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The Natural and Cultural History of the Ku-ring-gai GeoRegion, New South Wales

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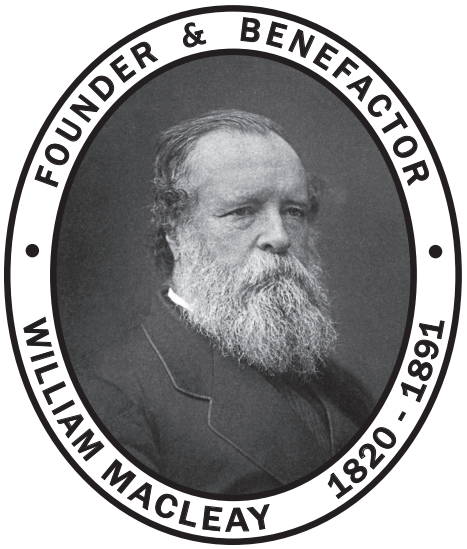

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Cover: Morning Bay in Pittwater, one of many deep-water inlets in the classic drowned valley system of Broken Bay, in the northern part of the GeoRegion..

REVIEW PAPER

The Natural and Cultural History of the Ku-ring-gai GeoRegion, New South Wales

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The proposed identification and promotion of a 'Ku-ring-gai GeoRegion (KGR)', an area of approximately 440 km^2, is a community project initiated by the Friends of Ku-ring-gai Environment (FOKE). The proposed GeoRegion embraces the Ku-ring-gai Chase National Park, other bushland areas, as well as the coast and estuaries located just north of the city of Sydney. This paper describes the outstanding natural history of the GeoRegion including significant examples of Permo-Triassic sedimentation with evidence of ancient climate change and Jurassic/Cenozoic volcanic activity, together with associated geomorphology, soil genesis, endemic biodiversity, and cultural values. Its preserved ancient land surface supports diverse vegetation communities and the drowned river valleys provide evidence of the continuing impacts of climate change. The strong connection between this Country, its landscape, and its First Peoples is also highlighted. This foundation of outstanding geology and geomorphology and associated values has inspired a longer-term objective of the GeoRegion being nominated as an Aspiring UNESCO Global Geopark, particularly given its accessibility and strong potential for educational and recreational outreach to a large visitor base. In the short term, it is proposed to establish demonstration geosites, many of which are connected by themed geotrails, and which are expected to provide significant benefits to conservation, education, and tourism.

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KEYWORDS: Aboriginal sites, biota, cliff stability, geoparks, geotourism, Hornsby diatreme, Ku-ring-gai GeoRegion, soils.

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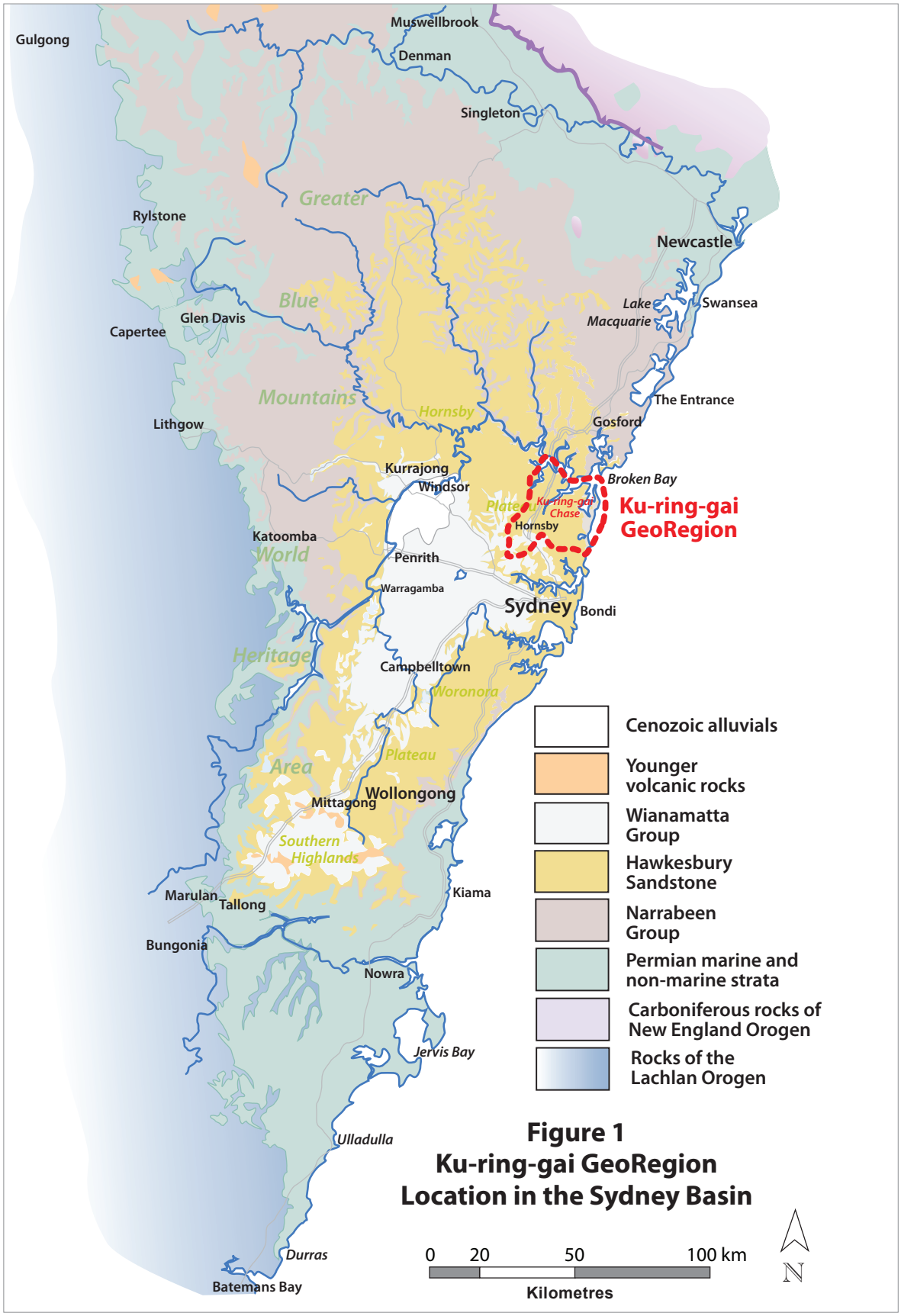

Figure 1. Map of the Ku-ring-gai GeoRegion and its location within the Sydney Basin.

INTRODUCTION (R.J. Conroy)

The Ku-ring-gai GeoRegion (KGR) embraces the upper northern suburbs and northern beaches of Sydney, essentially comprising a total area of about 44,000 ha (Figure 1). The Hornsby Plateau is a prominent feature of the KGR which rises northwards from its lowest levels around Port Jackson to elevations up to 220 to 230 metres before being deeply dissected by the drowned valley of the Hawkesbury River (Figure 2). Its rise continues northwards beyond there to terminate in a chain of escarpments overlooking the lowlands of the Hunter Valley and its 'Hunter Valley Dome Belt' of anticlines and synclines (Bembrick et al. 1973).

Figure 2. Morning Bay in Pittwater, one of many deep-water inlets in the classic drowned valley system of Broken Bay, in the northern part of the GeoRegion.

The bedrock is primarily Hawkesbury Sandstone, a lower Middle Triassic (Anisian 247-242 Ma) fluvial deposit of quartz sandstone with interbedded clayey sandstone, siltstone, shale, and minor occurrences of quartz pebble conglomerate. The sandstone has a maximum thickness of about 250 m in the northern part of the study area. It overlies other sandstones and shales in the Newport Formation (Narrabeen Group) and is conformably overlain by the Mittagong Formation (not always present), the Ashfield Shale (Wianamatta Group), and is intruded by igneous dykes and diatremes. The Hawkesbury Sandstone of the KGR contributes fundamentally to its outstanding natural and cultural heritage by shaping key features of its landscape and its diverse vegetation, and as a canvas for the artworks of its Aboriginal people.

The KGR is located within the Sydney Basin Bioregion and has a land area of some 38,000 ha comprising warm temperate rainforest, tall open forest, woodlands, shrubland and cleared and developed areas, as well as some 5,060 ha of estuaries, islands and coastal embayments, and approximately 27 km of coastline (Figure 3). A large part of the natural bushland of the KGR is conserved within eight protected areas totaling 21,073 ha (48.5% of the KGR) with the core being Ku-ring-gai Chase National Park (KCNP) and parts of other protected areas including Muogamarra Nature Reserve, Berowra Valley National Park, Lane Cove National Park, and Garigal National Park. Other large bushland reserves managed by local government are also protected within the KGR including Narrabeen Lagoon State Park (388 ha), Dee Why Lagoon Wildlife Refuge (77 ha), Ku-ring-gai Wildflower Garden (123 ha), and Sheldon Forest and Rofe Park (50 ha). The KGR also samples part of the Hawkesbury Shelf Marine Bioregion and includes three aquatic reserves at Barrenjoey Head, Narrabeen Head, and Long Reef.

The soils and vegetation communities of the KGR are heavily influenced by variation in geology, aspect, slope, and landform. The most common vegetation types occur on the Hawkesbury and Lambert soil landscapes

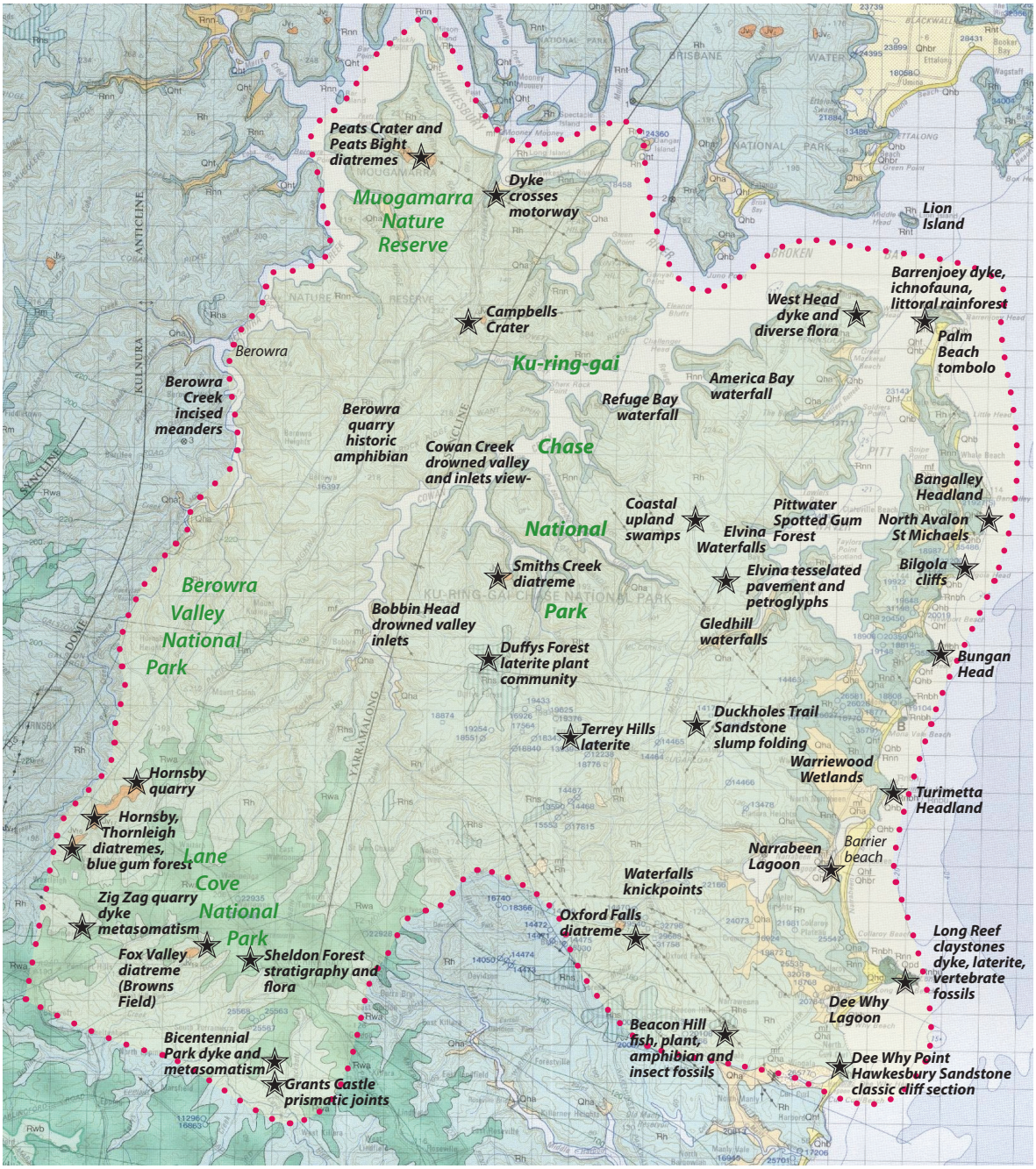

Figure 3. Designation of the KGR (dotted line) and location of some geosites.

(Chapman et al. 2009) and include Sydney Coastal Dry Sclerophyll Forest (33%), Sydney Hinterland Dry Sclerophyll Forest (18%), Sydney Coastal Heaths (8%), North Coast Wet Sclerophyll Forest (3%), and small areas of warm temperate and sub-tropical rainforest on richer soil landscapes (e.g., Hornsby, Glenorie, and Watagan soil landscapes). Mangrove, saltmarsh, and seagrass meadow communities (about 2%) are present on Quaternary sediments in the estuaries (Keith and Simpson 2010; OEH 2013). Approximately 31% of the area is cleared, primarily for residential development.

Aboriginal people have maintained, and continue to maintain, a strong association with the landscapes of the KGR. The plateaux, ridges and slopes, drowned river valleys, islands and coastal landscapes of this area contain extraordinary evidence, not only of our geological heritage, but also of Aboriginal occupation over at least the last 20,000 years, a period during which they would have been witness to generational change in