reefs and harbour islands(ibid).

With regard to contemporary seagrass occurrence in the Sydney Harbour estuary, West et al.(2004) found that, with the exception of numerous small seagrass stands, seagrass distribution is primarily focused east of both the Harbour and Spit bridges, with the majority existing in the Parramatta River sector. Once again, the seagrass beds identified were composed of mixed and/or monospecific stands of *Zostera* sp., *Posidonia* sp. and *Halophila* sp., with *Zostera* being the dominant genus (ibid). The study by West et al.(2004) also showed that proportionately more seagrass biomass is located on the southern shorelines of the estuary than on the northern shorelines.

7.6.2 Temporal Change in Estuarine Macrophyte Distribution in Sydney Harbour

In comparing the findings emanating from the two studies by West et al. (1985) and West et al. (2004), it is apparent that the macrophytic communities of the Parramatta River and Sydney Harbour estuary have undergone significant changes in distribution and biomass since 1978.

The studies indicate that there was a large net loss of seagrass in Sydney Harbour as a whole, from 129ha in 1978 to 52ha in 2000(West et al., 2004). While large losses were identified at some locations (e.g. off Clontarf and in the vicinity of the Spit Bridge), small gains in seagrass biomass were identified at other harbour sites (e.g. Iron Cove, Five Dock Bay and Hen & Chicken Bay)(ibid).

In contrast, the area of mangrove in the Sydney Harbour estuary increased from 148ha in 1978 to 185ha in 2000, and the area of saltmarsh remained steady at less than 10ha(ibid).

West et al.(2004) also found approximately 86ha of kelp in the Sydney Harbour estuary in 2000. As kelp distribution was not mapped by West et al. (1985), however, temporal changes in distribution and biomass can not be elucidated.

7.6.3 Estuarine Macrophytes of the Pyrmont Peninsula Study Area

A) Pyrmont Peninsula Historical Records

With respect to the estuarine waters of the PPSA, the available historical literature outlines that estuarine macrophyte communities have been present in the region.

Mangrove swamps were present at Rozelle Bay, and were also likely to have occurred in Blackwattle Bay. Between 1876 and 1908, however, such mangrove stands were destroyed due to foreshore works, extensive land reclamation and creek and swamp infilling to provide land for industry (Waterways Authority, 2002). It could be proposed that these direct anthropogenic stresses, impacting on the intertidal macrophyte communities, would have also been detrimental to the subtidal, submerged macrophyte communities.

Subsequently, the study by West et al.(1985) found no occurrence of estuarine vegetation in association with the PPF nor within the greater PPSA (see Figure 7.2). The harbour foreshore map clearly indicates the absence of seagrass, mangroves and saltmarsh within the defined study area(ibid).

Subsequent studies by The Ecology Lab(1986,1987), aimed at describing the physical environment of Rozelle Bay, reinforced the findings of West et al. (1985) by noting the distinct lack of seagrass, mangroves, saltmarsh and macroalgal beds for the Rozelle embayment.

B) Pyrmont Peninsula Contemporary Records

The available literature pertaining to contemporary records of estuarine macrophyte assemblages within the defined PPSA suggests that, while not totally absent, their occurrence is extremely limited.

Consistent with the findings of West et al.(1985), West et al.(2004) once again found a lack of estuarine vegetation in association with the immediate Pyrmont foreshore, with neither seagrass, mangrove nor saltmarsh mapped for the Peninsula (Figures 7. 3 and 7.4). In contrast to the earlier study by West et al.(1985) however, West et al.(2004) indicated the presence of estuarine macrophytes within the greater PPSA. They mapped a stand of the seagrass *Halophila* sp., together with small areas of macroalgal kelp occupying the Ewenton Park embayment (southern shore of East Balmain) and outer embayment headlands respectively. Although possibly sourced from West et al.(2004), the NSW Maritime Western Port Jackson Navigation Chart(2004) also illustrates the presence of seagrass in the Ewenton Park embayment of East Balmain (Figure 7.5).

While not documenting the immediate PPF itself, various other studies have been conducted on the physical estuarine environment of locations within the defined PPSA.

The Ecology Lab(2004) undertook a marine habitat survey for the Glebe foreshore (Rozelle Bay, Glebe Point and Blackwattle Bay). While ERM (1998) and West et al.(2004) present an absence of macrophytic assemblages in the Glebe foreshore waters, the study by The Ecology Lab(2004) employed visual survey methodology, as opposed to remote sensing techniques, thus permitting the location of floral stands at the highest resolution. In this way, they identified the presence of seagrass, saltmarsh, mangrove and macroalgae in the Glebe foreshore region, albeit in very restricted occurrences(ibid). A tidally influenced stormwater canal, intersecting the Bicentennial Park seawall at Rozelle Bay, was found to support a small stand of remnant saltmarsh on its northern bank (ibid). Several mangrove trees and saplings were identified on a small area of mudflat at Glebe Point, with a small cluster of more established mangroves being located at Rozelle Bay(ibid). Given that the intertidal and subtidal habitats of the greater Glebe foreshore region are characterised by sandstone seawalls and submerged rubble respectively(ibid), it is not surprising that the estuarine macroalgae taxa *Sargassum* sp. was found to be distributed widely. Large amounts of *Sargassum* sp. were found to occur in Rozelle Bay and offshore from Bicentennial Park West, and were found in smaller quantities in Blackwattle Bay and at Glebe Point(ibid). Other common macroalgae genera such as *Corallina* and *Dictyota*, typically found as small outcrops on hard substrata, were also identified in Blackwattle Bay(ibid). Finally, at the end of Glebe Point Road several singular blades of the seagrass *Halophila* sp. were discovered approximately 15m offshore at a depth of 2m(ibid).

Figure 7.2: Estuarine macrophytes nearest Pyrmont, 1978 (West *et al.*, 1985)

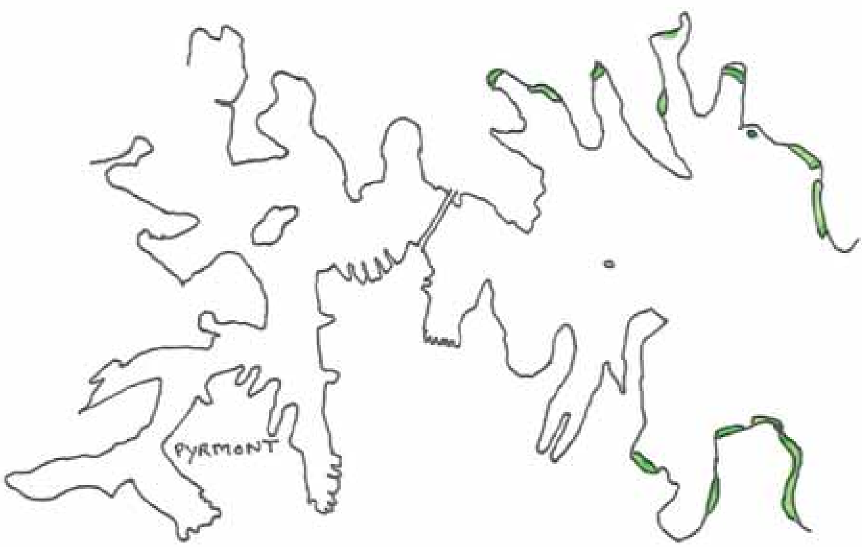


Figure 7.3: Estuarine macrophytes nearest Pyrmont, 2000 (West *et al.*, 2004)

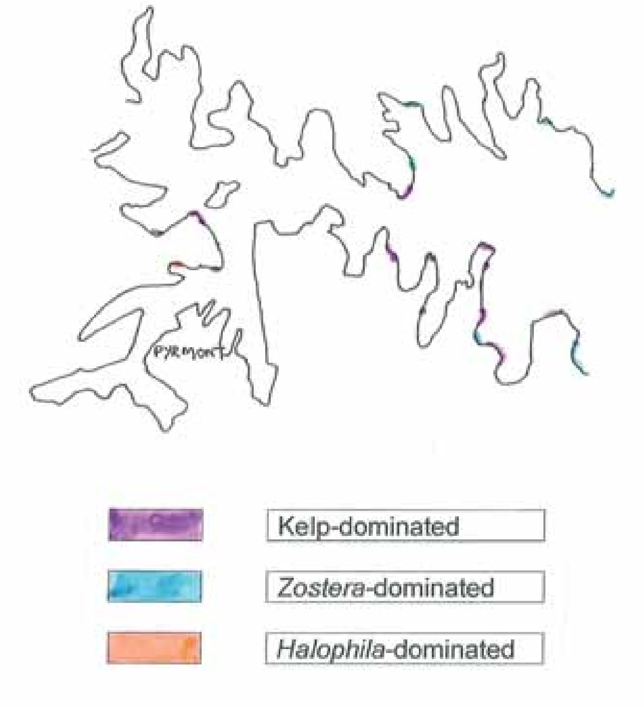


Figure 7.4: Estuarine macrophytes within the PPSA, 2000 (West *et al*, 2004)

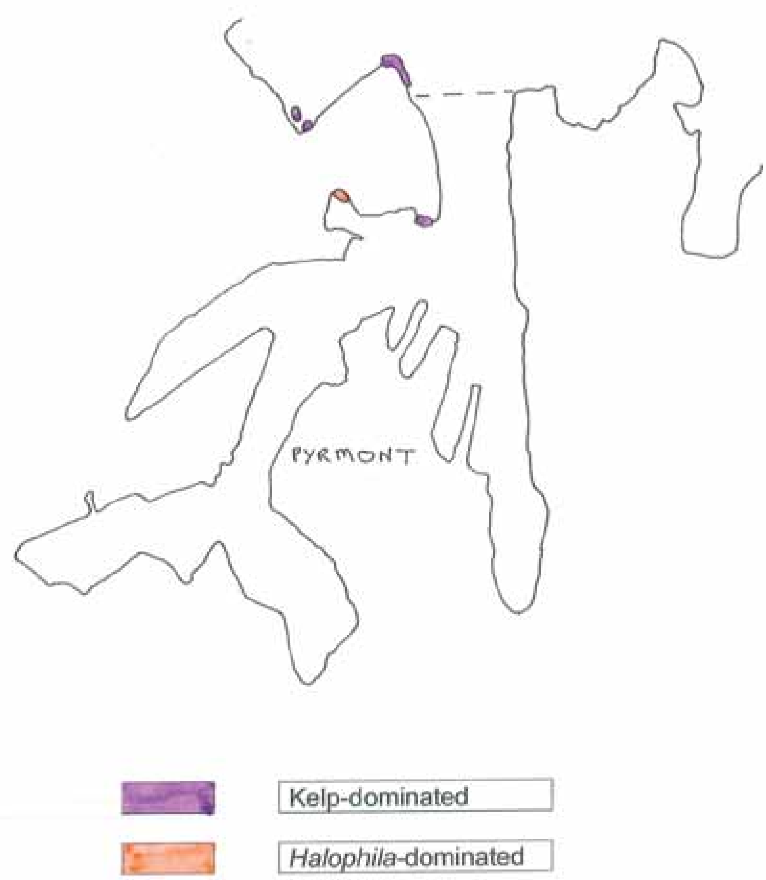
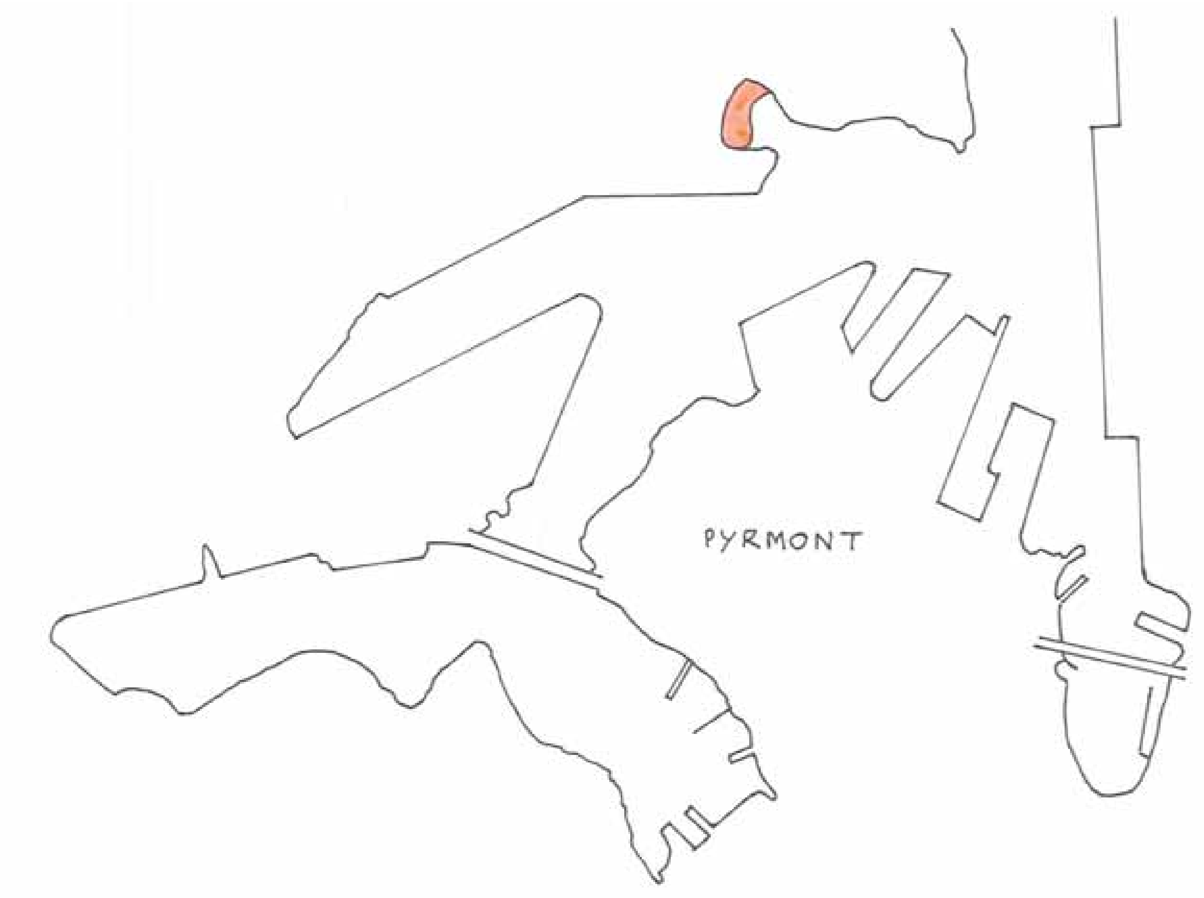


Figure 7.5: Occurrence of seagrass within the Ewenton Park embayment, East Balmain



7.7 Estuarine Fauna of the Pyrmont Peninsula Study Area

7.7.1 Teleost Fishes

Table 7.1 lists the estuarine teleost fish records for the Pyrmont Peninsula waters and greater PPSA, observed between 1891 and 2001, obtained from desk top resources. Records were predominantly sourced from the Australian Museum Ichthyology Department, which conducted a Sydney Harbour port survey in 2001. This survey was a one-off, qualitative event. Other records were incidental and/or haphazard.

Some 77 species of estuarine teleost fishes from 37 families have previously been recorded in the study area (Table 7.1). In the context of NSW estuaries, this represents high taxa diversity, and includes many commercially important species.

Table 7.1: Teleost fish records for the PPSA (1891 - 2001) Includes records for Cockle Bay; Darling Harbour; Johnstons Bay; Blackwattle Bay; Rozelle Bay; White Bay; Glebe Island; Goat Island; Millers Point; Sydney Fishmarkets (Australian Museum Ichthyology Database, 2006; The Ecology Lab, 2004).

Family		Species	Common Name	Code
Ambassidae	Glassfishes	*Ambassis jacksoniensis*	Port Jackson glassfish	
Anguillidae	Freshwater Eels	*Anguilla reinhardtii*	Long-finned Eel	*HCB
Antennariidae	Anglerfishes	*Antennarius striatus*	Striped Anglerfish	
Apogonidae	Cardinalfishes	*Apogon fasciatus* *Apogon limenus* *Vincentia novaehollandiae* *Siphamia roseigaster*	Striped Cardinalfish Sydney Cardinalfish Eastern Gobbleguts Pinkbreast Siphonfish	
Atherinidae	Hardyheads	*Atherinosoma microstoma*	Smallmouth Hardyhead	*IC
Batrachoididae	Frogfishes	*Batrachomoeus dubius*	Eastern Frogfish	
Blenniidae	Blennies	*Omobranchus anolius* *Parablennius tasmanianus*	Oyster Blenny Tasmanian Blenny	
Bothidae	Lefteye Flounders	*Pseudorhombus arsius*	Largetooth Flounder	
Carangidae	Trevallies	*Caranx* sp. *Pseudocaranx dentex* *Trachurus novaezelandiae*	Trevally Silver Trevally Yellowtail Scad	

Family		Species	Common Name	Code
Cheilodactylidae	Morwongs	*Cheilodactylus spectabilis*	Banded Morwong	
Clinidae	Weedfishes	*Cristiceps australis*	Crested Weedfish	*IC
Clupeidae	Herring	*Hyperlophus translucidus*	Glassy Sprat	
Congridae	Conger Eels	*Conger wilsoni*	Eastern Conger	
Elopidae	Ladyfishes	*Elops hawaiensis*	Giant Herring	*HCB
Engraulididae	Anchovies	*Engraulis australis*	Australian Anchovy	*HCB
Gerreidae	Sliverbiddies	*Gerres subfasciatus*	Common Silverbiddy	
Gobiidae	Gobies	*Acanthogobius flavimanus* *Acentrogobius pflaumii* *Afurcagobius tamarensis* *Arenigobius bifrenatus* *Arenigobius frenatus* *Bathygobius krefftii* *Callogobius depressus* *Callogobius mucosus* *Favonigobius exquisitus* *Favonigobius lateralis* *Gobiopterus semivestitus* *Istigobius hoesei* *Mugilgobius stigmaticus* *Priolepis nuchifasciata* *Pseudogobius* sp.9 *Redigobius macrostoma* *Tridentiger trigonocephalus*	Yellowfin Goby Striped Sandgoby Tamar Goby Bridled Goby Half-bridled Goby Krefft's Frillgoby Flathead Goby Flathead Goby Exquisite Sandgoby Eastern Longfin-goby Glass goby Hoese's Sandgoby Black-spot Mangrove-goby Threadfin Reef-goby Blue-spot Goby Largemouth Goby Trident Goby	 *HCB *HCB
Kyphosidae	Drummers	*Girella tricuspidata*	Luderick	
Labridae	Wrasses	*Achoerodus viridis* *Coris picta* *Bodianus unimaculatus*	Blue Groper Comb Wrasse Pigfish	
Monacanthidae	Leatherjackets	*Mauschenia freycineti* *Meuschenia trachylepis* *Monacanthus chinensis* *Scobinichthys granulatus*	Six-spine Leatherjacket Yellow-finned Leatherjacket Fan-bellied Leatherjacket Rough Leatherjacket	
Monodactylidae	Pomfrets	*Monodactylus argenteus*	Diamondfish	

Family		Species	Common Name	Code
Mugilidae	Mullets	*Liza argentea* *Valamugil georgii* *Mugil cephalus*	Flat-tail Mullet Fantail Mullet Sea Mullet	† † *HCB
Mullidae	Goatfishes	*Parupeneus spilurus*	Black-spot Goatfish	
Ophidiidae	Bortulas	*Dermatopsis macrodon*	Eastern Yellow Blindfish	
Platycephalidae	Flatheads	*Platycephalus* sp. *Platycephalus fuscus*	Flathead Dusky Flathead	 *HCB
Pleuronectidae	Righteye Flounders	*Ammotretis rostratus*	Longsnout Flounder	
Plotosidae	Eeltail Catfishes	*Cnidoglanis macrocephalus* *Plotosus lineatus*	Estuary Catfish Striped Catfish	†
Pomatomidae	Tailors	*Pomatomus saltatrix*	Tailor	*HCB
Sciaenidae	Croakers	*Argyrosomus japonicus*	Mulloway	*IC
Scorpaenidae	Scorpionfishes	*Centropogon australis*	Fortescue	
Sillaginidae	Whitings	*Sillago ciliata* *Sillago maculata*	Sand Whiting Trumpeter Whiting	 *HCB
Sparidae	Snapper, Breams	*Acanthopagrus australis* *Pagrus auratus* *Rhabdosargus sarba*	Yellowfin Bream Snapper Tarwhine	 *IC †
Sphyraenidae	Barracudas	*Sphyraena novaehollandiae*	Pike	*IC
Syngnathidae	Pipefish, Seahorses	*Hippocampus abdominalis* *Hippocampus whitei* *Stigmatopora nigra* *Trachyrhamphus bicoarctatus* *Urocampus carinirostris*	Bigbelly Seahorse White's Seahorse Wide-body Pipefish Stick Pipefish Hairy Pipefish	 *IC
Terapontidae	Trumpeters	*Pelates sexlineatus*	Eastern Striped Trumpeter	
Tetraodontidae	Pufferfishes	*Tetractenos hamiltoni*	Common Toadfish	
Tripterygiidae	Triplefins	*Brachynectes fasciatus* *Enneapterygius* sp. *Trinorfolkia clarkei*	Barred Threefin Common Threefin	

* Denotes likely occurrence based on records from nearby comparable embayments (HCB: Hen and Chicken Bay; IC: Iron Cove);

†Denotes likely occurrence (temporary or resident) based on known distribution and habitat preference.

7.7.2 Estuarine Invertebrates

Table 7.2 lists the estuarine invertebrate records for the Pyrmont Peninsula waters and greater PPSA, observed between 1961 and 2004. All records were sourced from the Australian Museum Marine Invertebrates database. Records were obtained during qualitative survey events.

Some 139 species of estuarine invertebrates from 8 phyla have previously been recorded in the study area (Table 7.2).

Table 7.2: Estuarine invertebrate records for the PPSA (1961 - 2004) Includes records for Pyrmont; Darling Harbour; Blackwattle Bay; Rozelle Bay; White Bay; Glebe Island; Millers Point (Australian Museum Marine Invertebrates Database, 2007).

Phylum	Class	Family	Species
Annelida (Segmented Worms)	Polychaeta (Bristle Worms)	Capitellidae	*Barantolla lepte* *Capitella capitata* *Mediomastus australiensis* *Notomastus chrysosetus*
		Chaetopteridae	*Phyllochaetopterus socialis* *Spiochaetopterus* sp.
		Cirratulidae	*Chaetozone setosa* *Cirriformia capensis* *Tharyx retusiseta*
		Dorvilleidae	Not identified
		Eunicidae	*Eunice aphroditois* *Marphysa* sp. *Nematonereis* sp.
		Flabelligeridae	Not identified
		Glyceridae	Not identified
		Hesionidae	*Ophiodromus microantennata*
		Lumbrineridae	*Augeneria verdis*

Phylum	Class	Family	Species
		Nereididae	*Australonereis ehlersi* *Ceratonereis aequisetis* *Leonnates* sp. *Neanthes cricognatha* *Neanthes kerguelensis* *Neanthes vaalii* *Platynereis bicanaliculata*
		Orbiniidae	*Naineris australis*
		Pectinariidae	Not identified
		Pilargidae	Not identified
		Polynoidae	*Harmothoe ascidiicola*
		Sabellariiidae	Not identified
		Sabellidae	*Branchiomma* sp. *Demonax* sp. *Euchone limnicola* *Laonome triangularis* *Pseudopotamilla* sp.
		Serpulidae	*Hydroides diramphus* *Hydroides elegans* *Hydroides ezoensis* *Spirobranchus tetraceros*
		Sigalionidae	*Sthenelais pettiboneae*
		Spionidae	*Dipolydora* sp. *Polydora haswelli* *Polydora socialis* *Prionospio* sp. *Pseudopolydora paucibranchiata*
		Syllidae	*Langerhansia cornuta* *Syllis gracilis* *Typosyllis* sp.
		Terebelliadae	*Amaeana* sp. *Longicarpus modestus* *Streblosoma acymatum*
		Trichobranchidae	*Terebellides kowinka*

Phylum	Class	Family	Species
Bryozoa (Bryozoans)	Gymnolaemata	Beaniidae	*Beania magellanica*
		Bugulidae	*Bugula flabellate* *Bugula neritina*
		Cabereidae	*Tricellaria occidentalis*
		Celleporairiidae	*Celleporaria fusca*
		Cheiloporinidae	*Watersipora subovoidea*
		Membraniporidae	*Conopeum tenuissimum*
		Microporellidae	*Microporella malusii*
		Schizoporellidae	*Schizoporella unicornis*
		Vesiculariidae	*Amathia* sp. *Bowerbankia* sp.
	Stenolaemata	Crisiidae	*Crisia* sp.
Chaetognatha (Arrow Worms)	Sagittoidea	Sagittidae	*Flacisagitta* sp.
Chelicerata (Marine Arthropod)	Pycnogonida (Sea Spider)	Ammothellidae	*Ammothella stocki*
Coelenterata (Corals, Jellies, Anemones)	Alcyonaria	Primnoidea	*Plumarella filicoides*
	Hydrozoa	Bougainvilliidae	*Bougainvillia muscus*
		Clavidae	*Turritopsis nutricola*
		Eudendriidae	*Eudendrium carneum*
		Tubulariidae	*Tubularia gracilis*
		Campanulariidae	*Obelia angulosa*

Phylum	Class	Family	Species
		Haleciidae	*Halecium sessile*
		Plumulariidae	*Plumularia setacea*
	Scyphozoa	Mastigiidae	*Phyllorhiza punctata*
	Zoantharia	Rhizangiidae	*Culicia quinaria*
Crustacea (Crustaceans)	Cirripedia (Barnacles)	Archaeobalanidae	*Elminius covertus* *Hexaminius popeiana*
		Balanidae	*Balanus amphitrite* *Balanus trigonus* *Balanus variegates*
	Malacostraca (Decapods, Isopods, Amphipods)	Caprellidae	*Caprella californica* *Caprella equilibra* *Caprella penantis* *Caprella scaura*
		Cheluridae	*Chelura terebrans*
		Alpheidae	*Synalpheus paraneomeris* *Synalpheus tumidomanus*
		Callianassidae	*Biffarius arenosus*
		Dromiidae	*Stimdromia lateralis*
		Grapsidae	*Paragrapsus laevis*
		Hymenosomatidae	*Halicarcinus ovatus*
		Majidae	*Hyastenus elatus* *Notomithrax minor*
		Palaemonidae	*Macrobrachium novaehollandiae*
		Pilumnidae	*Pilumnus vestitus*
		Pinnotheridae	*Pinnotheres hickmani*
		Porcellanidae	*Pisidia dispar*

Phylum	Class	Family	Species
		Sergestidae	*Acetes* sp.
		Xanthidae	*Actaea granulata*
		Cirolanidae	*Cirolana harfordi*
		Limnoriidae	*Limnoria indica* *Limnoria quadripunctata* *Limnoria rugosissima* *Limnoria saseboensis* *Limnoria tripunctata*
		Sphaeromatidae	*Paracerceis sculpta* *Sphaeroma quoianum* *Sphaeroma terebrans* *Sphaeroma walkeri*
		Mysidae	*Heteromysis abrucei* *Rhopalophthalmus brisbanensis*
		Squillidae	*Oratosquilla oratoria*
		Paratanaidae	*Leptochelia ignotus*
		Tanaidae	*Tanais tenuicornis*
	Copepoda (Copepods)	Taeniacanthidae	Not identified
Porifera (Sponges)	Demospongiae	Raspailiidae	*Raspailia gracilis*
		Darwinellidae	*Chelonaplysilla violacea* *Darwinella gardineri*
		Halisarcidae	*Halisarca dujardini*
		Dysideidae	*Dysidea fragilis*
		Suberitidae	*Suberites australiensis* *Suberites axinelloides* *Suberites cupuloides*
		Callyspongiidae	*Callyspongia diffusa* *Haliclona* sp.

Phylum	Class	Family	Species
		Chalinidae	Not identified
Urochordata (Sea Squirts)	Ascidiacea (Ascidians)	Cionidae	*Ciona* sp.
		Didemnidae	*Didemnum moseleyi* *Didemnum patulum* *Didemnum psammatode*
		Molgulidae	*Molgula ficus*
		Pyuridae	*Microcosmus australis* *Microcosmus squamiger* *Pyura stolonifera*
		Styelidae	*Botrylloides leachii* *Cnemidocarpa radicosa* *Styela canopus* *Styela plicata* *Symplegma oceania*

7.8 Discussion

7.8.1 Habitat and Estuarine Environment

The estuarine habitat of the PPSA is composed primarily of artificially created substrata due to anthropogenic activity, and the region's sediments and estuarine waters have been heavily polluted with a wide range of contaminants. This has resulted in the environmental quality of the area being considered poor(NSW Dept. of Planning, 1993b; Ecological Engineering, 2003).

The distribution of toxicants in the estuaries and bays of Sydney Harbour points strongly to catchment runoff being the major source of pollutants(Birch & Taylor, 1999; Birch et al., 1999; McCready et al., 2000). The finding that pollutant concentrations in the PPSA increased dramatically during, and immediately following, a rain event suggests that contaminants entering the estuarine system from a land-based source is true for the PPSA. Artificial debris composing much of the substratum, high contamination of the benthic sediments and pollution of the estuarine waters of the PPSA is not a surprising outcome given the land-use history of its catchment. Lands constituting the PPSA foreshore have been subject to a range of potentially hazardous industries over the past 150 years. These industries include transport, power generation, shipping and container handling, ship repair, abattoirs, tobacco works, sugar refining, copper smelting, tanneries, soap factories, petroleum storage, and chemical storage and processing(NSW Dept. of Planning, 1993b; Waterways Authority, 2002; Ecological Engineering, 2003). Such noxious industrial works, which have characterised Pyrmont and the Bays Precinct over its history, together with foreshore development and restructuring, major land reclamation, dredging, removal of native riparian vegetation and the subsequent increased imperviousness of the catchment have directly impacted on the estuarine ecosystem of the PPSA. Impacts have predominantly been in the form of contaminated storm-water runoff, polluted industrial effluent, and increased erosion and sedimentation.

The catchment of the defined PPSA is extensive, and its highly impervious nature results in substantial stormwater runoff entering its embayments(NSW Dept. of Planning, 1993b). Stormwater potentially impacts on an estuarine environment, such as the PPSA, through increases to toxicant and anthropogenic chemical loads; alterations to nutrient input; increases in salinity disturbances; and changes to substrate composition(Ecological Engineering, 2003). Increased loads of contaminants and anthropogenic chemicals have very significant implications for the health of the receiving estuarine system, the negative impacts of which have already been identified from the sediment and water quality data available from the PPSA. Toxicants and chemicals stored in stormwater runoff can potentially have long-lasting effects due to their propensity to accumulate in estuarine sediments(ibid). With respect to changes to nutrient input, urban stormwater runoff typically acts to increase the nutrient load of an estuarine system. Nutrients contained in runoff come from a variety of anthropogenic sources, and the resultant increased nutrient load facilitates filamentous algal growth, in turn impacting ecosystem health. Solid material contained in stormwater runoff and deposited into the estuarine environment has the potential to alter benthic substrate characteristics. Urban drainage typically results in a variation in the rate and particle size distribution of material delivered to the estuary, and thus can significantly change the composition of the substrate(ibid). As estuarine benthic communities (predominantly invertebrates) are highly sensitive to substratum characteristics, it is clear that stormwater runoff can negatively impact on a receiving aquatic system(ibid). Finally, stormwater runoff can impact an estuarine ecosystem due to increased salinity disturbances(ibid). While estuaries are characterised by variations in salinity, and their inhabitants are specifically adapted to such an environment, the efficiency of urban drainage systems and increased catchment imperviousness (a result of roads, paving, buildings, roofing, stormwater drains, etc.) has resulted in a substantial increase over time in the rate and volume of runoff entering estuarine waters such as the PPSA(ibid). The subsequent increased salinity gradient may cause reductions in community diversity due to some organisms' inability to cope with the associated physiological stress(ibid). Given the highly developed nature of the PPSA catchment it can be expected that untreated stormwater will continue to be discharged into the various embayments. While the quality of the stormwater may have improved in recent years, coinciding with changes in types of industries in the catchment and their waste protocols as well as with the installation of Gross Pollutant Traps, floating booms and silt traps, stormwater will remain the source of many toxicants entering the PPSA estuarine system into the future(ibid).

Another major contributor to the contamination of the PPSA waters and sediment has been the direct release of polluted industrial effluent, a factor operating from the early 1800s. Discharge of such effluent was facilitated through the historical use of local creeks and waterways for direct release of noxious industrial and solid wastes(NSW Dept. of Planning, 1993b). An example of this is Blackwattle Creek which was used to drain most of the factories in the vicinity of Blackwattle Bay. By as early as 1850 the creek became known as Blackwattle Swamp on the basis of its condition, health and the materials it supplied to the adjacent estuarine system(Waterways Authority, 2002; Ecological Engineering, 2003). Also, from 1875 Colonial Sugar Refinery (CSR) occupied the northern tip of Pyrmont Peninsula, where it directly released waste and by-products, polluting the surrounding waters. Furthermore the Government Glebe Island abattoirs were recognised as a heavy source of pollution within the Bays Precinct. Community protests led to its closure by the 1870s(Waterways Authority, 2002). In more recent times, intensive commercial shipping operations have been responsible for the release of pollutants into the PPSA environment, as well as activities at the Sydney Fish Markets (SFM). Discharge from the latter has previously displayed deposition of sediments that contain high levels of contaminants (Birch & Taylor, 1999; Birch et al., 1999; GHD, 2001). In addition, stormwater drainage at the SFM site is not treated to remove oil, grease or solid waste (rubbish and debris) prior to discharging into Blackwattle Bay(GHD, 2001).

The dumping of fill, litter and other anthropogenic materials around the PPSA foreshores has also proved to contribute to the polluted, disturbed estuarine waterway(NSW Dept. of Planning, 1993b).

The pollutants identified from the PPSA estuarine waters and benthic sediment (faecal coliforms, excessive nutrients, heavy metals, greases, oils and litter) tend to be in greatest concentration at the head of embayments (Ecological Engineering, 2003). This phenomenon is typical of embayment systems exhibiting limited tidal flushing, such as those that compose the PPSA(ibid). The relatively narrow entrance from the main harbour at Simmons Point and Millers Point limits the tidal flushing of the greater PPSA embayment. The flushing of inner-bays such as Blackwattle and Rozelle Bays is further limited by the narrow inlet at the ANZAC bridge(ibid). Tidal currents in many Sydney Harbour embayments are often too weak to effectively disperse sediment and toxicants deposited by local urban runoff(ibid). It is thus likely that regions of the wider PPSA embayment, particularly the smaller, inner bays, act as settling and accumulation areas for solids and noxious material in suspension discharged in stormwater(NSW PWD, 1981; Eagle and Malone, 1987; McLoughlin, 2000). Parts of the PPSA have previously been recognised as being such accumulation areas, with maintenance dredging having been employed up to the 1960s in Blackwattle Bay to remove sediment silt and associated pollutants being deposited in runoff(McLoughlin, 2000). However, water quality analysis has also shown that Johnston's Bay and the entrances to the PPSA embayments have reasonable water circulation, mixing and oxygenation when compared to the upper reaches (head) of the embayments(Eagle and Malone, 1987). Thus, it can be suggested that the majority of the waters and sediment immediately encompassing Pyrmont Peninsula (that is, the PPF) are less likely to accumulate contaminants.

Dispersal of toxicants from areas directly influenced by stormwater discharge and exhibiting limited tidal flushing is further complicated by the propensity of some contaminants to absorb strongly to suspended particulate matter (Ecological Engineering, 2003). Such behaviour is typical of heavy metals and hydrocarbons, the former at least being found in high concentrations in the PPSA. As some areas and embayments of the PPSA have been recognised as consistently exhibiting elevated turbidity levels (caused largely by suspended sediment) and limited water circulation, pollutants are likely to be accumulating and persisting in the sediments of these areas(ibid).

The historical land-use of the PPSA catchment has also impacted on the estuarine environment through the resultant temporal acceleration in erosion and sedimentation rates. Sedimentation from land clearing, gravel roads, large scale construction, local industry and sewage, foreshore development and land-reclamation has been a major issue through the history of the PPSA. In 1980 the sedimentation rate for Blackwattle Bay was calculated at approximately 15 times the pre-settlement sedimentation rate. Elevated erosion and sedimentation has implications for an estuarine system in terms of altering substrate composition, increasing turbidity, smothering macrophyte communities as well as providing further suspended sediment for toxicants to bond to.

7.8.2 Estuarine Macrophytes

Being photosynthetic organisms, the primary determinates of macrophyte occurrence and distribution within an estuarine system are the availability of light and nutrient resources, together with suitable substrata(Sumich, 1999).

Suitable substrata within the littoral and supralittoral zones (that is, intertidal and above) presents the most significant factor determining the occurrence of mangrove and saltmarsh communities(ibid). Such floral taxa are typically found in tidally-influenced, sheltered, soft sediment habitats of riverine channels and embayments(ibid).

With respect to submerged macrophytes (seagrass and marine macroalgae), however, water clarity plays the vital role in determining initial occurrence, and continued growth and survival(Sumich, 1999; West et al., 2004). Water clarity (or water turbidity) acts to directly limit the depth to which these photosynthetic, estuarine plants may exist, in turn limiting their spatial distribution(Sumich, 1999). Where macrophytes are already established, their growth and survival can be affected by heightened water turbidity(ibid). An increase in water turbidity acts to increase light attenuation in the water column, reducing light intensity, and in turn reducing the photosynthetic capabilities of the individual plants(Sumich, 1999; Huisman, 2000; West et al., 2004).

It is widely recognised that the distribution and abundance of estuarine vegetation changes on a temporal scale(West et al., 2004), with changes having been observed at many NSW estuaries over the past 20 years, including the Parramatta River/Sydney Harbour drowned river valley estuary (Williams et al., 2003). Fluctuations in location, density and extent of estuarine macrophyte stands are often attributed to natural phenomena such as storm-driven wind-waves, currents and sediment disturbances(ibid). Other observed changes are accounted for by invasive, anthropogenic activity such as reclamation, shoaling, shading from man-made structures, as well as activities resulting in alterations in water chemistry and increases in turbidity such as dredging, boating, increases in stormwater discharge and release of polluted urban run-off(ibid). Historically, each of these invasive stresses has negatively impacted on, and/or is currently impacting on, both the Sydney Harbour estuarine system as a whole and the PPSA in question.

The temporal fluctuations in macrophyte abundance and distribution observed in the Sydney Harbour estuary between 1978 and 2000 by West et al.(1985) and West et al.(2004) respectively, involving both biomass losses and gains, may be accounted for by either natural processes, anthropogenic disturbances, by inaccuracies associated with the remote sensing survey methodologies employed, or combinations of the above(West et al., 2004).

The historical Sydney Harbour estuarine macrophyte maps, created by West et al.(1985), employed the camera lucida principle to interpret the aerial photos taken in 1978. In light of inherent inaccuracies in this remote sensing technique there is some uncertainty about the actual amount of estuarine vegetation present in Sydney Harbour 30 years ago(West et al., 2004). These authors put forward that, due to the camera lucida technique being a less accurate method relative to the GIS technique used in their study, the apparent temporal change in biomass for Sydney Harbour between 1978 and 2000 may be an artefact due to inaccurate estimations reported in the 1985 paper.

The differences in survey methodology between the 1985 and 2004 papers, coupled with the proposed inaccuracies in the 1985 macrophyte estimations, may account for the apparent gain in mangrove biomass in Sydney Harbour, from approximately 148 to 185 hectares(West et al., 2004). However, a difference of 37ha is unlikely to be a function of survey inaccuracy alone, with the apparent biomass gain being more likely to be a result of a combination of biomass underestimation resulting from survey technique, and natural expansion processes. Small mangrove stands, too small to be visible in aerial photos, can be expected to expand sufficiently over a 20 year period to become visible(ibid). Also, recent studies (Saintilan & Williams, 1999; 2000) have found that mangrove has been increasing in area at a number of locations along southeast Australia to the detriment of saltmarsh.

It is possible that the substantive loss in seagrass biomass observed in Sydney Harbour between 1978 and 2000, from 127 to 52 hectares, is also largely an artefact due to inaccurate estimates presented by West et al. (1985). However, as with the observed fluctuation in mangrove biomass, it is unlikely that a difference of 75ha would be accounted for by error alone. A more credible hypothesis is that, combined with the possible inaccurate historical estimate of 1985, natural processes and/or anthropogenic impacts may explain the apparent significant loss of seagrass biomass in Sydney Harbour over the 20 year period.

In considering the PPF and greater PPSA specifically, the historical and contemporary macrophyte records are characterised by a distinct lack of significant macrophyte stands(West et al., 1985; West et al., 2004). This overall absence of estuarine vegetation is predominantly the result of a lack of suitable benthic habitat. Extensive land reclamation, foreshore alteration in the form of rock walls constructed along the PPF and various other embayments of the study area, as well as other physical, anthropogenic activities, has resulted in a modification of the natural benthic gradient, and the subsequent removal of much of the shallow habitat(Waterways Authority, 2002). In this way a large proportion of the PPSA waters are too deep to support estuarine macrophyte communities(Ron West, University of Wollongong, pers. com). In addition, The Ecology Lab(2004) found that much of the substratum of the Rozelle Bay, Glebe Point and Blackwattle Bay foreshore waters consisted largely of rocky rubble. Saltmarsh, mangrove and seagrass are all only found on soft substrata(West et al., 2004). The heavy industrial history of the PPSA foreshore, the source of much pollution to the associated embayments since the 1830s(Waterways Authority, 2002), the considerable traffic of commercial and recreational vessels within the Pyrmont study area, disturbing soft benthic sediments into suspension(West et al., 2004), together with the impervious nature of much of the Peninsula, facilitating increased stormwater discharge and polluted urban run-off, are other factors also worth considering in explaining the lack of substantial estuarine vegetation within the vicinity of Pyrmont Peninsula.

The Ecology Lab(2004) however, did identify small stands of seagrass, saltmarsh, mangrove and macroalgae within the Rozelle Bay-Glebe Point-Blackwattle Bay region through visual surveys. This finding, in light of the overriding lack of macrophytes identified in the historical and contemporary studies by West et al.(1985) and West et al.(2004), would suggest that at present the PPF is perhaps not completely void of estuarine vegetation, rather that these previous remote sensing surveys lacked the resolution necessary to locate the small macrophyte stands present.

7.9 Recommendations

In considering practical approaches/strategies/actions that relevant authorities may adopt to improve the ecological quality of Pyrmont's estuarine environment the management of stormwater run-off must be thoroughly addressed. In addition, the protection of valuable fauna habitat features, the potential construction of additional fauna habitat structures, together with the conservation of existing macrophytes must each also be considered.

7.9.1 Stormwater Management

The available literature has clearly identified anthropogenic activity and associated discharge of pollutants through both stormwater runoff and noxious waste release as being the major factors that have impacted on the ecological quality of the PPF and greater PPSA over time. More specifically, storm-water runoff has been identified as the source of toxicants such as heavy metals and faecal coliforms, as well as nutrients, litter and fine sediments, each being found in elevated concentrations in the PPSA estuarine waters(Birch & Taylor, 1999; Birch et al., 1999; Ecological Engineering, 2003). In order to improve the quality of the stormwater run-off discharging into the PPSA, and thus limit the supply of toxicants, fine sediments, nutrients and solid waste material, the following treatment, collection and interception measures should be employed as extensively as possible throughout the PPSA catchment:

- Gross Pollutant Traps (GPTs);
- Vegetated swales;
- Buffer strips;
- Foreshore revegetation; and
- Household rainwater tanks.

Prior to the treatment of stormwater runoff by those means listed above (excl. rainwater tanks), however, the employment of measures aimed at reducing the volume of stormwater runoff entering the PPSA, in turn reducing toxicant loads and sewage overflow, is of utmost importance. Rainwater harvesting and reuse, via the installation of rainwater tanks, is a practical and effective approach, one which is particularly important in urban settings such as Pyrmont Peninsula(Ecological Engineering, 2003). Rainwater tanks permit the collection of stormwater drained directly from a roof, thus allowing the reuse of the collected water. Rainwater tanks also provide some degree of treatment to the collected stormwater through settlement of fine sediment(Waterways Authority, 2002).

Once attempts are made to control the volume of stormwater being released into the PPSA through water collection and retention, it is important for the relevant authorities to consider methods of stormwater treatment.

GPTs, typically fitted to stormwater outlet pipes, are an effective method of prohibiting litter and other large, solid waste material from being discharged into a receiving waterway(ibid). GPTs have been installed in a number of locations along the PPSA foreshore, including Blackwattle Bay, and remain in use today. GPTs, however, have little impact on reducing the discharge of fine particulates(ibid). The supply of fine sediments to the PPSA has increased temporally, coinciding with increased catchment development and imperviousness. Fine particulate loading has proven to be a critical issue for the PPSA, as elevated levels of fine sediment has resulted in increased water turbidity, in turn impacting on primary productivity, and has provided greater opportunity for heavy metal accumulation(Waterways Authority, 2002; Ecological Engineering, 2003). The management of fine particulate matter, therefore, requires suitable source controls to eliminate them from the stormwater system.

Recommended source controls for fine sediment and particulate matter include stormwater collection and filtration through vegetated swales, buffer strips and the revegetation of foreshore areas(Waterways Authority, 2002). Swales are grassed or vegetated channels that are capable of conveying stormwater runoff, and buffer strips refer to a wide, flat grassed or vegetated area across which shallow overland flows travel prior to entering a drainage network(ibid). Swales, buffer strips and foreshore vegetation are effective in treating stormwater and reducing fine and medium sediment discharge to a receiving estuarine system through means of filtration, as contaminants and suspended sediment contained within the runoff are filtered as they pass through the vegetated area(ibid). Furthermore, vegetated areas are effective also in reducing runoff volume through the soaking of waters into the soil.

A further stormwater management option is that of bioretention systems(ibid). A bioretention system is employed for the removal of fine and soluble pollutants from stormwater, and combines a vegetated swale feature with fitted filtration apparatus. Stormwater is intercepted and guided to a vegetated swale where the waters are filtered through a prescribed media before being collected by an underlying perforated pipe for subsequent discharge to the stormwater system.

It is noted, however, that each of the above recommended methods for stormwater management, and potential opportunities for their implementation, must be individually assessed by the relevant authorities for their suitability within the Pyrmont urban area. Nevertheless, water quality sampling points should be established at various representative locations within the PPSA together with a regular monitoring program aimed at assessing the effectiveness of the stormwater control measures established.

7.9.2 Estuarine Fauna, Flora and Habitat

Potential improvements to the ecological quality of the PPSA, and the conservation of resident populations and biodiversity, are entirely reliant on both improvements in water and sediment quality, and the protection of physical habitat. With the former having been addressed above (Section 7.9.1), recommendations pertaining to estuarine fauna, flora and habitat are dealt with here. These recommendations have been classed into: the protection of valuable fauna habitat features; the potential construction of additional fauna habitat structures; and the conservation of existing macrophytes.

A) Protection of Fauna Habitat

The protection and retention of existing fauna habitat features within the highly degraded PPSA estuarine system is of primary importance for the conservation of the resident faunal communities and maintenance of fish and invertebrate biodiversity in the region. Studies have revealed that the PPSA largely lacks important estuarine habitat features such as extensive intertidal rock platforms and significant intertidal and subtidal macrophyte assemblages. Rather, the substratum is composed predominantly of fine-sand and silt, as well as features artificial in origin including vertical and sloping sandstone and concrete seawalls, shores of broken rock, and fill in the form of anthropogenic demolition rubble and sandstone excavation waste(The Ecology Lab, 1986; 1987; 2004; NSW Dept. of Planning, 1993b). The PPSA substratum also exhibits regions of sand, shell grit and organic matter, as well as some isolated rocky outcrops(The Ecology Lab, 2004).

The fine-sediment substratum of the PPSA is characteristic of estuarine embayments. However, the limited tidal flushing of the PPSA would explain the high silt content of the sediment profile. Also, the stormwater discharge regime, resulting from the increased development and imperviousness of the catchment, has exacerbated the silt and fine-sediment content of the PPSA substrate over time. Nevertheless, as shown qualitatively in Section 7.5.2, the PPSA supports a diverse community of benthic invertebrates living in association with the sediment. In this way, efforts made to improve the quality of estuarine sediment through the limiting of toxicants entering the PPSA system in stormwater would be particularly beneficial for the local invertebrate population.

Although an aside, it is important to note that anthropogenic activities such as dredging act to directly affect benthic invertebrate communities through large-scale direct removal, disturbance of sediment and contaminants contained within, substrate modification and through increases to turbidity. Whilst it would be ideal for all dredging activities to be ceased within the PPSA, it is noted that this is perhaps not viable given the channel and depth requirements to sustain the intense shipping industry operating locally.

Although not quantitative, Section 7.5.1 also demonstrates that the PPSA system supports a diverse community of teleost fishes. The fish records represent estuarine and marine taxa known to inhabit a broad range of habitats including pelagic, benthic, rocky reefs, and shallow intertidal. Excluding temporary residents (that is, pelagic species), the teleost fishes of the PPSA system would live in close association with the foreshore seawalls, subtidal demolition rubble, fill and boulders, moored vessels, shallow intertidal flats, rocky outcrops, any existing macrophyte communities, as well as any structures constructed over, or placed in, the water such as wharves, pylons and moorings. Although the majority of fish habitat in the PPSA is of an artificial origin, it provides valuable grounds for feeding and protection. Many of the habitat features listed above also provide valuable habitat for macroalgae, as well as invertebrate organisms such as sponges, ascidians, molluscs and crustaceans.

Therefore, in light of the historical removal of natural habitat such as intertidal floral assemblages and shallow sand-mud flat environments through land reclamation, the overriding recommendation with respect to fauna habitat in the PPSA is to ensure the retention of dumped material such as rubble and sandstone blocks in the subtidal zone.

Removal would significantly decrease available fish, invertebrate and macroalgae habitat, and would increase soft sediment habitat which is already abundant in the PPSA(The Ecology Lab, 2004).

The dilapidated seawalls along the PPSA foreshore have also been recognised as offering complex habitat for many intertidal and subtidal invertebrates (sponges, molluscs and crustaceans) and macroalgae(ibid). The restoration of such structures, together with subsided or collapsed seawalls, provides the relevant authority opportunities to create additional complexity to the seawalls, an action which will maintain and potentially enhance estuarine invertebrate biodiversity(ibid).

B) Construction of Fauna Habitat

There exists some opportunities for the improvement of fish and invertebrate habitat in the PPSA, and thus potential for enhancement of fauna stocks, through the construction of new habitat structures.

An increase in abundance of fishes in the PPSA embayment is reliant on two factors: improvements in local habitat available; and an increase in fish biomass and productivity in the Sydney Harbour estuary as a whole, given that the PPSA represents a part of the greater estuary as opposed to an independent system. Local habitat improvement is a possible outcome that may be achieved on a Pyrmont Peninsula scale.

The construction of artificial reefs is one option available for habitat improvement. Artificial reefs are structures typically made of boulders, cement blocks, tyres, sand bags or wrecks, and are intentionally deployed on the seafloor. Among other purposes such as for coastal management and recreation, artificial reefs are widely acknowledged as habitat for fish, invertebrates and macroalgae(Seaman, 2000). Most research to date has recorded significant post-deployment increases in fish abundance on and around artificial reefs, concurrent with increases in the benthic organisms that fishes may consume(Pickering & Whitmarsh, 1997; Glasby, 1999; Sanchez-Jerez & Ramos-Espla, 2000). Therefore there is general acceptance that following deployment, human-made habitats will, if sufficiently large and complex, increase local densities of fishes(Pickering & Whitmarsh, 1997; Pitcher & Seaman, 2000; Sayer et al., 2005). Although generally used in coastal and offshore waters, artificial reef structures within the PPSA estuarine system would be beneficial through the provision of both a valuable alternative habitat to the extensive soft-sediment and an addition to the dumped rubble presently existing. Due to the association of high fish abundance with artificial reefs, their construction has been employed as compensatory restoration for damages to natural resources, for example as a result of intense commercial fishing as is the case for the Sydney Harbour estuary(Ambrose, 1994). However, whether artificial reefs actually enhance local fish production and biomass, or simply attract and redistribute existing individuals remains very much in debate(Powers et al., 2003; Brickhill et al., 2005). The specific outcome of this debate is not relevant within the context of habitat and fauna improvement for the PPSA, as it is clear that artificial reef would both add valuable habitat for a variety of taxa, and increase local fish abundance.

Further to that discussed above, one potential consideration for the PPSA is the deployment of 'reef balls', an artificial reef initiative currently being explored for use in estuarine environments by the NSW Department of Primary Industries (Fisheries). Pilot studies have previously been conducted in Lake Macquarie and St Georges Basin (Sussex Inlet), both being large coastal estuarine systems. Reef balls are hemisphere-shaped concrete structures of approximately 0.75m diameter and 0.75m height, and are constructed in such as way as to maximise complexity, thus encouraging colonisation by invertebrates and macroalgae.

It must be noted, however, that any newly constructed habitat within the PPSA would need to be considered in the context of local shipping requirements with regards to pathways, water depth and navigation.

C) Conservation of Existing Macrophytes and their Habitat

The conservation of existing macrophyte communities in the PPSA, however limited, coupled with measures for water quality improvement, will act to encourage further macrophyte growth, in turn producing valuable fish and invertebrate habitat and thus enhancing local fauna abundance and biodiversity.

The conservation of macrophytes, which includes seagrass, intertidal mangrove and saltmarsh communities, can be achieved through maintaining light availability, avoiding sediment disturbance and smothering by settling sediment and/or dumped material, and prohibiting public access to inter-tidal zones to avoid trampling. In this way, structures built over water should be designed in order to maximise the amount of light able to filter through, reducing the potential for shading, and any construction operations conducted in the water or adjacent foreshore should avoid direct physical damage of floral communities and implement measures to reduce sediment disturbance and water turbidity.

Having said the above, however, due to past land reclamation works and poor stormwater management, there exists minimal suitable macrophyte habitat within the PPSA, and thus limited potential for further submerged macrophyte colonisation and growth, on the basis of contaminated sediments coupled with water depths being too great for light penetration within a turbid water column. A viable approach for macrophyte enhancement in the PPSA thus must focus on the intertidal regions through the revegetation of mangroves and salt marsh communities.

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Part 8

Proposals

8.1 Introduction

'Cities are among the brightest stars in the constellation of human achievement. At the same time, ecological footprint analysis shows that they act as entropic black holes, sweeping up the output of whole regions of the ecosphere vastly larger than themselves. Given the causal linkage between global ecological change and concentrated local consumption, national and provincial/state governments should assess what powers might be devolved to, or shared with, the municipal level to enable cities better to cope with the inherently urban dimensions of sustainability'

Rees & Wackernagel(1996:245)

While cities, through their resource demands, are the prime cause of ecological degradation of our planet, the level of government most concerned with the functioning of our cities has not historically had responsibility for the wider consequences of urban lifestyles. This historical gap between cause and effect has caused a progressive and increasingly troublesome weakening of the human/nature bond in city dwellers. This weakening is not only of recent origin, as large-scale urbanisation is also comparatively recent, but has now assumed global proportions as all societies rapidly urbanise. Already, global populations are well beyond the capacity of our planet to sustain(8.2), and this, coupled with a growing ecological amnesia among city dwellers, makes global society progressively more vulnerable to collapse(see Part 1).

It is increasingly clear that municipal government must engage with the global ecological consequences of urban lifestyles, so that it can have policy settings appropriate to the wider context. This is a recognised, to a point, in the Sustainable Sydney 2030 initiative.

In framing proposals to City Council on its responsibilities for ecological sustainability, account must be taken of the widening horizons of local government. While this study has been concerned with the ecology of a part of Sydney City – the Pyrmont peninsula – the proposals must canvass opportunities for City Council in progressively wider spheres of influence moving beyond the peninsula to the city as a whole, to the state of NSW, the continent and, ultimately, to the planet itself.

The proposals in section 8.4 respond to these widening horizons of municipal responsibility; from the local to the global. Admittedly, though, because concerns today are still largely parochial, the proposals made here emphasise the local rather than the global. For the ecological sustainability of our planet to be realised, though, City Council should engage progressively with communities beyond its own. A city like Sydney, proud of its environmental amenity, should be a world leader in instigating such change processes as a means of realising global ecological sustainability.

First though, the criticality of today for human futures, although noted in part 1 of this report, should be reiterated here, this time from a global perspective. This is done in section 8.2.

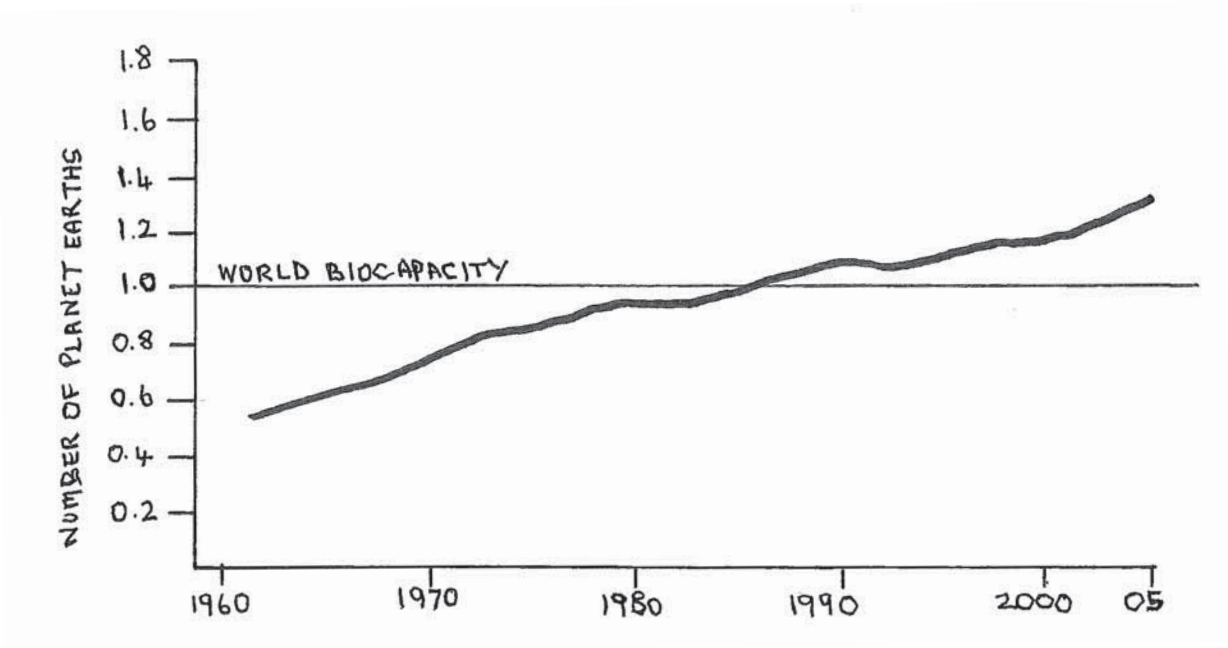
Humanity is starting to confront a stark choice – between cultural collapse or cultural transformation. Collapse has defined most/all past civilisations, as is engagingly described in the Reader's Digest recent(2009) publication *Vanished Civilizations*. Transformation will be hugely complex, requiring not only a fundamental reconsideration of human-nature relationships but also a systemic recasting of the ecology-economy nexus, to favour the former much more than has been the case since the earliest human civilisations. These matters are more-fully addressed in section 8.3

8.2 Global ecosystems in crisis

The World Wildlife Fund periodically updates on the state of the world's ecosystems through its Living Planet Report. This report is built around two indicators:

The Ecological Footprint, which shows the extent of human demand on the world's ecosystems(see also 1.4). Since the late 1980s, human demands on the biosphere have been in overshoot, and by 2003 the Ecological Footprint of humans exceeded the Earth's biocapacity by about 25%: 'Effectively, the Earth's regenerative capacity can no longer keep up with demand – people are turning resources into waste faster than nature can turn waste back into resources'(Figure 8.1). A moderate business-as-usual scenario suggests that by 2050 human demands on nature will be twice the biosphere's productive capacity: 'At this level of ecological deficit, exhaustion of ecological assets and large-scale ecosystem collapse become increasingly likely'(see also European Environment Agency, 2005).

Figure 8.1: Humanity's ecological footprint, 1961-2005

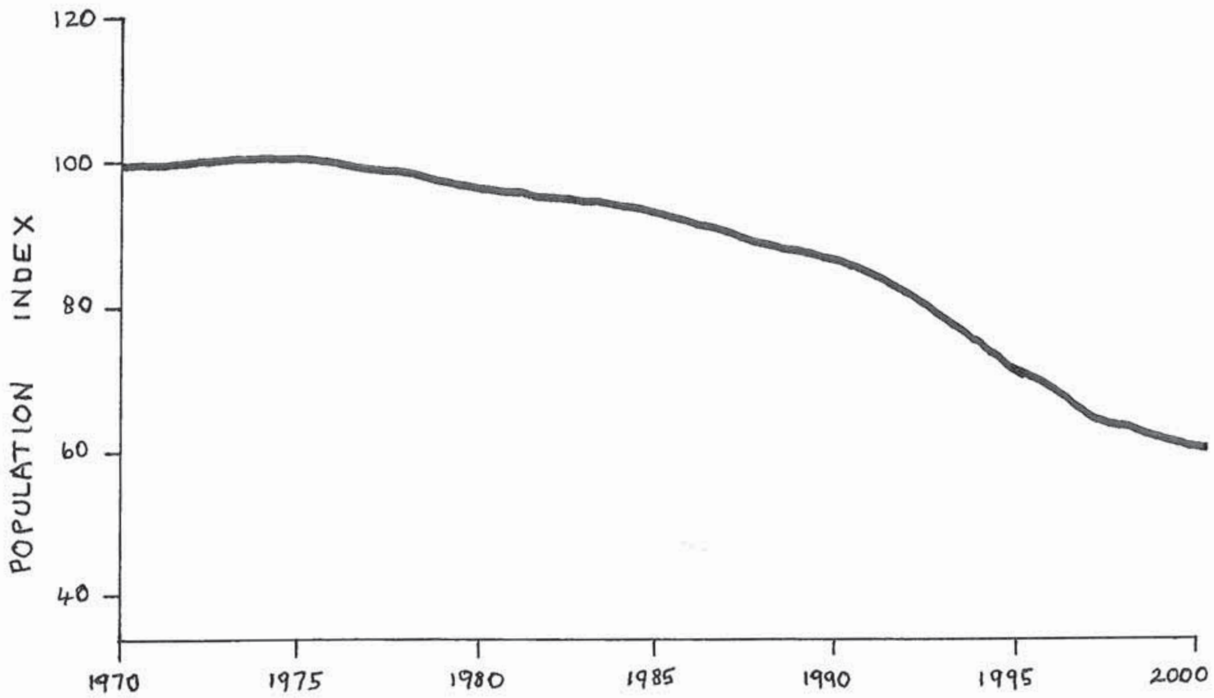


The Living Planet Index, which reflects the health of the planet's ecosystems. WWF's latest Living Planet Index, prepared for the UN Conference on Biodiversity in Germany in May 2008, shows terrestrial, marine and freshwater species all suffered declines in their populations between 1970 and 2005(Figure 8.2). Terrestrial populations fell by an average 25% in the 35-year period, marine populations by 28% - with a dramatic decline after 1995, and freshwater populations by 29%: 'The causes of the declines are varied but ultimately stem from human demands on the biosphere'.

Contemporary concerns about losses in global biodiversity emerged in the 1970s, and gained credence with publication of The Sinking Ark by Norman Myers in 1979. Since then, a growing number of studies have refined our ideas on what is being termed "the sixth mass extinction". Today, 'humans have increased extinctions of other species to levels 1000 and 10 000 times higher than those resulting from non-human causes'(Alberti et al., 2003:144). It is estimated that by 2150 half to two-thirds of all species on this planet will be extinct. This begins to approach the worst mass extinction episode in Earth's history, about 245 million years ago, when 95% of all animal species known to palaeontology became extinct. Recovery to the ecological diversity of the recent past is predicted to take

5-10 million years. Survivors of this extinction spasm will be broadly adapted and broadly distributed species – the very species, indeed, which today dominate the flora and fauna of Pyrmont peninsula: 'virtually everything will live virtually everywhere, though the list of species that constitute "everything" will be small …Earth will be a different sort of place soon, in just five or six human generations'(Quammen, 1998:68).

Figure 8.2: The Living Planet Index, 1970-2000



Of the 22,000 species of vascular plants in Australia, 14.8% are globally rare or threatened(Murray, 2007). 'Overall, at least one in five woodland birds[species in Australia] is known to be in trouble, but the proportion is suspected to be higher'(Olsen et al, 2005:4).

Coral reefs are one ecosystem particularly sensitive to environmental change: 'As of now, 10% of the coral reefs worldwide have already been destroyed. At this rate of destruction, approximately 70% will be killed in the next 40 years' (Schlager, S., University of Florida(http://eee.geology.ufl.edu/). According to Professor Hoegh-Guldberg, Director, Centre for Marine Studies, University of Queensland, the Great Barrier Reef's coral could disappear in as little as 20 years as sea temperatures rise faster than expected (www.theage.com.au/news/National/Too-late-to-save-the-reef/2005/02/11/1108061879117.html).

It is surely prudent to understand and better manage the ecological consequences of urbanisation.

8.3 Collapse or transformation?

> '*... we argue that shrinking carrying capacity* [of the planet] *may soon become the single most important issue confronting humanity*'.
>
> Rees & Wackernagel(1996:226)

Our civilisation hopefully still has two choices for its future – collapse or transformation – although delay pushes us inexorably towards the former.

Earlier civilisations mostly chose collapse over transformation, simply because 'Most people cannot imagine that the powerful nations that they live in could suddenly collapse'(Taylor, 2008:103). Taylor elaborated: 'a catastrophic collapse typically involves the irreversible destruction of a society's economy and institutions and a rapid reduction in population size and density'(p.104). Tainter(1988:193) noted: 'collapse is recurrent in human history; it is global in its occurrence; and it affects the spectrum of societies from simple foragers to great empires. Collapse is a matter of considerable importance to every member of a complex society, and seems to be of particular interest to many people today'.

Examples of civilisations which have collapsed abound: the Western Roman Empire, the Soviet Union, Aztecs, Incas, Mycenaeans, Hittites, Han Empire, Assyrians, Ancient Greece, Egyptian Old Kingdom, Western Chou Empire, Harappan civilisation, the Olmecs, lowland classical Maya, the Chacoans, the Huari and Tiahuanaco Empires, Minoans, Norse Greenland, Anasazi(Johnson, 1996). Vanished Civilizations(Reader's Digest, 2009) lists others.

Tainter(1988:42) listed eleven major themes in the explanation of collapse; they included:

- resource depletion
- insurmountable catastrophe/chance concatenation of events
- insufficient response to circumstances
- hostile neighbours
- decreased support from friendly neighbours
- internal conflict or dysfunction
- economic factors

Diamond(2005:11) constructed a similar, overlapping five-point framework to explain civilisational collapse:

- environmental damage
- climate change: for, example, droughts of up to 30 years in the early 1400s and in the mid-18th century have been linked with the collapse of kingdoms in south-east Asia – Thailand, Vietnam and Laos(including the Kmer civilisation at Angkor Wat)(Fogarty, 2009)
- hostile neighbours
- decreased support from friendly neighbours
- inadequate societal response

Diamond(2005:516) described stressed contemporary societies as follows: 'Today, just as in the past, countries that are environmentally stressed, overpopulated, or both become at risk of getting politically stressed, and of their governments collapsing. When people are desperate, undernourished, and without hope, they blame their governments, which they see as responsible for or unable to solve their problems. They try to emigrate at any cost. They fight each other over land. They kill each other. They start civil wars. They figure that they have nothing to lose, so they become terrorists, or support or tolerate terrorism'.

Ecological collapses follow large-scale human interventions into natural ecosystems. Historically the Australian continent experienced such a collapse after the arrival of aboriginal peoples some 50,000 years ago, with the extinction of the megafauna. Burney & Flannery (2005:397) described studies which 'show that human arrival [in Australia], an increase in burning of the environment and megafaunal decline all cluster around 45 000 – 55 000 years ago'. It seems that European colonisation of Australia is causing a second collapse. More widely, the authors predicted 'biotic catastrophes … that are beyond our capacity to even imagine'(p.400).

Tainter(1988:194) identified four concepts in understanding collapse:

- human societies are problem-solving organisations
- sociopolitical systems require energy for their maintenance
- increased complexity carries with it increased costs per capita
- investment in sociopolitical complexity as a problem-solving response tends to reach a point of declining marginal returns

Tainter(1988:195) described the trajectory of a complexifying society thus:
'The problems with which the universe can confront any society are, for practical purposes, infinite in number and endless in variety. As stresses necessarily arise, new organizational and economic solutions must be developed, typically at increasing cost and declining marginal return. The marginal return on investment in complexity accordingly deteriorates, at first gradually, then with accelerated force. At this point, a complex society reaches the phase where it becomes increasingly vulnerable to collapse'.

It is clear that sociocultural complexification is unrelenting; those civilisations which embrace stasis fail and collapse. Systemic innovation must occur across all facets of a society to keep its marginal returns positive. This process becomes transformational when sustainability of the whole system (socioculture) is threatened, as at present.

In an organisational context, transformation is: 'a process of profound and radical change that orients an organization in a new direction and takes it to an entirely different level of effectiveness. Unlike 'turnaround'(which implies incremental progress on the same plane), transformation implies a basic change of character and little or no resemblance with the past configuration or structure'(BusinessDictionary.com). Although this definition relates primarily to traditional business entities – like companies – it is equally valid for sociocultural entities like councils, state, national and international bodies, and, increasingly and ultimately, global humanity.

In seeking a way forward, Tainter(1988:215) advocated: 'The capital and technology available must be directed … toward some new and more abundant source of energy[than fossil fuels]. Technological innovation and increasing productivity can forestall declining marginal returns only so long. A new energy subsidy will at some point be essential'. This is now widely understood, and is reflected to a point in Council's 2030 strategy.

8.4 Proposals

'Bold actions are needed by all levels of government
and the community-at-large to safeguard
the ecological basis of our civilisation'

How does improving the ecology of Pyrmont peninsula relate to these perspectives? Firstly, the inhabitants of Pyrmont peninsula are a microcosm of global society. The strategies proposed to improve their ecological well-being must, therefore, progressively resonate through wider society. Secondly, transformational events are whole-of-system episodes. Without the sustainability of our global ecosystems, no effort will overly delay societal collapse.

8.4.1 Introduction

Councils are responsible for the flora and fauna of their domain. This obligation requires Councils to develop relevant policy frameworks and to actively and effectively implement them. Until recently, and to varying extents, Councils have overlooked or ignored this part of their portfolio. As a result native floras and faunas have frequently struggled to survive, all too often adversely affected by ad-hoc decision-making.

Wittig et al(2008) sought to identify key strategies in the creation of an 'ecologically ideal city'. While these were substantially environmental, the authors included the 'preservation and promotion of nature'. Among their strategies for this latter were:

- creation of priority areas for environmental and nature protection
- setting of nature and landscape priorities based on zoning
- consideration of historical continuity
- preservation of large connected spaces
- preservation of location differences: an overall strategy is to develop distinctiveness between places, to heighten resident identification and sense of responsibility
- preservation of differential intensities of use
- preservation of the variety of typical elements of an urban landscape
- functional integration of structures into ecosystems
- maintenance of green spaces

These insights are woven into, and elaborated in, the following proposals. These proposals are intended to promote the prospect of Sydney 2030 as both ecologically and environmentally sustainable. Some of the proposals confront widely-held values, but robust actions are needed urgently before ecological sustainability – hence human wellbeing - becomes unattainable.

There are five areas in which action by City Council is needed:

- Ecological
- Organisational
- Capacity-building/educational
- Research and monitoring
- Collaboration

8.4.2 Ecological initiatives

'Sydney … sits on a grand harbour at the heart of a region
that once boasted some of the continent's richest diversity
of habitats and native species. Its essential character
has been changed forever,
but it still obviously has the capacity to support
a much greater biodiversity, and,
with careful planning and sustained effort
from the grass roots of the community up,
it will do so again, and serve its citizens and its environment
much better in the process'

Archer & Beale(2004:308)

As Archer and Beale note, there has been a drastic decline in biodiversity in Sydney City since European settlement. Table 8.1 shows the numbers of native flora and vertebrate fauna species believed to have been present on Pyrmont peninsula in 1788 and the figures today (2008).

Table 8.1: Biodiversity on Pyrmont peninsula in 1788 and 2008

		Number of native species	
		1788	2008
Flora		>675	15
Fauna	- Mammals	63	2
	- Birds	220	45*
	- Reptiles	44	7
	- Frogs	23	0

* Of which 10 are vagrants and 6 are rare

The loss of invertebrate biodiversity on the peninsula would be considerably higher.

The reasons for this decline are various, but five are of particular note:

- Qualitative loss of habitat
- Quantitative loss of habitat
- Fragmentation of populations
- Introduced fauna
- Introduced flora

Each of these causal agents is now considered, with suggested remedial strategies. While these latter relate particularly to Pyrmont peninsula the underlying principles have citywide relevance.

A) Qualitative loss of habitat

Human settlement is accompanied by a qualitative loss of habitat. Plants and animals may be collected for food, fuel, decoration, for example. Such activities cause a loss in the numbers and diversity of plants and animals in the affected area. Several Councils in the Sydney Coastal Councils Group have reserves managed partly or wholly for their ecological values (http://www.sydneycoastalcouncils.com.au/member_councils.htm). City of Sydney should also engage with this important aspect of ecological improvement.

Pyrmont peninsula has been repeatedly reworked during transitions, so much so that no patches of substantially native vegetation remain. Notwithstanding, there are several sites on the peninsula where nature should be given priority over human-centred activities. These residual sites should be managed by Council primarily for their ecological values.

- **Proposal 1: Cliff Reserves.** The residual native flora and fauna of Pyrmont peninsula is associated particularly with the cliff faces created by quarrying. These cliffs are also a striking visual feature of the peninsula. The Pyrmont cliffs and immediately contiguous lands above and below them(buffer zones) should be declared designated conservation areas and managed for their biodiversity values. Narrow buffer zones should be planted above and below the cliff-lines to lessen the "edge-effect". Other initiatives should include the appropriate re-introduction of native flora and fauna and weed removal by methods not deleterious to residual native species

- **Proposal 2: Distillery Hill Reserve.** Distillery Hill may be of historic significance. Its height suggests that its top may be an original part of the Pyrmont peninsula which once graced the other side of Cockle Bay at European settlement. Matthews(1982) described the peninsula as 'a shell shocked, denuded area … the site of large scale vandalism'. Fitzgerald & Golder(1994) noted 'so much that has enriched Sydney has impoverished the peninsula'. Maybe our forbears intentionally left this last piece of the original peninsula as a memorial to its past.

  If the top of Distillery Hill is indeed less touched by human hand, it could become a memorial to all those living things – the plants, animals, Aboriginals, and Europeans since settlement – for whom the peninsula was once 'home'. Appropriately rehabilitated, the top could be replanted with the native species which would have once grown there. This act alone would greatly increase the biodiversity of native plants on the peninsula.

- **Proposal 3: Hellhole Quarry Reserve.** The wall of Hellhole Quarry, the southernmost of the Saunders family quarries, remains largely intact. The northern section frames Council's Wattle Street depot while the southern section between Fig and Quarry Streets is barely visible behind huge former woolstores.

  The quarry face in Wattle Street depot should be opened to public access. Current weed infestations should be sensitively removed to retain any residual native species and a buffer zone and pathway created along the bottom of the face. Introduced structures should be carefully removed, unless of heritage significance.

- **Proposal 4: Wardell Line Reserve.** The light-rail corridor through Pyrmont peninsula has much potential to provide habitat for native plants and animals. Pyrmont-Ultimo Landcare has two major planting projects along the corridor, and these have already had significant visual impact. But more can be done. Sydney City Council should make representations to State Government at the highest level to allow wider access by landcarers to this unique and potentially most significant ecological resource.

- **Proposal 5: Ecologically-based Tree Master Plan**

> *'Australia's first avenue of street trees –*
> *some swamp mahoganies[Eucalyptus robusta] lining a road*
> *in what is now the Royal Botanic Gardens in Sydney –*
> *were natives planted in the early 1800s'.*
>
> Archer & Beale(2004:307)

City Council is rightly proud of its record in planting street trees, with 5000 planted between 2004 and 2008. Many of these, though, are exotic to Sydney and have little or no wildlife value: 'there is a 43% increase in diversity of bird species if trees planted are local to the area: there is a five-fold increase in exotic birds if exotic trees are planted'(McCarthy, 2005).

Randwick City Council(1995) is an examplar of what is achievable in respect of street trees. This Council began a process in 1993 which provided it with 'an opportunity to develop a comprehensive ecologically based masterplan and tree management strategy which seeks to conserve and enrich the environmental heritage of the area, while addressing the important concerns of urban water management, air pollution, environmental amenity and neighbourhood character'.

Their study:

- researched the original plant communities – to identify indigenous species as one basis for determining future plantings
- identified existing remnant vegetation – and acknowledged these areas by creating buffers around them and connections between them
- developed precincts determined in part by physical factors – to allow easier selection of a range of trees suitable to that microclimate

Sydney City Council could well replicate this imaginative initiative through an ecologically-based Tree Master Plan, in which urban streets were 'greened' with native plants collaboratively with local communities. This would contribute greatly to ecological sustainability in Sydney: 'The plan should be aimed as successively eliminating the exotic trees and replacing them with native trees'(Biosphere Environmental Consultants, 2001:25).

B) Quantitative loss of habitat

'Habitat loss and fragmentation are by far the most significant threats to the conservation of native wildlife … By influencing the amount and pattern of habitat that is fragmented, degraded, and destroyed in a landscape, land use decisions made at the local level play a significant role in the conservation of biodiversity.'

Farr(2008:120).

Although the poor quality of the residual ecological resource is one reason for the decline in biodiversity in Sydney City, a more important reason is the ongoing loss of habitat around the city since European settlement. Paintings and photographs from the second half of the nineteenth century show areas of natural bush or open space near to the city centre, but these lands have largely disappeared as they have become an increasingly scarce and precious resource for urban development.

This process of attrition continues to this day, and iconic species on Pyrmont peninsula – for example Blue Wrens, Willie Wagtails, Magpie Larks – are now at risk of local extinction. Other habitats which once bejewelled the peninsula landscape – wetlands in particular – have altogether disappeared, along with their associated plants and animals.

These trends are the outcome of conscious decisions to place economic considerations above ecological ones, and can be reversed at any time if there is a will to do so.

Landscaping of Council parks and gardens is often a legacy of past cultural values and expectations. These open spaces provide multiple services to the community, among which should be the protection and promotion of native floral and faunal biodiversity.

- **Proposal 6: Ecological values of Council parks and gardens.** Council should initiate a review of its parks and reserves to determine whether their ecological values could be improved without unduly compromising their other functions: 'Parks and open spaces should be planned for birds and other wildlife as well as people'(Australian Museum, 2005).

  Research by the Sydney Olympic Park Authority(2006:19) established 'the need for ongoing management to adapt the Park's habitats so we can conserve and enhance the ecologically diverse needs of native birds. The types and numbers of birds that the Park can support in the long term will depend upon the nature of the habitats that are created'.

  Tony Saunders, in a recent report to Leichhardt Council Avian biodiversity monitoring and bird habitat management within the Leichhardt LGA provides good advice on how we can best manage parks and gardens to ensure the continued presence of native birds (http://www.leichhardt.nsw.gov.au/IgnitionSuite/uploads/docs/Avian%20Biodiversity%20Monitoring%20&%20Bird%20Habitat%20Management%20within%20the%20Leichhardt%20LGA.pdf). Council should determine present and potential biodiversity values for their parks and reserves, and establish individual management plans which acknowledge these opportunities.

Such projects 'need adequate resourcing covering issues such as training and supervision of volunteers, occupational health and safety, effective fencing and signposting and communication with local people, potential volunteers and Council staff'(Lembit, n.d:14/15).

- **Proposal 7: Adoptapark.** In an associated initiative, Council should encourage Adoptapark initiatives, whereby local residents take responsibility for the maintenance of their local reserves and are encouraged by Council to promote biodiversity in these spaces(e.g. www.ocparks.com/adoptapark/)

- **Proposal 8: Wentworth Park wetlands.** As noted above, the wetlands which once flanked Pyrmont peninsula have been lost to land reclamation. A regional wetland could be created in Wentworth Park between the light-rail viaduct and the Moreton Bay figs. It could have both fresh and brackish water lakes, an ecological yin and yang, with a raised walkway and viewing platforms between them. Each lake could have a small island for wildlife breeding and refuge. The lakeside lands could be planted with wetland, heathland and open forest plants once indigenous to the area.

  The freshwater lake would provide habitat for native ducks, herons and egrets, cormorants and ibis, grebes, possibly bitterns and swans. It could be used to polish stormwater from the catchment of the former Blackwattle Creek. Stormwater management strategies, including off-line treatment solutions rather than end-of-pipe solutions, were listed 17th of 76 actions proposed to improve Sydney Harbour catchment by the Sydney Harbour Catchment Management Board(2003).

  Such initiative would also address proposals in the Australian Museum marine study of Pyrmont peninsula(Part 7) in regard to the control of:

  - excessive freshwater runoff into marine waters, due to extensive hard surfaces in adjoining catchment areas and overly efficient stormwater collection and management.
  - fine particulate matter in stormwater runoff.

  The brackish water lake could support mangroves, saltmarsh and perhaps sea-grasses. It would not only provide resources for wetland fauna but could become a fish-breeding area. However, 'Any proposals to construct saltmarsh wetlands must consider the existing distribution of species within the estuary and select and plant accordingly'(Kelleway et al., 2007:54).

  The terrestrial plantings would attract honeyeaters, some forest birds and perhaps birds-of-prey long since departed from the peninsula. The reserve would require controlled access and an appropriate perimeter fence would make possible the re-introduction of frogs, reptiles and some native mammals. The wetland would be a major educational resource and a regional and international tourist attraction. Its creation might need the opening up of Wentworth Park Sporting Complex to wider community usage, so that sporting groups are not disadvantaged by this proposal.

  Any such initiative might draw on the considerable expertise in Wyong Shire Council and the Department of Natural Resources(Hunter Region Gosford). Together, these organisations, through the Tuggerah Lakes Estuary, Coastal and Floodplain Committee, have generated a Tuggerah Lakes Estuary Management Plan. Their several publications are a valuable source of information on the diverse issues around wetlands.

- **Proposal 9: Darling Harbour wetland:** The 2030 Plan's proposal to place the Western Distributor underground at Darling Harbour, to make possible the creation of a large park, is inspirational. With or without its realisation, an artificial wetland could be created in now underused lands around the Sydney Entertainment Centre. The wetland could polish stormwater from the former Cockle Creek catchment, link into the water bodies of the Chinese Gardens and behind Tumbalong Park (now under reconstruction) – so ensuring that waters entering Darling Harbour would be clean enough not to harm estuarine ecosystems. The wetlands could become an important sanctuary for wetland birds during inland droughts and on migration, provide breeding habitat for a range of vertebrate and invertebrate animals, support wetland plant communities, and become an important educational resource and tourist attraction.

  Because of current doubts about the future of the Sydney Entertainment Centre(http://www.abc.net.au/news/stories/2009/08/06/2647710 .htm?section=business), it may be timely for Council to ensure that any planning for the future of this important site incorporates ecological concerns.

- **Proposal 10: Ultimo Youth Park.** Council might consider acquisition of the former Government Printer's car park, which fronts onto Pyrmont Street, for an Ultimo Youth Park. This would also conserve the quarry face on which the Government Printer's building stands, a relict of among the earliest quarries on Pyrmont peninsula. It would also make possible creation of a rainforest in the shadow of the Western Distributor(or the Goldsbrough Mort building if the overpass goes subterranean), and would be an important link in a green corridor between the proposed Darling Harbour park and Wentworth Park.

- **Proposal 11: Ecological landscaping of city unit blocks:** The landscaped gardens around many inner city unit blocks are usually planted with species exotic to the locality. These plants usually have little or no wildlife values, and sometimes become naturalised. The rooftops of these blocks are often barren spaces, with no associated vegetation. Council might consider initiatives, with bodies corporate, to foster the creation of native biodiversity around and on these blocks. Such reactive measures could be complemented by pro-active measures, through which Council could establish ecological requirements for property developers as part of the development approval process.

- **Proposal 12: Mount Street Native Garden.** Council might acquire the car park between Mount and Harris Streets. The site could become gardens which showcase the remarkable diversity of plants which once grew on Pyrmont peninsula, and become a stronghold for the threatened Blue Wrens of Pyrmont.

- **Proposal 13: Frog ponds.** Pyrmont peninsula appears to be bereft of frogs(apart from aquarium escapees), a most regrettable state-of-affairs. Council should install frog ponds in its parks and gardens, as appropriate and in consultation with local residents. Some frog species could be readily re-introduced to the peninsula, while others would require more sophisticated schemes for successful re-colonisation.

- P**roposal 14: Little Penguins.** Little Penguins *Eudyptula minor* have been observed in most parts of Sydney Harbour and for some distance up the Parramatta River. This species may once have nested on the rocky/sandy shores which once characterised the northern part of Pyrmont peninsula. Council might consult with National Parks and Wildlife Service to assess whether potential breeding sites exist or could be created on Pyrmont peninsula.

- **Proposal 15: Hole-requiring fauna.** Microbats, other mammals, and several bird species depend on holes in trees to roost or nest. Safety considerations have essentially eliminated suitable trees from the urban environment. In Melbourne, nest boxes have increasingly become a management tool to provide hollows for bats(Evans & Lumsden, 2007). They could be similarly used for hole-nesting birds, possums, and roosting microbats in Sydney. Council should engage appropriate expertise to explore this means of increasing biodiversity in the City.

- **Proposal 16: Species-at-risk Recovery Plans.** Council should develop recovery plans for locally-threatened plants and animals, in conjunction with local communities. The Blue Fairy-wren project in Glebe is a good exemplar(Wise, 2007; Stevens, 2008). This project has emphasised:
  - the importance of regular surveys of populations and distribution of species at risk
  - the need to include both public and private lands in such projects
  - the discouragement of species antagonistic to those at risk
  - the need for community information and education campaigns on species at risk
  - the creation of habitat favoured by species at risk, including demonstration areas with interpretive signage on public land
  - the encouragement of residents to create habitat for species at risk, e.g. by information campaigns, plant give-aways etc(based on Stevens, 2008)

Council might consider Pittwater Council's program on threatened species in its LGA as a basis for similar initiatives in Sydney City (http://www.pittwater.nsw.gov.au/environment/plants_and_animals/threatened_species).

- **Proposal 17: Foreshore rehabilitation.**

> *'Among the most important environments of the coastal zone are estuaries, which constitute transition zones or ecotones, where fresh water from land drainage mixes with seawater, creating some of the most biologically productive areas on earth'*(Kennish, 2002:78)

A wide range of ecologically-appropriate sea wall systems and techniques are now available(Part 7.9.2), and Council should use every opportunity to negotiate their use with State instrumentalities whenever the opportunity arises.

Mangroves are particularly important to the biological health of estuarine waters. Despite mixed experiences to date(8.4.6), Council should persevere with initiatives to re-introduce mangroves to suitable parts of Sydney Harbour, in recognition of their former more widespread occurrence. Particular mention should be made of the Bank Street frontage to Blackwattle Bay and adjoining the new parks at Jackson's Landing.

A useful entry into mangrove rehabilitation projects, research and practice is provided by the Kooragang Wetland Rehabilitation Project (http://www.hcr.cma.nsw.gov.au/Kooragang/Research.htm).

- **Proposal 18: Construction of marine fauna habitat.**

  Extensive modification of the sea bed in the embayments of Pyrmont peninsula, during construction of the Port of Sydney early last century, has much diminished the ecological values of these waters. The Australian Museum marine ecology study suggested installation of 'reef balls' at suitable offshore locations; candidate sites might include Elizabeth Macarthur and Blackwattle Bays. More information on this technology can be found e.g. at http://www.reefball.com.au/.

- **Proposal 19: Creation of ecological priority areas.**

  Implementation of some or all of the preceding proposals would reverse the decline of native plant and animal species on Pyrmont peninsula, and promote the reappearance of species now lost to the place. More importantly, they would – through educational programs – foster deeper appreciation among urban dwellers of the dependence of humans on global biodiversity. It would also provide an opportunity to create ecological priority areas on the peninsula. These latter should be carefully selected through appropriate planning processes and community consultation, and maintained primarily for their ecological values. One example of such would be Jones Street Pocket Park which, with its associated cliffs, has the highest floral and herpetofaunal diversity of any site on Pyrmont peninsula.

C) Fragmentation of populations

Reed et al(2003:23) wrote: 'The Earth is currently suffering a catastrophic loss of biodiversity. A primary goal of conservation biology is to arrest this loss. Population size has been shown to be the major determinant of persistence in populations of a variety of animal species. As the catastrophic loss of biodiversity continues unabated, guidelines for how extinction risk is related to population size should be a high priority in conservation biology'.

The increasing conflict between people and nature has spawned theoretical developments like 'Minimum viable population size'(MVP), which has been defined as 'an estimate of the number of individuals required for a high probability of survival over a given period of time. A commonly used, but somewhat arbitrary definition is >95% probability over 100 years'(Traill et al, 2007). There is a trend towards defining the time frame as 40 generations of the species of interest rather than number of years.

Influences which affect the determination of MVPs include genetic considerations, natural catastrophes, environmental and demographic stochasticity, and population density dependence. Characteristics of the species under consideration, like per capita growth rate, longevity, fecundity, are also influential. For such reasons, it is now recognised that the notion of a generally applicable MVP is unrealistic. Perhaps with this in mind, Traill et al(2007) suggested that in poorly informed situations MVPs in a broad range from 100 – 10,000 individuals may be 'cautiously used'.

Reed et al(2003) used actual life history data for 102 vertebrate species, a few of which were from Australia, to establish MVP estimates. They concluded: 'The results of our simulations suggest that conservation programs, for wild populations, need to be designed to conserve habitat capable of supporting approximately 7,000 adult vertebrates in order to ensure long-term persistence'. They recognised that for some wild species it was not possible to set aside continuous blocks of the required size and concluded: 'Thus, the need to coordinate networks of smaller populations to ensure viable populations through the use of corridors, or managed immigration, should be a high priority'(p.31).

Although consideration of species conservation has so far centred on wild populations in natural or semi-natural lands, human settlement of large regions of our planet is generating interest in the contribution that species conservation strategies in such regions can make to the wider perspective. Plants and animals need populations large enough to retain their genetic fitness – to avoid inbreeding and loss of diversity - and to withstand stress of various kinds, for long-term survival. Urbanisation fragments open lands, and creates high habitat patchiness. As a result, urban populations of plants and animals are very prone to extinction.

A local example is a case study of the Squirrel Glider *Petaurus norfolcensis* in a fragmented urban landscape in the suburbs of Newcastle(Winning & King, 2004). A consideration in this study was whether gliders still moved between open forest patches fragmented by urban development and, if so, whether a minimum viable population could be sustained.

While Soulé(1991) considered that the best way to maintain wildlife and ecosystem values is to minimise habitat fragmentation, he recognised that: 'among the most important measures that can be taken are consolidation of open space, set-asides and the provision of corridors linking habitat patches. Corridors can mitigate some of the negative effects of development on wildlife, especially where they facilitate the movement of large predators'.

The need for effective corridors for both flora and fauna movement is strengthened by CSIRO predictions of change in Sydney's climate: 'it is believed that the city's average temperature will rise by up to 1.6 degrees [Celsius] by 2030 and 4.8 degrees by 2070'(ABC News Online, 2007). Rainfall is expected to decrease by up to 40% over the next 70 years. According to a report prepared for the Climate Change and Development Roundtable: 'A number of international assessments point to a threshold for 'dangerous' climate change of approximately 2°C above pre-industrial temperatures'(Preston et al, 2006:1). Such changes will likely reduce the resilience of ecosystems to cope with stress, an important consideration in the planning for ecological sustainability.

- **Proposal 20: Green networks.** The green networked corridors proposed in the Sustainable Sydney 2030 Plan should work for plants and animals as well as humans. The initiative should have ecologists in the core team, so that this strategy benefits both humans and urban biodiversity: 'Council should use opportunities to combine recreational linkages such as walking tracks or bike paths with biodiversity linkages'(Lembit, n.d:16). Plant and animal species should be identified in different parts of the network, so that location-specific design principles can be developed. Pittwater Council's website provides useful information on wildlife corridors (http://www.pittwater.nsw.gov.au/environment/plants_and_animals/wildlife_corridors).

- **Proposal 21: Green islands.** Streets planted with trees and shrubs native to an area will provide some corridor function. This can be improved by converting, say, every fifth car parking space to a biological island with biodiverse native plants. Bioswales could be included. The intensity of 'green islands' could relate to location, and might be increased over time. Harris Street, for example, could benefit greatly from such treatment.

- **Proposal 22: Backyard Buddies.** Council could encourage sympathetic yard plantings by residents whose properties adjoin green networked corridors. Council could offer residents suitable trees and shrubs without charge, and maybe provide arboricultural services. Plants should come from seeds collected locally wherever possible. Good advice on strategies to increase bird diversity in gardens is given by Olde(2001). The Backyard Buddies scheme is described at (http://fnpw.org.au/Backyard_Buddies/Backyard_Buddies_home.htm).

- **Proposal 23: Balcony Buddies.** Council might consider introduction of a 'Balcony Buddies' element into its tree/shrub giveaway scheme, in which six—packs of native plants suited to windy, shady, sunny etc balconies could be given to residents.

D) Introduced fauna

By way of introduction, it should be noted that an Office of Technology Assessment study found that 4,500 non-native species(flora and fauna) have established free-living populations in the United States, of which about 15% cause severe harm: 'Looking at just 79 of these species, the OTA documented $97 billion in damages'(Quammen, 1998).

At a more practical level, interactions between long-term resident species ('natives') and introduced species appear complex(Davis, 2003). Introduced species sometimes cause the rapid extinction of long-term resident species, especially if intertrophic interactions are involved(e.g predator/prey or pathogen/host interactions). Thus the Brown Tree Snake *Boiga irregularis*, a species native to Australia, is believed to have caused the extinction of more than 10 bird species on Guam since its introduction in 1950.

In this regard, of utmost concern are two predator species introduced into Sydney early in European settlement:

- Domestic Cat *Felis catus*: Studies in Adelaide have found that on average, the domestic cat kills 16 small mammals, 8 birds and 8 reptiles a year; over 100 different bird species were taken during the studies(van Tiggelen, 1992). In a city like Melbourne, it is estimated that the bird toll alone is of the order of 5 million a year; but cats only take home about half their prey. There are an estimated 18 million feral cats in Australia(Game Council NSW, 2006).

- Red Fox *Vulpes vulpes*: Predation by the fox is listed as a Key Threatening Process under both the Threatened Species Conservation Act and the Environmental Protection and Biodiversity Conservation Act. The fox population in Australia is estimated at 7.2 million and threatens the survival of many small to medium sized mammals, birds, reptiles and amphibians(Game Council NSW, 2006). Pyrmont peninsula has had, until recently at least, a fox population of unknown size.

- **Proposal 24: Cat and fox management.** Council should develop Cat and Fox Management Strategies. These plans should integrate 'best practice' animal control programs with community education and scientific research. A model approach may be found on the Central Coast, where Gosford City Council, Wyong Shire Council and the National Parks and Wildlife Service have cooperated with other government agencies and community organisations to control their local predators. Another useful contact might be the Invasive Animals Cooperative Research Centre, University of Canberra, Bruce, ACT 2617, +61-2-6201-2887, contact@invasiveanimals.com. This initiative should be considered urgently.

Other introduced fauna are known to also hunt native fauna, Brown Rats for example. Introduced birds – such as starlings, sparrows, bulbuls, turtle-doves, pigeons, Indian Mynahs – also cause irritation in the community – sometimes leading to backyard trapping.

- **Proposal 25: Management of other feral animals.** Council should review contemporary knowledge of all exotic animals in its LGA and their control, and determine the worth of management schemes. Pittwater Council provides an excellent text on the issues around feral animals, with links to other organisations active on this issue (http://www.pittwater.nsw.gov.au/environment/plants_and_animals/feral_animals).

E) Introduced flora

Long-term resident species('natives') are unlikely to be driven to extinction by competition from introduced plant species(Davis, 2003). Populations of the native species may decline, but equally they may adapt to new competitive pressures while the newly established species may themselves be subject to adversity.

The City may support 200-300 plant species introduced from around the world. On Pyrmont peninsula, nine in every ten plant species have been introduced – there is a veritable league of nations of plants on the peninsula! Some of these species have been declared noxious, and Council Officers are legislatively responsible for their control.

- **Proposal 26: Security of native flora populations.**

  Interactions between relict native and introduced floras(and faunas) are likely in a high state of flux in the inner suburbs of Sydney. Investigations should establish the status of populations of residual species, and the nature of their interactions with introduced species, so that timely action can be taken to prevent localised extinctions of residual native species.

- **Proposal 27: Review of Council weed-control practices.**

  Weed control, on Pyrmont peninsula at least, is primarily by herbicide. By observation, it appears to be non-discriminatory – killing native and introduced plants alike. Council should review current practice and provide educational programs to achieve more ecologically-sensitive outcomes. Private operators should be required to adopt similar practices

8.4.3 Organisational initiatives

If Council is to engage with issues of ecological sustainability – issues which underpin its 2030 Sustainable Sydney strategy – it should adjust its organisational capabilities accordingly. While this is largely a matter for Council, two particular suggestions to appropriately upgrade its intellectual and skills resources are made here.

- **Proposal 28: Appointment of Senior Ecologist.** Council should appoint, as a matter of urgency, a senior ecologist. This person would, inter alia:
    - inform Council staff, councillors, and the wider community on issues of ecological sustainability
    - advise on funding priorities for ecological projects
    - be empowered to effectively represent ecological interests wherever a project has an ecological component
    - collaborate with counterparts, or more generally, in other metropolitan councils, State instrumentalities and business to improve biodiversity Sydney-wide
    - collaborate with the metropolitan universities, state and federal instrumentalities, and other institutions to meet research needs in urban ecology
    - act as a change-agent generally in Council and the community, to promote much greater ecological awareness

- **Proposal 29: Appointment of Landcare Officer.** Council should appoint a landcare officer/bush regeneration co-ordinator to:
    - promote and support landcare activities
    - manage the introduction of frog-ponds
    - encourage and support Adoptapark initiatives
    - collaborate with others in Council and beyond on Backyard and Balcony Buddy schemes
    - promote nesting/roosting box initiatives
    - liaise with National Parks and Wildlife Service and other relevant authorities on the re-introduction of flora and fauna wherever possible

- **Proposal 30: Creation of a native plant nursery.** A major concern of landcarers is the limited range of native plant species available to them. This problem is accentuated by a preference for locally provenanced species. Council could play a pivotal role by remodelling its nursery to:
    - establish a collection of species from within City limits for use by landcarers, to ensure local provenance
    - supply plants and seeds complementary to those available from other sources
    - research, in collaboration with others, the growing of species not generally available to landcarers(e.g. Australian Native Plant Society(Australia) at http://asgap.org.au).

Any such initiative might well subscribe to a Model Code of Practice like that proposed by FloraBank(Mortlock, 1998). As noted by Lembit(n.d:15) in respect of Canada Bay City Council: 'Council should investigate partnerships with neighboring or nearby councils which have community nurseries and with organisations such as the Sydney Olympic Park Authority [FloraBank] or Greening Australia to source appropriate stock'.

Notable in this regard is the Randwick City Council Community Nursery: 'The Community Nursery is one of Sydney's leading nurseries … [it] is also used regularly for school and community workshops. It is an important part of the Randwick Council Environmental and Sustainability education program' (http://www.randwick.nsw.gov.au/Looking_after_our_environment/Greening_our_city/community_nursery/index.aspx)

- **Proposal 31: Appropriate review procedures.** Council should keep under review its ecological initiatives, to ensure that they remain adequately resourced(funds/staff).

8.4.4 Capacity building/educational initiatives

'We believe the role cities can play in shaping community attitudes
to 'nature' is greatly underestimated and poorly exploited.
They are where most of us live,
where some of the heaviest human impact
on native plants and animals has been,
and where the need and opportunities are
for the greatest number of people to learn about them
and regain a sense of connection to the natural world'

'So dense have our cities become …
that today we need to consider new ways to create …
opportunities for contact with the natural world'

Archer & Beale(2004:307)

The lack of relevant ecological knowledge during the European colonisation of Australia has had profound consequences for the wellbeing of nature on this continent. While the early settlers shared cultural attitudes towards the ecology of place with their colonising cousins elsewhere, they encountered a largely unique flora and fauna here. The devastating consequences of their mindset on this continent's ecology are well-documented(e.g. Serventy, 1966; Flannery, 1997).

In a challenging critique of sustainable development, Banerjee(2003:169) commented: 'Sustainable development is not just about managerial efficiency (although that has a part to play); it is about rethinking human-nature relationships, re-examining current doctrines of progress and modernity, and privileging alternate visions of the world. It requires a retracing of steps to the juncture where 'nature' became transformed into 'environment', distancing the natural world and positioning it as a resource to be mastered, in the way that human feelings and expression become mastered through 'culture'. Contemporary notions of sustainable development are embedded in the development discourse that requires the death of nature and the rise of environment. Alternate visions can be imagined only by rescuing sustainable development from this dichotomy'.

Marzluff & Ewing(2001) emphasised the need for community education: 'The public needs to understand how humans affect wildlife and what they can do to minimize their effects. Traditional extension, outreach, summer nature camps, and school programs are helpful, but they are only a start. To further engage the public in wildlife conservation, we suggest that high-profile, collaborative efforts among [or involving] reserve managers, urban planners, K-12 schools, local management agencies and municipalities, universities, and conservation organizations are needed'.

Surprisingly, urban ecology is poorly addressed by current programs at Sydney's metropolitan universities. The University of Technology Sydney (UTS) has a Bachelor of Science in Urban Ecology, with a 6-point urban ecology project. The University of New South Wales similarly offers a subject 'Sustainable Development and the Urban Environment'.

Not surprisingly, then, those who populate decision-making bodies in Australia have limited understanding of the role of urban ecology in global systems or, indeed, of the consequences of their own decision-making on biodiversity. The wider community will, for the most part, be even less informed about the place of urban ecology in global futures.

A most pressing task in respect of ecological sustainability for local government is an educational one. Insofar as councils have only recently taken responsibility for this matter, community expectations in this regard remain poorly-informed. Most urban dwellers hold very anthropocentric world views, with little or no accommodation of ecological issues. There is a strong social inertia to change in this regard. This presents a huge educational task, even more so if we are to confront issues of ecological sustainability before the planet's ecosystems deteriorate beyond redemption. So short are the time frames for action, and so alien are the values of most city dwellers to the constraints that ecological sustainability will place on them, that the task of transformation may be politically, economically and practically beyond us. Such considerations place a very high emphasis indeed on capacity-building both in Council itself and more widely in the community it serves. The following proposals open up this dimension of ecological sustainability for debate, and can doubtless be greatly strengthened by others better qualified.

City Council should instigate initiatives to relieve this distressing state of affairs.

- **Proposal 32: Urban Ecology Workshop.** City Council should sponsor an Urban Ecology Workshop, similar to the 'Comparative Ecology of Cities and Towns' initiative taken in Melbourne in July 2003. While the latter attracted contributors worldwide, a case can be made for keeping an Australian focus to such an event. A 2005 Urban Ecology and Conservation Symposium held in Portland/Vancouver attracted 284 participants of which almost a quarter were from metropolitan agencies and another 16% were from county, state and federal agencies.

- **Proposal 33: Council/University Urban Ecology Initiative.** City Council should collaborate with a Sydney metropolitan university to institute a University-based Urban Ecology program. Lincoln University's Isaac Centre for Nature Conservation, for example, has established a program based on staff from the University, Christchurch City Council, Landcare Research Ltd, Department of Conservation, University of Canterbury, Ministry of Agriculture and Fisheries, and private consultants. The program's objectives include:
    - collaboration in investigating ecological and sociological aspects of urban ecosystems and the

conservation of biodiversity in urban areas

- providing opportunities for community involvement in the process of nature conservation and restoration in urban areas. (http://www.lincoln.ac.nz/story10335.html).

- **Proposal 34: Building knowledge within Council.** City Council should institute in-house programs for staff on the place of urban ecology in local government. WWF Australia may be a useful resource in this regard, as its 2003 submission to the Federal Government's House Select Committee on the Recent Australian Bushfires included a recommendation that 'the Committee examine and report on the lack of ecological knowledge of volunteer fire fighters and municipal staff, and ways to reverse this situation'

  (http://www.aph.gov.au/house/committee/bushfires/inquiry/subs/sub199.pdf).

- **Proposal 35: Educational leaflets on biodiversity.** Council should consider advisory leaflets for residents on how to improve biodiversity in their properties. A good model is provided by Leichhardt Council's 'Living with birds in Leichhardt' (http://www.leichhardt.nsw.gov.au/IgnitionSuite/uploads/docs/2005_05_31_31-5%20bird%20brochure_v6.pdf)

  Another is the City of Melbourne's 'The Green Leaflet' (http://www.melbourne.vic.gov.au/rsrc/PDFs/EnvironmentalPrograms/2570_Greenleafletaug_sept.pdf).

- **Proposal 36: Educational leaflets on noxious weeds:** Council should produce information leaflets on noxious plants present in the LGA, for distribution to community groups and interested individuals, and for its website. Considerations might include issues of identification, known distribution, methods of control, key contacts, illustrations. For example, 'Noxious weeds of the Sydney North Region' has been prepared by the Sydney North Regional Weeds Committee, made up of 11 local councils and several State government departments (http://www.sydneyweeds.org.au/docs/Noxious-Weeds-Poster.pdf).

- **Proposal 37: Council/Schools collaboration.** Council should consider a collaborative program with those schools in the LGA which wish to protect, manage and re-plant indigenous vegetation: 'This could be through sponsorship of school greening projects, assistance with technical advice or through linking schools to community groups and individuals who can contribute to such projects'(Lembit, n.d:15).

  Pittwater Council, for instance, has an active program on ecological capacity building in its local community through signage, school kits and public displays (http://www.pittwater.nsw.gov.au/environment/coastal/estuaries/pittwater_estuary/pittwater_estuary_management_plan/ecology_management_options).

8.4.5 Research and monitoring initiatives

Urban ecology is a relatively new branch in the wider field of ecology, and has many research needs. These needs will greatly increase as we enter a period of rapid global climatic change and uncertainty.

Marzluff et al(2001:1) noted: 'Much of the current urban planning and policy-making concerns the impacts of urbanization on human society, rather than on biodiversity. For biodiversity to become a major consideration in the planning and implementation process, the available science must be relevant, rigorous, compelling and visible'. They concluded: 'Therefore, our research should serve to direct inevitable development so that threats to biodiversity are minimized'(p.13). It is more likely, though, that research into urban ecology should not only minimise the effects of development on biodiversity, but identify how biodiversity can be improved with least economic and social cost.

Marzluff et al(2001:1) identified three research priorities, namely to establish:

- where development will have the least effect on organisms.
- how biodiversity responds to settlement density.
- if certain patterns of settlement minimise expected(adverse) effects of density.

These broad tasks for research should be contextualised to the specific circumstances of Sydney, where spatial complexity and variation are marked. We need an understanding of what constitutes 'ecologically benign settlement patterns': 'The relevance of … urban ecology in general to the urban planning process can be increased by identifying those processes or patterns that have important implications to both humans and to biodiversity'(Marzluff et al., 2001:14).

Marzluff and colleagues identified two broad kinds of urban ecology research:

- surveys and correlational investigations into the distribution of urban flora and fauna, common to more traditional ecological investigations. This is the nature of the Pyrmont peninsula ecological studies to date.
- Studies to identify mechanisms and causal relationships identified by the former studies.

Finally, Marzluff et al(2001:14/15) emphasised the need for transdisciplinary bridges: 'A challenge facing scientists working on urban ecology issues is how to make their complex, and to some degree uncertain, science accessible to policy makers. Meeting with planners, managers, and policy makers is critical, as is joint development of research goals and publishing in non-traditional outlets … Tailoring the format of results to a more diverse audience is also important. For example, maps or photographs that communicate the association of land cover with avian population viability would be especially compelling to planners, managers, and policy makers. Such summaries are not to be overly simplified or gross extrapolations. Rather, they should be distillations based on our rigorous studies that have been peer reviewed and published'.

- **Proposal 38: City-wide Flora and Fauna Inventories.** There is an urgent need for City Council to develop a City-wide inventory of its flora and fauna – native and introduced. This inventory should be quantitative, in that population sizes are defined, and specific localities where these populations occur are identified. Broad-brush qualitative information is insufficient for policy-making.

  The scale of a City-wide project will require a collaborative approach. There are probably enough volunteers knowledgeable in the various branches of flora and vertebrate fauna to make such a survey possible. There is also a strong case for extending the survey to invertebrate groups, although this will likely require hired expertise.

Whether the proposed survey should extend to contiguous estuarine environments is for Council to decide. The Pyrmont study hired the expertise of staff at the Australian Museum for this purpose.

Other research priorities will emerge as a City-wide ecological survey proceeds.

- **Proposal 39: Modelling the urban ecosystem** (based on Alberti, 1999).

  Early attempts at integrated assessment modelling are to be found in such classics as <u>World dynamics</u> by Jay Forrester(1971) and <u>Limits to Growth</u> by Donella Meadows and colleagues(1972). The first generation of operational integrated models emerged in the mid-1980s. These developments coincided with the emergence of notions of the city as an ecosystem, and sought to incorporate – albeit simplistically – the interactions between natural and social systems. Alberti sought to create an urban-ecological model(UEM) in the late 1990s. These significant developments should be followed through to the present generation of such models, to establish their relevance for Sydney.

- **Proposal 40: Monitoring.** All initiatives at ecological improvement of urban areas should have a monitoring component, to ensure that 'our well-intentioned activities actually work'(Marzluff & Ewing, 2001:289).

8.4.6 Collaboration

The foregoing strategies confront the anthropocentricity of most urban dwellers. Their worlds are populated largely or solely by other humans, and their concerns are particularly directed towards social issues. To many, ecology is associated with places of relaxation or escape rather than where they live. This cultural perspective is doomed, as ecological processes underpin the totality of human existence on this planet. The longer anthropocentric views dominate, largely or exclusively of ecocentric ones, the more intractable the 'environmental problematique' will be.

Council is well aware of the difficulties in changing such deeply entrenched world views, as they found in the rancorous debate on the creation of mangrove habitat in Bicentennial Park West. McManus(2006) sought to understand the factors at play between initiation and completion of this project. He concluded, in part, 'unless lessons are learned from adverse experiences such as the proposed mangrove habitat in Bicentennial Park West, other people may be dissuaded from engaging in this activity[ecological restoration]. The most important lesson to be drawn from the case study of restoration are the importance of understanding science as socially constructed, to appreciate the necessity of scientific knowledge in restoration projects and to ensure its harmonious articulation with individual and community values and visions of landscape. These visions and values are most appropriately expressed through a timely and inclusive public participation process'(p.69).

Seen in the context of sociocultural transformation Councils are, properly, change agents. Controversy inevitably attends their processes, so that their <u>modus operandi</u> is a central concern. McManus quotes Gobster(2001:36): 'broad-based citizen involvement in restoration efforts is as critical as interdisciplinary professional involvement; it empowers stakeholders and helps ensure that the landscapes they desire will be maintained over the long term'.

McManus concluded: ' … the articulation of a deeper appreciation of competing cultures of nature and a suitable public participation process would probably have avoided the 'mangrove battlelines' and contributed to a successful example of ecological restoration'(p.69). A more reflective approach both to Council's fundamental role, and the means by which this role is best achieved, might greatly improve the prospect for ecological sustainability in the future.

- **Proposal 41: Use of collective intelligence**

  Traditional community consultation practices greatly undervalue the innate wisdom of participants. Council should employ more progressive and consultative processes. A recommended practice is the World Café model, described at http://www.theworldcafe.com/, or its 'down-under'- equivalent, the Conversing Café (http://ww.pnc.com.au/~lfell/café.html). A major advantage of these approaches is that they foster the deep involvement of diverse participants, rather than only those comfortable with public speaking.

While the need to cope with conflicting value systems within an LGA may be difficult enough, there is a pressing need for collaboration between LGAs if ecological sustainability is to be realised. As Rees & Wackernagel(1996:236) make clear:

> '… *the* ecological locations of high-density human settlements no longer coincide with their geographic locations. *Twentieth-century cities and industrial regions for survival and growth depend on a vast and increasingly global hinterland of ecologically productive landscapes. Cities necessarily "appropriate" the ecological output and life support functions of distant regions all over the world through commercial trade and natural biogeochemical cycles. Perhaps the most insight … is that* no city or urban region can achieve sustainability on its own. *Regardless of local land use and environmental policies, a prerequisite for sustainable cities is sustainable use of the global hinterland … the seeming depopulation of many rural areas does not mean they are being abandoned in any ecofunctional sense. Whereas most of the people may have moved elsewhere, rural lands and ecosystem functions are being exploited more intensely than ever in the service of newly urbanized human populations.*'
>
> Rees & Wackernagel(1996:236)(Authors' emphases)

Rees & Wackernagel(1996:241) suggested, inter alia, that: 'To reduce their dependence on external flows, urban regions and whole countries may choose to develop explicit policies to invest in rehabilitating their own natural capital stock … This would increase regional independence thus creating a hedge against rising international demand, global ecological change, and potentially reduced productivity elsewhere.

The concern here is to achieve ecological sustainability, and Rees & Wackernagel convincingly make a case for urban societies to recognise the wider consequences of their demands.

- **Proposal 42: Inter-Council collaborations.** A first step in the recognition of the widening horizons of ecological sustainability could be for City Council to enter into discussions with selected rural councils in New South Wales on possible collaborations to improve the ecological sustainability of rural NSW. Collaborations could take many forms – financial, establishment of volunteer networks, inter-Council joint projects etc. The process of engagement will make clearer the rich potential for appropriate collaborations. Such initiatives would go some way in acknowledging the huge ecological footprint of the City of Sydney.

8.5 Conclusions

It is readily acknowledged that the above proposals, taken together, constitute an ambitious and bold change program. That they are so substantial in number and kind is an acknowledgment of the systematic neglect by Council of its responsibilities for the ecological well-being of its jurisdiction since incorporation. It is well understood that the present Council is keen to remedy past inactions, and is making excellent progress in this regard. The proposals made here are intended to stimulate opportunities which further enrich and diversify current efforts. The ecological well-being of Council lands, seen in the context of global sustainability, is a matter of extreme urgency and importance. Council should always remain mindful of the consequences of systematically neglecting such a key part of its overall portfolio.

While the proposals made here pertain particularly to Pyrmont peninsula, they clearly have a generic relevance to other parts of Council's jurisdiction. Local studies will be needed to establish particularities in each area.

8.6 Postscript

> *'This twenty-first century of ours will be faced with appalling social injustices, with conflict and pestilence. But these will not be its defining challenges. Instead, our task is a far more difficult one: to bring sustainability to a species that has not known it since it manufactured its first tool. And yet it is a defining responsibility, for by our actions we shall determine whether Gaia shall achieve intelligent control[through humans], or whether the blind watchmaker[evolution] will tinker on, just as he has for the past 4 billion years. If we fail, all of our species' great triumphs, all of our efforts, will have been for nought. And perhaps the past 4 billion years[the evolution of life on Earth] will have been for nought as well'*
>
> Tim Flannery(2008:64)

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Part 9

Key Dates

Key dates

Year	Event
Pre-1788	Cadigal people occupy Pyrmont peninsula; Cockle Bay known as Tumbalong – a place where seafood is found
1788	Darling Harbour named 'Long Cove', but 'Cockle Bay' is adopted
1794	John Malone granted 24 acres and William Mitchell 18 acres
1795	Thomas Jones granted 55 acres
1799	Capt. John Macarthur buys Jones' farm and later names it 'Pyrmont'
1803	First land grant of 34 acres to Surgeon John Harris
1804/1805	Ultimo House built
1803/1818	Further grants to John Harris, totalling 191 acres
1810	Greenway commissioned to remodel Ultimo House
1810/1811	Tollgate built on George Street built near junction with Pitt Street(about Railway Square)
1811	First Port Authority established First wharf built in Cockle Bay
1814	Greenway commissioned to remodel Ultimo House
1815	Construction of Dickson's steam mill in Haymarket marks start of industrial revolution in New South Wales
1821	John Harris moves to Shane's Park, near Rope's Creek
1826	Cockle Bay named Darling Harbour by Sir Ralph Darling
1831	30 allotments on Parramatta Road sold for between £1-10-0 and £2-16-0 per frontage foot
	Steam power comes to Sydney Harbour; mostly sail to 1838
1834	John Macarthur dies 'Newstead House'(Mrs Bunn's cottage) completed
1836	Edward Macarthur subdivides Pyrmont into 100 allotments
	Toll bar installed at Grose Farm Hill, April 1836
	Harris Street formed
1838	John Harris dies; Ultimo estate willed to his brothers, George & William Harris
1839	First 41 lots on Pyrmont sold on for £18,067 Bowman Street built Shipyard established in Jones Bay Road
1840	Russell's shipyard built at Pyrmont
	Stone Mason's Hotel built
1840s	Small scale sandstone quarries operational in Pyrmont
1842	Dunmore Lang builds wooden Presbyterian Chapel in Mount Street
1844	Ultimo & Pyrmont incorporated into City of Sydney
1846	Australian Steam Navigation Co(ASN) established shipyard at Pyrmont

Year	Event
1849/1850	Construction of St Bartholomew's Church started in August 1849, on land donated by Macarthur; completed in 1850
1850	130 dwellings in Pyrmont; Ultimo still a rural estate Act to establish public abattoir or place of slaughtering on Glebe Island
1853	Railway Department resumed 14.5 acres of Ultimo Estate for Darling Harbour goods yard
	Charles Saunders starts quarrying sandstone on land leased from the Harris Estate
	Glebe Island abattoir built
mid-1850s	Block bounded by Harris, Scott, Cross & Bowman Streets built
1855	ASN expanded to Darling Island Fyfes iron foundry opens Pyrmont Bridge Company incorporated First record of Saunders yellowblock being used, at the Australian Museum Ten quarrymen working in Pyrmont
1856	Railway line completed between Redfern and Darling Harbour
1857	Wooden bridge built between Glebe Island and Pyrmont(Glebe Island Bridge)
1858	First Pyrmont Bridge opened 17 March; a wooden toll bridge Pyrmont Bridge Road built
	Mount Street Public School opened Blackwattle Bay Bridge completed Charles Saunders gains license for the 'Quarryman's Arms' hotel, corner John and Mount Streets
1859	Six hotels in Pyrmont
	Ultimo Estate subdivided into 70 blocks
1860	Worker's cottage, 27 Pyrmont Street built City Abattoirs move to Glebe Island Charles Saunders starts Paradise Quarry at western end of Miller Street
1864	Police Station opened at Pyrmont
1865	City Iron Works becomes operational; still operating 1886
1867	St Bede's church built City Iron works established in Abattoir Road, Pyrmont
1869	Dredging begun in Sydney Harbour
1870s	Royal Pacific Hotel built Ultimo housing stock doubles, from 220 to 466 dwellings
1870	Railway goods yard built on reclaimed land in Darling Harbour
1871	ASN shipyard employed 300 men
1872	Robert Saunders becomes partner with his father in the Saunders firm
1873	Blackwattle Bay Reclamation Act passed
1875	City Council built first public baths in Sydney at Pyrmont
1876	Methodist church built, now Maybanke Kindergarten, on site partly donated by Charles Saunders Building of CSR starts
1877	Murray Street School built

Year	Event
	Infilling of Blackwattle Swamp began; continued until 1880 Three-storey 'Saunder's Terrace' built at corner of Harris/Miller Streets
1878	CSR sugar refinery established
1879	Pyrmont Arms Hotel built
1880	Pyrmont police station built: demolished for power station expansion
1881	Lord Wolseley Hotel, Bulwara Road opened Mechanisation introduced at Purgatory quarry
1882	Hellhole Quarry closed and filled in
1883	Saunders Quarry employed 100 men, used 50 horses
	Quarry Street Presbyterian Church built
1884	State Government buys Pyrmont Bridge for £49,600; tolls abolished Robert Saunders acquires portion of former Art Gallery building and installs it on north side of Miller Street where Richmont Apartments are now located
1885	Wentworth Park proclaimed
1886	Darling Harbour goods rail terminus opened
1887	Public School built in Murray Street
	Robert Saunders starts final levelling of Darling Island
1888	First wool store opens at corner of Murray and Pyrmont Streets
	Congregational church built where Angliss Meats now stand 578 Harris Street built Ultimo Presbyterian Manse and School Hall built
1889	State Government purchased Darling Island for £135,000
	Darling Island fully levelled
1890	Sydney's first Technical College opened at Mary Ann Street
	Population around Ultimo and Pyrmont about 19,000
1891	Railway line extended to Darling Island wharves
	Mount Street(Pyrmont) public school built Grindstones made from Pyrmont sandstone exported
	Pyrmont-Ultimo population reaches 19,177; housing stock was 3966, the highest recorded figure
1892/93	New Technological Museum opened
1896	Sam Hordern fountain installed
1898	Pyrmont tram line connected; becomes operational in late 1899
1899	Ultimo Power House built to power trams September: Construction of second Pyrmont Bridge starts
1898	Last period of residential building began in Ultimo, and continued for 4 years
1900	Sydney Harbour Trust Bill passed First motor vehicle imported into NSW Wheat loading terminal opens at Pyrmont Bay Robert Saunders takes over the quarrying firm from father; one of only two quarrymasters remaining on Pyrmont
1901	Sydney Harbour Trust formed: private wharves resumed

Year	Event
	Steel bridge built between Glebe Island and Pyrmont
	Pyrmont baths redeveloped
	Tramline to Pyrmont Point began/opened
1902	Second Pyrmont Bridge opened; built next to first one; powered by electricity from Ultimo powerhouse
1904	Sydney Electric Lighting Station at Pyrmont opened; starts generating electricity to light Sydney streets
1906	Council opens Wattle Street Depot on part of Hellhole quarry
1906/07	Stores at Royal Edward Victualling Yard completed
1907	December: Pyrmont Fire Station opened
	Davey Flour Mill in Union Street opened Uniting Church, corner Quarry/Bulwara Streets, constructed
1909	Vegetable markets open in Ultimo Ordnance Stores building on Darling Island commenced
1910	City Incinerator built in Bank Street
	Paddy's Markets open at southern end of Darling Harbour Tramlline from Pyrmont to Rozelle via Glebe Island Bridge opened Royal Edward Victualling Yard warehouse complex erected at Darling Island
1911	Ultimo House and land resumed for Technical College, for £24,000 Jones Bay wharf built
1912	Dairy Farmers factory opened in Ultimo Street
1913	Quarryman's Arms and Royal Pacific hotels opened
1915	Glebe Island Abattoirs demolished Pyrmont Arms Hotel built
1916	Wardell railway line built from Darling Island to Dulwich Hill
	Ways Terrace built by City Council
	Wattle Street school built Murray Street School demolished for goods yard expansion
1917	Terminus hotel opened Fulltime tram service to Pyrmont withdrawn on 29 November 1917
1920	McCaffery's stables built
1921	Pyrmont Flour Mill built in Union Street(became 'Anchor Flour Mills' of Gillespie Bros. Ltd.)
1922	Pyrmont Power Station extended
1924	Channel dredging in Sydney Harbour ceased
1929	Saunders firm leaves Pyrmont
1932	Ultimo House demolished
1935	Original Goldsbrough Mort building burnt down
1936	Burley Griffin's incinerator constructed
1939	Festival Records art deco building, Miller Street built

Year	Event
1939/1945	Botany Bay grows to become Sydney's major port and container terminal; trade begins to pass by Darling Harbour
1946	Pyrmont Swimming Baths finally closed
1950	Heavy industries on Pyrmont peninsula start to close down
1953	Last regular tram to Pyrmont on 27 June 1953
1955	Second Pyrmont Power station built by Electricity Commission Horses phased out of McCaffery's stables
1956	Use of Mary Ann St tram depot ceased end-1956
1960s	Rows of terraces demolished in Point, Jones, John, Harris, Bulwara Streets and Ada Place
1963	New Wattle Street school built
1966	Sydney Fish Market relocated from Haymarket to Blackwattle Bay
1970	St Bartholomew's Church demolished
mid-1970s	Darling Harbour a series of empty warehouses and rarely used train tracks; only the odd vessel uses its wharves
1971	Pyrmont incinerator ceased operation: demolished in 1992
1979	Michael Matthews founds UPROAR(Ultimo Pyrmont Residents Opposed to Arbitrary Redevelopment)
Early 1980s	Multi-million dollar grandstand completed at Wentworth Park
1981	Meriton built apartment blocks in Harris, Jones and Macarthur Streets; first residential buildings on the peninsula since 1916 First Pyrmont Ultimo Festival held Pyrmont Bridge closed to pedestrians 27 July, vehicular traffic 7 August
1982	August: Nevlle Wran directs Department of Main Roads not to demolish Pyrmont Bridge
1984	1 May: Wran announces Darling Harbour Bicentennial scheme Last goods train leaves Darling Harbour; NSW Transport Workers Union Band plays the funeral march NSW government decides to redevelop the area Darling Harbour Authority formed, to oversee redevelopment of Darling Harbour
1985	Work starts on Sydney Convention and Exhibition Centres
1987	Key components of Darling Harbour redevelopment completed
1988	Darling Harbour formally opened by Queen Elizabeth II, during Australia's Bicentennial Celebrations July: TNT monorail operational Central Sydney Strategy published, identifying Pyrmont-Ultimo as warranting a separate strategy CSR engages Lend Lease to planning/development feasibility study on their Pyrmont refinery site
1989	Government inter-departmental project team starts on a regional strategy for City West James Watkinson Reserve bulldozed
1990	Interim Park claimed by locals from rubbish tip at end Point Street: still there in 1999 Pyrmont-Ultimo Heritage Study completed for Department of Planning City West Urban Strategy first exhibited

Year	Event
1991	Gillespie Bros Anchor Flour Mill in Union Street demolished Social Impact Assessment of City West Urban Strategy completed Draft City West Regional Environmental Study and Environmental Plan released
1992	Sydney Regional Environmental Plan No 26: City West released State and Commonwealth Agreement signed to provide Building Better Cities funds for Pyrmont-Ultimo City West Development Corporation established Pyrmont Pieces project conducted by local residents
1993	Pyrmont-Ultimo Urban Development Plan approved Master Plan for Pyrmont Bay approved Pyrmont-Ultimo selected as site for Sydney Casino
1994	Ultimo-Pyrmont Urban Design Advisory Committee established City West Housing Pty Ltd established as a non-profit company Precinct advisory committees established in Pyrmont-Ultimo by City Council Control of Government Printing Office and ALMF woolstore sites transferred to Darling Harbour Authority State Environmental Planning Policy No. 41 gazetted, vesting development consent authority for the casino in the Minister for Planning Master Plans for Saunders St, Pyrmont Point, Sydney Fish Market adopted
1995	Anzac Bridge expected to open by Christmas Draft update of Urban Development Pland for Ultimo-Pyrmont exhibited Master Plans for Gateway site and St John Square adopted Draft amendments to City West Regional Environmental Plan No.26 exhibited, with mechanism to provide for low cost housing City West Development Corporation functions transferred to Department of Urban Affairs and Planning Fig Street Park construction scheduled June: Work due to start on Ultimo Community Centre August: Construction on cover over Fig Street cutting underway
1996	Stage 1 of Ultimo Community Centre opened
1997	Stage 2 of Ultimo Community Centre due for completion 'Sega World' in Darling Harbour opened Lend Lease purchased CSR site Light Rail(Stage 1) scheduled to open
1999	Elizabeth Healy reserve, Harris Street, extended Renovation of Jones Bay Wharf goes to tender February 1st: Sydney Harbour Foreshore Authority formed April: Jackson's Landing under construction September: Convention Centre South, Darling Harbour, scheduled to open : Nokia building proposed for Harris Street October: Plans for ABC building, Harris Street, finalised November: Rocking ladders installed in Pyrmont Point Park : Mary Ann Park opened on 1st November

Year	Event
2000	NSW Minister for Urban Affairs and Planning approved the Rozelle and Blackwattle Bays Master Plan under SREP 23 March: 'Art under the Freeway' project first launched April: City West Office Park Building "B" completed May: Redevelopment contract for Jones Bay Wharf awarded July: Anzac Bridge cycle/pedestrian way opened : Water Police about to relocate from Elizabeth Macarthur Bay to Balmain August: Light Rail extended to Lilyfield October: City West Office Park Building "C" due for completion
2001	Redevelopment of Water Police site proposed Wattle Street footbridge opened Novotel, Ibis and Grand Mercure open October: Construction of cross-city tunnel approved
2002	Summer: Stage 1 of Jones Bay wharf redevelopment released March: reconstruction of 136 metre section of Blackwattle Bay wharf completed July: Waterfront Park at Jackson's Landing announced
2003	January: Extension to Ultimo School due for completion March/April: Stage 2, Jones Bay wharf reconstruction almost completed July: Pyrmont Action(PA) community group started by Elizabeth Elenius December: Green ban placed on Water Police site
2004	Friends of Pyrmont Point(FoPP) formed 29 February: Water Police leave Pyrmont, after 18 years presence June: Agreement to make Water Police site a public park
2005	March: Sydney Fish Market Master Plan signed off by Minister April: Water Police site officially handed over to City 28 August: Cross-city tunnel opened Plaque to commemorate Saunders yellowblock quarrying installed on cliff-face of former Paradise quarry, off Quarry Master's Drive
2006	January: Pyrmont fishing fleet of some 19 vessels 26 June: Masterplan for Water Police site approved September: Wildlife Centre at Darling Harbour opened
2007	January: Macarthur-on-Sydney-Harbour units released for sale July: City Council launched Sustainable Sydney 2030 plan
	26 August: Ian Thorpe Aquatic Centre, Harris Street opened
	October: State Government extends license of Greyhound Association for use of Wentworth Park for 20 years : NSW Maritime leased Blackwattle Bay wharf for next decade : Work started on Water Police site, Pyrmont November: New 300-room hotel proposed for Star City Casino, with 2010 completion
2008	January: Sydney Harbour Foreshore Authority acquires 1 Bank Street

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