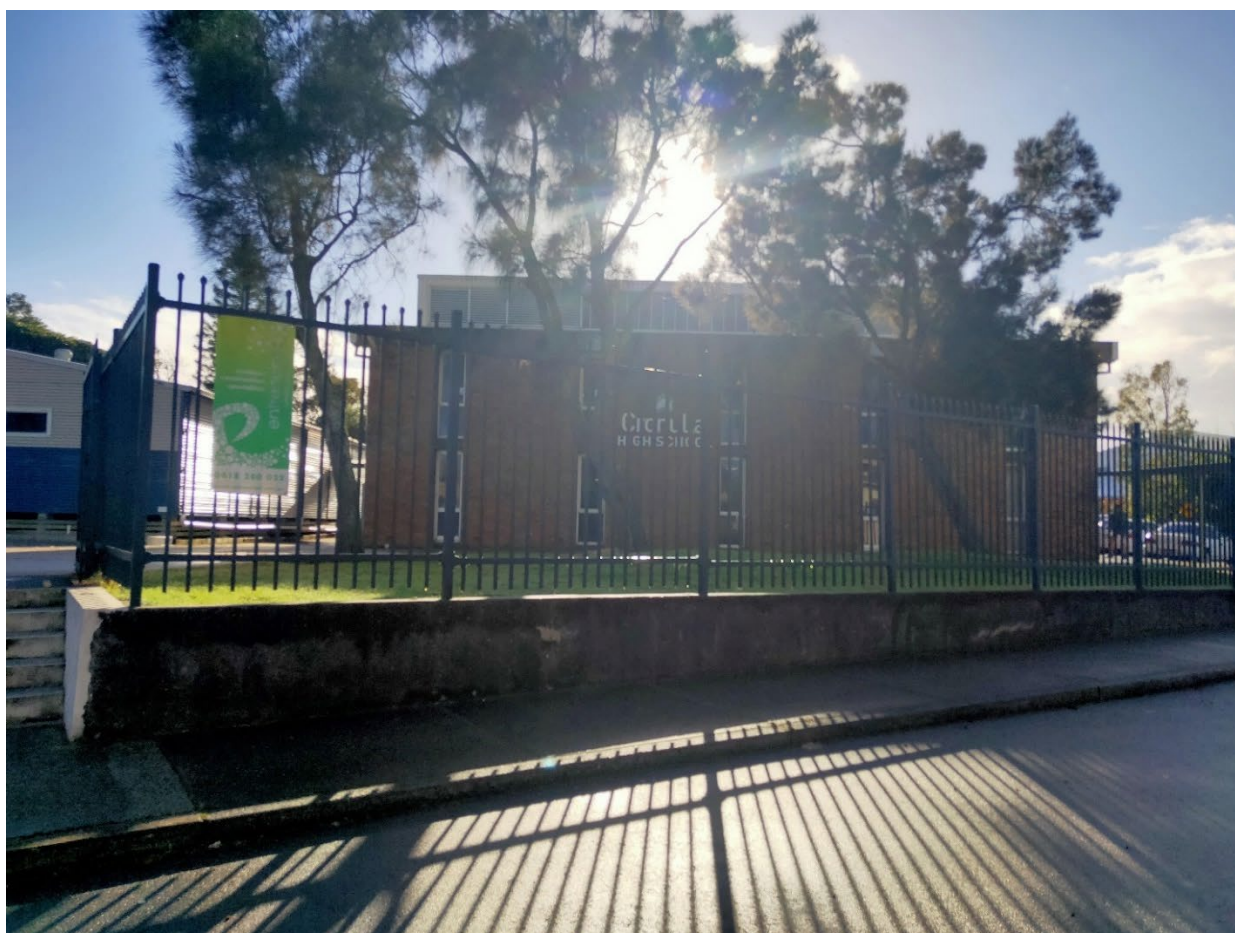


Cronulla High School

Aboriginal Due Diligence Report

Report prepared for School Infrastructure

September 2022



Acknowledgement of Country

At GML we acknowledge that we work and live on the land of the First Australians. We know that this land was never ceded, and we respect the rights and interests of Australia's first people in land, culture, and heritage. We acknowledge their Elders past and present and support the concepts of voice, treaty, and truth in the Uluru Statement from the Heart.

Report Register

The following report register documents the development and issue of the report entitled Cronulla High School Aboriginal Due Diligence Report, undertaken by GML Heritage Pty Ltd in accordance with its quality management system.

Job No.	Issue No.	Notes/Description	Issue Date
21-0134	1	Draft report	28 June 2021
21-0134A	2	Final Draft Report following sediment study	20 September 2022

Quality Assurance

GML Heritage Pty Ltd operates under a quality management system which has been certified as complying with the Australian/New Zealand Standard for quality management systems AS/NZS ISO 9001:2016.

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

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1.0 Introduction

School Infrastructure New South Wales (SINSW) has engaged GML Heritage Pty Ltd (GML) to prepare an Aboriginal heritage Due Diligence report for Cronulla High School (the study area). This heritage assessment is for the proposed upgrade of the existing school at Captain Cook Drive, Cronulla. The High School (study area) is located on Dharawal (Tharawal) Country and falls within the La Perouse Local Aboriginal Land Council (LALC) area.

Aboriginal or First Nations heritage is diverse, rich, and enduring, extending from the deep past to the present. The natural and cultural environment is interwoven in First Nations heritage, creating an interdependent relationship between land and people, which is sustained by cultural knowledge. It incorporates intangible heritage, such as Dreaming stories, Song Lines, oral traditions, ceremonies, and social practices; and tangible heritage, such as stone tools, bone, woven and wooden implements, shell middens, culturally modified trees, rock art sites, ceremonial places and fringe camps. Many of these items combine both tangible and intangible values through a complex web of interconnection.

In NSW, Aboriginal heritage is principally protected under two Acts (Appendix A):

- the *National Parks and Wildlife Act 1974* (NPW Act); and
- the *Environmental Planning and Assessment Act 1979* (EPA Act).

Under the NPW Act statutory protection is afforded to 'Aboriginal objects'. A proponent is expected to assess and make a plan for the management of all Aboriginal objects. Determining whether a place or site has Aboriginal objects requires archaeological assessment, undertaken for the purpose of 'Due Diligence'.

The key purpose of the due diligence assessment is to identify whether the study area holds or has the potential to hold Aboriginal heritage sites, places, objects and/or values, in accordance with Heritage NSW guidelines for Aboriginal due diligence. A due diligence assessment focuses on tangible items, particularly 'Aboriginal objects'. However, as part of the heritage assessment process, it is crucial that consultation is carried out with the relevant Traditional Owners/Custodians. The assessment outcome will provide advice on whether further Aboriginal heritage assessment is required, or a proposed action can commence (subject to caution).

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*.¹ sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

1. identify whether or not Aboriginal objects are, or are likely to be, present in an area.
2. determine whether or not the activities they propose are likely to harm Aboriginal objects (if present).
3. determine whether an AHIP application is required.

The generic five steps prescribed by Heritage NSW for the due diligence process are:

Step 1. Will the activity disturb the ground surface or any culturally modified trees?

Step 2. Search the AHIMS database and use any other sources of information of which you are already aware. Are there any:

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- a) relevant confirmed site records or other associated landscape feature information on AHIMS? and/or
- b) any other sources of information of which a person is already aware? and/or
- c) landscape features that are likely to indicate presence of Aboriginal objects?

Step 3. Can you avoid harm to the object or disturbance of the landscape feature?

Step 4. Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?

Step 5. Further investigations and impact assessment.

As part of this due diligence assessment, the draft *Connecting with Country Strategy* has been employed to frame broader design work. Reflections about the strategy and further recommendations are provided at the end of this report.

1.1 Study Area

Cronulla High School (the study area; Lot 1 DP 815804) is approximately 27km south of Sydney CBD (Figure 1.1 and Figure 1.2). It is situated on an isthmus approximately one kilometre wide that connects the suburbs of Cronulla and Kurnell. The western side of the study area is bordered by Captain Cook Drive and Elouera Road, beyond which is Woollooware Bay and Cronulla Golf Course (Figure 1.3). The southern side is bordered by Bate Bay Road. The eastern side abuts Greenhills Beach residential area, which extends approximately 300m east, 600m north and 1km south; beyond this area are Wanda Beach and Reserve, Greenhills Beach, and Cronulla Beach and Park. North of the Greenhills Beach residential area are several large, protected reserves, including Kamay Botany Bay, Towra Point Reserve, Boat Harbour Park, and the suburb of Kurnell. South of the study area are the suburbs of Cronulla and Woollooware.

1.2 Method of assessment

Development of this due diligence report has been undertaken through two phases. An initial assessment in 2021 included both an archaeological assessment and First Nations cultural overview. This work included a site inspection. For archaeology (and therefore Aboriginal objects) outcomes of the 2021 work were ambiguous because a rigorous understanding of the site's sediment layers could not be inferred. In 2022 the project's geotechnical works allowed for a detailed assessment of the sediment layers beneath the extant school. We engaged with Professor Stephen Gale (Sydney University) who undertook a detailed analysis of sediment profiles. This has allowed for a robust understanding of the dune formation processes, and thus a revision to our statement of Aboriginal archaeological potential.

1.3 Proposed Works

The proposed works at Cronulla High School include replacing 10 temporary demountable buildings currently on site with 10 permanent teaching spaces, as well as an upgrade to the administration and staff facilities throughout the site (Figure 1.4 and Figure 1.5). The objective of the work is to increase the capacity of the school.

1.4 Authors

Version 1 of the report was prepared by Dr Charlotte Feakins (Team Leader/Senior Heritage Consultant), Léonie Masson (Senior Heritage Consultant), and Talei Holm (Graduate Consultant). Version 2 of the report contains additional work by Professor Stephen Gale (GML subconsultant) and Renée Regal (Regal Heritage). Dr Tim Owen (Principal) assisted with the preparation of the second version of the report and completed the internal review of both versions. First Nations consultation was undertaken with Uncle Bruce Howell, of Wiradjuri descent, a long-time Cronulla resident and local knowledge holder.

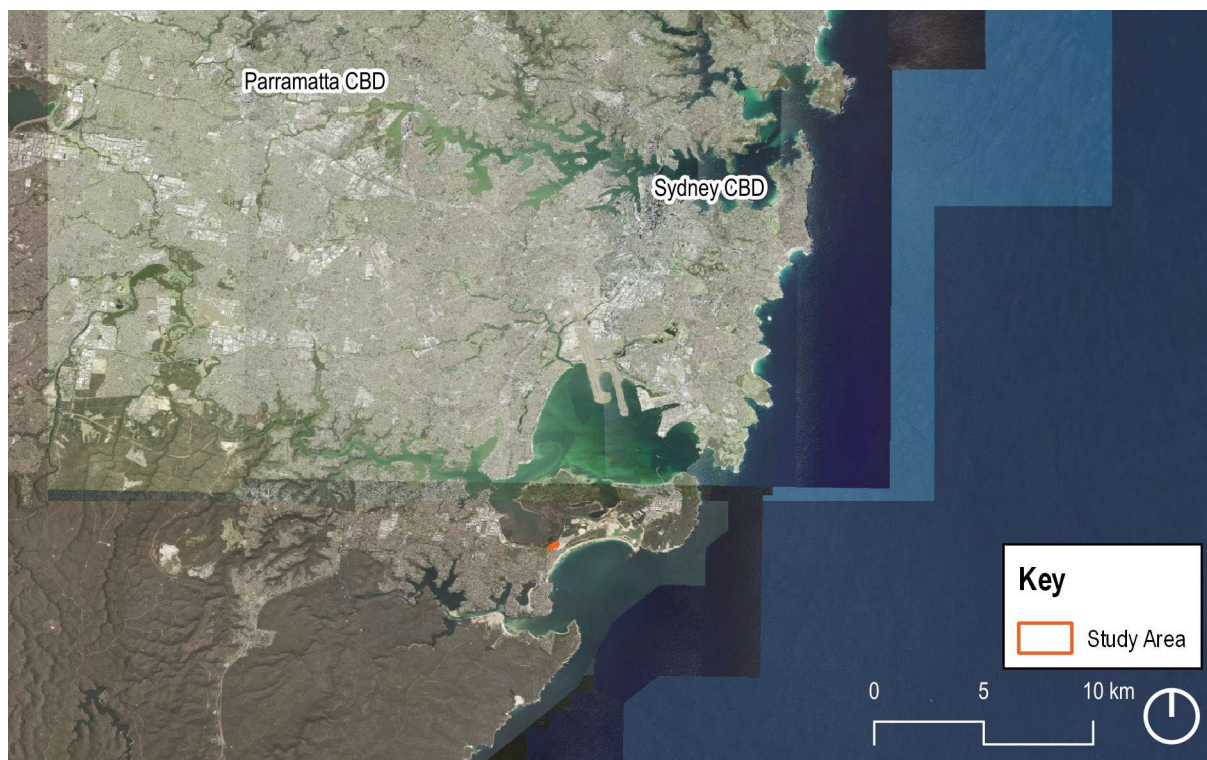


Figure 1.1 The study area within the Sydney region. (Source: SIX Maps 2016, with GML additions, 2020)



Figure 1.2 The study area within the Sutherland Shire. (Source: SIX Maps 2016, with GML additions, 2021)



Figure 1.3 The study area within its local context. (Source: SIX Maps 2016, with GML additions, 2021)

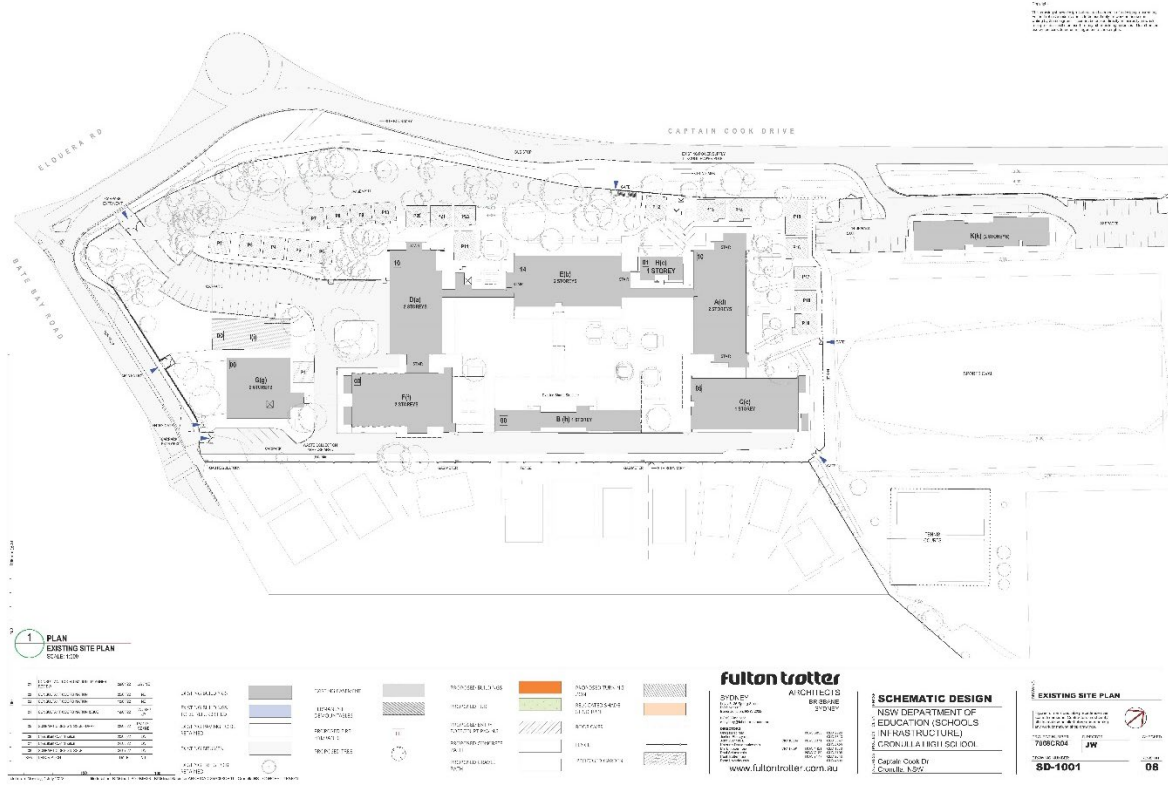


Figure 1.4 Existing layout plan of Cronulla High School. (Source: MBB Group 2022)



Figure 1.5 Cronulla High School, proposed Master Plan. (Source: MBB Group 2022)

1.5 Historical Overview

1.5.1 First Nations History: Deep Time to the Present

This historical overview provides a brief background to the First Nations history of the Cronulla area with specific reference to the land now occupied by the Cronulla High School. It also provides a history of the establishment and development of Cronulla High School and its North Cronulla site.

Aboriginal and Torres Strait Islander tribes were the first sovereign Nations of the Australian continent and adjacent lands. The land possessed under First Nations laws and customs, since 'time immemorial', more than 65,000 years ago. In what is now known as Sutherland Shire, Dharawal (Tharawal) people have lived for thousands of years. The Gweagal, around the southern shores of the Botany Bay, are the northern most clan of the Dharawal speaking people. According to radiometric dating of archaeological deposits around coastal Cronulla, largely shell and bone, Dharawal people have been occupying and harvesting food in the area for at least 8,000 years BP. However, people have been inhabiting the region significantly longer—many tens of thousands of years—but there are limited deep time occupation sites that can be archaeologically dated. In the acidic soils around the Sydney region, shell and bone typically do not last beyond 3,000 to 4,000 years; and many of the older (former) coastal occupation sites older than 8,000 years have since been inundated after the Last Glacial Maximum (LGM)².

Over the last 60,000–65,000 years, fluctuating sea levels changed coastal Australia. Around 60,000 years ago, the sea level was approximately 35m below its present level. From around 35,000 years ago, the sea level dropped further, and between 30,000 to 18,000 years ago it was around 120m below the current sea level. As the ice sheets melted after the LGM, around 21,300 years ago, water re-entered the land and inundated the coast. Around 10,000 years ago, the base of Botany Bay was a swampy sand plain where the earlier (proto)-channel of the Georges River flowed to join the proto-Hacking River and the Cooks River. The sea level was 20m lower than its present level. Around 7,800 to 10,000 years ago, dunes formed on the Kurnell Headland. At around 7,000 years ago the sea level reached its highest level. At around 4,500 years ago transgressive dunes formed on the Kurnell Headland and the northern shoreline of Botany Bay was established. This landscape remains largely the same today, despite the development that has occurred since European colonisation.³

To First Nations people, Country is a living entity—it provides nourishment for mind, body, and spirit. From the past to the present, the land and water has provided people with a broad range of materials for food, medicine, tools, shelters, weapons, and body decorations. On Dharawal Country, people lived off the district's abundant resources and sheltered in the rock overhangs around the bays of Port Hacking. Plentiful bird life, game and ample bush tucker could be found around the shores. In the coastal middens around the Cronulla area a range of material provides an understanding of everyday life, including reptile, bird and frog bones, along with other faunal remains of small and large mammals such as quolls, kangaroos, bush rats, possums and bandicoots.⁴ Stingray spines have also been identified within middens and have been worked to form spear barbs.⁵ Generally, people living in the coastal regions of NSW used bone or shell for items such as spear barbs, scrapers and adzes, rather than stone which was favoured by groups further inland.⁶ However, stone was used, and raw materials were traded among different groups. Stone artefact material is mainly silcrete, indurated tuff/mudstone, and quartz, but includes some limited examples of rhyolite and petrified wood, none of which occur naturally in the coastal geology of NSW and would have been transported from elsewhere.⁷

In 1770 James Cook arrived at Kamay (Botany Bay) on the *Endeavour*, staying for eight days. It was remarked by crew that there were around six or eight campsites on the northwest arm of Botany Bay

and many people at the camps. Cook observed that fishing was important to the Dharawal people on the southern side of Botany Bay and they used canoes made of bark. In 1788 Arthur Phillip arrived at Kamay with over 1,000 people on board 11 ships. He spent three days in this area from 18 to 20 January, before moving to find a better source of fresh water and more fertile soil.

The lives of Dharawal people, and Australia's First Nations peoples more broadly, changed considerably after European invasion. The rich diversity of culture was ruptured by colonisation, and violent dispossession followed, including massacres, disease and poisoning; yet First Nations peoples were resistant and resilient to the invaders and fought a guerrilla war. Despite forced displacement, the anecdotal accounts of white invaders suggest that there were still significant numbers of Dharawal people on Country in the 1840s, and as late as the 1870s.⁸

1.5.2 European Development of the Area (1788–1940)

Early European settlers showed little interest in the Cronulla–Sutherland area, which had sandy soil and few marketable resources. Consequently, the Cronulla District was virtually unsettled and rarely visited until the 1880s. The area remained largely Crown Land interspersed with a few comparatively small free holdings.

In the early 1860s, Thomas Holt, a successful pioneer, wool merchant, financier, and parliamentarian, began purchasing freehold and Crown land in the Sutherland Shire, amassing an estimated 12,000 acres (4856 ha).⁹ His ambition was to establish the Holt Family Estate, like that of an English Lord, in this largely undeveloped area. Despite various attempts to make his land productive he had limited success.

Between 1881 and 1887, Holt conveyed management of his land to the Holt Sutherland Estate Land Company Ltd, planning to lease his estate to tenant farmers on small farmlets. Unfortunately the soil was not sufficiently fertile, and many of the tenant farmers were soon in arrears to the company, which in turn fell deeply into debt to the Holt family. In this circumstance, and with the blessing of Frederick Holt, Thomas's son, the NSW Government in 1900 unanimously passed a special Act of Parliament (the *Holt-Sutherland Estate Act 1900*) which allowed the leasehold land to be converted to freehold.¹⁰ This Act marked a new era in the development of the area.

The Sutherland Railway line opened in 1885, making it possible for large numbers to visit the district, but this had limited impact on what is now Cronulla, where fishermen, shell gritters and the occasional timber getters were the only visitors. The Cronulla peninsula was a government reserve, and very few prospective settlers took up leases on the Holt-Sutherland Estate. In 1890 only three people on the electoral roll resided at Cronulla Beach.

Change took place in 1895 following the subdivision of the government reserve, permitting settlement of the area. The Village of Gunnamatta (Cronulla) was gazetted in 1899 and five roads were constructed giving access to the beach. The permanent population remained small with only 13 residents listed on the electoral roll for Cronulla in 1900. One year later the population had grown to 30. The suburb was officially renamed Cronulla in 1908, derived from an aboriginal word 'kurranulla' meaning 'place of pink seashells'.

In 1911 a single-track tramline was built from Sutherland Station to Cronulla Beach to transport increasing numbers of tourists and day-trippers to Cronulla and Gunnamatta Bay. The inter-war period saw a wave of residential subdivision of the area and increasing population. The tramway closed in 1932 when the railway was extended to Cronulla Beach from Sutherland as a spur line. Cronulla remained a semi-rural outpost until 1945 and has only become a Sydney suburb in the post-war period.¹¹

1.5.3 Historical Development of the Site

Cronulla High School is located on land forming part of two early land grants in the Parish of Sutherland, namely 73 acres granted to John Connell Laycock in May 1858 (Portion 122 the Parish) and 252 acres granted to Thomas Holt in May 1864 (Portion 138 of the Parish). Holt purchased Laycock's grant in 1861, becoming part of the extensive Holt-Sutherland Estate.

Arthur Rickard & Co Ltd (real estate developers) acquired at least 360 acres of Holt's Sutherland Estate at Cronulla in the early 1900s, including the subject site. Rickard subdivided portions of their land at Cronulla as residential estates, such as Tramway Estate (1908), Beach Park Estate (1915) and St Mervyn's Estate (1920). However, a large portion of the land was set aside initially as a large park which encompassed the Cronulla High School site. When Arthur Rickard & Co Ltd went into voluntary liquidation in 1930, unsold or unsubdivided land was conveyed to the Haymarket Land and Building Company Ltd in August the same year. In January 1942 the mortgagee exercised power of sale of a large portion of the landholding to William Taren Tate.¹² By this date Tate was sole proprietor of Southern Sand Pits, sand pit proprietors based at Bate Bay Road Cronulla and with offices at Kogarah. Sand mining was presumed to have taken place on or adjacent to the subject site. Tate subsequently leased part of his land to Ready Mixed Concrete Ltd, continuing sand mining operations in the vicinity of the study area.

Tate conveyed two parcels of land in October 1950 and March 1954 respectively to Composite Holdings Pty Ltd. The first comprised over 36 acres of Land (Lot A) while Lots B and C were two small allotments in Bate Bay Road measuring just over three acres.¹³ Composite Holdings Pty Ltd was a sand mining company at Cronulla, renamed Barr & Hall Pty Ltd in 1949.

In 1958 the Sutherland Council considered an application by Roche Products Pty Ltd to build a chemical and pharmaceutical laboratory and factory in Captain Cook Drive and Bate Bay Road. Locals submitted a petition opposed to the plan, as it was to be built on the site of a caravan park and was better suited as a high school site. The Council ultimately rejected the application because this site was under consideration for a new school. According to A. Elphinstone, at a public meeting held at Sutherland in March 1959,

Land urgently needed for Caringbah and Cronulla High Schools had not, in one case, been fully acquired, and in the other had not been negotiated, he said.¹⁴

The Education Department resumed two portions of land in 1960 from Composite Holdings Pty Ltd totalling over 15 acres.¹⁵ Working drawings were prepared for the Cronulla Co-educational High School by the Department of Public Works, estimated to cost £320,000.¹⁶ Tenders were invited in June 1960 for construction of the school and the contract was awarded to TC Whittle Pty Ltd. The builders commenced work on the site by January 1961. Cronulla High School was completed in 1963 and officially opened on 3 September. More than 300 first year students watched the ceremony on closed circuit television.¹⁷

Growth of the school population saw the addition of two new classrooms within two years of opening. School facilities gradually improved through the 1960s including the playing fields. Major conversions took place in 1977 costing \$50,000. This included a new library building. The school population has fluctuated throughout its history in concert with state-wide trends, and currently accommodates over 1200 students with a multi-cultural diversity reflecting the broader population. According to figures released for 2017 Gonski funding, there was a Cronulla High School received \$264,962 was the total funding change between 2014 and 2017.

Additional land was added to the school grounds in 1992. The Commonwealth government gave \$2.6 million to Sutherland Shire schools in May 2006, of which Cronulla High School was awarded \$97,992 under the Investing in Our Schools Programme.¹⁸

Cronulla High School recognises its Aboriginal and Torres Strait Islander (ATSI) students and employs an ATSI co-ordinator and team. The school celebrates/participates in ATSI Heritage Day and National Reconciliation Week and other activities throughout the year. Every Monday morning the Aboriginal and Torres Strait Islander flags are flown alongside the Australian flag and an acknowledgement to Country is expressed on morning assembly by a Year 12 prefect.

In November 2019, 17 students participated in a contemporary Aboriginal Art workshop with Wiradjuri Aboriginal Artist Merindah Funnell. Funnell is a published illustrator and muralist who works full time as an Artist Educator across Sydney, and she attended Cronulla High School graduating in 2009.

According to the school's annual report in 2019, there were over 30 ATSI students enrolled at the school. The school also applied during the year for a grant from the Healing Foundation, which was used to finance an Aboriginal mural for the school designed by students and Aboriginal Elder Deanna Schreiber. The artwork was displayed in the quadrangle of the school.

The design depicted Dharawal culture and history and was in process of being painted when the annual report was published in June 2020.¹⁹



Figure 1.6 ATSI Heritage Day artwork painted by students at Cronulla High School, 5 March 2019. (Source: Cronulla High School Facebook)

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The Year 12 students gifted to the school a mural designed and painted by an Aboriginal artist Zachary Bennett-Brook ('Saltwater Dreaming'), a Dharawal man who grew up in the Wollongong area. to represent the waters around the Cronulla area. This mural is situated at the front of the school. Cronulla High School students have also spent the year creating a mural alongside Aboriginal Elder Aunty Deanna Schreiber. The mural is our student's representation of the saltwater people, the Gweagal People of the Dharawal Nation, and their culture. Students aspire to complete this mural in 2021.²⁰

2.0 Environmental and Archaeological Context

2.1 Aboriginal Heritage Information Management System

The following section provides environmental and archaeological context for the study area. It provides the results of the Aboriginal Heritage Information Management Systems (AHIMS) database and an overview of relevant reports, landscape context, predictive modelling, and modern land use and site disturbance.

A search of the AHIMS database maintained by Heritage NSW was undertaken on 1 August 2022 (Appendix B). The search covered a zone of 76.5km² from latitude S34.0636°, longitude E151.1034° to S33.995°, E151.2123°, with no buffer. No registered sites were located within the study area. However, 114 Aboriginal sites/places were located in the 76.6km² around the study area. They comprised 105 physical archaeological sites (some with intangible values) and ten locations identified to hold Aboriginal archaeological potential (known as potential archaeological deposits, or PADs). The results of the search are shown in Figure 2.1 and Figure 2.2. One restricted site was identified in the search, and on 1 August 2022 the restricted site was confirmed to not be within the study area. The results of the search are shown in Table 2.1.

The most prevalent site type in the area is Artefact and Shell, which frequently occurs in the sand dunes of the Kurnell Peninsula, followed by Art, a Shelter/Habitation Structure, and a burial. The burial has been recorded within 1km of the study area. The environmental context of the site however is different to the study area.

Two sites were recorded near the study area (52-3-1971 and 52-3-1972). The AHIMS record notes that these are 'not Aboriginal sites'. Through further research it was determined that this recording is incorrect and was designated to enable archaeological testing of the areas associated with each registration.

The testing results determined that 52-3-1971 was a 'site' and contained some stone artefacts on a former dune surfaces. We note these buried dune surfaces are within 100m of the southeast boundary of the school, but around 400m from the proposed development zone within the school. Site 52-3-1972 contained no artefacts or buried horizons.

GML Heritage

Table 2.1 Results of AHIMS Search.

Site Feature	Frequency
Aboriginal Resource and Gathering , Shelter and Shell	1
Aboriginal Resource and Gathering and Shell	1
Art	7
Art and Habitation Structure	1
Artefact	23
Artefact and Shell	54
Artefact, Burial and Shell	1
Artefact, Hearth and Shell	1
Artefact, Shelter with Art and Shell	3
Burial	1
Shelter with Shell	1
PAD	8
Shell	10
Shelter with Art	1
Restricted Site	1
Total	114

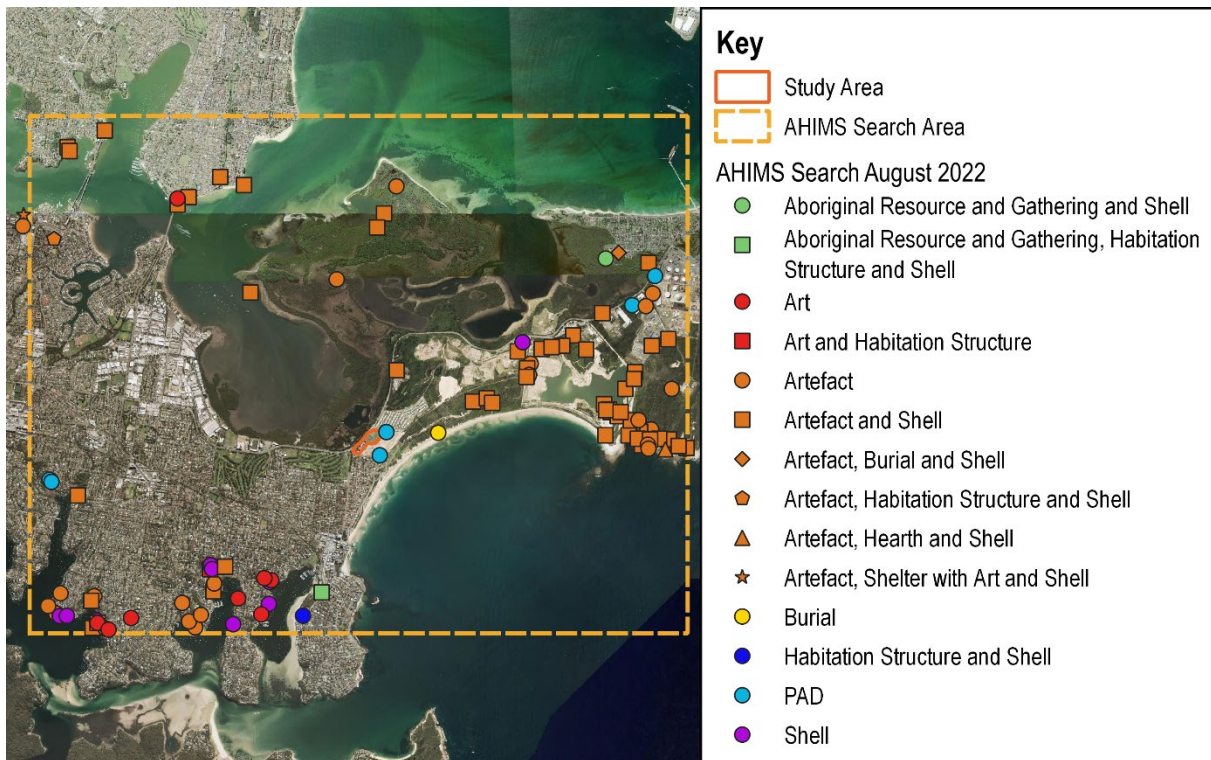


Figure 2.1 AHIMS search results. (Source: NSW LPI, with GML additions, 2022)



Figure 2.2 Detailed AHIMS search. (Source: NSW LPI, with GML additions, 2022)

2.2 Relevant Local Literature

This section synthesises available information from relevant archaeological and ethnohistorical studies to provide a context and baseline for what is known about Aboriginal cultural heritage in the study area.

GML Heritage

A literature review of Heritage NSW library holdings and reports held by GML was undertaken, targeting reports relevant to the study area. Keyword searches were used to find reports for the locality in AHIMS. A summary of relevant key reports is provided.

The synopsis of the literature review is that, in general, some locations within the broader area may retain archaeological deposits.

De La Salle College, Cronulla—Archaeological Assessment—JMDCH, 2001

Jo McDonald Cultural Heritage Management²¹ undertook an assessment for proposed upgrades to the De La Salle College in Cronulla, approximately 3km southwest of the study area. Two previously unrecorded Aboriginal sites were identified, comprising rock shelters with midden material and art. The sites were not within the impact area for the proposed development. No other sites were identified within the development area.

Cronulla Sewerage Treatment Plant—Archaeological Assessment—Mary Dallas, 1996

Mary Dallas²² completed an assessment for upgrades to the Cronulla Sewerage Treatment Plant and associated effluent transfer pipeline, located approximately 1km north of the study area. No previously known Aboriginal sites were identified during the assessment, although three areas were recommended for monitoring to ensure archaeological deposits were not impacted, and known sites were to be fenced to avoid impact.

Cronulla—Archaeological Assessment—Mary Dallas, 2013

Through consultation with MDCA we understand that archaeological testing of PADs at 52-3-1971 and 52-3-1972 (Figure 2.2) occurred in 2013. The MDAC 2013 report is not on AHIMS and was otherwise unavailable. We understand that some lithics were identified in a disturbed and buried context (below fill) in connection with 52-3-1971. These objects were identified around 400m away from the current proposed development area.

Cronulla Sharks—GML, 2011

GML undertook a detailed Aboriginal archaeological assessment for the Cronulla Sharks stadium site and surrounds. These included analyses of geotechnical data, the extent of the sand sheets, and land reclamation. The outcome was identification of fill layers (from land reclamation) in and across the study area with no Aboriginal archaeological potential. This analysis and outcome is important in the context of the current study because it indicated the variable nature of the dune system in this area, and that locations near the coast may have been formed recently.

2.3 Landscape Context

The purpose of this section is to provide environmental contextual information for use in developing a predictive model of Aboriginal site locations in or near to the study area. Interactions between people and their surroundings are of integral importance in both the initial formation and the subsequent preservation of the archaeological record. The nature and availability of resources, including water, flora and fauna, and suitable raw materials for the manufacture of stone tools and other items had—and continues to have—a significant influence over the way in which people use the landscape.

Alterations to the environment also impact upon the preservation and integrity of cultural materials that may have been deposited, whilst current vegetation and erosional regimes affect the visibility and

detectability of Aboriginal sites and objects. For these reasons, we consider the environmental context in detail here.

2.3.1 Geology and Soil Landscapes

The underlying geology of the region in which the study area is located is sand dunes with fixed vegetation which borders Ashfield Shale, and an unconsolidated silt and clay. The study area has been mapped in connection with 'disturbed terrain' (Figure 2.3); however, this mapping appears to be based on surface survey and the appearance of some limited disturbance. Extrapolation of adjacent soil landscape mapping indicates the study area would have been associated with the Gymea, Wollongong, and Mangrove Creek soil landscapes.

Disturbed Terrain²³

Disturbed terrain is a soil landscape characterised by disturbance from human activity to a depth of at least 1m, with the original soil being removed, greatly disturbed, or buried. The landscapes in the vicinity of the study area are likely to have been levelled and cleared of vegetation. The land around Woollooware Bay and Captain Cook Drive are known to contain a large quantity of landfill. As a result, the likelihood of upper intact soil profiles being present is low. This means that the original soil profiles across the study area are likely to have been partially truncated. It is therefore important to understand the nature, depths and profiles of the original soil landscapes, and determine whether any remnant horizons could retain Aboriginal objects.

Gymea²⁴

The Gymea soil landscape, which is classified as erosional, is characterised by rolling rises and low hills located on Hawkesbury Sandstone. The A1 horizon is a loose loamy sand, often described as a dull yellowish brown and can reach up to 300mm in depth. A2 horizon, is a yellowish-brown clayey sand which can contain orange mottling with sandstone and ironstone fragments. This also can reach 300mm in depth. B horizon, the culturally sterile layer, is an earthy yellowish sandy clay loam and occurs as a subsoil from coarse-grained sandstone. The Gymea soil landscape is likely to be associated with the western half of the study area (based on the 1951 and 1961 aerial photographs and an extrapolation of evident sands and connected vegetation, refer to Figures 2.5 and 2.6). If this part of the study area has been disturbed to 0.5m to 1.0m in depth, it is likely that all Gymea horizons capable of holding an Aboriginal archaeological deposit have been removed.

Wollongong

The Wollongong soil landscape is characterised by beaches, costal fore-dunes and hind dunes forming on Quaternary marine and wind-blown sands. Due to the extreme wind and wave erosion, the landforms can vary greatly. This soil landscape is a series of undulating sand horizons, the upper most being a loose, pale yellow, apedal single-grained sand then a loose pale brown sand with similar composition to the one above. Finally, a yellowish brown mottled loamy sand forms the lower layer. A clear B horizon is not present and vertical movement of artefacts through the profile is highly likely due to erosion, fluvial and alluvial processes. Shell middens and associated artefacts are likely to occur within this soil landscape, with the potential for stratigraphy to be present. The Wollongong soil landscape is likely to be associated with the eastern half of the study area.

Kurnell²⁵

The Kurnell soil landscape is an aeolian coastal landscape of windblown Pleistocene marine quartz sand. The topography is rolling dunes and occasional, sometimes swamp-filled swales, with a local relief of 15m. Loose brown sand comprises the A1 horizon and can range in depth between 100–300mm. A2 is a grey brown mottled loose sand, and becomes mottled as the depth increases. The B horizon is a brown soft sand with iron staining. It is often associated with a black soft organic pan, deposited in situ—commonly referred to as ‘coffee rock’ or ‘Waterloo rock’. Coffee rock can cover a relatively short period, and horizons below the layer can retain archaeological deposits.²⁶ Thus, the C horizon, a loose yellowish brown and, which is single-grained and earthy, may retain an Aboriginal archaeological deposit. We note the mapped expression of Kurnell soils is located at some distance east of the study area.

Mangrove Creek²⁷

This soil landscape was created by estuaries and is typically an undulating tidal flat with mangroves. It has a low local relief and is prone to flooding and becoming waterlogged. The surface material for this soil landscape is described as a separate horizon to the A1 horizon. It is a dark brown silty loam, with a spongy texture. The A1 horizon is a shelly, black organic sandy loam and frequently has an anaerobic smell. Beneath that lies the A2 horizon, a shelly greyish yellow sand which is permanently saturated and has a coarse, single-grained structure. The B horizon is characterised by a grey sandy clay, often with orange mottling.

This soil landscape is associated with mangrove formation, low-lying tidal areas, and in general the current shoreline, which formed in its current position in the last 1,000 to 500 years. There could be expressions of this soil landscape along the northern parts of the study area. Whilst this soil landscape probably will not hold an archaeological signature, the landforms abutting the former coast/mangrove flats can be considered an ecotone and would, in general, hold potential for shell midden deposits and stone artefacts. This potential is linked to the possibility of soil retention for each of the Wollongong and Gynea soil landscapes, as discussed above.

2.3.2 Landforms, Hydrology and Vegetation

The study area is located on the isthmus separating Woollooware Bay and Bate Bay, leading to Kurnell Peninsula. The Georges River empties into Woollooware Bay. The landform is a low-relief dunefield which has no creeks or known springs. This landform, as for most associated with the dune systems can contain shallow swales which retain fresh rainwater—such features could have been accessed and used by Aboriginal people as a source of water, albeit following larger rainfall events. These swales can become buried within a transgressive dune system, and thus former surface levels have, in some instances, been identified metres below the current surface level.

The original vegetation has been cleared from the study area, but historical aerial photographs indicate it was originally coastal grassland with larger trees such as banksias and tea-trees, as well as shrubs. Within Woollooware Bay and Botany Bay, mangrove swamps are still present.

As outlined in Gale 2022 (refer to Appendix B) the shore of the Kurnell Peninsula would have been approximately 5 km from its current location during the maximum of the last glacial stage 20,000 years ago. As this glacial period ended and the climate became more temperate the sea levels rose forming a wide shallow estuary that would have connected Botany and Bate Bays. During this process a coastal sand barrier would have been driven into the inner shelf and attached itself to the bedrock headlands at nearby Jibbon and Kurnell. This would have blocked the passage of the river and shifted the outlet to

the current Botany Bay. Due to the southerly winds sand dunes would have started to form, these dunes would have accumulated across the front of the peninsula as beach ridges and aeolian frontal dunes during the maximum of the Holocene transgression (Gale 2022: 6-7). Over the Holocene (the last 9,000 years) sea levels rose to 2m above current level.²⁸ The rising water levels and protection of the river swamp areas could have formed extensive wetland areas around the coastline, which were accessed by Aboriginal people over this period. A projection of sea-level rises (1.8m to 2m) are shown in Figure 2.5—this indicates that waters would have risen into the northern and western boundaries of the site. Noting the extent of dune modifications over the last 50 years (Section 3.2) the steeper dunes rising up from the water's edge could have provided landform above higher sea levels.

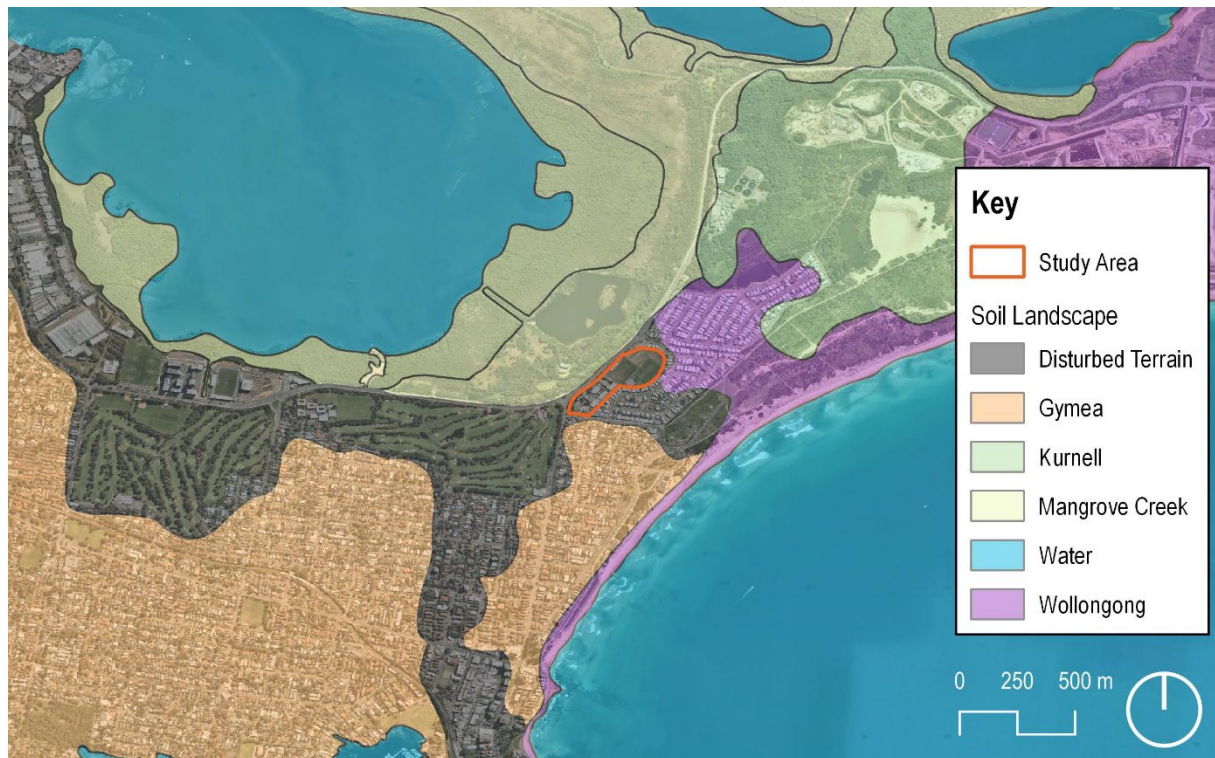


Figure 2.3 Soil landscapes of the study area. (Source: NSW LPI, with GML additions, 2021)

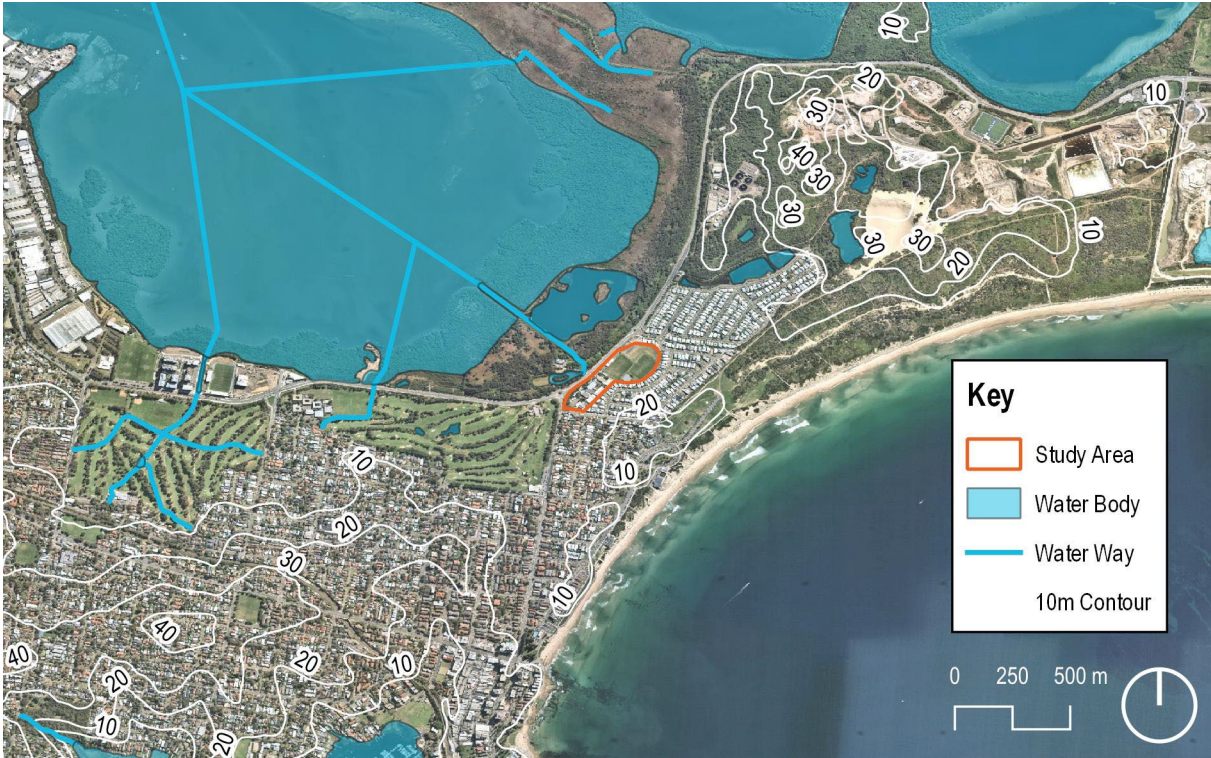


Figure 2.4 Hydrology and contour lines across the study area. (Source: NSW LPI, with GML additions, 2021)



Figure 2.5 Indicative model showing a rise in sea level of 2m. Sea water inundation floods the western portion of the school site, to the edge of sand bank which rises steeply, on which current and proposed buildings are located. (Source: Coastal risk Australia 2100)

2.4 Disturbance and Modern Land Use

Throughout most of the Holocene, sea levels were up to 2m higher than today. The extent of water rises within the northern and western parts of the study area are shown in Figure 2.5. These patterns could have influenced how Aboriginal people accessed and move through this part of the dune system. Following invasion, the study area has been subject to a process of continued sand mining, vegetation and sand stripping, and development activities. Aerial photography from 1951 to 1990 provides evidence for the history of twentieth century alterations and impacts, as follows:

- 1951 aerial (Figure 2.6)—The northern part of the study area is associated with an extensive expression of the Wollongong soil landscape sand dune system. This primary dune is an aeolian transgressive feature with high mobility. Little vegetation appears to be growing on this soil landscape. The presence of Aboriginal artefacts (AHIMS site 52-3-1971) within this soil landscape suggests that the dune area was used by Aboriginal people for activities which resulted in deposition of a cultural signature. The southern part of the study area has some surface-based impacts with localised vegetation removal, road and building construction, and perhaps some form of agriculture. Within the area subject to redevelopment are a series of buildings and landscape works, the northern boundary of the site retains vegetation.
- 1961 aerial (Figure 2.7)—Cronulla High School has been constructed across the southern portion of the site, resulting in most of the area being cleared. A road and easement has been constructed north of the school buildings. The dune system in the northern portion of the site has been impacted by sand mining. An area with vegetation separating the school and the sand mining appears intact.
- 1970 aerial (Figure 2.8)—All zones with remnant vegetation have been stripped and replaced with grass. Stripping is likely to have been undertaken by machine with root ripping disturbing the ground surface. Following stripping the area was likely levelled, and a topsoil fill introduced, possibly to a depth of 300mm. To the east, sand mining has continued to the edge of the grass field.
- 1990 aerial (Figure 2.9)—The grassed area now extends to the boundary of the study area. Further impacts to the dune continue outside the study area. Vegetation appears to be re-established along the northern part of the school site.

The analysis of past impacts through aerial photographs has identified that the study area has been disturbed across its broader extent. The breadth and depth of impacts resulting from impacts (notably construction of the school buildings and playing fields) is likely to have affected the upper 0.5m of dunes. This would have altered and moved any remnant Aboriginal archaeological signatures associated with the dune's upper horizons. However, the nature of the Botany dune system can be a series of undulating swales and ridges, which means that Holocene landforms were not necessarily have flat. Localised swales and ridges can be present, with depth variations over 2m. The extent of recent impacts, contrasted with the potential for remnant dune swales, meant that inference of archaeological potential was very virtually impossible across the study area. In order to address this issue, a detailed sedimentary analysis of the dune was undertaken. The outcomes are presented in Section 3.2.



Figure 2.6 1951 aerial photograph with the study area indicated. (Source NSW Spatial Collaboration Portal, with GML additions 2021)



Figure 2.7 1961 aerial photograph with the study area indicated. (Source NSW Spatial Collaboration Portal, with GML additions 2021)



Figure 2.8 1970 aerial photograph with the study area indicated. (Source NSW Spatial Collaboration Portal, with GML additions 2021)



Figure 2.9 1990 aerial photograph with the study area indicated. (Source NSW Spatial Collaboration Portal, with GML additions 2021)

3.0 Study Area Inspection and Sediment Assessment

3.1 Inspection and consultation in 2021

A study area inspection was undertaken by Dr Charlotte Feakins on 24 May 2021. Uncle Bruce Howell, a First Nations elder, met Charlotte at the school near the entrance and adjacent to the 'totem' poles (Figure 3.2). Bruce is a long time Cronulla resident, of Wiradjuri descent, and Deputy Chair of the Sutherland Shire Council Aboriginal Advisory Committee. Bruce is also a former student of Cronulla High School, attending in the 1960s, a retired high school teacher and has spent many years studying the history of the Cronulla and Kurnell area.

Charlotte was guided around the school by Bruce. He talked about the history of the area, stopping at areas he felt were of particular significance, these included the flagpoles in the internal courtyard and sports playing fields (Figure 3.2 and Figure 3.3). Other notable areas visited included the Captain Cook mural, c. 1988 (Figure 3.4), opera house and harbour bridge mural, c. 1988 (Figure 3.5), flower mural (Figure 3.6), Captain Cook Drive (Figure 3.7) and a recent First Nations mural (Figure 3.8).

The study area could be described in three parts: a developed school zone with hardstand surfaces, buildings and structures; a lightly vegetated zone with new growth trees along the northern boundary; and the playing field zone, which is an open grass field. Within these three areas there were no exposures, cuts or other disturbance that allowed an understanding of subsurface conditions. No evidence for archaeological materials or Aboriginal objects was observed.

The inspection demonstrated a connection between the school and the local Aboriginal community. This connection is evident through the murals and other art items on site, and has been expressed by Uncle Bruce Howell.

At the current time, the investigations into the social values and connections between the school and Aboriginal community are only just commencing. We have provided guidance associated with developing First Nations heritage themes, involvement through the development process, and general direction setting in the final section of this report.



Figure 3.1 'Totem' poles at the school entrance. (Source: GML 2021)

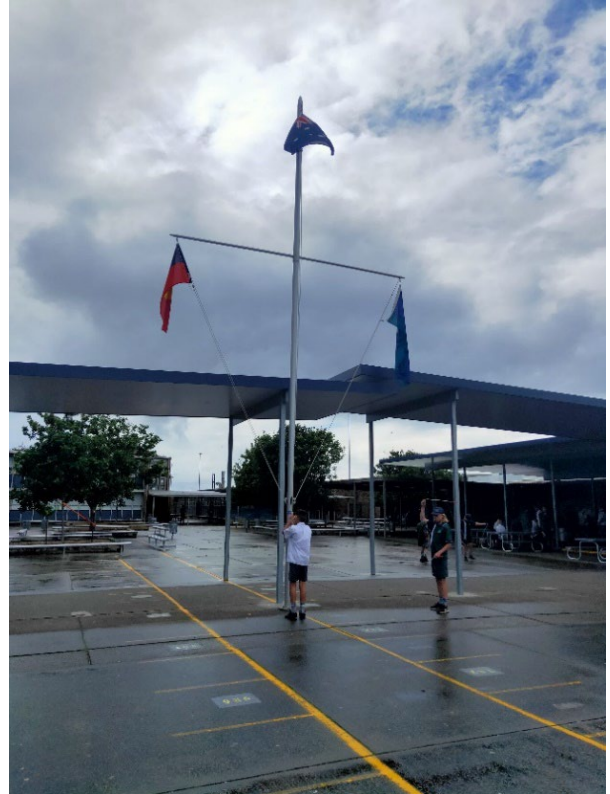


Figure 3.2 Flag poles in the internal courtyard. (Source: GML 2021)



Figure 3.3 Sports playing fields. (Source: GML 2021)



Figure 3.4 Captain Cook mural c.1988. (Source: GML 2021)



Figure 3.5 Sydney harbour and opera house mural c.1988. (Source: GML 2021)



Figure 3.6 Flower mural. (Source: GML 2021)



Figure 3.7 Looking onto Captain Cook Drive. (Source: GML 2021)



Figure 3.8 First Nations mural on side wall. (Source: Burnett 2021)

3.2 Sediment assessment in 2022

Between 4 and 6 July 2022, Professor Stephen Gale, Sally McInerney and Renée Regal completed the collection of sediment cores from within the study area. The work was coupled with taking geotechnical samples for contamination and structural assessment. The purpose was to recover cores which retained a sequence of the buried sediments from the current surface level, through layers of fill, and to intersect any dune and as could be present. This allowed for a determination of whether any dune profile remained intact, where within the dune sands sequence the intact portion commenced, and thus allow for an interpretation of archaeological potential.

The work recovered six cores from locations associated with the development footprint. The locations are shown in Figure 3.9, along with the depths of 'fill' at each core location. The depth of disturbed or deposited sands in each location is presented in Table 3.1; a representation of the layers with depth AHD is shown in Figure 3.10.

The outcome of this assessment as outlined by Gale 2022 (provided as Appendix B) and detailed below in Table 3.1. In summary it is suggested that the dune sequence in this area has been highly truncated, removing layers of sand which were formerly near the top of the dune. No evidence was observed for the former organic layer at the top of the dune, nor the stained white sands which are frequently present immediately below this horizon:

Although Cores 2–6 all preserve clear signs of undisturbed deposits, in every case the depositional sequence has been truncated and there is no convincing evidence that the pre-contact buried soil or the pre-contact land surface remain intact across the site. (Gale 2022, Appendix B)

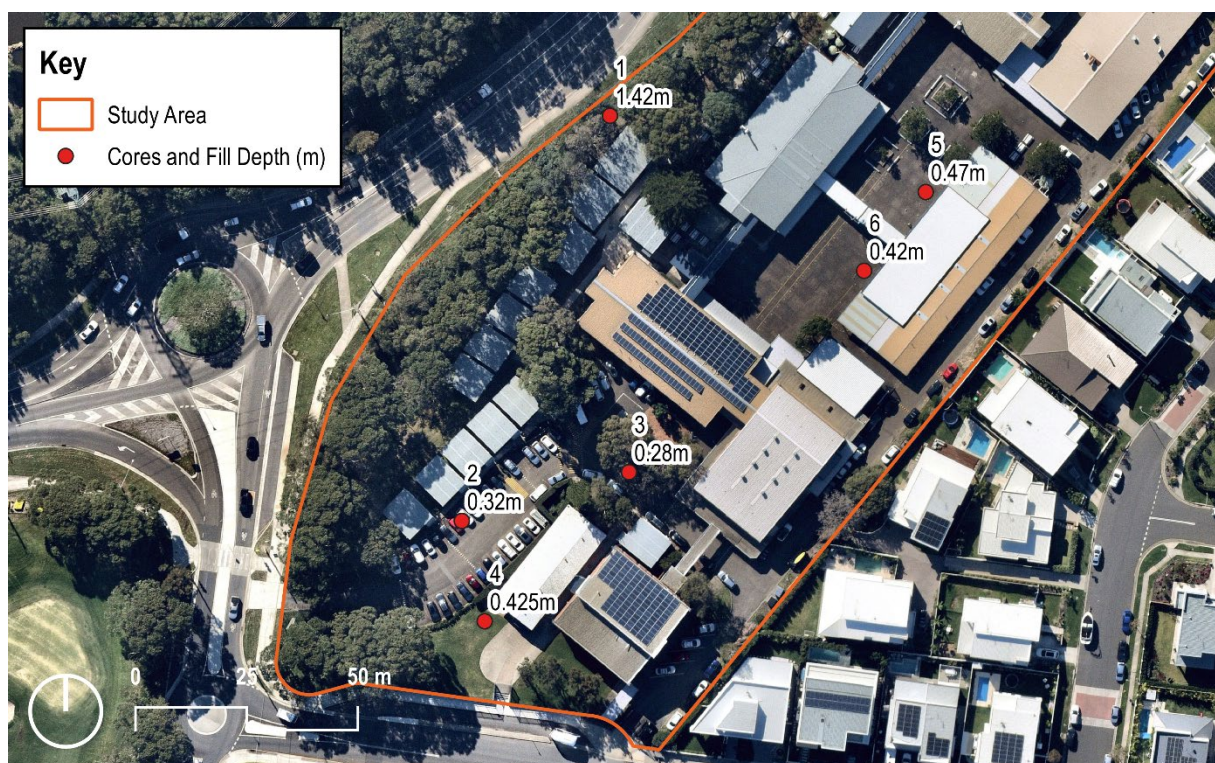


Figure 3.9 Location of core and introduced fill depth. (Source: NSW LPI with GML additions, 2022)

Table 3.1 Details of stratigraphy of each core. (Source: after Gale 2022)

Core #	Stratigraphic Sequence	Consequence for Archaeological Potential
1	A series of redeposited sand and humic layers, over a floating sandstone boulder. No intact sand horizons.	Exhibits total disturbance. There is no potential for intact subsurface archaeological deposit and in situ Aboriginal objects.

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Core #	Stratigraphic Sequence	Consequence for Archaeological Potential
2	<p>The upper 0.32 m of this core comprise bitumen. The underlying sands display some characteristics of the bleached upper component of Botany Sands (eg sand which were located at depth within the dune sequence), but these could be the result of recent leaching of fines from the overlying fill.</p>	<p>Significant disturbance has occurred in this location notably in proximity to the surface. There could be intact dune surfaces at depth.</p> <p>The upper horizons of the dune have been removed in the last 50 years. Any remnant dune horizon would be representative of a sand layer deep within the dune sequence.</p> <p>There is a low potential for intact subsurface archaeological deposit and in situ Aboriginal objects.</p>
3	<p>The upper levels of this core are similar to Core 2. The top of this core is heavily truncated by the development of the school playground. At depth this core demonstrates the typical sand changes associated with the formation of Waterloo Rock.</p> <p>The Waterloo Rock is an informally defined, yellow to black, variably indurated layer that is superimposed on the pre-existing sedimentary sequence. It post-dates the beds that host it, but otherwise little is known of the timing or duration of its formation. At depth the Waterloo Rock overlies a layer of unbleached Botany Sands.</p>	<p>Significant disturbance has occurred in this location notably in proximity to the surface. There could be intact dune surfaces at depth.</p> <p>The upper horizons of the dune have been removed in the last 50 years. Any remnant dune horizon would be representative of a sand layer deep within the dune sequence.</p> <p>There is a low potential for intact subsurface archaeological deposit and in situ Aboriginal objects.</p>
4	<p>The upper 0.425m of this core comprises of introduced pebbles. Similar to Cores 2 and 3 this deposit overlays a dark yellowish brown quartzose, that lighten down sequence to light grey.</p>	<p>The upper parts of the dune sequence have been truncated, and replaced with fill.</p> <p>The lower part of the sequence represents deeper bleached sands within the dune profile.</p> <p>There is a low potential for intact subsurface archaeological deposit and in situ Aboriginal objects.</p>
5	<p>The upper 0.47 m of this core comprises of concrete. This overlays a layer of industrial slag and pebbles.</p> <p>The lower portion of the core is similar to Core 3, a typical Botany Sands profile.</p>	<p>Exhibits high levels of disturbance through the upper part of the sequence, to depth.</p> <p>There is a low potential for intact subsurface archaeological deposit and in situ Aboriginal objects.</p>
6	<p>Almost identical to Core 5, this core consists of 0.05m of concrete overlying 0.37m of reworked sand. Underlying this is a layer of unworked Waterloo Rock, which is suspected would have formed since the introduction of the concrete surface.</p>	<p>Exhibits high levels of disturbance through the upper part of the sequence, to depth.</p> <p>There is a low potential for intact subsurface archaeological deposit and in situ Aboriginal objects.</p>

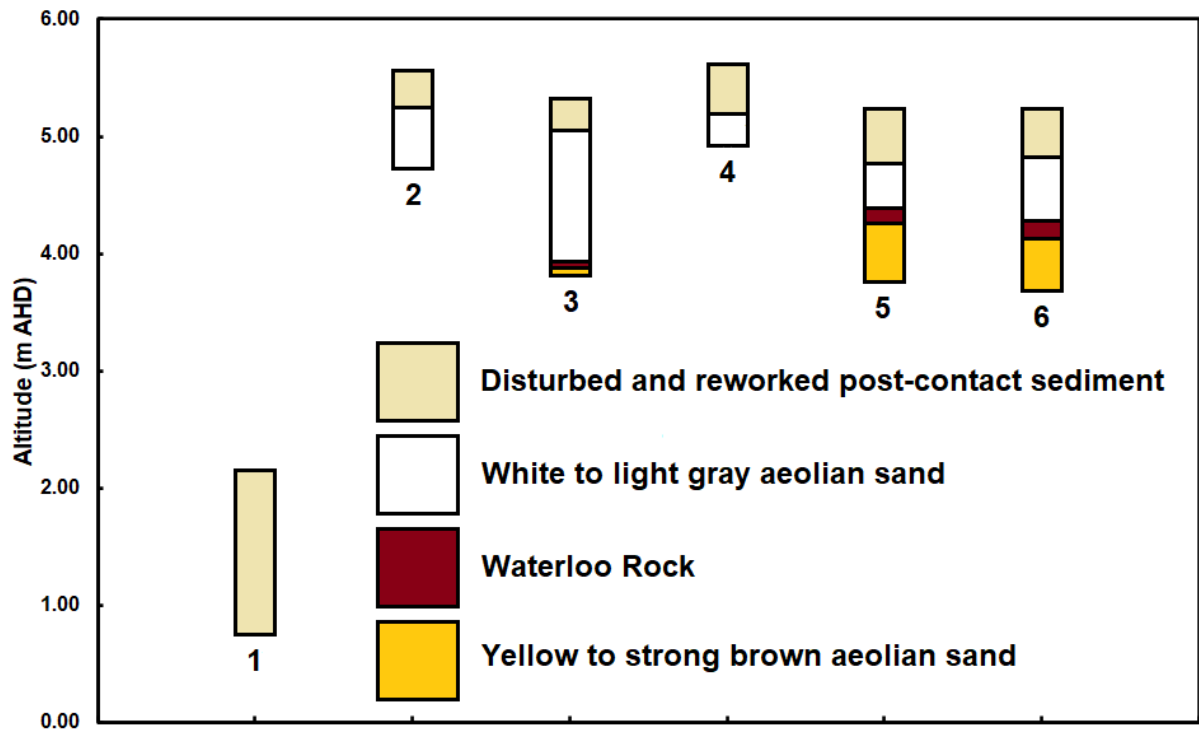


Figure 3.10 The stratigraphy of the Cronulla High School site. White to light gray aeolian sands have been truncated, and in some instances could be redeposited following works over the last 50 years. The formation of the Waterloo Rock could be a recent event, not reflective of the pre-development duricrust. All core sequences demonstrate truncation deep into the bleached portion of the Botany Sands—there is an absence of near surface horizons or former A1 organic horizon which would likely have topped the dune. There are no buried former organic horizons at depth, nor evidence for swales and buried swamp/wetland areas.

3.3 Archaeological Interpretation

Correlation between the AHIMS record (which identified site 52-3-1971 in the sand dunes to the east of the study area), the soil landscapes (with Gynea soil to the west and deeper Wollongong dunes to the east), suggests the study area could have been occupied/used by Aboriginal people most likely in the late Holocene (last 1,000 years). This location has always been on the margin of a dune system, and was most likely traversed as Aboriginal people moved east to west, and back again.

The background review examined development actions within the study area and identified a sequence of sand mining impacts, followed by construction in the areas subject to our investigation. A series of six core samples has demonstrated the Botany dune sequence within the study area has been truncated removing the upper organic horizon and the layer of mottled white sands below this horizon. There was no evidence for deeper swales or undulating dune surface across the study area.

As such, the presence of intact bleached white botany sands is synonymous with dune horizons present at depth beneath the upper surface and horizons of the dune. These likely formed earlier in the Holocene and are unlikely to present evidence for Aboriginal occupation as archaeological deposits. We find there is no Aboriginal archaeological potential above a depth of approximately 5m AHD; below this depth the study area has a low to very low potential for Aboriginal objects.

Any Aboriginal objects present would likely be single isolated items, discarded resultant from an unfocused activity. Such objects are unlikely to be archaeologically identified through a program of test excavation.

4.0 Impact Assessment

4.1 Proposed Works

SINSW are currently developing the master plan for the Cronulla High School. An indicative proposal is provided in Figure 4.1. Two new buildings are proposed (yellow in the master plan), and a future building site (blue) is also allowed. Demountables along the northern perimeter will be removed. Other works involve changes to existing building stock.

The proposed works entail grading and cutting across the study area of depths between 200 mm and 1.2 m, dependant upon slope levels. Fill will also be introduced to the north- western embankment of the site for the development of one of the two new buildings. A summary of the works, the depth of excavation and associated service trenches is provided in Table 4.1 and Table 4.2.



Figure 4.1 Preferred Master Plan. (Source: SINSW 2021)

Table 4.1 Details of the footprints and depths of excavation for the proposed civil works.

Items	Extent of New Works	Depth of New Works
Building I	45m x 21 m= 945m ²	0.4m
Building M and stormwater lines	70m x 43m=2754m ²	max 1.1m
Building M	968m ²	0.4m
Storm water lines and landscaping	1786m ²	max 1.1m
OSD and car park	1363m ²	max 2.5m
Proposed stormwater line, north of building G	62m x 21m =1302m ²	max 0.8m

Table 4.2 Details of the footprints and depths of excavation for the proposed services.

Items	Extent of New Works	Depth of New Works
Building L Hydrants	260m x 1m= 260m ²	1m
Building M Hydrants	290m x 1m= 290m ²	1m
New communications trenches	As per site plan markup.	Max 800mm
New electrical trenches	As per site plan markup.	Max 1200mm
New hydrant	As per site plan markup.	1m below ground (Approx.)
New security gate and power lines	Locations as per site plans. 230v Power @ 500mm (depth) x 120 metres (Auto Gate Power) Cat 6A Cabling @ 350mm (depth) x 120 metres (Security Cameras) Cat 5E Cabling @ 350mm (depth) x 120 metres (Intercom) 6 Core Cabling @ 350mm (depth) x 120 metres (Access Control) Estimated width: 100 mm Power and comms to be in separate trenches	As left

4.2 Impact Assessment

Construction of the two new buildings would result in grading and excavation to a maximum of 1.2 m across the study area. Construction laydown areas, crane bases and other items associated with construction could also result in an impact to the soil horizons. The removal of existing demountables, if undertaken carefully, is unlikely to further impact the ground or deep soil horizons.

The upper horizons across the study area have been previously disturbed generally to a depth of 5m AHD, noting that some locations exhibit total disturbance. Former dune sequences have been truncated to depth, and the consequence assessment of Aboriginal archaeological potential has determined there is a low potential for intact Aboriginal archaeological deposits below the layers of fill and disturbance. As such, it is unlikely the proposed works would impact Aboriginal objects.

5.0 Conclusions and Recommendations

The conclusions and recommendations arising from this assessment are for both Aboriginal archaeology (through the due diligence process), and First Nations Heritage.

5.1 Aboriginal Archaeology (Aboriginal Objects)

5.1.1 The Due Diligence Process

The conclusions and recommendations of the due diligence process include:

- The development of new school buildings will disturb and excavate the ground and horizons below the ground.
- There are no AHIMS sites registered inside the Cronulla High School. AHIMS sites 52-3-1971 is located approximately 400m southeast from the study area. This site presented evidence for buried soil horizons with an unknown number of Aboriginal objects.
- The proposed works will impact the landforms associated with the extant school, which *could* hold some sensitivity for Aboriginal objects only if the dune sequences are intact.
- Analysis of prior impacts through aerial photography identifies there are potentially significant past impacts to dune horizons. Following an inspection no landscape features could be associated with Aboriginal archaeological objects, and no Aboriginal objects were identified.
- The sedimentary analysis confirmed the presence of fill and a process of dune truncation to 5m AHD across most of the study area. Some locations had been entirely impacted by past activities. The truncation had removed the upper dune layers including the former organic horizon and underling mottled sands.
- An archaeological assessment of the study area found that there was no to low potential for intact Aboriginal objects. If present, any Aboriginal objects would most likely be representative of isolated objects, which were unlikely to be detectable through a program of archaeological test excavation.
- The proposal can proceed subject to caution.

Recommendations

The following recommendations are guided by the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*. The due diligence assessment has found that the Cronulla High School has low to no sensitivity to hold Aboriginal objects. SINSW can proceed with their proposed activities with the following recommendations:

- All site workers and contractors should be inducted to the area and informed of their obligations under *the National Parks and Wildlife Act 1974*.
- During the initial process of site excavation, once any fill material has been removed to the top of the remnant intact dune layer, a representative from the La Perouse LALC (and an archaeologist) could be invited to inspect the excavated area and confirm the absence of Aboriginal objects.

- During any works, in the unlikely event that an Aboriginal object is identified or suspected, temporary fencing must be placed around the object with a buffer of at least 10 meters. An appropriately qualified archaeologist should be engaged to assess the finding. Should the object be determined an Aboriginal object, then Heritage NSW and the La Perouse LALC should be informed. Works should not proceed until statutory advice is received from Heritage NSW.
- In the unlikely event that suspected human remains are encountered during construction, all works should cease immediately and:
 - the location, including a 10 m buffer should be secured using a barrier to avoid further disturbance;
 - any sands removed from the study area should be identified and returned to the works area;
 - the NSW Police should be contacted immediately;
 - no further action is to be undertaken until the NSW Police provide advice that it is safe to do so;
 - if skeletal remains are identified as being Aboriginal, the proponent or their agent must contact Heritage NSW via the Environment Line on 131 555, and representatives of the La Perouse LALC, and;
 - no further works are to continue until Heritage NSW provides notification to SINSW or their agent.

5.2 First Nations Heritage

As part of this study, a number of framings and key themes have been identified and recommended to assist in the design and planning process. These include:

Draft Connecting with Country Strategy

The draft Connecting with Country framework developed by the Government Architect is a set of commitments, pathways and principles for action intended to help design and deliver government infrastructure. It has been largely informed by the experiences and knowledges of First Nations peoples, including the NSW Aboriginal Affairs OCHRE plan. It provides practical ways for government, designers, industry, and planners to address legislative requirements of the *Environmental Planning and Assessment Act 1979* (NSW). The framework encourages those in design and planning to challenge the business-as-usual practices within government—to think differently, work differently and prioritise Country. Its principles and pathways will help to protect the health and wellbeing of Country and embed Aboriginal knowledge into the design and planning of the built environment to make NSW a better place for all its citizens.

A key aim of the Strategy is to support a more holistic approach to the design and planning processes, bridging the conceptual divide between tangible (archaeology, objects, places) and intangible (language, songlines, stories, dance) First Nations culture and heritage.

Uluru Statement from the Heart: Voice, Treaty, Truth

The Uluru Statement from the Heart is a key document that can also assist framing the design and planning process of Cronulla High School. The Statement can be applied to government and non-

government projects across local, state and national levels. It outlines a path forward for recognising Indigenous Australians in the nation's constitution. It was introduced in 2017, following a four-day First Nations National Constitutional Convention held at Uluru, and engaged more than 1200 Aboriginal and Torres Strait Islander representatives in a dozen regional dialogues across Australia. The Statement asks Australians to change the constitution to allow Indigenous Australians a voice in the laws and policies that are made about them. The three tenets of the Statement are Voice, Treaty and Truth and key themes include, The Law, The Invasion, Resistance, Mourning, Activism, Land Rights, Makarrata.

Country and Culture: We are all, always on Country

The term Country relates to the land that First Nation cultural groups or nations belong to. However, Country also means much more, it is a place of origin in cultural, spiritual and literal terms—we are all, always on Country. It includes not only land, but also skies and waters. Country incorporates both the tangible and intangible, for instance, all the knowledges First Nations peoples have been caring for Country since time immemorial in a sustainable way, passing on the responsibility and custodianship to countless generations. Country is at the core of every Aboriginal person's identity and sense of belonging. From a First Nations perspective, Country is continuously speaking, has a spirit and is living. Caring for country is both a collective and an individual responsibility.

The country and culture themes are entangled with heritage, and important for framing research and interpretation of Cronulla High School.

History and Heritage: Always was, always will be

NSW is Aboriginal land. It always was and always will be. The design and planning processes associated with the history and heritage of Cronulla High School, and broader cultural landscape, provide an opportunity to engage in truth-telling around colonisation and reimagining the broader narrative of Australia. This includes employing a co-design process to identify, acknowledge and incorporate local Dharawal history and heritage, from deep time to the present; and engage in dialogue with national history and plurality of perspectives around invasion and settler-colonialism.

A number of key themes to explore include saltwater people, Dharawal people, Gweagal, whales, harvesting sea food, travelling routes, Captain Cook, colonial invasion, settler colonialism, 'Terra nullius', flags, Dreaming stories, songlines. resistance and reconciliation.

Recommendations

The redevelopment of Cronulla High School provides an opportunity for learning, sharing, truth-telling and reconciliation through the design and planning processes. The broader area around Cronulla High School holds high social significance for First Nations peoples, including Dharawal, Gweagal and La Perouse LALC, and non-Aboriginal people at the local and national level.

The school, as a site of education and its location within the broader cultural landscape, provides an opportunity to celebrate and learn more about Dharawal country including, cultural practices, expressions, identity, and language. The framings, Connecting with Country and Uluru Statement from the Heart, provide First Nations perspectives and encourage a co-design approach to engage First Nations stakeholders in design and planning. These key themes and framings are illustrated below (Figure 5.1). NB these themes are not mutually exclusive.

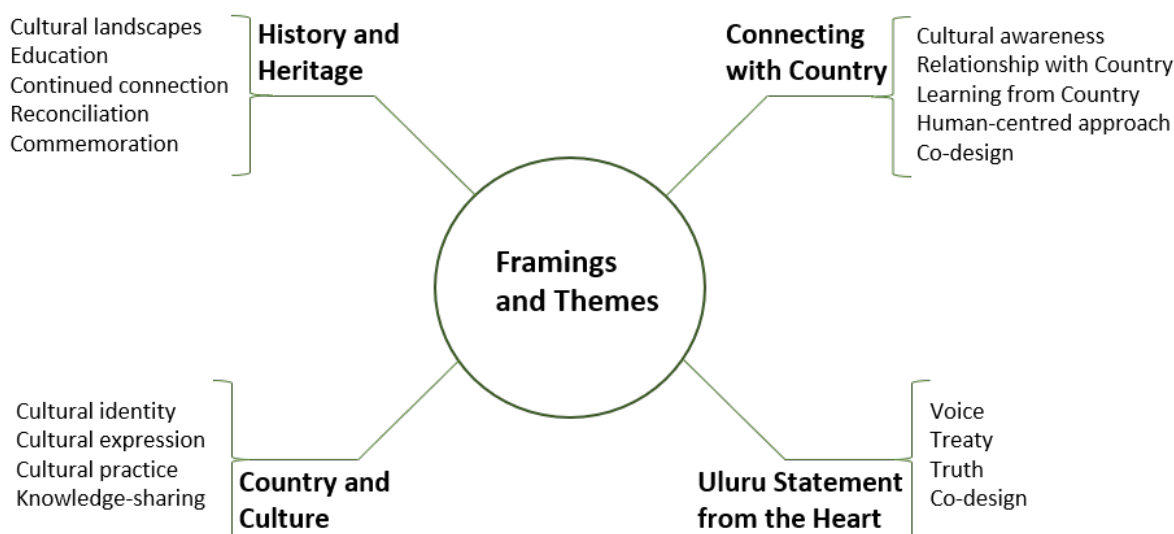


Figure 5.1 Framings and themes to assist design and planning processes at Cronulla HS. (Source: GML 2021)

5.3 Cronulla High School—Heritage Conclusions

The Cronulla High School has been subject to archaeological and sedimentary analysis. These studies have confirmed the process of recent dune stripping and impacts from development. The former dune system has truncated with its upper horizons being entirely removed. The study area has low to no Aboriginal archaeological potential, and the proposal for redevelopment can continue subject to caution.

We have recommended that all site works are inducted with respect to Aboriginal cultural heritage and Aboriginal objects. During ground works, following the removal of fill, a representative from the La Perouse LALC could be invited to inspect the study area and confirm the absence of Aboriginal objects. If any Aboriginal objects are identified during any future works, then work should cease and Heritage NSW be contacted.

At the current time it is not recommended that a program of Aboriginal archaeological test excavation be undertaken, and there if the program for social values recognition (refer below) is implemented, there is no need to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR).

Cronulla High School and broader surrounds holds social value to the local Aboriginal community. This value needs to be recognised, assessed and included within the new development. We have provided recommendations on current First Nations heritage best practice consultation. To implement these recommendations, the following actions should be undertaken. These should occur as part of an ongoing process of consultation during and post development of the school's masterplan:

- identify and engage relevant Traditional Owners/Custodians in the master planning process. A Gweagal/Dharawal working group needs to be established and engaged throughout;
- input must be sought from relevant Traditional Owners/Custodians and Gweagal/Dharawal working group into the master planning process;
- consultation with the working group should aim to establish better understanding of culture and heritage and identify key themes. The draft Connecting with Country Strategy should be employed to frame consultation;

GML Heritage

- a 'directions paper' should be developed through a co-design approach with Traditional Owners/Custodians and Gweagal/Dharawal working group. It would present key themes across heritage and culture, including a method for addressing First Nations heritage matters and identifying any special management requirements; and
- the directions paper should be incorporated into the master planning process.

These actions should occur independently from any consultation required for the future management of Aboriginal objects, under the NPW Act.

6.0 Endnotes

- 1 Department of Environment Climate Change and Water NSW 2010, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, Department of Environment, Climate Change and Water NSW, Sydney.
- 2 Attenbrow V 2010, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p 18.
- 3 Attenbrow V 2010, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p 18.
- 4 Attenbrow V 2010, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p 71–76.
- 5 Attenbrow V 2010, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p 118.
- 6 Attenbrow V 2010, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p 112.
- 7 Attenbrow V 2010, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p 123.
- 8 Curby P 1998, *Pictorial History Cronulla*, Kingsclear Books, p 5.
- 9 Walker J 1970, *Two Hundred Years in Retrospect – Kurnell-Sutherland 1770-1970*, for the Bi-Centenary Publication Syndicate of Cronulla, pp 28–29.
- 10 Walker J 1970, *Two Hundred Years in Retrospect – Kurnell-Sutherland 1770-1970*, for the Bi-Centenary Publication Syndicate of Cronulla, pp 35–36.
- 11 Curby P 1998, *Pictorial History Cronulla*, Kingsclear Books, p 2.
- 12 CT Vol 3514 Fol 52, NSW Land Registry Services.
- 13 CTs Vol 6271 Fol 118 and Vol 6837 Fol 92, NSW Land and Registry Services.
- 14 'Around the electorates', *Tribune*, 11 March 1959, p 12, Trove, National Library of Australia, viewed 7 June 2021 <<http://nla.gov.au/nla.news-article236734774>>.
- 15 'Notification of resumption of land under the Public Works Act, 1912, as amended', Government Gazette of the State of New South Wales 26 February 1960, p 1522, Trove, National Library of Australia, viewed 7 June 2021 <<http://nla.gov.au/nla.news-article220306755>>.
- 16 'Notification of resumption of land under the Public Works Act, 1912, as amended', Government Gazette of the State of New South Wales 20 May 1960, p 1522, Trove, National Library of Australia, viewed 7 June 2021 <<http://nla.gov.au/nla.news-article219906111>>.
- 16 Department of Public Works Annual report for the year ended 30th June, 1961, Open Gov NSW, viewed 7 June 2021 <<https://www.opengov.nsw.gov.au/publications/12245>>.
- 17 N.S.W. Teachers' Federation and New South Wales Public School Teachers' Federation. Education : journal of the N.S.W. Public School Teachers Federation Sydney: The Federation, 1919, Trove, National Library of Australia, viewed 7 June 2021 <<http://nla.gov.au/nla.obj-655234632>>
- 18 'Shire schools receive \$2.6 million from the Australian Government, Parliament of Australia, <https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id:%22media/pressrel/2FLJ6%22>>
- 19 2019 Annual Report Cronulla High School, p 31
- 20 2020 Annual Report Cronulla High School, p 24.
- 21 Jo MacDonald CHM 2001, *Survey for Aboriginal Sites: Proposed Extension to De La Salle College, Cronulla*. Report to Glendenning Group Architects Pty Ltd.
- 22 Dallas, M. 1996. *Cronulla Sewage Treatment Plant Upgrade and Additional Effluent Transfer Pipeline Archaeological Study*. Report to Sydney Water.
- 23 Chapman, G et al. 1989, *Soil Landscapes of the Sydney Region 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney.
- 24 Chapman, G et al. 1989, *Soil Landscapes of the Sydney Region 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney.
- 25 Chapman, G et al. 1989, *Soil Landscapes of the Sydney Region 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney.
- 26 Timms, S G C d R S M A 2017, 'The Origin and Stratigraphic Significance of the Quaternary Waterloo Rock of the Botany Basin of South-East Australia', *Australian Geographer*, vol 49, no 2, p 312.
- 27 Chapman, G et al. 1989, *Soil Landscapes of the Sydney Region 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney.
- 28 Lewis, S E et al. 2013, 'Post-glacial sea-level changes around the Australian margin: a review', *Quaternary Science Reviews*, vol 74. Figure 5.

7.0 Appendices

Appendix A

AHIMS Report 2022

Appendix B

Cronulla High School, Sediment Report, July 2022

Appendix A

AHIMS Report 2022

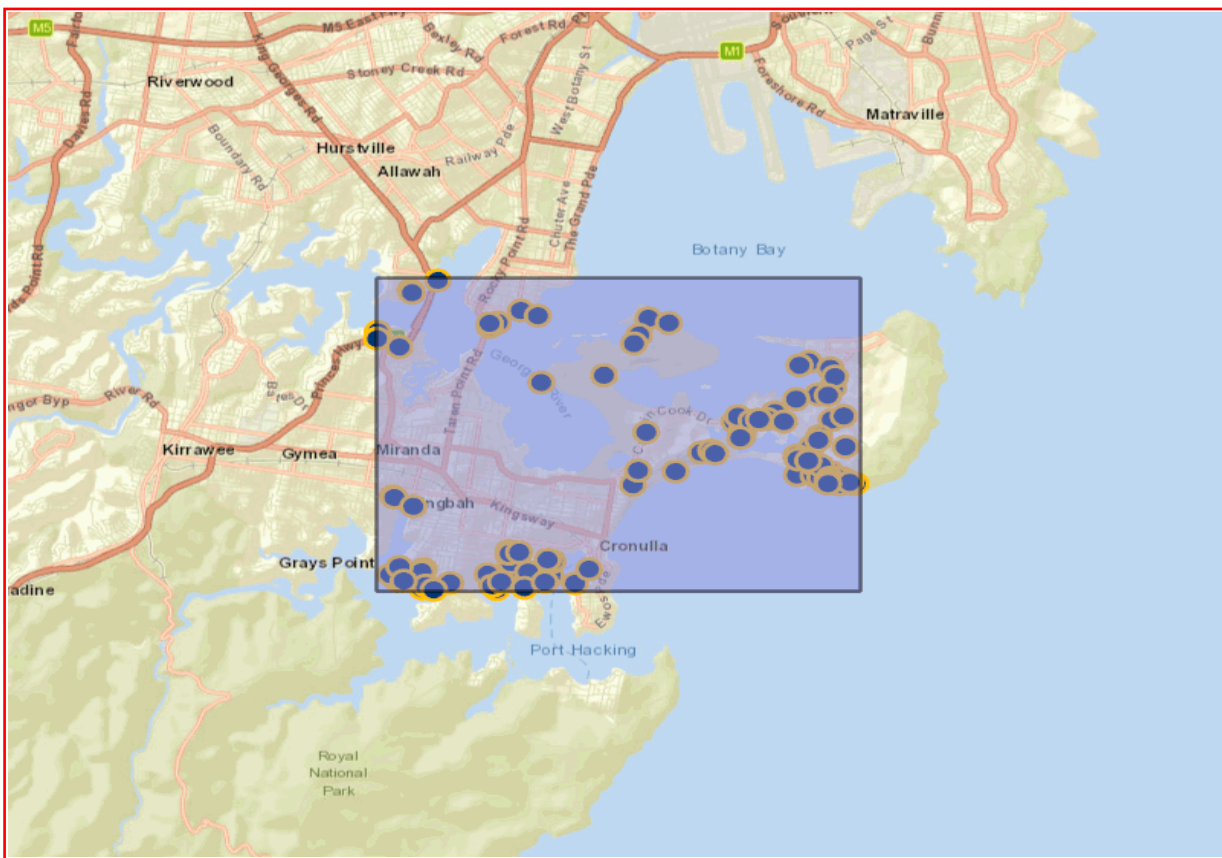
GML Heritage Pty Ltd - Surry Hills
 Level 6 372 Elizabeth Street
 Surry Hills New South Wales 2010
 Attention: Andie Coulson
 Email: andiec@gml.com.au

Date: 01 August 2022

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -34.0636, 151.1034 - Lat, Long To : -33.995, 151.2123, conducted by Andie Coulson on 01 August 2022.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

115	Aboriginal sites are recorded in or near the above location.
1	Aboriginal places have been declared in or near the above location. *

<u>ID</u>	<u>Aboriginal Place Name</u>
97	Towra Point Resting Place

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Appendix B

Cronulla High School, Sediment Report, July 2022

The archaeological and palaeoenvironmental assessment of the sediments of Cronulla High School, Cronulla, central eastern New South Wales



Report to GML Heritage

27 July 2022

PROFESSOR STEPHEN GALE
Sedimentology and Geomorphology

ABN 14 824 251 557

Email: geoscience100@aol.co.uk

Summary

The Department of Education New South Wales plans to demolish and redevelop several of the buildings on the Cronulla High School site on the Kurnell peninsula on the southern flank of Botany Bay. This work will involve the partial excavation of the unconsolidated Quaternary sediments that crop out across the site. Elsewhere across the peninsula, these sediments and the complex terrestrial environments with which they are associated support a dense assemblage of Aboriginal archaeological sites.

A programme of coring was proposed to assess whether any trace of the pre-contact soil and sedimentary landscape is preserved at the site, and to determine whether excavation may be undertaken without causing further damage to a potentially archaeologically significant landscape remnant.

Six cores were taken to depths of 720–1565 mm across the site. The position of the sampling sites was determined in part by the locations at which the proposed developments are to take place (Figure 1) and in part by information on the depth of fill obtained from earlier sampling for geotechnical and acid sulphate soil assessment (Ghimire, 2022).

With one exception, Core 1, in which no pre-contact deposits were encountered, the cores all preserve evidence of disturbed and reworked post-contact sediments overlying an aeolian sand succession of bleached and unbleached Botany Sands separated by Waterloo Rock. The stratigraphic triplet of bleached aeolian sand–Waterloo Rock–unbleached Botany Sands occurs widely across the region. Its presence in whole or in part in stratigraphic order across the study site provides evidence for the integrity of the pre-contact stratigraphy at the site.

Although Cores 2–6 all preserve clear signs of undisturbed deposits, in every case the upper part of the depositional sequence has been truncated and there is no convincing evidence that the pre-contact buried soil or the pre-contact land surface remain intact across the site.

1 Scope of work

The Department of Education New South Wales intends to demolish and redevelop several of the buildings on the Cronulla High School site (Figure 1). This work will involve the partial excavation of the unconsolidated Quaternary sediments that have been mapped beneath the site (Figure 2). These sediments and the complex terrestrial environments with which they are associated are known to support a dense assemblage of Aboriginal archaeological sites (Figure 3).

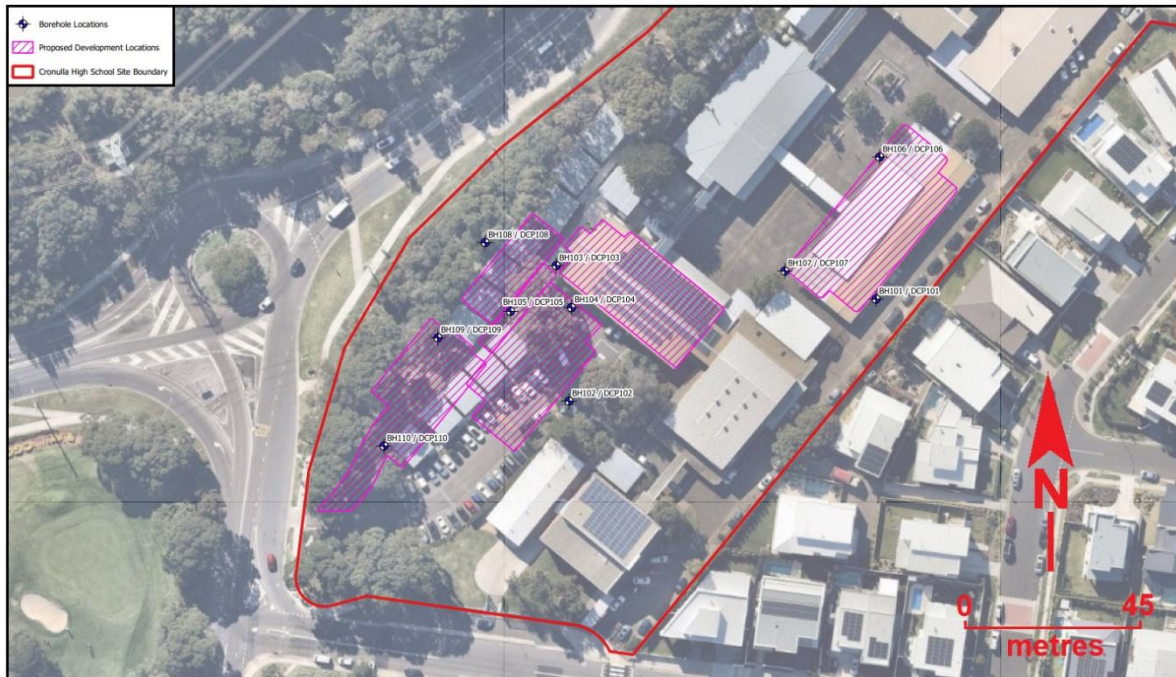


Figure 1. The location of the proposed developments at Cronulla High School, Cronulla, central eastern New South Wales. Modified from Ghimire (2022, 23).

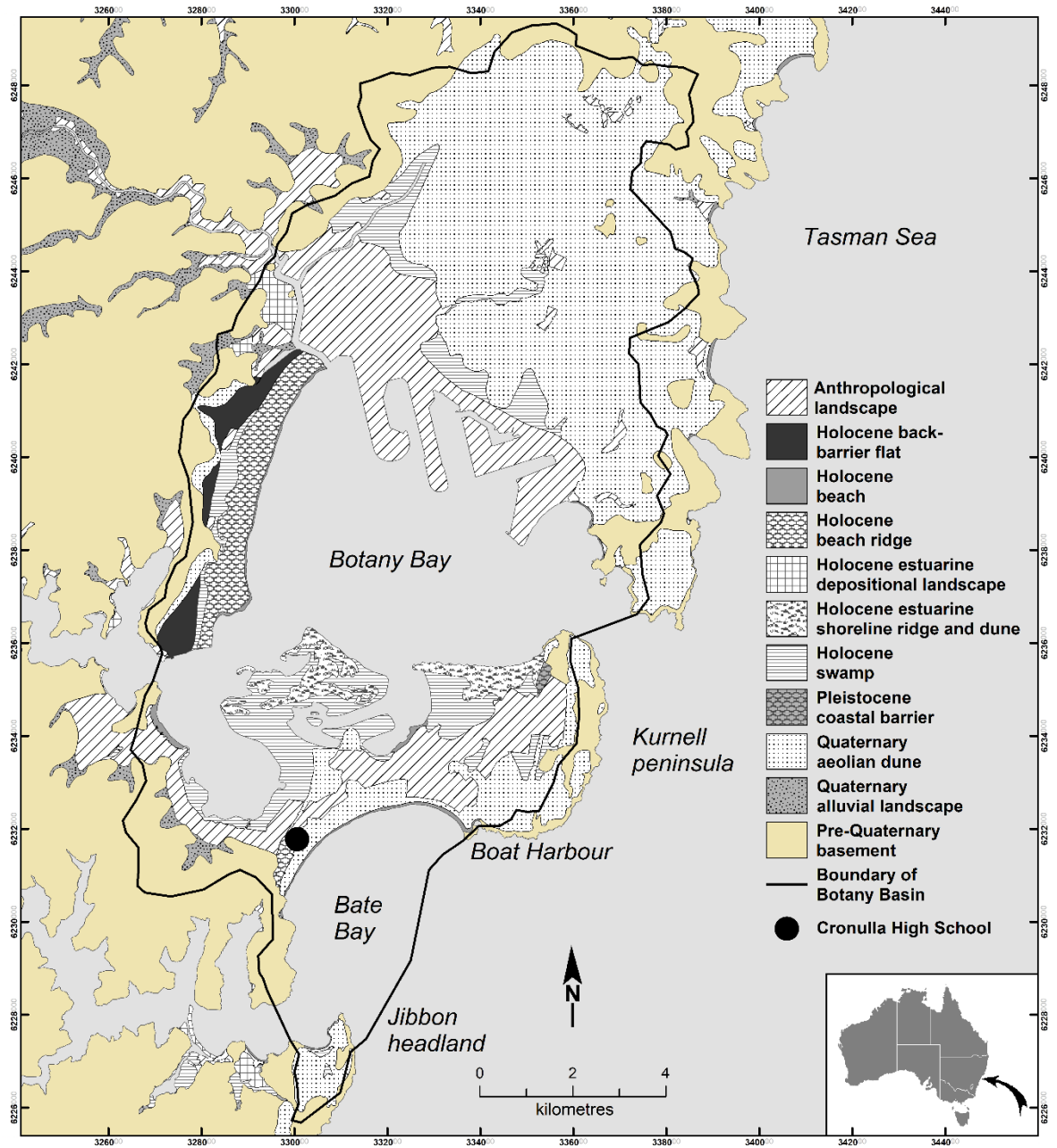


Figure 2. The physical landscape of the Botany Basin of central eastern New South Wales, Australia. Modified from Gale and Wales (2022).

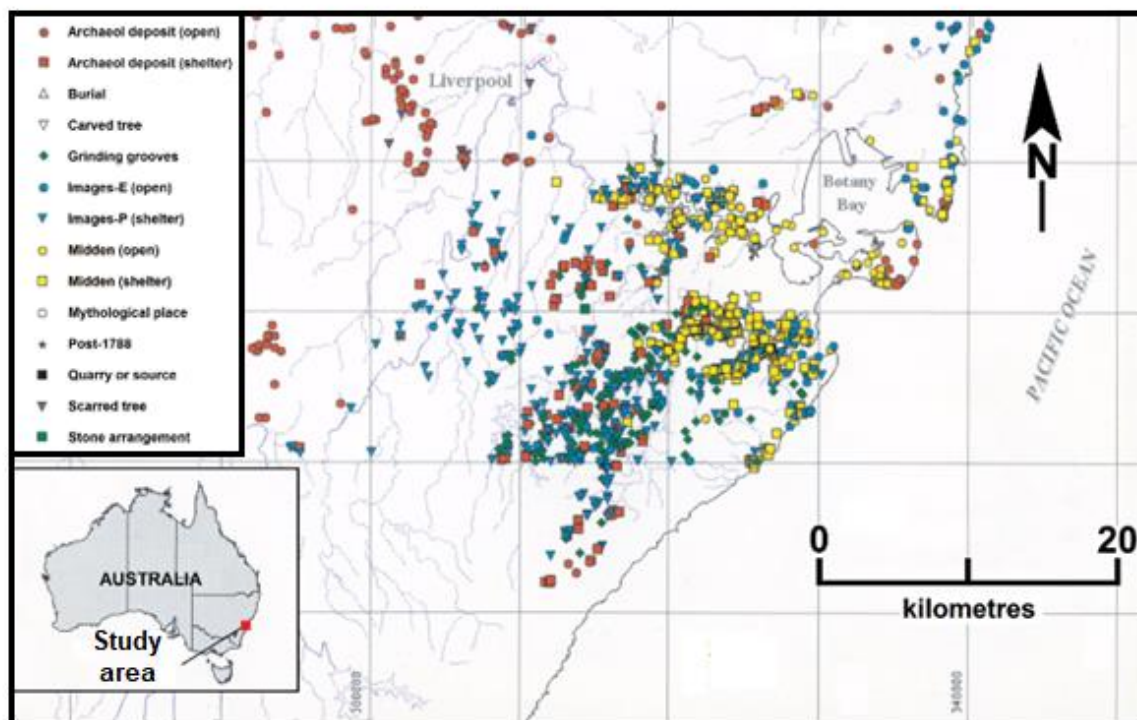


Figure 3. The distribution of Aboriginal sites in the Botany Basin. Modified from Attenbrow (2002, Plate 12).

Professor Stephen Gale was retained by GML Heritage to determine whether the pre-contact buried soil and sediment sequence remains intact across that part of the site likely to be subject to development, and whether excavation may be undertaken without causing damage to a potentially archaeologically significant landscape remnant.

The aim of the project was thus to obtain a network of undisturbed cores of the upper c. 1000 mm of the surficial soils and sediments from that part of the School subject to redevelopment, to obtain information on the vertical and lateral pattern of soils and sediments across the area and to determine which parts of the site may be excavated without causing damage to a potentially archaeologically significant landscape remnant.

The field component of this project was undertaken on 4 and 6 July. This work involved the recovery of sediment cores from across the site, reporting on the stratigraphy of the cores and assessing the palaeo-environmental conditions under which deposition had occurred, with particular reference to their archaeological implications.

2 The physical context of the site

The Kurnell peninsula lies along the southern side of Botany Bay in central eastern New South Wales (Figure 2). The peninsula itself forms a *tombolo*, a depositional landform that links a pre-existing offshore island (the modern Kurnell headland at the eastern end of the peninsula) to the mainland. The basement rocks in the region are composed of Triassic Hawkesbury Sandstone. These outcrop below the Kurnell

headland and at the western end of the peninsula. Beneath the central part of the peninsula, however, the sandstones form a north–south aligned bedrock valley. This reaches depths of around -100 m AHD and formerly conducted the waters of the George’s and Cook’s Rivers into Bate Bay and out to sea (Figure 4).

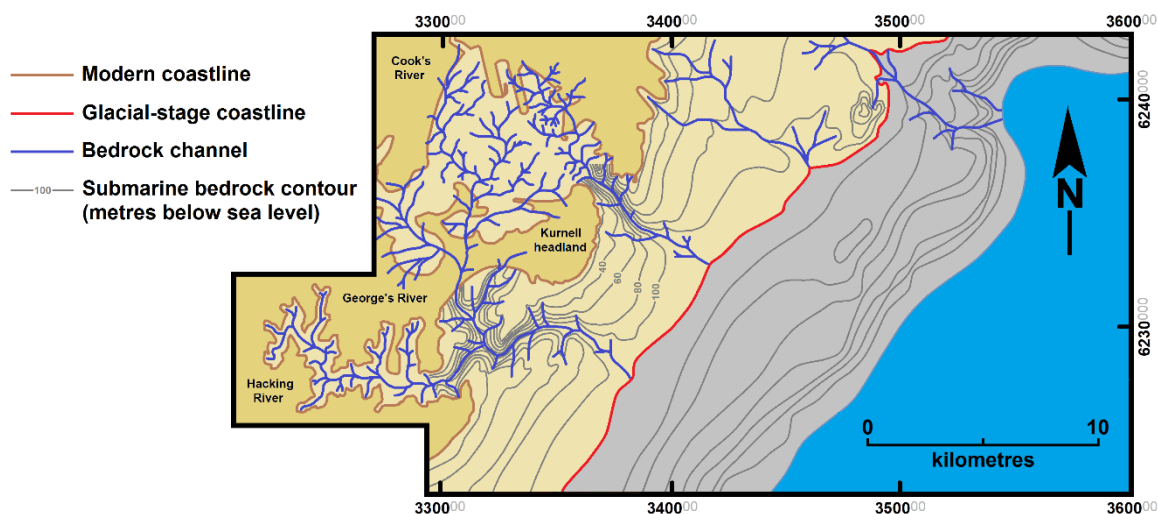


Figure 4. The bedrock topography of Botany Bay and Port Hacking, eastern central New South Wales, showing the submarine palaeodrainage lines and the glacial-stage coastline. Modified from Albani *et al.* (2015, 687).

The rivers are thought to have been initiated as far back as the Oligo–Miocene (Gale, 2021) and the lowest deposits in the channel beneath the peninsula are of fluvial origin (Byrnes, 1975; Roy and Crawford, 1981) (though they are unlikely to date back to the earliest episode of drainage). During the maximum of the last glacial stage, about 20 000 years ago, sea levels would have lain up to 134 m below those of the present (Lambeck *et al.*, 2014, 15 301) and the shore would have been about 5 km offshore of its present position. The George’s–Cook’s River would have followed a course south across Bate Bay through a landscape of terrestrial sand dunes deposited by onshore winds reworking sands exposed across what is now the marine inner shelf (Gale and Wales, 2022).

As the glacial stage ended and climate warmed, sea levels would have risen, drowning the lower reaches of the valleys to form a wide shallow estuary connecting Botany and Bate Bays. The rising sea-levels would have driven a coastal sand barrier up the inner shelf. The barrier appears to have been attached to the bedrock headlands at Gibbon and Kurnell (Figure 2), blocking the passage of the river into Bate Bay and shifting its outlet to Botany Bay. Under the influence of dominant southerly winds, the coastal dunes associated with the barrier subsequently migrated northward onto the Kurnell headland where they overlap the earlier landscape of terrestrial dunes (Roy and Crawford, 1981). As sea-levels rose to close to their modern positions, the proto barrier appears to have been destroyed and its sediments were reworked and transported shorewards to accumulate across the front of the peninsula as beach ridges and aeolian frontal dunes during the maximum of the Holocene transgression. This appears to have been followed by the deflation of the frontal dunes and the erosion of the beach face under the influence of southerly

and southeasterly winds. The result was the migration of calcareous sand northwards over the relict estuarine deposits on the southern side of Botany Bay. Two sets of parabolic dunes were emplaced and stabilised by vegetation. A final phase of renewed erosion resulted in a third episode of dune migration, which is still continuing. This has buried older dune soils dating from the last millennium (Roy and Crawford, 1981).

3 The human context of the site

There is no evidence from the reports of the *Endeavour* scientists or the journals of the First Fleet of active, unvegetated dunes on the peninsula. However, several decades of logging and grazing in the middle years of the 19th century appear to have destabilised and reactivated the windblown sands that blanket the area. Rickwood and Albani (1998, 207) reported the presence of sandhills near Cronulla beach on an 1868 map, though they provided no reference for this and it is possible that these features were part of the active foredunes on the inner edge of the beach. The same year, the manager of the Holt–Sutherland Estate, R.C. Walker, commented that:

‘The whole length of Krenulla Beach is backed by very large Sand Hills covering about 300 acres of ground. These hills are composed of a shifting shell sand ...’ (Curby, 2004, 16).

Skinner (1973) identified sand movement as a result of clearing and burning in 1872. More reliable evidence of dune activation may be seen in an 1860 image reproduced in Salt (2000, 32), which shows large areas of exposed dune sand and grazing cattle. Another image from 1870 presents a similar scene (Salt, 2000, 33). A c. 1910 photograph shows the area from Boat Harbour and across Bate Bay dominated by active dunes and almost entirely unvegetated (Curby, 2004, 16). In 1927, Doak and Macaulay-Doyle (1927, 31) reported a rapidly advancing sand ridge in the vicinity of Boat Harbour. And in 1931, Rolfe (1931) described the land between Kurnell and Cronulla as a desolate waste with exposed roots of large trees indicating large-scale deflation of the land surface. The exposed roots on one stump alone branched out five feet above ground level.

Pickard (1972) recorded rates of northward movement of the Cronulla Beach dune sheet of 6–10 m a⁻¹ during the period 1930–1965. Similar values were obtained by Rickwood and Albani (1998) over the period 1930–1975.

Although dune buggies, construction and the use of heavy machinery must all have contributed to the destabilisation of the sands, their impacts are likely to have been insignificant by comparison with the devastation wrought by the mining companies. Mining of dune sand to the west of the Kurnell headland began in ‘about 1928’ (Wallace, c. 1973, 96) or the 1930s (Salt, 2000, 93), when the state government granted mining leases on freehold and crown land.¹ In 1937, the Haymarket Land and Building Company offered the Shire Council 720 acres on the peninsula at only £8 an acre. Some members of the Council proposed using the land to establish a

¹In 1933, Sutherland Shire Council asked the state government to set aside 2000 acres between Cronulla and Kurnell village as a reserve, but there was no support for an additional National Reserve so close to Captain Cook’s Landing Place Reserve (Salt, 2000, 34).

national park, but the President, Joe Monro, used his casting vote to argue that the land ‘was all sandhills [and] was completely useless’. Its fate was sealed. Since that time over 70 million tonnes of sand have been removed from the peninsula, transforming the area into a wasteland of water-filled sand pits into which demolition waste has been tipped in the name of reclamation (Salt, 2000, 34–35, 93–96).

4 Methods

4.1 Field sampling

The position of sampling sites across the school premises was determined in part by the locations at which the proposed developments were to take place (Figure 1) and in part by information on the depth of fill obtained from earlier sampling for geotechnical and acid sulphate soil assessment (Ghimire, 2022). On this basis we selected six locations for coring, taking into account the constraints of tree coverage (with bioturbation associated with root systems likely to compromise the stratigraphy of the sediments) and the existence of a network of services across the site (including drains, electrical conduits and telecommunication lines). Using this information, six sites were selected for coring (Figure 5). At each of these locations, percussion cores of 720–1565 mm in length were extracted using either 44 mm or 55 mm external diameter polyvinyl chloride tubing.



Figure 5. Location of coring sites, Cronulla High School, Kurnell, central eastern New South Wales. Aerial image: Google Earth.

4.2 Stratigraphy and lithology

Each core barrel was opened in the laboratory by making longitudinal cuts on opposite sides of the sleeving. One section of sleeve was removed to expose the deposits without disturbing them. The core and its retained sediments were photographed and detailed logs were made of the regolith sequence. The core descriptions employ the particle-size conventions of Wentworth (1922). Note that particles of diameters >2 mm are referred to as gravels. These are subdivided into granules (2–4 mm), pebbles (4–64 mm), cobbles (64–256 mm) and boulders (>256 mm). Our textural classification of regolith materials follows the definitions of Folk (1954). All colours were determined in field state following the procedures outlined by Gale and Hoare (2011, 158–161).

5 Results

5.1 Core 1

Core 1 penetrated 1.42 m (Figure 6). At its top is a thin A1 horizon upon which is developed a cover of turf. Below this is an alternating sequence of black (10YR 2/1) to dark gray (10YR 3/1) silty, plant-organic-rich sands containing common roots and gray (10YR 5/1), well-sorted, quartzose, medium sands. At the base of the core, the entire sequence is underlain by a cobble of weathered Hawkesbury Sandstone. This appears to be part of a larger slab of weathered rock penetrated by the tip of the core barrel.



Figure 6. Core 1, Cronulla High School, Kurnell, central eastern New South Wales (56H 329925.627 6232014.180). Surface elevation 2.155 m AHD.

5.2 Core 2

Core 2 penetrated 0.845 m (Figure 7). The upper part of the core consists of 0.13 m of bitumen sharply overlying 0.17 m of angular granules and pebbles of basalt supported in a matrix of well-sorted, quartzose, medium sand. This sharply overlies a 0.023 m thick unit of angular exotic pebbles and gravels in a silty matrix.

At a depth of 0.32 m, a bed of well-sorted, quartzose, medium sand displays a sharp, subhorizontal contact with the overlying unit (Figure 8). This lightens from grayish brown (10YR 5/2) at the top to light gray (10YR 7/2) at the base. The sand contains rare fragments of charcoal and a subhorizontal layer of woody fragments at a depth of 0.58 m.



Figure 7. Core 2, Cronulla High School, Kurnell, central eastern New South Wales (56H 329892.307 6231923.182). Surface elevation 5.562 m AHD. Note that the 0.13 m of bitumen that forms the upper unit at the site was removed before coring.

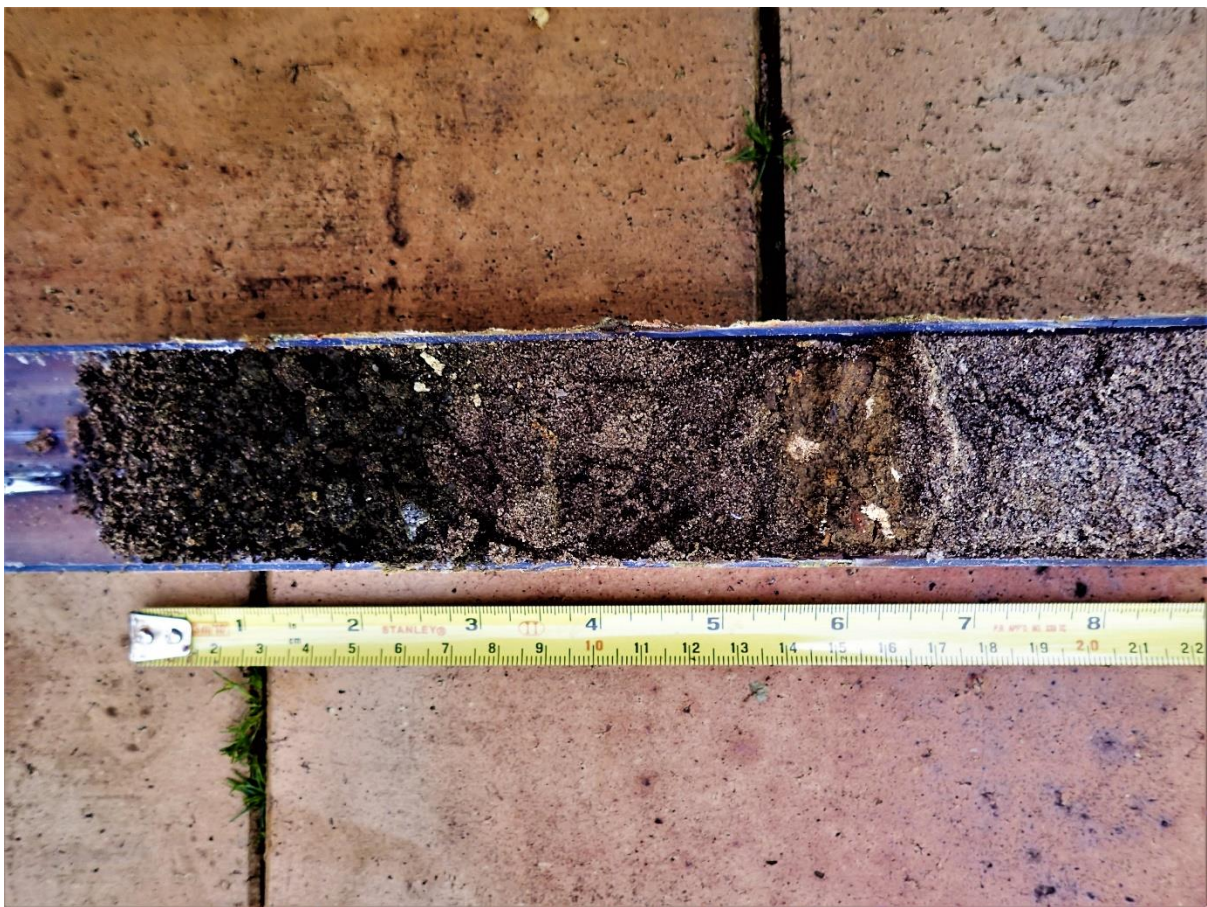


Figure 8. Core 2, Cronulla High School, Kurnell, central eastern New South Wales, showing the sharp, subhorizontal contact between the upper unit containing exotic gravels (to the left) and the lower unit (to the right) of well-sorted, quartzose, medium sand. The upper scale is in inches, the lower in centimetres. Note that the 0.13 m of bitumen that forms the upper unit at the site was removed before coring.

5.3 Core 3

Core 3 penetrated 1.525 m (Figure 9). The upper part of the core consists of 0.13 m of bitumen overlying 0.14 m of angular basalt pebbles supported in a matrix of well-sorted, quartzose, medium sand. The pebbles appear to have been forced down into the underlying unit.

Below the gravels at a depth of 0.28 m is a bed of well-sorted, quartzose, medium sand containing rare fragments of charcoal. This lightens from grayish brown (10YR 5/2) at the top to white (10YR 8/2) at the base. Below ≈ 1.33 m, the colour changes over around 20 mm to brownish yellow (10YR 6/8), reaching dark brown (10YR 3/3) at a depth of 1.42–1.45 m depth, before returning to brownish yellow (10 YR 6/6) below.



Figure 9. Core 3, Cronulla High School, Kurnell, central eastern New South Wales (56H 329929.889 6231934.140). Surface elevation 5.326 m AHD. Note that the 0.13 m of bitumen that forms the upper unit at the site was removed before coring.

5.4 Core 4

Core 4 penetrated 0.72 m (Figure 10). At its top is a 0.425 m thick unit of plant-organic-rich, well-sorted, quartzose, medium sand containing common roots and occasional exotic pebbles. These include a broken rounded pebble of quartzite at a depth of 0.41 m.

At a depth of 0.425 m, a bed of well-sorted, quartzose, medium sand displays a sharp, subhorizontal contact with the upper unit. This lightens from dark yellowish brown (10YR 4/4) at the top to light gray (10YR 7/2) at the base.



Figure 10. Core 4, Cronulla High School, Kurnell, central eastern New South Wales (56H 329897.451 6231900.649). Surface elevation 5.618 m AHD.

5.5 Core 5

Core 5 penetrated 1.525 m (Figure 11). The upper part of the core consists of 0.06 m of concrete that unconformably overlies 0.41 m of millimetre- to centimetre-scale, horizontally laminated, well-sorted, quartzose, medium sand containing rare charcoal fragments and, at a depth of 0.30–0.34 m, an angular pebble of industrial slag. The laminae alternate in colour from white (10YR 8/2) to dark grayish brown (10YR 4/2).

Sharply underlying the laminated sands at a depth of 0.47–0.84 m is a massive unit of white (10YR 8/2) well-sorted, quartzose, medium sand. The lower 0.065 m of this unit is transitional to 0.14 m of brown (10YR 4/3) sands. Below this a sharper transition, over ≈ 15 mm, gives way to 0.51 m of dark yellowish brown (10YR 3/4) to brownish yellow (10 YR 6/6) mottled sands.



Figure 11. Core 5, Cronulla High School, Cronulla, central eastern New South Wales (56H 329996.597 6231997.048). Surface elevation 5.233 m AHD. Note that the 0.06 m of concrete that forms the upper unit at the site was removed before coring.

5.6 Core 6

Core 3 penetrated 1.565 m (Figure 12). The upper part of the core consists of 0.05 m of concrete that unconformably overlies 0.37 m of reworked sand, its base defined by a rectilinear plug-like contact with the underlying unit (Figure 13).

Beneath this sharp contact lie 0.54 m of white (10YR 8/2) well-sorted, quartzose, medium sand, becoming very pale brown (10YR 7/3) towards the base. There is a transitional contact over ≈ 30 mm with the underlying unit. This is 0.15 m thick and darkens to dark yellowish brown (10YR 4/4) between 1.06 and 1.11 m, but is otherwise indistinguishable from the under- and overlying beds.

Below this a sharper transition, over ≈ 3 mm, gives way to 0.46 m of dark yellowish brown (10YR 4/6) to brownish yellow (10 YR 6/8) mottled sands.



Figure 12. Core 6, Cronulla High School, Cronulla, central eastern New South Wales (56H 329982.759 6231979.364). Surface elevation 5.237 m AHD. Note that the 0.05 m of concrete that forms the upper unit at the site was removed before coring.



Figure 13. Core 6, Cronulla High School, Cronulla, central eastern New South Wales, showing the sharp, plug-like contact between the upper unit (to the left) of reworked sands and the lower unit (to the right) of well-sorted, quartzose, medium sand. The upper scale is in inches, the lower in centimetres.

6 Discussion

6.1 The stratigraphy of the individual cores from the site

6.1.1 Core 1

At the base of Core 1, the coring barrel penetrated weathered Hawkesbury Sandstone. At this point, the closest bedrock lies at a depth of several tens of metres below sea level where it forms the former buried valley of the George's–Cook's River. Otherwise, the closest outcrops of Hawkesbury Sandstone are found over a kilometre to the southwest (Figure 2). It is unlikely that the sandstone in the core has reached this position by other than anthropogenic activity and, on this basis, we interpret the entire sequence as representative of disturbed and reworked post-contact sediment. This assessment is supported by the overlying sequence of alternating black to dark gray, silty, plant-organic-rich sands and gray, well-sorted, quartzose, medium sands. This is quite unlike that anticipated on the distal edge of a coastal barrier sequence and is instead strongly suggestive of a series of deposits of material excavated by recent human activity from nearby outcrops of aeolian sand, some of which appear to have supported soil A1 horizons.

6.1.2 Core 2

The upper 0.32 m of Core 2 consists of bitumen overlying angular gravels of basalt and other exotic lithologies. These sharply overlie grayish brown, quartzose, well-sorted sands that lighten downsequence to light gray. Locally, basalt is widely used as a road base and we interpret this part of the core as a product of the construction of the school playground hereabouts. The underlying sands display all the characteristics of the bleached upper component of the aeolian Botany Sands (Gale *et al.*, 2018; Gale and Wales, 2022, 3–4). The grayish brown upper component of the sands could be interpreted as indicative of the truncation of a topsoil formerly developed on the sands, with the possibility that the pre-excavation ground surface therefore lay close to the modern surface. Although this is an attractive thesis, we hesitate to pursue it, for it is equally likely that the staining of the sands was the result of the recent leaching of fines from the overlying bitumen and road base.

6.1.3 Core 3

The upper part of Core 3 is very similar to that of Core 2, with bitumen and road base unconformably overlying bleached aeolian sands. Once again, the bleached sands become lighter with depth and, once again, we hesitate to attribute this to the truncation of a topsoil formerly developed on the sands. At depth, however, the sequence is more complicated than that of Core 2 and the sands display the characteristic change in colour associated with the weathering that gives rise to the so-called Waterloo Rock (Gale *et al.*, 2018).

The Waterloo Rock is an informally defined, yellow to black, variably indurated layer that is superimposed on the pre-existing sedimentary sequence. It post-dates the beds that host it, but otherwise little is known of the timing or duration of its formation. (Though there is evidence that it can form rapidly and that in some circumstances deposition continues to the present.) At depth, the Waterloo Rock conformably overlies the unbleached component of the Botany Sands. This consists of yellow to strong brown, windblown, well-sorted medium sands.

The Waterloo Rock is thus a pseudo-stratigraphic feature, whose presence appears to be closely related to the bleaching of the upper parts of a Botany Sands sequence and the reprecipitation of the mobilised material at a weathering front marking the boundary between the leached upper sands and the unbleached lower deposits.

We therefore interpret the sequence in Core 3 as representative of a typical Botany Sands weathering profile (unbleached sands beneath bleached sands, with the two separated by the weathering front of the Waterloo Rock). The top of the sequence has been truncated, probably as a result of excavation associated with the construction of the school playground.

Given the rapidity with which weathering is believed to occur in the Botany Sands, it is not inconceivable that the weathering profile of Core 3 has developed entirely in the time since the Sands were excavated and the bitumen laid down.

6.1.4 Core 4

The upper 0.425 m of Core 4 contains exotic pebbles that can only have reached the site by human agency, almost certainly in post-contact times. This deposit is most likely a product of the reworking of local aeolian sediments combined with gravels brought in for construction or road fill. These deposits sharply overlie dark yellowish brown, quartzose, well-sorted sands that lighten downsequence to light gray. As with Cores 2 and 3, we interpret these as bleached aeolian sands. These become lighter with depth and, again, we are reluctant to attribute this to the truncation of a topsoil formerly developed on the sands.

6.1.5 Core 5

The upper 0.47 m of Core 5 consists of concrete unconformably overlying alternating white and dark grayish brown laminated sands containing a pebble of industrial slag. The slag demonstrates the recent origin of this unit, as do the laminations, which are quite unlike the sedimentary structures anticipated in aeolian coastal barrier deposits. Instead, they are likely to be the product of the anthropogenic redeposition of material excavated from nearby outcrops of aeolian sand, some of which appear to have supported soil A1 horizons.

The remainder of the sequence is closely comparable with that of Core 3. We interpret it as an example of a typical Botany Sands weathering profile (unbleached sands beneath bleached sands, with the two separated by the weathering front of the Waterloo Rock). As with Core 3, the top of the sequence has been truncated, probably as a result of excavation associated with the construction of the school playground. And, as with Core 3, we speculate that the entire weathering profile may have developed in the time since the Sands were excavated and the concrete was poured.

6.1.6 Core 6

The stratigraphy of Core 6 is almost identical to that of Core 5. The upper part of the core consists of 0.05 m of concrete that unconformably overlies 0.37 m of reworked sand, its base defined by a rectilinear plug-like contact with the underlying unit.

Beneath this sharp contact lies a sequence of unbleached sands beneath bleached sands, with the two separated by the weathering front of the Waterloo Rock. As with Cores 3 and 5, we speculate that the entire weathering profile may have developed in the time since the Sands were excavated and the concrete was poured.

6.2 The interpreted stratigraphy of the Cronulla High School site

The interpretations reached in 6.1 are summarised in Figure 14. Material interpreted as anthropogenic fill forms the upper part of the sequence in every core. In the case of Core 1, this extends to a depth of at least 1.42 m. In every other core the anthropogenic deposits unconformably overlie the bleached upper unit of the Botany Sands. Some of these cores display a marked lightening in colour with depth through the bleach unit. The upper darker component might be interpreted as indicative of the truncation of a topsoil formerly developed on the sands, with the possibility that the pre-excavation ground surface therefore lay close to the modern surface. It is equally likely, however, that the staining of the sands is a recent phenomenon, a consequence of the leaching of fines from the overlying anthropogenic deposits.

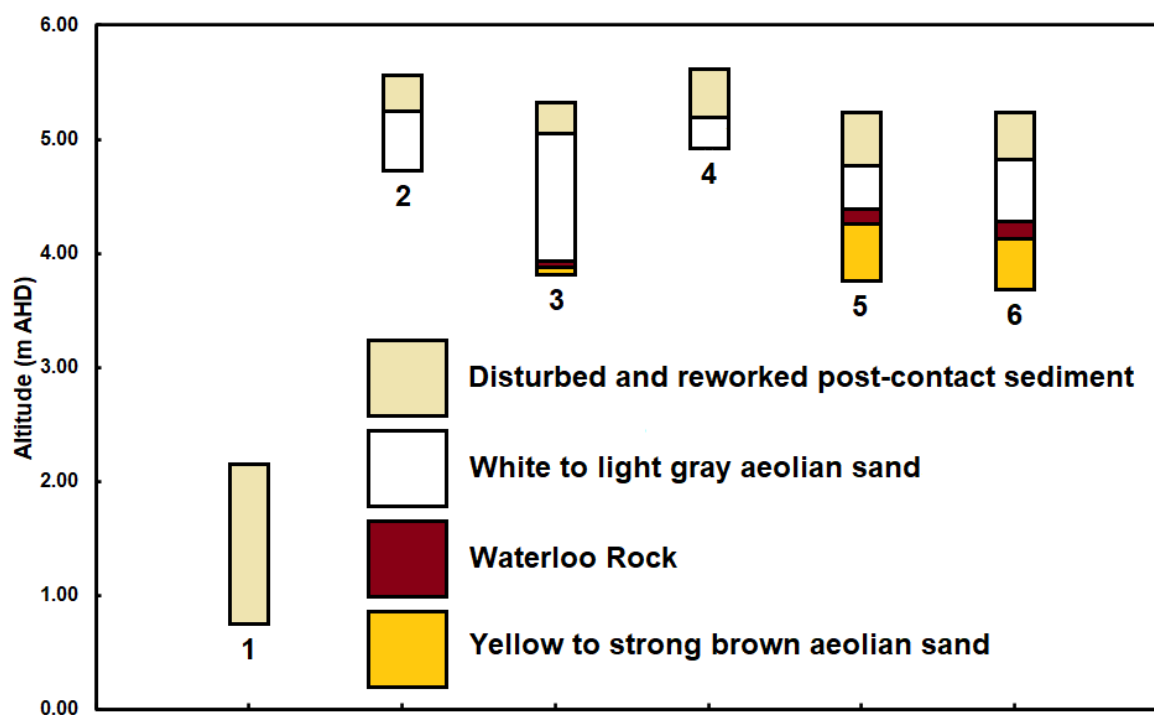


Figure 14. The stratigraphy of the Cronulla High School site. The location of the cores is shown on Figure 5.

In three of the cores, the bleached sands may be seen to form the upper part of a typical Botany Sands weathering profile (unbleached sands beneath bleached sands, with the two separated by the weathering front of the Waterloo Rock). This sequence is a product of the bleaching of the near-surface parts of the Botany Sands and the reprecipitation of the mobilised material at a weathering front marking the boundary between the leached upper sands and the unbleached lower deposits.

The yellow to black, reprecipitated layer that separates the bleached and unbleached sands is locally known as the Waterloo Rock. It is a *duricrust*, the product of the

accumulation of material reworked from the overlying bleached unit. It is thus a pseudo-stratigraphic feature. Although it post-dates the beds that host it, little is known of the timing or duration of its formation. Nevertheless, there is evidence that it can form rapidly and that in some circumstances deposition continues to the present. We speculate that the examples of the Botany Sands triplet observed here may all have developed in the time since the upper part of the Sands were excavated. In the light of this, it is noteworthy that the three cores in which this sequence may be observed are the three deepest of those in which the Botany Sands have been found.

Although Cores 2–6 all preserve clear signs of undisturbed deposits, in every case the depositional sequence has been truncated and there is no convincing evidence that the pre-contact buried soil or the pre-contact land surface remain intact across the site.

On the basis of the information obtained from Cores 1–6, we suggest that the upper parts of the stratigraphic sequence at the site are likely to have been truncated and that the underlying sediments are unlikely to retain evidence of Late Holocene archaeological deposits.

7 Conclusions

The Department of Education New South Wales plans to demolish and redevelop several of the buildings on the Cronulla High School site on the Kurnell peninsula on the southern flank of Botany Bay. This work will involve the partial excavation of the unconsolidated Quaternary sediments that crop out across the site. Elsewhere across the peninsula, these sediments and the complex terrestrial environments with which they are associated support a dense assemblage of Aboriginal archaeological sites.

A programme of coring was proposed to assess whether any trace of the pre-contact soil and sedimentary landscape is preserved at the site, and to determine whether excavation may be undertaken without causing further damage to a potentially archaeologically significant landscape remnant.

Six cores were taken to depths of 720–1565 mm across the site. The position of the sampling sites was determined in part by the locations at which the proposed developments are to take place (Figure 1) and in part by information on the depth of fill obtained from earlier sampling for geotechnical and acid sulphate soil assessment (Ghimire, 2022).

With one exception, Core 1, in which no undisturbed pre-contact deposits were encountered, the cores all preserve evidence of disturbed and reworked post-contact sediments overlying an aeolian sand succession of bleached and unbleached Botany Sands separated by Waterloo Rock. The stratigraphic triplet of bleached aeolian sand–Waterloo Rock–unbleached Botany Sands occurs widely across the region. Its presence in whole or in part in stratigraphic order across the study site provides evidence for the integrity of the pre-contact stratigraphy at the site.

Although Cores 2–6 all preserve clear signs of undisturbed deposits, in every case the upper part of the depositional sequence has been truncated and there is no convincing evidence that the pre-contact buried soil or the pre-contact land surface

remain intact across the site. On the basis of the information obtained from Cores 1–6, therefore, we believe that excavation may proceed and that this is unlikely to cause damage to a potentially archaeologically significant landscape remnant.

8 References

- Albani, A.D., Rickwood, P.C., Quilty, P.G. and Tayton, J.W. 2015. The morphology and late Quaternary paleogeomorphology of the continental shelf off Sydney, NSW. *Australian Journal of Earth Sciences* 62, 681–694.
- Attenbrow, V.J. 2002. *Sydney's Aboriginal Past: Investigating the Archaeological and Historical Records*. University of New South Wales Press, Sydney, 225 pp.
- Byrnes, J.G. 1975. A vertical sequence in Quaternary sand at Kurnell isthmus. *Geological Survey of New South Wales Report GS1995/117*, 1–14.
- Curby, P. 2004. *Pictorial History Sutherland Shire*. Kingsclear Books, Sydney, 139 pp.
- Doak, J.K. and Macaulay-Doyle, C. 1927. “The white heart of Cronulla.” An ethnological study of the aboriginal middens at Cronulla. *The Science Journal Sydney University Science Society* 11, 30–40.
- Folk, R.L. 1954. The distinction between grain size and mineral composition in sedimentary-rock nomenclature. *The Journal of Geology* 62, 344–359.
- Gale, S.J. 2021. Age and origin of the Cumberland (Inner Sydney) Basin of southeast Australia. *Australian Journal of Earth Sciences* 68, 299–315.
- Gale, S.J., de Rochefort, C.A., Moore, S.R. and Timms, A.J.C. 2018. The origin and stratigraphic significance of the Quaternary Waterloo Rock of the Botany Basin of south-east Australia. *Australian Geographer* 49, 291–316.
- Gale, S.J. and Hoare, P.G. 2011. *Quaternary Sediments: Petrographic Methods for the Study of Unlithified Rocks*. Blackburn Press, New Jersey, 2nd ed., xlv + 325 pp.
- Gale, S.J. and Wales, N.A. 2022. The Botany Sands of southeast Australia: a Quaternary inland dune and swamp system *Geomorphology* 405(108175), 1–24.
- Ghimire, A. 2022. Geotechnical and Acid Sulfate Soil Assessment: Cronulla High School, Captain Cook Drive, Cronulla, NSW. Report to School Infrastructure New South Wales, Department of Education New South Wales. Martens & Associates, Sydney, 85 pp.
- Lambeck, K., Rouby, H., Purcell, A., Sun, Y. and Sambridge, M. 2014. Sea level and global ice volumes from the Last Glacial Maximum to the Holocene. *Proceedings of the National Academy of Science of the United States of America* 111, 15 296–15 303.
- Pickard, J. 1972. Rate of movement of transgressive sand dunes at Cronulla, New South Wales. *Journal of the Geological Society of Australia* 19, 213–216.

Rickwood, P.C., Albani, A.D. 1998. Movement of sandhills on the Kurnell Peninsula, In McNally, G.H. and Jankowski, J. (eds) *Environmental Geology of the Botany Basin*. Environmental, Engineering and Hydrogeology Specialist Group, Geological Society of Australia and Conference Publications, Springwood, 205–222.

Rolfe, J.S. 1931. An Aboriginal midden at Quibray Bay. *Mankind* 1(2), 36–37 and 1(3), 61–63.

Roy, P.S. and Crawford, E.A. 1981. Holocene geological evolution of the southern Botany Bay–Kurnell region, central New South Wales coast. *Records of the Geological Survey of New South Wales* 20, 159–250.

Salt, D.F. 2000. *Kurnell Birthplace of Modern Australia—a Pictorial History*. Clarion House, Sydney, 160 pp.

Skinner, J.E. 1973. A barrier system, Kurnell Peninsula, Botany Bay, New South Wales. Unpublished BA (Hons) thesis, School of Earth Sciences, Macquarie University, Sydney, 158 + xxii pp.

Wallace, I. c. 1973. Extractive resources of the Botany Bay region: constructive materials and coal. In Anderson, D.J. (ed.) *The Botany Bay Project a handbook of the Botany Bay region – some preliminary background papers*. Botany Bay Project Committee, Sydney, 95–100.

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. *The Journal of Geology* 30, 377–392.