'OVERLOOKED HISTORY'

POLLEN ANALYSIS OF SAMPLES FROM THE PARRAMATTA SQUARE PS3 DEVELOPMENT SITE:

153 Macquarie Street, Parramatta

Mike Macphail

Photograph showing 1830s plough lines preserved in buried topsoil within former Civic Place (from Casey & Lowe 2016)

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51 Reuss Street Leichardt, NSW 2040

Consultant Palynological Services, 13 Walu Place, Aranda. A.C.T. 2614
Ph 0432-233-230. E-mail mike.macphail@anu.edu.au

INTRODUCTION

When completed, the multibillion-dollar Parramatta Square project will be the latest in a palimpsest of developments, some by Chinese residents, dating back to the 1790s in the modern heart of the Parramatta CBD. Proposed constructions on this 3 ha (7 acre) site bounded by Church, Macquarie, Smith and Darcy Streets (Figs. 1 & 2) include six tower blocks lining a 250 m long corridor of public space. One of the planned tower blocks – the c. 300 m tall/90 floor *Aspire Tower* – aimed to be Australia's tallest residential building but recently its height has been trimmed to 64 levels due to aviation concerns. PS Stage 3 of this Development encompasses the archaeological site at 153 Macquarie Street.

Mid-late 20th century constructions on this site (Study Site) include the eastern side of *Civic Place*, the *Australia Post Office Building*, the *Parramatta Library* and their associated car parks (Figs. 1 & 2). Historic allotments on the same site are Nos. 28 & 1(181) (former *Civic Place*), 30 (the former *Post Office Building*) and 32 (part of the *City Campus* of the University of Western Sydney) (see Fig. 3 below). Archaeological remains include the foundations of three late 19th century houses under which are preserved the footprints of an early Colonial cottage built by c.1822, and the stables of an inn built between 1844 and 1857. Even more remarkable survivals are (i) furrows on land in Parramatta cultivated by plough in the 1830s (see Frontispiece) and (ii) topsoil dating to a time before 1790 when Parramatta was occupied by the Burramattagal Clan of the Indigenous Darug Peoples.

A meticulous study of the non-Indigenous archaeology was undertaken by *Casey & Lowe Heritage Archaeology and Heritage Consultants* Pty. Ltd between 2013 and 2016. Plant microfossils preserved in cultural deposits and buried topsoils (including the cultivated areas) on the Site provide a discontinuous record of changes in the Indigenous and European landscape between 1790 and 1960s.

At the time of writing, it is unknown whether these and other remnants of Parramatta's Past will continue to be 'overlooked' by current developments on the Parramatta Square site.

1.1 This report

This report analyses and discusses fossil pollen and spores (miospores) and other microfossils preserved in cultural and natural deposits. Most can be dated by their archaeological context (CTX) to broad periods of time between 1790 up to the late 19th century (S. Kuiters pers. comm.). Specific aims were:

- Determine whether fossil miospore are preserved in the samples, and, if so, to use the fossil assemblages (microfloras) to:
- Reconstruct the natural and/or cultural environment prevailing at the times of deposition.
- Test previous reconstructions of the pre-European landscape based on Colonial period documents and remnant native plants communities.

These aims are part of broader research questions (see Casey & Lowe 2013: 9) regarding:

- Current perceptions of the Aboriginal landscape at Parramatta.
- Modification of the Aboriginal landscape by convicts, including the impact of early agricultural practices (clearing, cropping and grazing) and residential occupation of poorly-drained areas.
- Cultural and social practices in Colonial period Parramatta.

1.2 Samples

Twenty-one samples (Table 1) were submitted for pollen analysis by *Casey & Lowe* Pty. Ltd. All samples were processed for fossil miospores and other plant remains by *Morgan Goodall* Pty. Ltd. (Perth) using standard chemical and micro-sieving techniques designed to recover organic-walled microfossils.

Background information on the Study Site) is given in Section 3 (Setting): Palynological data are presented and discussed in Section 4 (Palynology) and Section 5 (Individual results).

1.3 **Ancillary information**

Colonial period buildings surviving along Macquarie Street (and Church Street to the west of the Study Site) include the *Leigh Memorial Church* (1896) on the western boundary of Parramatta Square and *Parramatta Town Hall* (1880) fronting Church Street (Fig. 3). The latter was built across land set aside by Governor Macquarie in 1812-1813 for fairs (*Market Place*), a *Meeting/Feasting Place* for Indigenous and European residents, and a *Pound* for straying animals.

Extracts from the *Non-Indigenous Research Design* (Casey & Lowe 2013) and *Preliminary Results of the Historical Archaeological Investigation Report* (Casey & Lowe 2016), photographs and diagrams of the study area, and comments on the individual archaeological contexts were provided by Mary Casey, Amanda Dusting, Sandra Kuiters, Jill Miskella and Jane Rooke (*Casey & Lowe* Pty. Ltd.).

Fig. 1: Map showing the area bounded by Macquarie, Smith, Darcy and Church Streets undergoing re-development as Parramatta Square (PS3 Study Site shaded in red).

Fig 2: 3PS study area shaded orange.

Table 1: Sample data for 3PS (153 Macquarie Street), Parramatta

SAMPLE NUMBER		AREA.	LOT	TT	House	Room No./	Context	Phase	Sample	CONTEXT
MKM	**Casey & Lowe**	**No.**	**No.**	**No.**	**No.**	**Square**	**No.**	**(revised 2019)**	**lithology**	**DESCRIPTION**
1	**19**	**A**	**30**	**-**	**-**	**-**	**16189**	4.2 1850-70s	grey sandy mud	Fill within brick/sandstone sump (CTX 16187) associated with House 4. Dated to c. 1850-1880s. The channel led to the Town Drain
2	**182**	**A**	**30**	**-**	**-**	**-**	**16211**	4.2 1850-70s	grey mottled silt	Fill of pond. Cuts subsoil and parent clays. Located below the yard fills of House 1/House 4. Dated to c. 1836-1895
3	**218**	**A**	**30**	**-**	**-**	**-**	**16120** **(hoe mark)**	3.1 1788-1790	grey silty clay	Rear yard. Sample from agricultural marks (hoe marks) cutting subsoil. Unclear whether original or modified topsoil infills the marks. c. early 19th century.
4	**230**	**A**	**30**	**-**	**-**	**-**	**16120**	4.2 1850-70s	grey silty clay	Modified topsoil in rear yard of House 4. C19.
5	**236**	**A**	**30**	**-**	**4**	**3**	**16193**	4.1 c. 1822-1850s	brown sandy loam	Modified orange and brown sand leveling fill predating the construction of House 4, i.e. pre-1822.
6	**155**	**A**	**30**	**-**	**4**	**4**	**16245**	4.2 1850-70s	grey-brown silt, oyster shell	Occupation-related deposit in square AM16 spit 1. Late phase occupation of House 4. Dated to 1850-1880s.
7	**164**	**A**	**30**	**-**	**4**	**5**	**16248**	4.2 1850-70s	red-brown silt	Occupation deposit in square AF16 spit 1. Later phase occupation of House 4. Dated to 1850-1880s.
8	**254**	**A**	**30**	**-**	**4**	**-**	**16224**	4.1	grey silty clay	Dark grey soil below south verandah of House 4 (original topsoil)
9	**188**	**A**	**30**	**-**	**4**	**-**	**16386**	4.1	dk. grey mud/oyster shells	Silty fill including oyster shells within large cut (CTX 17228)located below Sump CTX 16817. Dated to c. 1810-1850s.
10	**365**	**A**	**30**	**-**	**4**	**Sq. AP10**	**16224**	4.1	olive-grey clay	R. Lawrie Sample 2 (from 58-60 cm depth in an 'original unmodified' topsoil)
11	**55**	**B**	**30**	**-**	**-**	**-**	**16416**	4.1	clay-rich silt	Sample of original topsoil from east-facing section of '*Comber*' Test Trench.
12	**110**	**B**	**30**	**-**	**-**	**Sq. 110**	**16933**	5.1 1880s-1960s	pebbly sandy mud	Grey deposit in base of cess pit CTX 16915 (probably *in situ*).
13	**47**	**C**	**32**	**-**	**-**	**-**	**16611**	4.1	mottled clay	Upper fill in box drain CTX 16608 (includes post-use backfill).
14	**128**	**C**	**32**	**-**	**-**	**-**	**16931**	5.1	olive-brown clay	Fill of large rectangular pit, possibly used for storage or for an industrial activity.
15	**37**	**C**	**32**	**-**	**-**	**-**	**16564**	4.1	well-sorted fine sand	Water-affected sand within box drain CTX 16563 (fill or build-up within drain).
16	**323**	**D**	**28**	**32**	**-**	**-**	**17854**	4.2 1850-70s	sandy silt, brick	Silty fill at base of pond. Dated to 1836-1895.
17	**269**	**D**	**28**	**-**	**-**	**-**	**17823**	5.1	dark grey muddy sand	Black sludge at base of Town Drain. Postdates1840.
18	**320**	**D**	**28**	**-**	**-**	**-**	**17852**	3.2 1790-c1819	olive-brown clay	Infilled creek line (c. 1830-1840) under Town Drain built c. 1840
19	**335-**	**D**	**28**	**-**	**-**	**-**	**17855**	4.1	olive-brown silty clay	Plough line from southern excavated area on Lot (late C18/early C19)
20	**344**	**D**	**28**	**35**	**-**	**-**	**17855**	4.1	olive-brown silty clay	From plough line F (late C18/early C19)
21	**362**	**A**	**-**	**18**	**-**	**Sq. AP10**	**16190**	1 Natural	olive-brown clay	R. Lawrie Sample 1: 65-70 cm. Predates 1790

2. EXECUTIVE SYNOPSIS

2.1 Background to study and general conclusions

Twenty-one (21) samples from historic allotments Lots 28 & 1(181), 30 and 32 at 153 Macquarie Street, Parramatta (Fig. 3) were submitted for pollen analysis (Table 1). The sampled archaeological contexts range from buried topsoils and ploughed land to 'occupation' deposits infilling Colonial period-built structures including drains and a cesspit.

- Based on their archaeological context, the sampled sediments range in age from older than 1790 into the 20th century, with the majority of samples dating to the late 18th to mid-late 19th century.

  Over this period, the Study Site was transformed from 'ground in cultivation' to suburban allotments occupied by brick terraces and a detached house in the late 1880s. During the intervening years, two of the historic allotments were occupied by a c. 1822 timber cottage (House 4 in the archaeological report) on Lot 30 and the stables (within the study area) associated with an inn (*White Horse Inn*) on Lot 32 on 1PS (outside the study area and destroyed in the 1960s).

- All samples yielded abundant, well-preserved to strongly humified organic matter. Yields of fossil pollen and spores (miospores) and other plant and animal microfossils varied from low to abundant but were adequate to make plausible reconstructions of depositional environment, past vegetation and past cultural usage. In most (but not all) instances, the palynological evidence supports the archaeological interpretation and/or inferred age-range of the deposits.

- Significant relative abundances of pine (*Pinus*/Pinaceae) pollen potentially are useful in distinguishing deposits dating to the mid-late 19th and 20th century from those deposited in the late 18th to early 19th century.

2.2 Specific conclusions

The combined archaeological and pollen analytical evidence allow a number of ±reliable conclusions to be made regarding land usage of specific areas and/or structures on the Study Site. In chronological order these are (**Casey & Lowe** numbers for key samples in parentheses):

- <u>Pre-1788</u> (includes Natural Landscape and Aboriginal Occupation)

1. The pre-European settlement vegetation on the Study Site was savanna grassland. These grasslands included eucalypts but locally these trees were uncommon compared to she-oaks (casuarinas), which appear to have been confined to poorly drained areas such as the shallow gully/creek line crossing Lot 28 (cf. Benson & Howell 1990, Casey 2009). Sclerophyll shrubs were rare but included a banksia, native heath, native hops, ti-tree and wattles; ferns grew on damp soils along the creek line [**R. Lawrie Samples/Sites 1**, **2**].

2. Essentially the same vegetation-type is recorded by miospores recovered from the hoe marks and topsoil used to infill the creek line on Lot 28, and also from early-late 19th century samples such as ponds, occupation deposits and plough lines, all of which appear to incorporate sub- or top soil material dating to the 1790s or earlier [compare **Casey & Lowe Samples 155**, **218**, **230**, **236**, **254**, **320**, **335**, **344**].

3. The same fossil pollen data confirm the Study Site (like the Parramatta CBD in general) was poorly-drained (see Figs. 3-4, Lawrie 1982).

- <u>1788-90s</u> (Government Farming: clearing and agriculture)

1. It is probable that a belt of clay-rich alluvium crossing the area was the reason why the site was reserved for the cultivation of crops by 1791 (see Figs. 4-5).

2. Clearing (by convicts) of the native vegetation resulted in a ubiquitous expansion of hornworts and agricultural weeds across burnt areas and areas of damp mineral soils. Crops planted on Lot 28 were cereals although *in situ* pollen evidence on the Study Site is sparse or equivocal [compare **Casey & Lowe Samples 218**, **230 (R. Lawrie Sample 2**?**)**, **320**, **335**, **362**,].

3. Vacant land was used as de facto latrines, although human sewage and? ferns appear to have been used as fertilizer in ploughed areas into the 1830s [cf. **Casey & Lowe Samples 218**, **335**, **344**].

- <u>1790s-c 1822</u> [Land modification and early usages]

    1. Few if any major changes in the local landscape are recorded by fossil pollen between the 1790s, when parts of the Site were under cultivation, and 1810/1822 when the first dwelling (House 4) was built on Lot 30 [**Casey & Lowe Sample 236**, **365/R. Lawrie 2**].

    2. The sandy loam used to level the site of House 4 is suggested to have come from the creek line [**Casey & Lowe Sample 236**].

- <u>c.1822-1884</u> [Agricultural Construction, cottage occupation then demolition (Lot 30) or construction phases (Lot 32)].

1. Archaeological evidence indicates sediments preserved in built structures such as drains and a pond are likely to be 'mixed age' (see Table 1 above): The creek line was 'channelized' by wooden palings, before being infilled by soil when the Town Drain was built across Lot 28 about 1840 in order to drain the area to the southwest, e.g., **Casey & Lowe Sample 254**.

2. It is possible that she-oaks were still growing on the site after c. 1822 or (preferred) casuarinas replanted by the European occupants.

    Otherwise the ground within the domestic curtilages of House 4 and the *White Horse Inn* outbuildings was disturbed (grazed) and waste land infested by weeds such as dandelions, knotweed and naturalized cereal grasses [**Casey & Lowe Samples 37**, **49**, **55**, **188**].

3. The pond dating to before 1858 in Area D on Lot 1 (181), appears to have started life as a cesspit or was dug into the site of a former cesspit [**Casey & Lowe Sample 323**].

4. The large 'cut' [CTX 17228] underlying a brick sump [CTX 16187] on Lot 30 initially was part of a drainage system but subsequently became used for the disposal of domestic waste and food scraps [**Casey & Lowe Sample 188**].

    The disposal of this domestic waste, such as salty water, resulted in soils around House 4 becoming salinized and allowed samphires (chenopods) to spread across the allotments [**Casey & Lowe Samples 19**, **49**, **110**, **128**, **182**].

5. There is some (equivocal) evidence for gardening activities on Lot 28 and/or Lot 30 [**Casey & Lowe Samples 182**, **269**, **320**].

6. Even if not initially dug for this purpose, the 'large rectangular pit [CTX 16931] on Lot 32 was used for the disposal of human sewage and probably fat or an oil, i.e., not for 'storage or industrial purposes'. However, the pit may have been attached to a building used for other activities, e.g., a kitchen, workshop or stables [**Casey & Lowe Sample 128**].

   The 'sewage' context makes it probable that the high cereal count (up to 16%) in the infill comes from coarse breads rather than crops or stock feed.

7. The 'occupation deposit' from Square AF16 Spit 1 on Lot 30 ('a later phase occupation of House 4 preserved low numbers of the sewage indicator (*Cloacasporites*) and may have been deposited close to or within a cesspit (**Casey & Lowe Sample 164**).

8. Sediments infilling box drains [CTXs 16608, 16563] indicate land surrounding the *White Horse Inn* was poorly drained: Built structures upslope of drain CTX 16608 included stables. The brick or stone work was sufficiently damp to be colonized by ferns and hornworts (**Casey & Lowe Samples 37**, **49**).

9. The low diversity of miospores recovered from one of the occupation deposits associated with c.1822 House 4 (CTX 16245) suggests the deposit was sealed against additional pollen and spore influx during from the 1880s into the 20th century (**Casey & Lowe 155**).

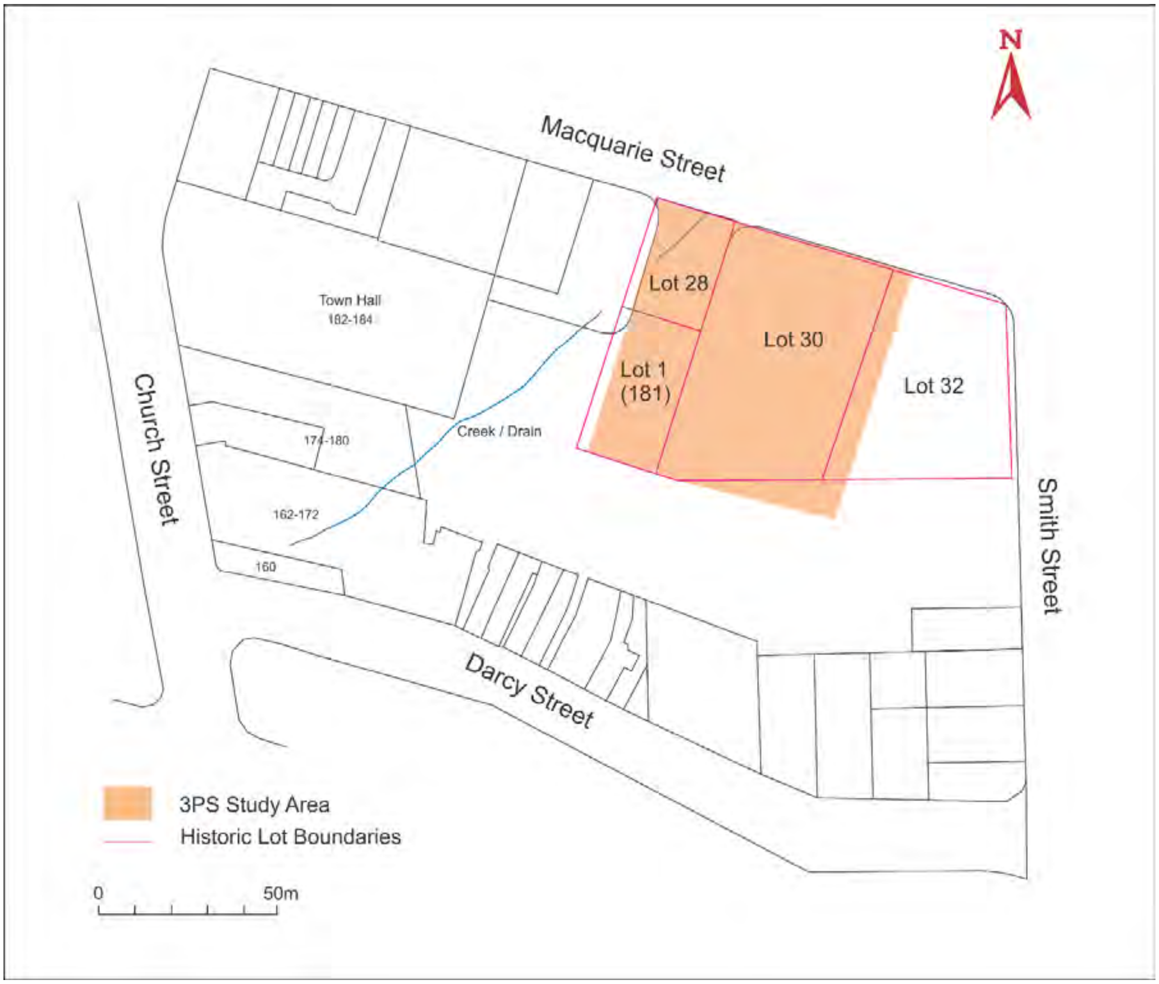
<u>1884-1960s</u> [Construction and occupation, then demolition of (i) *Wyverne* then Plaster Works (Lot 28 & 1 (181) and (ii) *Cranbrook, Harleyville* and *Northiam* (Lot 30)]

1. Sludge recovered from the Town Drain provides a snap-shot of a diverse range of mostly exotic plants growing 'updrain' of Lot 28 between the time the Town Drain was built in 1840 and 1884 when cesspits were constructed for the use of the residents of *Northiam* and *Harleyville*. Other deposits associated with *Northiam* and *Harleyville* on Lot 30 and *Cranbrook* on Lot 30 <u>primarily</u> appear to pre-the construction of these terrace houses [**Casey & Lowe Sample 269**].

2. Pebbly sand and mud at the base of cesspit CTX 16915 in Area B on Lot 30 lacks evidence of human sewage and appears to be soil used to infill the cesspit <u>after</u> this facility had ceased to be used by the residents in *Northiam* [**Casey & Lowe Sample 110**].

3. The 'mixed' microflora recovered from the modified topsoil (**Casey & Lowe Sample 55**) suggests this *Comber* test trench in Area B on Lot 30) was excavated in a place where oil/fat human sewage had been discarded before *Cranbrook*, *Northiam* or *Harleyville* were occupied.

Fig. 3: Historic lots Lot 28, Lot 1 (181), Lot 30 and Lot 32 (outlined in pink) shown with the 3PS study area shaded over the street plan. The blue line marks the infilled creek line/Town Drain.



3. SETTING

The Indigenous and Colonial history of Parramatta has been shaped by its location on the upper reaches of the Parramatta River, here a shallow river valley incised into Triassic bedrock. This valley became drowned following the rise in global sea levels during the Post-glacial period (c. 13 ka to Present): Since then, the river has been the main tributary flowing into Sydney Harbour. The c. 252 km^2 catchment of the Parramatta River drains an area extending from Castle Hill to the northwest and Greystanes to the southwest of Parramatta. The river changes from a freshwater stream whose flow has been controlled by weirs since the early 1800s, to a tide-dominated saltwater river downstream of present-day Charles Street. Triassic bedrock outcrops above this weir but elsewhere bedrock occurs at about 4-5 metres below the present-day landsurface.

3.1 **Background**

Landforms: The Colonial township (now metropolis) of Parramatta is built above flood level on flights of Pleistocene alluvial terraces. These terraces, which reach a height of c. 5 to over 10 m elevation above present-day river level, were formed during periods when global sea levels were similar to, or higher than at present (see Lewis et al. 2013). Any remnant fluvial landforms on the Pleistocene terraces are highly subdued while river terraces formed during the last c. 6000 years (mid Holocene to Present) occur up to 2 m elevation along both sides of the river (Lawrie 1982, 2006).

Soils: Soils developed on Pleistocene alluvium and Triassic lithologies in the Parramatta district are correlated with the Pleistocene Terrace Sands and Blacktown Soil Landscape, respectively (Fig. 4 & 5). Locally, these comprise fine quartz sands or red earths, whose profiles are mottled due to prolonged weathering. Insect burrows can reach depths of 35-60 cm below the present-day surface.

Vegetation: The urgent need to ensure a reliable food supply for Sydney during the 1790s 'famines' resulted in only cursory documentation of the native vegetation at the time the Pleistocene terraces at Parramatta were cleared for agriculture. For this reason, Benson & Howell (1990) have used remnant native vegetation to propose that the higher (Pleistocene) terraces were covered by woodlands dominated by grey box (*Eucalyptus moluccana*) and forest red gum (*E. tereticormis*) with an open grass understorey, whilst the lower (Holocene) terraces were colonized by the common reed (*Phragmites communis*), paperbarks (*Melaleuca linariifolia*) and/or rough-barked native apple (*Angophora floribunda*) depending on soil drainage.

How closely these 'remnant' communities mirror the pre-1790s vegetation is unclear since they will have developed under a markedly different fire regime to those prevailing before European settlement. A stand that may have regenerated following the changed fire regime is the 'grove of mimosa or acacia trees' (*Acacia*) recorded by an early Parramatta settler [George Suttor (1774-1859)] growing 'near [the] parsonage house in Church Street' about 1800.

Mangroves (*Avicennia marina*) are assumed to have colonized the river banks up to the tidal limit in 1790. As far as is known, early Colonial documents do not record she-oaks (casuarinas) such as the black she-oak (*Allocasuarina littoralis)*, river-oak (*Casuarina cunninghamiana*) or saltwater tolerant swamp-oak (*C. glauca*) that grew at Parramatta in the late 18^{th}/early 19^{th} century.

This 'negative' evidence is in stark contrast to the abundance of fossil *Allocasuarina/Casuarina* pollen recorded on many historical archaeological sites in Parramatta (see Macphail 2015, Macphail & Casey 2008). The combined data help point to the landscape being cleared for crops by convicts was a savanna grassland with scatted eucalypts (*Eucalyptus* sensu lato); sclerophyll shrubs (rare) and she-oaks (*Allocasuarina/Casuarina* spp.) lined local creek lines on the Pleistocene terraces and probably the sides of the river valley upstream of the tidal limit (cf. Macphail 2015).

Fig. 4: Soil types underlying Parramatta from excavated sites across the area. A low interfluve separates the Parramatta River and the area to the south drained by Clay Cliffs Creek. The location of the study area is arrowed in blue.

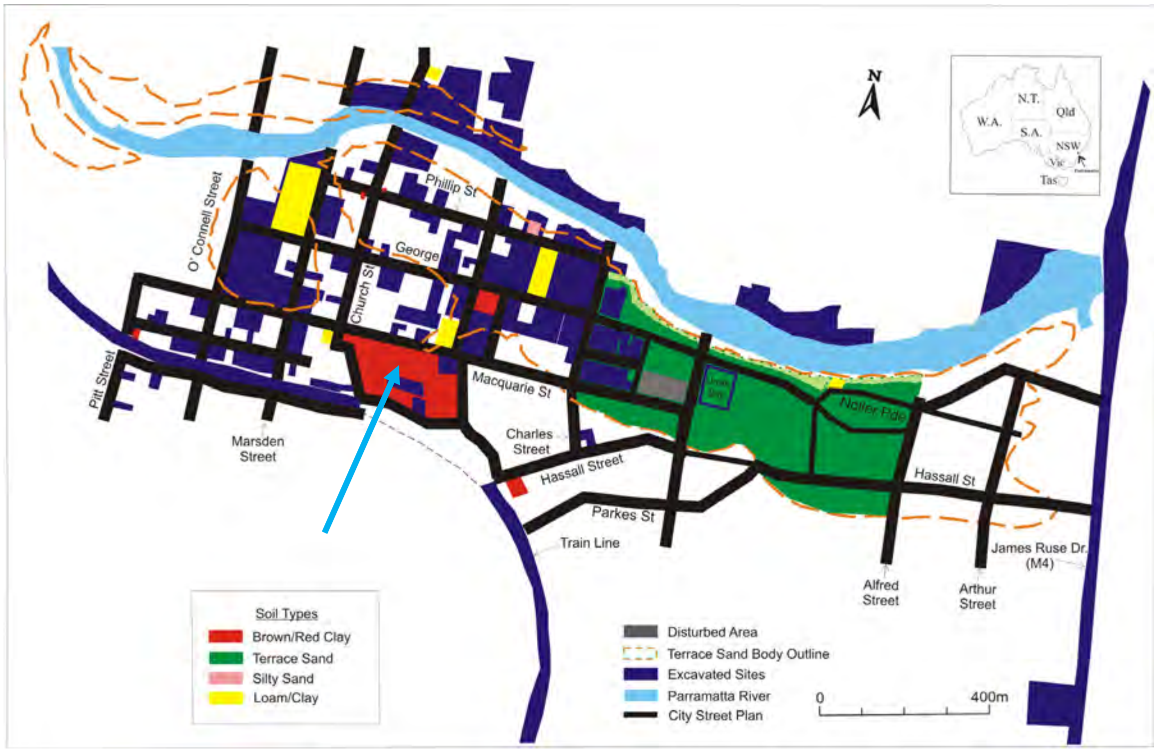


Fig. 5: Map of Parramatta showing relict fluvial landforms preserved on the Pleistocene river terraces. The location of the Study Site is marked by the red rectangle. The 'old drain' (solid line) is part of the Town Drain, used to divert water from poorly-drained areas into the Parramatta River (from Lawrie 1982 with Casey & Lowe additions in blue based on excavation results).

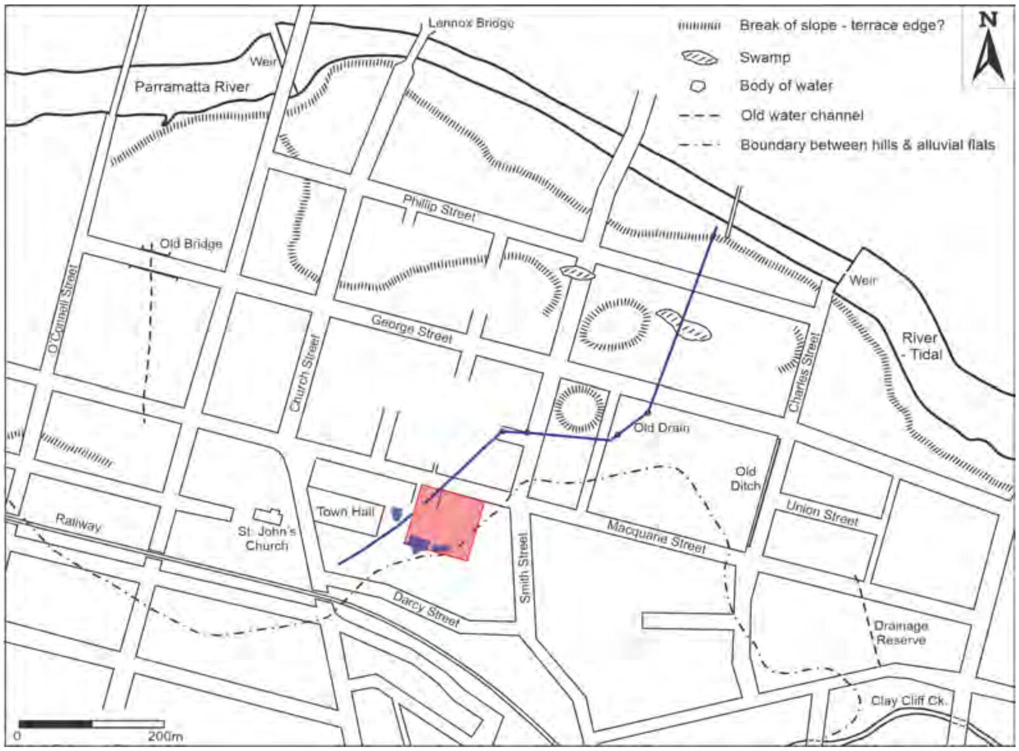
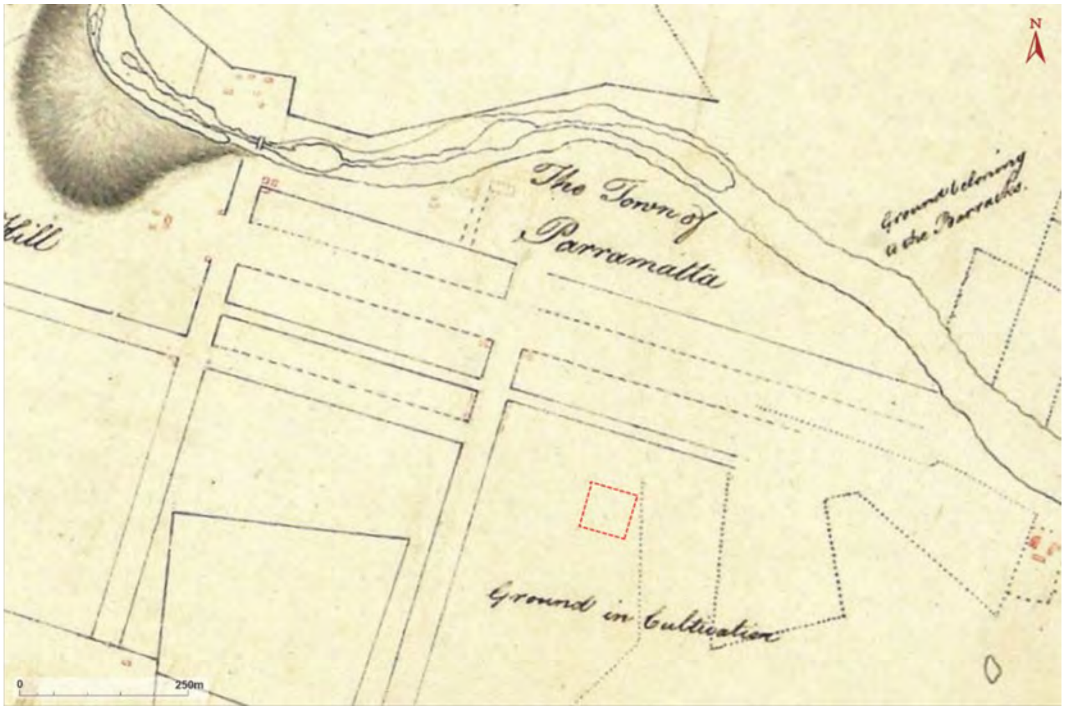


Fig. 6: Map of Parramatta c.1791 [CO 700NSW 3, UK Archives] showing the location of 3 Parramatta Square. Macquarie Street has not yet been aligned. The Study Site is just to the north of 'ground in cultivation'.



3.2 Cultural setting

Indigenous landscape: The upper Parramatta River valley has been occupied for millennia by Indigenous peoples who used the river as an important food resource and place for trade. For the same reason, the 'eucalypt woodland with grassy understory' argued by Benson & Howell (1990) to have been encountered by Europeans between 1788 and 1790 is likely to be the result of millennia of skillful burning (cf. Egan 1999). Many Colonial archaeological sites Parramatta have had 'ongoing but complex associations' with the Indigenous residents into the 1820s (D. Steele pers. comm.). The 'link to country' continued into the 1830s due to the Market Place west to the Study Site also being reserved as a Meeting Place for Aborigines and the British from c. 1814.

Colonial landscape: Convict clearing of the Pleistocene alluvial terraces for crops began in early 1789 for agriculture and once this ceased a town grid was laid out with a high street (modern George Street) linking the vice regal residence on Rose Hill (above the Crescent) about 0.7 km to the northwest of the Study Site, to the Landing Place (later Queens Wharf) on the Parramatta River about 1 km to the east of the Study Site. Macquarie Street (initially named South Street) was developed in stages between c. 1804 (western end) and 1814.

The area being redeveloped as Parramatta Square was set aside as 'ground in cultivation' and land 'reserved for Fairs' for (Figs. 6, 14) by 1814. During the 19th centuries the penal settlement has evolved from an early centre of agriculture, into a small rural town, then into a metropolis within Greater Sydney (see Jarvis 1961, Kass et al. 1996).

Drainage: The evolution of early Colonial Parramatta was shaped as much by poor drainage as by socio-economic imperatives due to the irregular topography. For example, detailed analysis of the pre-1790s landscape by the NSW Department of Agriculture confirms the inadequate drainage of stormwater from both low-lying and higher areas in early Colonial Parramatta despite much of the area being above 5-8 m AHD (Higginbotham 1983).

These natural water courses, whether or not converted into channels, rapidly became ineffective for the disposal of stormwater and human waste: Some were replaced by covered brick and stone-lined drains such as the Town Drain, built in c.1840 (see Fig. 7 below). Ponding of rainwater in gullies and depressions continued to cause problems into the late 19th century.

For example, Higginbotham (ibid: 34) argues run-off from the 'hills' to the south of Parramatta township between Church and Smith-Station Streets will have had to 'percolate' down a shallow gully across Macquarie Street, and in 1862, 'much sickness' prevailing in the same area was attributed to the collection of filth and a pool of stagnant water in the animal Pound located behind the Market Place.

The Market Place, now occupied by the Town Hall (constructed 1879-1883), is located next to the former site of a 'pond'. An early Colonial resident, Sam Garlick, recalled in 1870 that 'a creek running through [the] paddock to the back of the [Leigh Memorial] Methodist Church …became flooded [during heavy rains] and Church Street was impassable except by wading' (http://arc.parracity.nsw.gov.au/blog/2016/05/06/parramatta-square-in-the-1870s-sam-crouch-reminisences). The creek referred to is part of the creek line excavated on Lots 28 (see below) and 5 Parramatta Square, which was replaced by the Town Drain (Fig. 7), and presumably also is the 'shallow' gully noted by Higginbotham (1983).

3.3 Study Site

The Study Site is bounded by Macquarie Street to the north, the new Parramatta Square south to the south, the University of Western Sydney City Campus to the east, and the Mission building attached to the Leigh Memorial Church to the west. The Site slopes 'dramatically' from c. 9m m AHD at the southeastern corner northwest towards the unnamed 'creek line' whose path cut across former Civic Place (see Fig. 8 A. Dusting pers. comm.). Clay-rich alluvium deposited along the creek line almost certainly influenced the use of Lot 181 for cultivation in the 1830s.

Part of four historic allotments occur on the Site: (i) Lot 30 formerly occupied by the Australia Post Office Building forms most of the study area, (ii) Lot 28 redeveloped as Leigh Place in the late 20th century (iii) Lot 1/181 to the south of Lot 28 and (iv) Lot 32, only the western strip is within the study area while most of it is now part of the University of Western Sydney's City Campus (Fig. 10). Early Colonial period constructions whose remains were uncovered on the Study Site comprise:

- The footprint of an early 19th century timber cottage built by 1822 on Lot 30, House 4.
- Land use associated with the 1830s-40s on Lot 1 (181) included areas of cultivated land (Frontispiece).
- Amenities associated with use from c.1822-c.1888 cottage (House 4) included a rear yard, and a brick-lined well, a sump to drain water and waste into the Town Drain and two ponds dug at the southern end of Lot 30 and Lot 1 (181).
- The foundations and ancillary facilities such as cesspits, and outbuildings of the three 1880s brick houses, *Cranbrook*, *Harleyville* and *Northiam*, fronting onto Macquarie Street on Lot 30.
- Outbuildings (interpreted as stables) built by 1858 and a brick drainage system associated with an inn (*White Horse Inn*) built before 1833 on Lot 32.

Fig. 7: 1820s street plan showing the conduit (dotted line) used to drain water (and sewage) from higher (>5m AHD) areas into the Parramatta River (marked G) after c. 1820-1832. Areas with horizontal wavy-lines are below 5m AHD. The Study Site occurs between sites labelled C (Lancer Barracks) and B (Market Place). F marks the remnants of a Pleistocene 'high' river terrace blocking drainage to the Parramatta River (from Higginbotham 1983).

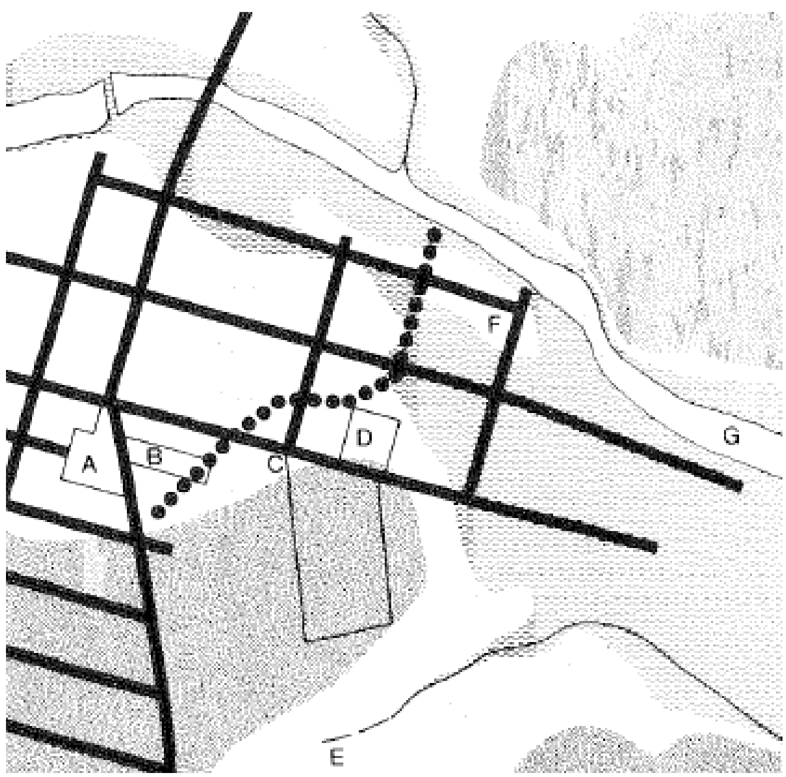


Fig. 8: Contour plan of 3PS showing the location of the Town Drain and slope from the southeast corner down to the drain in the northwest. (ArcSurv).

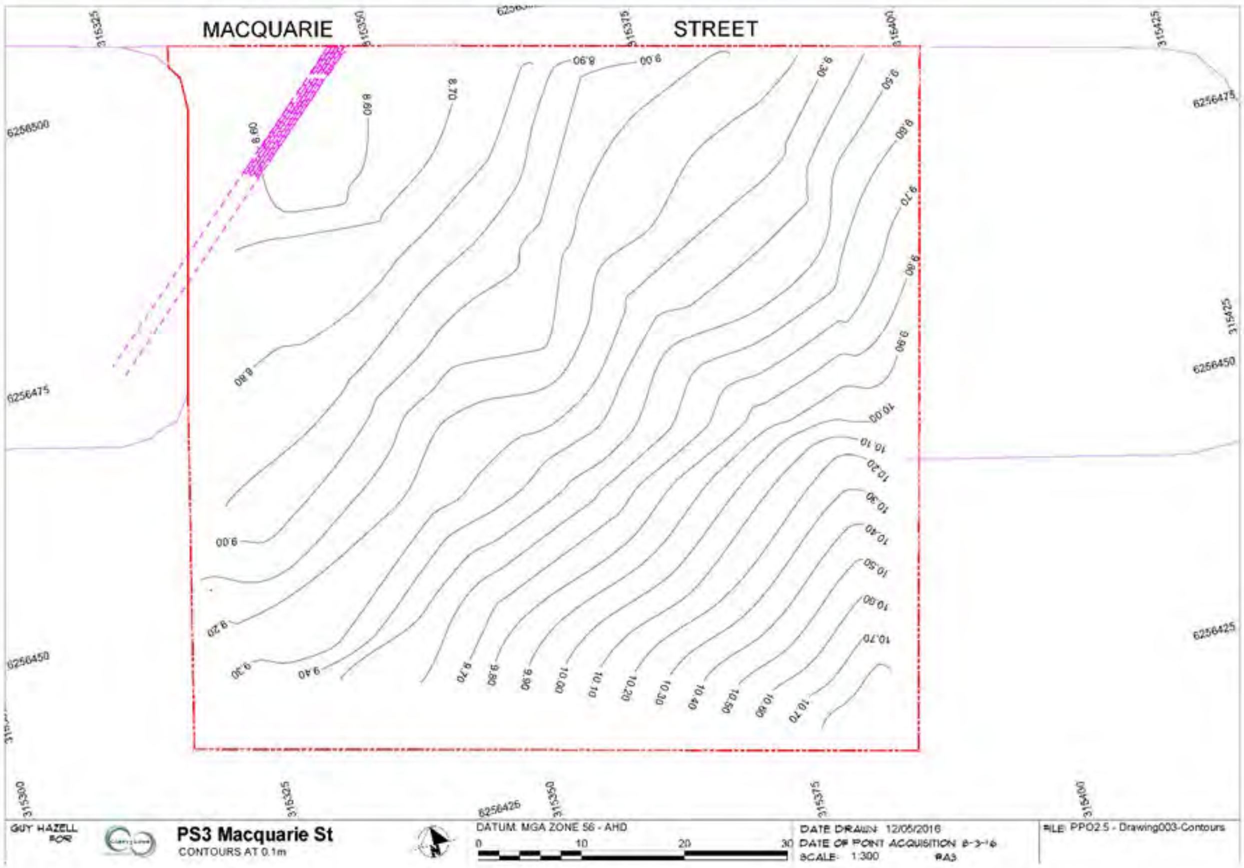
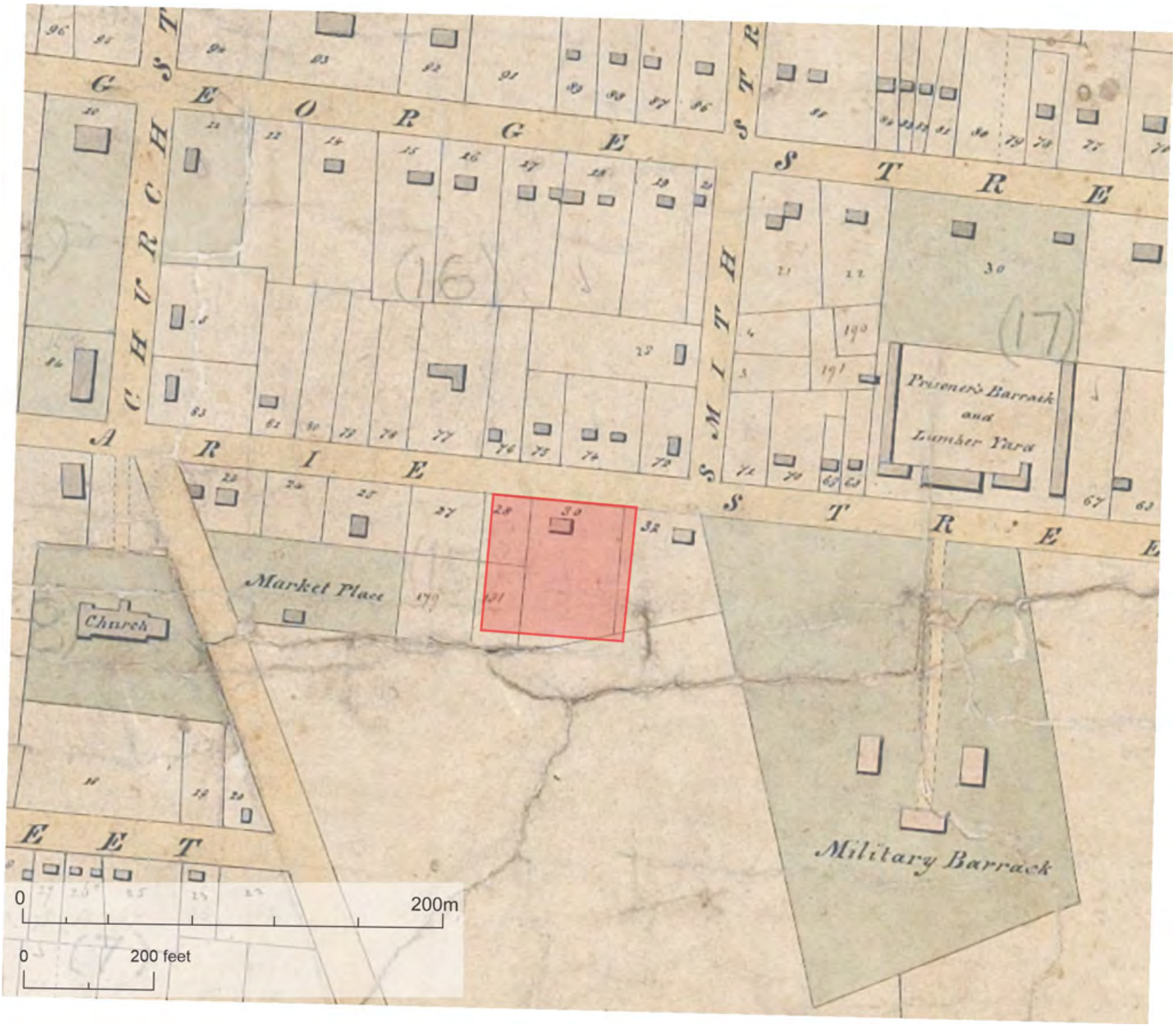


Fig. 9: Diagram of the Study Site showing House 4 on Lot 30 in 1823. The area reserved for markets and the Pound is within Lots 28 and 30. Lot 32 abuts onto land formerly occupied by Military Barracks, and now fronting onto Smith Street (from Casey & Lowe 2019, after Stewart 1823, ML, SLNSW)



3.4 **Site history**

Casey & Lowe (2019) present a time line of significant developments influencing the Study Site: Key points include:

1790-1804: The area encompassing the Study Site is vacant land reserved for 'cultivation' (Fig. 7). Other areas demarcated on the 1791 map are a mix of grant boundaries and fenced edges to cultivation. To the south of the Study Site is a large grant to William D'Arcy Wentworth

1813: The first of the biannual fairs instituted by Governor Macquarie is held on land reserved for a *Market Place*. This area fronting Macquarie Street covered c. 1/3 ha (3 acres) (see Figs 9-10). Markets are recorded as being held on this site (now occupied by the *Parramatta Town Hall*) as early as 1792.

1811-1814: Infrastructure built during the period of Lachlan Macquarie's governorship of NSW includes the 'regularization' of previous roads into their current alignments. This involved renaming the main E-W road (High Street) as George Street and planning additional (N-S) cross roads such as O'Connell and Smith Streets. A directive is given that no further (permissive) leases were to be issued without formal permission or dwellings erected without a magistrate's approval. One consequence is the eastward extension and subdivision of formal allotments along Macquarie Street (Figs. 7). The public *Market Place* (1813) is dedicated, with store for Grain and Pens for Cattle (*Pound*?), on an adjoining site within Parramatta Square. Governor Macquarie issues an open invitation to local Aborigines and European residents to come to the Market Place where a free dinner ('feast') would be offered (City of Parramatta Research Services June 2015). These functions were well-attended and held annually into the 1830s although by this time the 'feasting site' had been relocated to vacant ground further to the west along Macquarie Street (see below).

1822-1823: The 1823 map shows one building on Lot 30 (House 4) and several more on the site of the *Military Barracks* (Fig. 9). This 1823 plan shows the Study Site had been subdivided into four discrete allotments with buildings on Lot 30 and the eastern side of Lot 32 (cf. Fig. 9). Lot 30 is recorded as being leased to one John Thorn on 30 June 1823 and it is likely (Casey & Lowe 2016: 23) that he was responsible for the construction of the timber cottage whose excavated remains (House 4) date back to c. 1822.

1833: A building, possibly the *White Horse Inn*, is constructed on the western side of Lot 32 by 1832. The publican's license for this inn is renewed (to Edward Lakeman) in 1833 (the building appears on Brownrigg's Map of 1844).

1835: The last Annual Feast is held on the *Market Place*.

c. 1840: The *Town Drain* is built within the creek line crossing Lot 28. Split slabs tied together and embedded into the clay soil formed, on the western side of the creek, a barrier to limit flow westwards from the creek. The dating of a formal drain to c.1840 is based on historical information.

1845: Lot 30 is conveyed to one George Cavill.

1851: The *White Horse Inn* is sold to coachman John Hilt.

1858: Extensions are built onto the c.1822 timber cottage on Lot 30 and a pond dug or occupying a depression at the rear of this allotment. Large buildings shown at the rear of Lot 32 are inferred to be stables attached to Hilt's Coaching Service.

1860: George Cavill sells Lot 30 to John Holland, innkeeper and licensee of the *Star Inn* (a hotel which began trading in 1843 at 143 Church Street (8 PS). A sandstock brick sump connected to a timber-lined drainage channel indicates the occupants of Lot 30 were using the *Town Drain* (and presumably the creek line prior to c. 1840) as a sewer as well as a stormwater drain by this time.

1874: Lot 30 is left to Harriet Holland, wife of John Holland.

1884: Two-storey brick terraces (*Northiam* and *Harleyville*) on the eastern side of Lot 30.

1884-1888: John Thorn's timber cottage is demolished in 1884 and replaced by *Cranbrook* a ‘villa’ in 1888 (Fig. 11). Associated facilities included outbuildings and brick-lined cesspits. A pair of semi-detached houses are built on the eastern part of Lot 30 by 1884.

1890s: The *Leigh Memorial Church* is built on the site of an earlier church on Lot 27. Crown land behind the *Town Hall* continues to be 'undeveloped'. The 'best use' of this land and the site of the old *Pound* remained a matter for discussion into the 1930s.

1920s: A fibrous plaster manufacturing workshop is in operation on Lot 1 (demolished by 1955/1956).

1936: The Rev J. Somerville, Minister of the *Leigh Memorial Church*, reports that a drain [Town Drain?] on the old Pound site is in a very bad state of repair and in danger of whole sections collapsing.

1960s: All extant houses on Lot 30 are demolished; the *Post Office Building* erected on Lot 30 and Lot 28 was redeveloped as road access into the newly constructed *Civic Place* and former library carpark.

Fig. 10: Detail of 'Plan of the Township of Parramatta in New South Wales 1814', showing the study area dashed in red. The annotation shows that the site was reserved space for the fairs with the market place to the west on Church Street (SLNSW M2 811.1301/1814/1).

Fig. 11 Annotated plan showing the palimpsest of archaeological remains on the Study Site, e.g. the foundations of *Northiam*, *Harleyville*, and *Cranbrook*, the footprint of John Thorn's timber cottage ('House 4'), and other archaeological contexts such as the plough lines and Town Drain in Excavation Areas A to D and the

4. PALYNOLOGY

4.1 Age control

Revised (2019) inferred ages for the sampled archaeological sections are given in Table 1. These primarily are based on the archaeological evidence and secondarily on the palynological data. The latter are centred on (1) the presence/absence and relative abundance of pollen of plants introduced into Australia by Europeans in 1788, e.g. cereal grasses (Cerelia), dandelions (Liguliflorae), plantain (*Plantago lanceolata*-type), knotweed (*Polygonum aviculare*), or after c. 1820s-1840s trees such as pines (*Pinus*) and (2) high relative pollen abundances of native trees unlikely to have been growing in central areas of Parramatta after the late 1780s-1790s unless retained or planted for shade or wind-breaks.

Dandelions are very widely naturalized and appear to have been so since 1788, probably from seed contaminating grain imported on the First Fleet (see Macphail 2013). Because part of the Study Site was cultivated in the 1790s, the absence of cereal (Cerelia) pollen in natural topsoils is considered to be reliable negative evidence that the soil predates c. 1789 (cf. Macphail 2015).

4.2 Organic yield

All samples yielded well-preserved to strongly humified plant detritus, including charcoal particles; yields of fossil miospores varied from negligible to abundant: In most instance the individual miospores and other microfossils are well-preserved. Non-pollen palynomorphs such as fungal spores, algal cysts and microfaunal remains such as the egg cases of unidentified burrowing insects are frequent to dominant in many samples. Their relative abundance appears to be useful as proxy data for bioturbation.

4.3 Contamination

Trace numbers of modern pollen (some retaining the cytoplasm) occurred in occasional samples.

4.4 Reworking

Trace numbers of spores and gymnosperm pollen derived from Triassic Ashfield Shale occurred in samples from Areas A and D only (Tables 3A, 3D).

4.5 Caveats

Pollen and spores

The taxonomic level to which a pollen or spore can be assigned to a particular plant (species, genus or family) varies. For example, few pollen morphotypes are unique to a particular species, group of species or genus. Examples are the samphires/saltbushes (Chenopodiaceae) and grass (Poaceae) families and genera comprising the she-oaks (*Allocasuarina*, *Casuarina*) and eucalypts (*Angophora*, *Eucalyptus*, *Corymbia*). Exceptions are the soft tree-fern *Dicksonia antarctica* and broom spurge *Amperea xiphoclada*.

Different plant taxa produce different amounts of pollen (angiosperms, gymnosperms) or spores (ferns, fern allies, liverworts) and disperse these by wind, water or animals over widely varying distances into the surrounding landscape (*representation*).

A few plants produce pollen or spores in astronomical numbers, which then are dispersed long distances away from the parent plants. These *well-represented* native species are mostly trees, especially members of the she-oak, eucalypt (*Eucalyptus* sensu lato) and samphire families as well as many non-cereal grasses (Poaceae). The category also includes a few native sclerophyll shrubs (*Amperea*, *Monotoca*), herbs (*Gonocarpus*) and tree-ferns (*Cyathea*, *Dicksonia*).

Introduced plants in the well-represented category include grasses, samphires, pines (Pinaceae) and (if present) deciduous trees such as oaks (*Quercus*) and elms (Ulmaceae) and possibly some introduced members of the daisy family (Asteraceae). For this reason, pine, casuarina and eucalypt pollen form the background pollen rain over Sydney. However even with palynologically well-represented plants there are exceptions. For example cereal pollen (Cerelia) are very poorly dispersed compared to other grasses, and most records on archaeological sites come from threshing, stock feed, naturalized plants, transported grain and sediments incorporating human sewage (from coarse breads).

The overwhelming majority of native and introduced trees, shrubs, herbs, ferns and fern allies either produce relatively few pollen or spores and/or disperse these ineffectively into the surrounding landscape (*under-represented* taxa). Accordingly even low relative pollen abundances of these plants usually indicate the parent plants were growing close to the site unless unusual conditions existed. Examples of the latter are pollen and spores derived from plants lining stream banks or in water (riparian and aquatic plants).

Miospore taxa whose interpretation can be 'complicated' on historical archaeological sites include:

Casuarina and eucalypt pollen: Particular caution is needed when interpreting microfloras dominated by casuarina (*Allocasuarina/Casuarina*) and eucalypts (*Eucalyptus* sensu lato) for three reasons.

- Pollen produced by the dominant tree species in dry sclerophyll forests in the Sydney region are identical to specimens produced by small tree and shrub species growing in heath, on rocky substrates and salt-influenced environments.
- All casuarina species produce pollen in astronomical numbers and these are dispersed by wind and water over long distances from the parent plants.
- Even though eucalypts are insect-pollinated, their pollen also are dispersed in significant numbers by wind and water.

Accordingly, these two pollen types can be abundant in the fossil record because the parent plants grew on the site, or appear to be abundant because (i) the local flora consisted of trees, shrubs and/or herbs that produce/disperse relatively few pollen, (ii) because the site was devoid of vegetation, as is the case for many late 1800s archaeological sites in inner Sydney (see Macphail 1999), or (iii) the pollen have been carried downstream by water from stands growing higher along the catchment. Tetrads or large pollen aggregates usually indicate the parent plant(s) grew on the site unless human intervention or floodwater is involved. For example, flowering branches may have been carried onto a site for use in domestic fires.

Chenopodiaceae pollen: Like casuarina, Chenopodiaceae pollen are widely dispersed from samphires and salt-bush communities growing in semi-arid regions of Australia. In Parramatta, other potential sources are saltmarsh communities on mudflats along the Parramatta River, samphires growing on salinized soils and disturbed ground, and (potentially) the edible species fat hen (*Chenopodium album*).

Poaceae pollen: Pollen produced by the cereal grasses (Cerelia) are significantly larger (>40 microns in diameter) than the pollen of native grasses (native Poaceae) and have an annulate pore that is strongly developed and usually 'large' relative to the pores on pollen of non-cereal species. However, many archaeological contexts preserve smaller (30-40 microns) Poaceae pollen with large pores, which may be immature cereal pollen or pollen of an unidentified introduced grass. These equivocal specimens are counted separately as 'Cerelia?'.

Edible plants: Apart from the cereal grasses, the commonly eaten vegetables are members of under-represented plant families that also include non-edible species producing very similar, if not identical pollen. Examples include the crucifer/cabbage (Brassicaceae) and umbellifer/carrot (Apiaceae) families.

Non-pollen palynomorphs

As well as fossil pollen and spores, the majority of archaeological contexts also preserve other plant and animal microfossils (non-pollen palynomorphs), some of which (empirical evidence) are associated with specific conditions:

- The egg cases of unidentified soil fauna. High relative abundances of these microfossils typically indicate a high level of biological activity and are a proxy for bioturbation.
- Fungal spores. High relative abundances of fungal spores typically are associated with significant amounts of decaying organic matter in soils and cultural deposits. These spores are highly resistant to natural oxidative processes and can survive long after the organic substrates on which the fungi were growing have been destroyed.
- One distinctive fungal spore morphotype (*Mediaverrunites*) appears to be associated with decayed

fats, oils and similar animal waste in Indigenous and Colonial 'cooking' contexts (see Macphail 2000, 2013, 2014). The sources of other commonly found fungal spores, including a cigar or torpedo-shaped morphotype are unknown.

- *Cloacasporites sydneyensis*. This formally described (Macphail et al. 2012) but enigmatic microfossil is strongly associated with human sewage on Colonial archaeological sites in Sydney but, as yet, has not been found in archaeological context predating European settlement.

Depositional environments

The context in which pollen and spores are deposited (and preserved in the longer-term) has a marked influence on the way the fossil assemblages (microfloras) are interpreted. A selection of these environmental indicators and acid-resistant plant microfossil extracts are illustrated in Plates 1 and 2.

For example, because of natural oxidative processes, the microfloras recovered from soil samples are likely to be biased towards robust pollen types and microfossils produced by the soil microfauna: Those recovered from ponds and drains will be biased towards plants growing on damp soils around the margins and/or on damp brick and stonework (see below): Some grains may have been long-distance transported or derived from the regional pollen rain if the pond is a large one or the area is effectively devegetated.

Freshwater: Indicators of freshwater environments and analogous damp to wet conditions on historical archaeological sites in the Sydney region include: (i) the freshwater alga *Botryococcus* (ii) water-ferns such as *Azolla*, which often covers the surface of stagnant or slowly-flowing water, (iii) hornworts (*Anthoceros*, *Phaeoceros*), and ferns, including several genera that naturally occur on the margins of rainforest but which also colonize on damp stone and brick work, e.g. the bats-wing fern (*Histiopteris incisa*), coral-ferns (Gleicheniaceae), kangaroo fern (*Microsorium*-type), maiden-hair fern (Adiantaceae) and the rainbow fern (*Calochlaena dubia*), and (iv) wetland fern allies and herbs such as the swamp selaginella (*Selaginella uliginosa*), sedges (Cyperaceae) and cord-rushes (Restionaceae).

Exceptions are the rough- (*Cyathea*) and soft- (*Dicksonia antarctica*) tree-ferns, whose spores are likely to have been long distance transported from planted specimens or (earliest Colonial period) by wind from wet forests to the south and west of Parramatta.

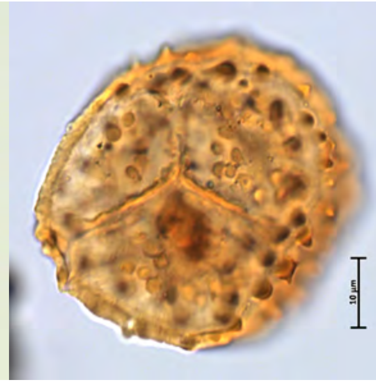
Saltwater: Indicators of saline conditions on historical archaeological sites typically are (i) dinocysts and dinoflagellates (Dinophyaceae) found in estuarine sediments and/or (ii) high relative abundances of pollen of salt-tolerant plants, chiefly samphires. Caution is need when inferring saline condition using dinocysts such as *Cobricoperidinium* since its ecological tolerances are unclear. Marine shells such as oysters are more likely to have been carried onto the site for food.

Plate 1: Plant and other microfossils used to infer past depositional environments (environmental indicators), vegetation and land usage

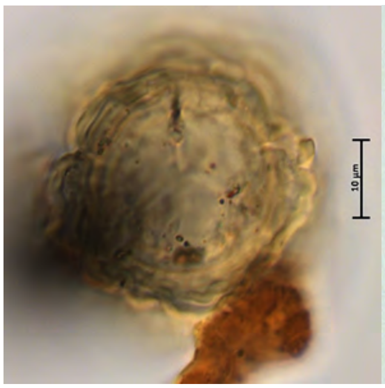
Botryococcus (infill in buried pond) — cf. *Maculatasporites* (infill in buried pond) — *Marsileaceae*? (topsoil-R. Lawrie 2)

dinocyst? (topsoil in *Comber* Trench)

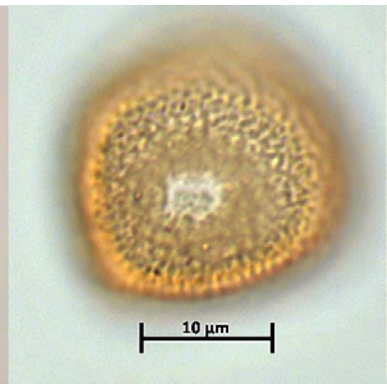
Anthoceros (original topsoil)



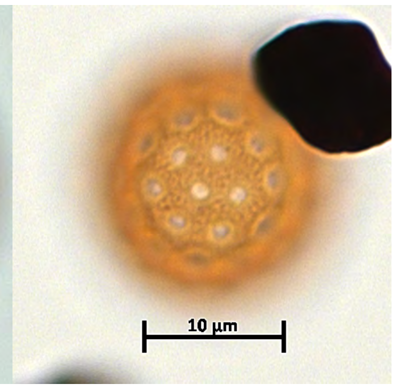
Phaeoceros (plough line F)



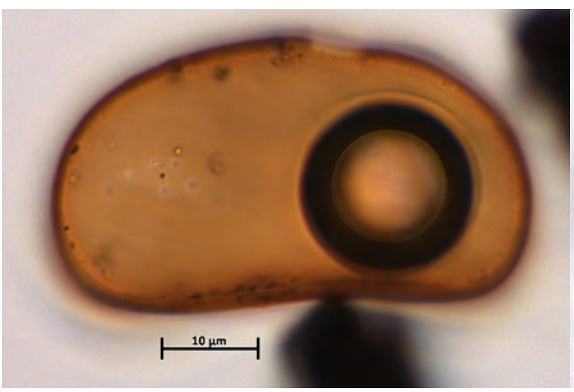
Selaginella uliginosa (occupation deposit)



Typha (infilled creek line)

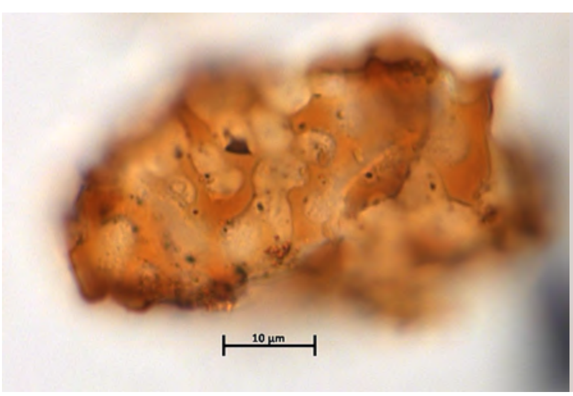


Chenopodiaceae (topsoil in *Comber* Trench)

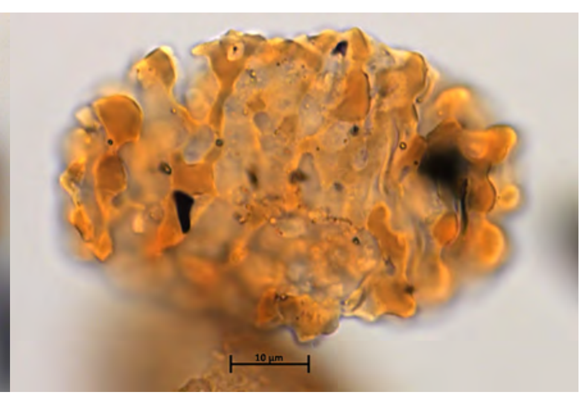


Asplenium-type (topsoil in *Comber* test trench)

Microsorium (lowest fill in box drain CTX 16608)

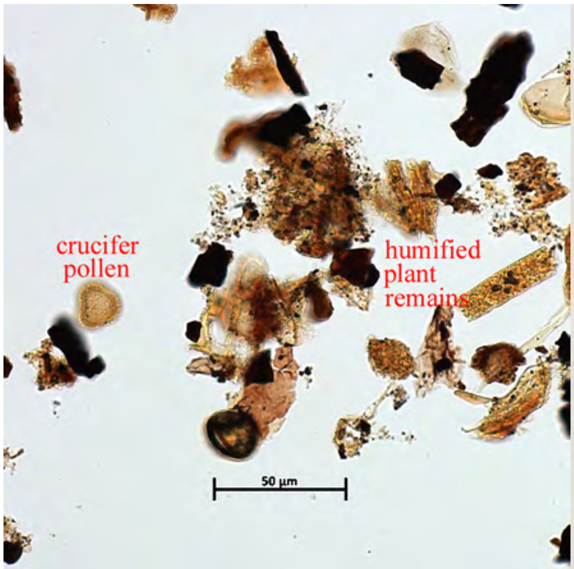


Cloacasporites (fill within brick/sandstone sump (CTX 16187)

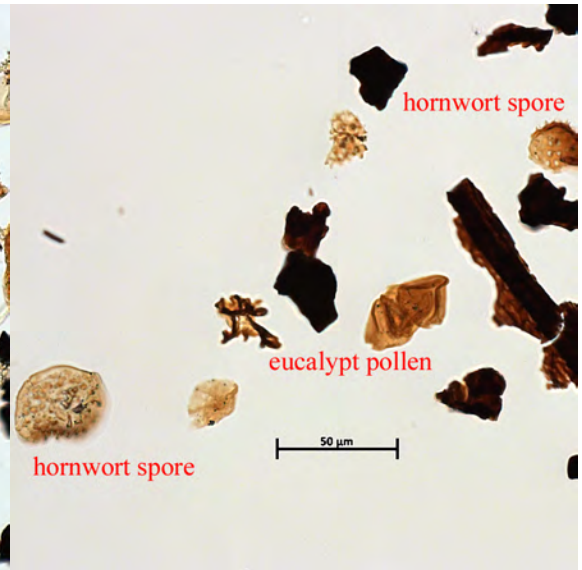


Cloacasporites (fill in large rectangular pit)

Plate 2: Acid resistant plant detritus and selected plant microfossils

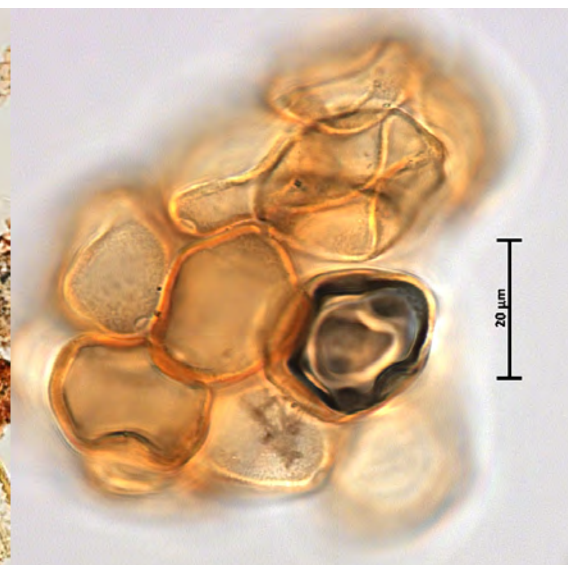


fill within brick/sandstone sump (CTX 16187)



infill in pond buried below the yard of John Thorn's cottage

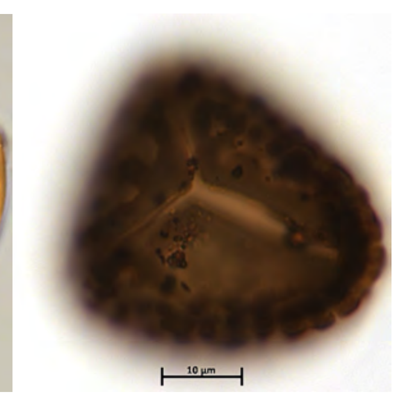
grey deposit in base of cess pit CTX 16915



she-oak pollen aggregate in box drain CTX 16563

leaf cuticle (*Comber* trench)

root microbial nodule (south verandah)



burnt fern spore (original topsoil)

5. INDIVIDUAL RESULTS

Except for **Sample 10**, the samples are listed in order of the Sample Number assigned by the author and, for each Excavation area, by the sample numbers assigned by Casey and Lowe, i.e. not by the date range.

The stratigraphic distributions of fossil miospores and other microfossils (including those representing soil microfauna) on excavated areas A to D on Lots 30, 28 and 32 are given in Tables 3A-D (see Fig. 11).

Estimates of relative abundance in these tables are expressed as a percentage of the total dryland pollen and spore count (*pollen sum*) for samples yielding over 100 identifiable specimens, excluding modern contaminants, hornwort and fungal spores and microfaunal remains. '+' indicates values less than 1%. For samples yielding less than 100 fossil pollen and spores, the data are given as raw counts (in parentheses).

Taxa with relative abundances greater than 30% are listed as 'abundant', relative abundances between 5-30% as 'common'; relative abundances between '1-5%' as frequent, and relative abundances less than 1% as 'rare'.

The botanical and cultural implications are discussed under 'Notes' for each sample and summarized in Section 2 (Executive Summary). A selection of plant and other microfossils are illustrated in Appendix 1.

Fig. 12: Overhead view of the excavated area including House 4: The outlines of the original cottage and verandahs (marked House 4 on Fig. 11) are shown in yellow and the later kitchen addition shown in red. The trapezoidal- and square features in the centre/centre-left of the photograph are footings of the demolished Post Office Building. North is at the top (from Casey & Lowe 2016)

5.1 **Lot 30 Area A [former site of Australia Post Building]**

Many of the samples submitted for pollen analysis from Area A are associated with House 4, built by John Thorn in 1822 but leased out and never resided in it by him. This timber dwelling was demolished by Harriet Holland in 1884. An overhead view of the footprint of this cottage is shown in Fig 12 (above).

Sample 1 (Casey & Lowe 19)

Context number: **16187** (sump) fill of sump (16189)_
Context: Fill within brick/sandstone sump found to the west of House 4, located on the western boundary of Lot 30. This sump aligns with a c. 1822-1850s timber-lined drain on Lot 28, heading towards the Town Drain.

Age range: 1850s-1880s

Abundant taxa: fungal spores, Chenopodiaceae
Common taxa: *Allocasuarina/Casuarina*, Brassicaceae, *Phaeoceros*
Frequent taxa: *Eucalyptus* and unassigned Myrtaceae, Liguliflorae, Cerelia, *Polygonum aviculare*, native Poaceae, *Gonocarpus*, Liliaceae, unassigned fern spores, *Anthoceros*
Exotics: *Pinus*, Asteraceae (high spine types), Liguliflorae, *Polygonum aviculare*, Cerelia
Edible taxa Cerelia (1%) (Apiaceae?, Brassicaceae?, Chenopodiaceae?)
Sewage: *Cloacasporites* (5%)
Microfauna: egg cases (3%)

Notes: The occurrence of pine (*Pinus*) pollen in trace numbers hints that **Sample 1** dates to 1850s-1860s rather the 1870s-1880s. By this time it is probable that the source of *Allocasuarina/Casuarina* pollen were she-oaks that been re-planted in the vicinity of the Study Site rather than the sump preserved sediment dating back to the 1790s. Hornwort (*Anthoceros*, *Phaeoceros*) and fern spores are likely to come from cryptogams growing on damp brick- and stonework within or near to the sump when this was in use. Rare taxa include reworked Paleozoic gymnosperm pollen.

The very high relative abundance of samphire pollen (48%) is more difficult to explain since the majority of grains are of a distinctive morphotype characterized by small sparsely distributed pores and which almost certainly represent the same species. Given the significant (19%) values of crucifer (Brassicaceae) and cereal (1%) pollen are associated with 5% *Cloacasporites*, equally plausible but not mutually exclusive explanations are (1) the source of the samphire pollen was an edible species, e.g. fat hen (*Chenopodium album*) or, preferred, that (2) soil around the sump was strongly salinized due to the disposal of salty water and other kitchen waste. A saltmarsh source is considered remotely possible given the presence of trace numbers of unidentified dinocyst-like microfossils. However, the reason(s) why sediment would need to be imported from the river flats below the Study Site in the 1850s-1880s is unclear.

Sample 2 (Casey & Lowe 182)

Context number: **16211**
Context: Sediment infilling a pond dug into or occupying a depression in natural subsoil in the rear southern yard of Houses 1 (*Cranbrook*?) and House 4 on the northwest corner of Lot 30.
Age range: 1836-1895

Abundant taxa: -
Common taxa: *Allocasuarina/Casuarina*, Chenopodiaceae, native Poaceae, *Phaeoceros*
Frequent taxa: unidentified species producing tricolporate pollen (19%), *Eucalyptus* (immature pollen aggregates), Liguliflorae, Brassicaceae, Cyperaceae, *Geranium*, *Gonocarpus*

Exotics:	*Cyathea*, Pinaceae, Amaryllidaceae, Asteraceae (sharp spine types), *Centaurea*-type, Cerelia, Liguliflorae, *Dianthus*-type, *Geranium*, *Plantago lanceolata*-type, *Polygonum aviculare* (2%), unassigned ferns producing monolete and trilete spores, *Anthoceros* (5%), '*Maculatasporites*'
Edible taxa	Cerelia (1%), *Cucumis*-type
Sewage:	*Cloacasporites* (trace)
Microfauna:	egg cases (1%), dental apparatus

Notes: Despite the different depositional environment, the microflora resembles **Sample 1** (above) in that casuarina and samphire pollen are common (20%, 19% respectively). In this instance, the common occurrence of grass (native Poaceae) pollen and the diversity of exotic weeds and other taxa point to the infill being soil derived from waste ground around the site. The evidence supports the interpretation of microflora in **Sample 1** that the brick/sandstone sump (CTX 16189) was infilled with salinized soil. Rare taxa include reworked Paleozoic spores.

An important difference between **Samples 1** and **2** is that the latter microflora also includes frequent numbers of pollen morphotypes that might represent garden plants. These include members of the amaryllis (Amaryllidaceae), boronia (Rutaceae-type) and carnation (*Dianthus*-type) families, a melon (*Cucumis*-type) and a geranium (*Geranium*). Whether these – like hornworts, ferns, sedges (Cyperaceae), the willow-herb (*Epilobium*), raspwort (*Gonocarpus*) and starwort (*Stellaria*) – were growing on damp soil around the pond or come from a mix of original topsoil and garden soil used to infill the pond is uncertain. The only aquatic cysts recorded are an enigmatic reticulate morphotype resembling the algal microfossil *Maculatasporites* and trace numbers of dinocyst-like microfossils (see Plate 1).

If this interpretation is accepted, the cereal pollen represents a naturalized species, probably established from spilled stock feed. An alternative source (human sewage) is unlikely given that *Cloacasporites* occurs in trace numbers only. Conversely, wattle pollen (*Acacia*) and traces numbers of broom spurge (*Amperea xiphoclada*) and native hops (*Dodonaea viscosa*-type) - and possibly casuarina pollen (20%) - are more likely to come from either remnants of the native bushland surviving on the site or subsoil pre-dating European settlement. Low numbers of immature eucalypt pollen aggregates (3%) could come from material carried onto the site for e.g. use in domestic fires or be evidence eucalypts were uncommon in the pre-1788 vegetation on the site.

Sample 3 (Casey & Lowe 218)

Context number:	**16120**
Context:	Sample from hoe marks cutting into the subsoil in the 'rear yard' of Lot 30, c.30m to the south of House 4. The hoe marks are inferred to be infilled with original (pre-1788) and/or modified (1790s) topsoil.'
Age range:	late 18th century
Abundant taxa:	fungal spores
Common taxa:	*Allocasuarina/Casuarina*
Frequent taxa:	*Phaeoceros*
Exotics:	Liguliflorae
Edible taxa	-
Sewage:	*Cloacasporites* (1 specimen)
Microfauna:	egg cases (17 specimens)

Notes: The yard concerned is attached to House 4 (whose remains underlie the foundations of *Cranbrook*) and potentially dates to the early period of cultivation on the site. The sample yielded abundant organic detritus but only low numbers of fossil miospores. The latter is wholly 'dominated' by fungal spores and casuarina pollen but includes significant numbers of hornwort spores and the egg cases of unidentified soil microfauna plus trace numbers of eucalypt and pollen and fern spores.

On the limited palynological data available (dandelion pollen), soil infilling the hoe marks most probably dates to the early 1790s land clearance/agriculture phase. *Cloacasporites* indicates the area was being used as a de facto latrine at this time. Nevertheless, it emphasized that similar sparse microfloras have been recovered under the drip line of early convict huts in Parramatta and also from disturbed ground dating to the late 19th century in the Sydney CBD (cf. **Sample 4**). Assuming a late 18th century age, then the pre-European settlement vegetation included tree or shrub species of casuarina lining the unnamed creek, possibly the black she-oak (*Allocasuarina littoralis)* or river oak (*Casuarina cunninghamiana*).

Sample 4 (Casey & Lowe 230)

Context number:	**16120**
Context:	Top soil in the rear yard of House 4 and was described as having been modified throughout the 19th century but might be the same buried topsoil as 'R. Lawrie Sample 2' (M. Casey pers. comm.)
Age range:	late 18th century, modified during 19th century

Abundant taxa:	fungal spores
Common taxa:	*Allocasuarina/Casuarina*
Frequent taxa:	*Phaeoceros*
Exotics:	*Polygonum aviculare*
Edible taxa	-
Sewage:	-
Microfauna:	egg cases (15 specimens)

Notes: Except that **Sample 4** preserves knotweed (*Polygonum aviculare*), not dandelion pollen, the sparse microflora recovered closely resembles that recovered from the hoe mark (**Sample 3**). For the same reason, the sample is inferred to represent soil dating to the 1790s clearance/agriculture phase, i.e. does not appear to have been substantially 'modified' during the 19th century

If correct (see Notes for **Sample 6**), the data support previous evidence that the woody vegetation growing along the creek line was dominated by she-oaks before c. 1790. The only other woody native plant represented by fossil miospores are a rice flower species (*Pimelea*) and the rough tree-fern *Cyathea*. Assuming the 18th century age is correct, these spores almost certainly have been long distance transported by wind from communities growing in wet gullies or the margins of rainforest to the south (Royal National Park) or west (Blue Mountains).

Sample 5 (Casey & Lowe 236)

Context number:	**16193**
Context:	'Modified' sandy loam used as levelling fill prior to the construction of House 4 in n c. 1822.
Age range:	pre-1822 (loam possibly as early as late 18th century)

Abundant taxa:	fungal spores
Common taxa:	*Allocasuarina/Casuarina*
Frequent taxa:	*Phaeoceros*
Exotics:	Liguliflorae
Edible taxa	-
Sewage:	-

Microfauna: egg cases (21 specimens)

Notes: The microflora closely resembles those recovered from **Samples 3** and **4** (above) and is inferred to be of the same age despite the sandy lithology. If the levelling fill was obtained locally, then it may have come from the nearby sand deposits from the east of Charles Street or the west from the Children's Court Site. The woody shrub flora included a member of the myrtacean subfamily Leptospermae, possibly ti-tree (*Leptospermum*).

Sample 6 (Casey & Lowe 155)

Context number: **16245**
Context: Late occupation deposit in House 4 Square AM16 Spit 1
Age range: 1850s-1880s (see Notes below)

Abundant taxa: -
Common taxa:
Frequent taxa: *Allocasuarina/Casuarina*, *Phaeoceros*
Exotics: *Liguliflorae*, *Polygonum aviculare*
Edible taxa -
Sewage: -
Microfauna: egg cases (17 specimens)

Notes: The 'mid-late 19th century' date is inconsistent with the composition of the sparse microflora in that it more closely resembles those recovered from **Sample 3** (archaeologically dated to the late 18th century) and **Sample 5** (pre-1822) as well as **Sample 4** (±late 18th). Alternative interpretations are:

- The occupation deposit incorporates 1790s or earlier topsoil but for some reason (e.g. was sealed under floor boards) did not accumulate more recently-sourced pollen and spores.
- The microflora mimics those from the 1790s due to the site being effectively devegetated since the 1850s.

The former (late 18th/early 19th century) date range is preferred based on a comparison of this microflora with microfloras recovered from **Sample 7** and **Sample 8** (see below) as well as by the presence of fossil pollen of an unidentified member of the protea family (Proteaceae). Oyster shell fragments are likely to be the remains of imported food, i.e. is not evidence the deposit includes sediment carried up from the Parramatta River.

Sample 7 (Casey & Lowe 164)

Context number: **16248**
Context: Late occupation deposit in House 4 Square AF16 Spit 1
Age range: 1850s-1880s

Abundant taxa: fungal spores, Chenopodiaceae, *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa: Liguliflorae, *Anthoceros*
Frequent taxa: *Polygonum aviculare*, Cyperaceae, native Poaceae, *Calochlaena*, *Mediaverrunites*, *Botryococcus*
Exotics: Cerelia, Liguliflorae, *Polygonum aviculare*
Edible taxa Cerelia
Sewage: *Cloacasporites* (1%)
Microfauna: egg cases (8%) dental plates and other insect parts (2%)

Notes: The deposit has been in a 'sealed space' since the 1850s. How the site was used before c. 1850 is unknown. A plausible interpretation, based on frequent (1%) *Cloacasporites*, and algal cysts (*Botryococcus*), is the deposit accumulated near to or within a cesspit associated with House 4.

Otherwise the microflora closely resembles those recovered from **Sample 1** (also archaeologically dated to the 1850s-1880s) and **Sample 2** (1836-1895) in that casuarina (33%) and samphire (44%) pollen are abundant and pollen of agricultural weeds such as dandelions (7%) and knotweeds (4%) are frequent. In this context, the sources are likely to be locally-planted trees (*Allocasuarina/Casuarina*) and weeds growing on salinized (Chenopodiaceae) or disturbed ground (Liguliflorae, *Polygonum aviculare*, *Stellaria*, native Poaceae, unidentified tricolporates). Damp brick- or stone work and soils were colonized by sedges (Cyperaceae), ferns such as the rainbow fern (*Calochlaena*), and abundant hornworts (*Anthoceros*, *Phaeoceros*).

Sample 8 (Casey & Lowe 254)

Context number: **16224**
Context: Original (natural) unmodified topsoil sealed below 300+ mm of sand below the south verandah on House 4
Age range: before 1789 to after 1822 (see Notes)

Abundant taxa: fungal spores, *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa: *Eucalyptus* and unassigned Myrtaceae, native Poaceae, *Anthoceros*
Frequent taxa: Liguliflorae, unidentified tricolporates
Exotics: Liguliflorae, unidentified tricolporates
Edible taxa -
Sewage: -
Microfauna: egg cases (18%)

Notes: It is difficult to reconcile the frequent occurrence of dandelion (5%), a trilete spore resembling those of bracken (*Pteridium*), and? unidentified tricolporate pollen types (1%) with a pre-1789 date for the unmodified (natural) topsoil unless exotic pollen continued to be transported into the soil profile, e.g. via rainwater dripping from the verandah of House 4, or burrowing insects. Support for this are (1) the high relative abundance of hornwort spores since these are frequent under the eaves of convict huts elsewhere in Parramatta (see Macphail & Casey 2008) and (2) abundant microfaunal egg cases implying the soil profile has been bioturbated even if this was not apparent at the time of sampling. For the same reasons, it is unclear whether the parent plants of *Acacia* (1%), *Eucalyptus* (8%) and *Allocasuarina/Casuarina* (66%) pollen were growing on the site before 1789 or after c. 1822 (cf. **Sample 9**).

Sample 9 (Casey & Lowe 188)

Context number: **16336**
Context: Silt with oyster shells infilling a large cut (CTX 17228) below the brick and sandstone sump associated with an earlier open drainage pit/sump of House 4.
Age range: c. 1822-1850s

Abundant taxa: algal cysts, fungal spores, *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa: *Eucalyptus*, *Anthoceros*
Frequent taxa: Liguliflorae, *Polygonum aviculare*, *Acacia*, Asteraceae (low spine types), Brassicaceae, Chenopodiaceae, *Gonocarpus*, Liliaceae, *Pteridium*, unassigned trilete fern spores,
Exotics: Liguliflorae, *Polygonum aviculare*, *Stellaria*, unidentified tricolpate and tricolporate pollen types
Edible taxa -

Sewage: *Cloacasporites* (trace)
Microfauna: egg cases (11%) and dental plates and other insect parts (1%)

Notes: The diverse microflora is difficult to date in that the dominant woody taxon (she-oaks) could be derived from the pre-European settlement vegetation or from trees planted in the mid-to late 19th century around House 4 (see Comment for **Sample 8**).

Abundant algal cysts hint that the 'cut' was water-logged at some time in the past and by extrapolation part of an early drainage system. Values of eucalypt (8%) and wattle (1%) are markedly higher, and the diversity of herbs typical of open and disturbed soils are lower, than in the sediments infilling the sump (cf. **Sample 1**). The disposal of domestic waste such as oyster shells and sewage at the time when the 'cut' was infilled almost certainly would have promoted colonization of the deposit by a diverse weed flora..

Sample 10 (Casey & Lowe 365/R. Lawrie Sample 2)

Context number: **16224**
Context: Sample taken at 58-60 cm depth from 'an original unmodified soil profile'
Age range: pre-1822

Abundant taxa: *Allocasuarina/Casuarina* (including pollen aggregates), *Phaeoceros*
Common taxa: native Poaceae, Anthoceros, fungal spores
Frequent taxa: Liguliflorae, Cyperaceae, *Calochlaena*, unidentified trilete fern spores,
Exotics: Cerelia, Liguliflorae, unidentified tricolporate
Edible taxa Cerelia
Cloacasporites: -
Microfauna: egg cases (1%)

Notes: Frequent dandelion and trace cereal pollen shows the 'original' topsoil either postdates 1788 or has included younger material. The former maximum age seems the most probable interpretation given that bioturbation appears to have been minimal. Abundant hornworts spores associated with sedge pollen and fern spores are ecologically consistent with the sampled horizon having accumulated or developed *in situ* sometime between 1789 and the early 1790s after fire was used to clear the native vegetation on a damp site (see Macphail & Casey 2008). The same evidence supports previous data that she-oaks lining creek lines and, by extrapolation, that abundant samphire pollen found in **Samples 1**, **2** and **7** are a consequence of soil degradation following European settlement.

Table 3A: Relative abundance data of identifiable microfossils in Area A, Lot 30

Sample Number. (MKM)		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Sample Number (Casey & Lowe)		**19**	**182**	**218**	**230**	**236**	**155**	**164**	**254**	**188**	**Lawrie 2**
Context Number.		**16189**	**16211**	**16120**	**16120**	**16193**	**16245**	**16248**	**16224**	**16336**	**16224**
Depositional environment		**sump**	**pond**	**hoe**	**yard**	**fill**	**house**	**house**	**topsoil**	**fill**	**topsoil**
Definite & probable exotic taxa											
Pinaceae	pine	+	+								
Amaryllidaceae-type	amaryllis family		+								
Apiaceae	umbellifer family	+									
Asteraceae (high spine)	exotic daisy?	+									
Asteraceae (sharp spine)	thistle?		+								
Centaurea-type	thistle		+								
Cerelia	cereal grasses	1%	2%					+			+
Cucumis-type	melon		+								
Dianthus-type	carnation-type		+								
Liguliflorae	dandelion	4%	4%	(1)		(1)	(1)	7%	5%	4%	2%
Liliaceae (exotic)	*Lilium*?										
Plantago lanceolata-type	plantain		+								
Polygonum aviculare	knotweed	1%	2%		(1)		(1)	4%		2%	
Rutaceae-type	boronia family		1%								
Stellaria	starwort	+	2%					+		+	
tricolpate spp.	unknown		+							+	
tricolporate spp.	incl. Fabaceae, Solanaceae?	+	10%					+	1%	+	+
Non-local taxa											
Cyathea	rough tree-fern		+		(1)			+			+
Trees, shrubs											
Acacia	wattle	+	1%						1%	1%	+
Allocasuarina/*Casuarina*	casuarina	15%	20%	(77)	(73)	(24)	(12)	33%	66%	61%	68%
(casuarina pollen masses)	casuarina										1%
Amperea xiphoclada	broom spurge		+								
Dodonaea viscosa-type	native hops		+								+
Eucalyptus pollen monads	eucalypt	5%		(2)	(3)	(3)	(1)	+	8%	12%	
(eucalypt pollen masses)	immature eucalypt		3%						+	+	
Leptospermae	incl. ti-tree	+				(1)				+	
Pimelea	rice-flowers				(1)						
unassigned Myrtaceae	bottlebrush family	3%	+						5%		
unassigned Proteaceae	protea family						(1)				
Herbs											
Asteraceae (low spine)	daisy/daisy bush	+							+	1%	
Brassicaceae	crucifer family	10%	1%					+		2%	
Chenopodiaceae	samphire	48%	19%					44%		2%	+
Cyperaceae	sedge family		2%	(1)				1%			3%
Epilobium	willow herb		+								
Geranium	geranium		2%								
Gonocarpus	raspwort	1%	3%					+		1%	+
Liliaceae	lily family	1%								2%	+
Plantago	plantain	+								+	
Poaceae (<30μm)	native grass	2%	14%					1%	9%	2%	9%
Restionaceae	cord rush										+

Table 3A (cont.)

Sample Number. (MKM)		1	2	3	4	5	6	7	8	9	10
Sample Number (Casey & Lowe)		**19**	**182**	**218**	**230**	**236**	**155**	**164**	**254**	**188**	**Lawrie 2**
Context Number.		**16189**	**16211**	**16120**	**16120**	**16193**	**16245**	**16248**	**16224**	**16336**	**16224**
Depositional environment		**sump**	**pond**	**hoe**	**yard**	**fill**	**house**	**house**	**topsoil**	**fill**	**topsoil**
Ferns & fern allies											
Calochlaena	rainbow-fern		+			(1)		2%	+	+	2%
Gleichenia	coral fern		+								
Lindsaea-type	screw-fern	+	+							+	+
Lycopodium	club-moss	+	+								
Marsilea/Pilularia	water-fern	+									
Microsorium-type	kangaroo fern		+	(1)							
monolete ferns	numerous ferns		1%			(1)	(1)	+			+
Pteridium-type	bracken?								2%	2%	
Pteris	tender brake			(1)				+			
unassigned trilete ferns	incl. filmy ferns	2%	3%	(1)		(1)	(2)	2%	1%	4%	3%
POLLEN SUM		**265**	**298**	**84**	**78**	**32**	**19**	**241**	**152**	**186**	**396**
Hornworts											
Anthoceros	hornwort	1%	5%	(4)	(2)	(4)	(3)	10%	18%	8%	9%
Phaeoceros	hornwort	8%	14%	(15)	(11)	(27)	(11)	36%	69%	30%	74%
Fungal spores											
Diporisporites	-	3%	+				(1)				
Mediaverrunites	-	+		(1)	(1)	(1)		2%	+	+	
unassigned spores	-	85%	+	(165)	(260)	(335)	(285)	265%	525%	660%	7%
Freshwater algal cysts											
Botryococcus	Botryococcus							2%			
Chara (oogonia)	chara		+								
Debarya	Zygnemataceae	+		(1)	(3)				2%	+	3%
Maculatasporites	Prasinophyta		5%					+			
Zygnema	Zygnemataceae				(1)					+	+
unidentified algae	-		+						+	abund.	
Saline algal cysts											
Cobricoperidium	Dinophyaceae							+			
dinocyst-like microfossil	Dinophyaceae?	+	+							+	
Other microfossils											
Cloacasporites	[sewage indicator]	5%	+	(1)				1%		+	
dental plates/jaw apparatus	(microfauna)		+		(1)	(1)		+			
egg cases	(microfauna)	3%	1%	(17)	(15)	(21)		8%	18%	11%	1%
insect setae & body parts	(microfauna)							2%		1%	
Permo-Triassic spp.											
Protohaploxypinus spp.		+									
unassigned bisaccates			+								

5.2 Lot 30 Area B [former site of *Northiam* and *Harleyville*]

Sample 11 (Casey & Lowe 55)

Context number: **16416**
Context: Clay-rich modified topsoil from east-facing wall of '*Comber Consultant*' Test Trench (P13) in Area B
Age range: mid 19th century

Abundant taxa: fungal spores, *Allocasuarina/Casuarina*
Common taxa: *Phaeoceros*, *Eucalyptus*
Frequent taxa: Liguliflorae, *Cyathea*, native Poaceae
Exotics: Liguliflorae,
Edible taxa -
Sewage: *Cloacasporites* (2%)
Microfauna: egg cases (2%)

Notes: The sparse microflora is wholly dominated by well-preserved casuarina pollen in an organic matrix comprising strongly-humified plant detritus, fungal spores (765%) and microbial nodules. Frequent microfossils include dandelion (5%) associated with trace numbers of European plantain (*Plantago lanceolata*-type) pollen, *Cyathea* spores (2%), *Mediaverrunites* (2%), a fungal spore which is associated with fat/oil, and *Cloacasporites* (2%).

The preferred interpretation is the test trench was excavated in an area where oil, fat and cess material had been discarded by the occupants of House 4, or (less likely) by the licensee of the *White Horse Inn* if/when Area B was used for grazing.

Sample 12 (Casey & Lowe 110)

Context number: 16933
Context: Pebbly sand and mud deposit at the base of cesspit CTX 16915 (deposit considered 'to be *in situ*') (Fig. 14).
Age range: 1884 -c.1907

Abundant taxa: fungal spores, Chenopodiaceae
Common taxa: *Allocasuarina/Casuarina*, unidentified tricolporate taxa
Frequent taxa: Cerelia, Liguliflorae, *Polygonum aviculare*, *Eucalyptus*, Cyperaceae, *Gonocarpus*, native Poaceae, *Phaeoceros*
Exotics: Cerelia, Liguliflorae, *Polygonum aviculare*, *Echium*, *Plantago lanceolata*-type, unidentified tricolpate and tricolporate taxa
Edible taxa Cerelia
Sewage: *Cloacasporites* (1 equivocal specimen)
Microfauna: egg cases (4%)

Notes: The fossil pollen data do not support the archaeological interpretation that the pebbly mud sample comes from an *in situ* deposit at the base of the cesspit unless this pit had been cleaned out shortly before being backfilled. Reasons include: (1) The absence of definite *Cloacasporites* and, pollen types that are typically found in cesspits other than cereal pollen (4%), and (2) the high diversity and total relative abundance of agricultural herbaceous weeds including samphires (42%) and possibility that some unidentified pollen types represent ornamental plants. Conditions within the cesspit appear to have been highly saline or the weed component may have come from salinized soil used to infill the cesspit since the relative abundance of cryptogams and hornwort spores is extremely low for a deposit accumulating within or around a wet brick-lined structure such as a cesspit..

Fig. 13: View of two of the four cess-pits located to the rear of *Northiam* and *Harleyville* (from Casey & Lowe 2016)

Table 3B: Relative abundance data of identifiable microfossils in Area B, Lot 30

Sample Number. (MKM)		**11**	**12**
Sample Number (Casey & Lowe)		**55**	**110**
Context Number.		**16416**	**16933**
Depositional environment		**topsoil**	**cess-pit**
Definite & probable exotic taxa			
Apiaceae	umbellifer family		+
Centaurea-type	thistle		+
Cerelia	cereal grasses		4%
Echium	Patersons curse		+
Liguliflorae	dandelion	5%	5%
Plantago lanceolata-type	plantain	+	+
Polygonum aviculare	knotweed		3%
tricolpate spp.	unknown		+
tricolporate spp.	incl. Fabaceae, Solanaceae?		12%
Non-local taxa			
Cyathea	rough tree-fern	2%	
Trees, shrubs			
Acacia	wattle	+	+
Allocasuarina/*Casuarina*	casuarina	81%	21%
Eucalyptus pollen monads	eucalypt	6%	3%
Leptospermae	incl. ti-tree		+
unassigned Proteaceae	protea family		+
Herbs			
Asteraceae (low spine)	daisy/daisy bush		2%
Brassicaceae	crucifer family		+
Chenopodiaceae	samphire		42%
Cyperaceae	sedge family		2%
Gonocarpus	raspwort	+	2%
Poaceae (<30μm)	native grass	3%	3%
Ferns & fern allies			
Asplenium-type	birds nest fern	+	
monolete ferns	numerous ferns	+	+
unassigned trilete ferns	incl. filmy ferns		+
POLLEN SUM		**127**	**129**
Hornworts			
Anthoceros	hornwort		+
Phaeoceros	hornwort	15%	2%
Fungal spores			
Diporisporites	-		2%
Mediaverrunites	-	2%	+
unassigned spores	-	765%	830%
Freshwater algal cysts			
Botryococcus	Botryococcus	+	
Debarya	Zygnemataceae	3%	
Saline algal cysts			
dinocyst-like microfossils	Dinophyaceae?	+	
Other microfossils			
Cloacasporites	[sewage indicator]	2%	
dental plates/jaw apparatus	(microfauna)	+	+
egg cases	(microfauna)	6%	4%
insect setae & body parts	(microfauna)		+

5.3 **Area C, Lot 32 [former site of *White Horse Inn* stables and associated outbuildings]**

Sample 13 (Casey & Lowe 49)

Context number:	**16611**
Context:	Lowest fill in a box drain CTX 16608 associated with an outbuilding of the *White Horse Inn* (this silt includes sediment dating from the periods when the drain was in use and then back-filled)
Age range:	mid and late 19th century
Abundant taxa:	fungal spores
Common taxa:	*Allocasuarina/Casuarina*, Chenopodiaceae, native Poaceae, *Phaeoceros* (and? immature cereal pollen)
Frequent taxa:	*Cyathea*, Pinaceae, mature Cerelia grains, Liguliflorae, *Polygonum aviculare*, Cyperaceae, *Calochlaena*, trilete fern spores, *Anthoceros*
Exotics:	Pinaceae, Cerelia, Liguliflorae, *Polygonum aviculare*, Persicaria, *Stellaria*, unidentified tricolpate and tricolporate taxa
Edible taxa	Cerelia
Sewage:	-
Microfauna:	dental plates, egg cases (30%)

Notes: This sample (and **Sample 14**) from Area C differ from samples from Areas A and B in that the microfloras include low (1%) numbers of exotic pine (Pinaceae) pollen.

Relative abundances are too low to show if pines were growing on Lot 32 although their presence is consistent with the drain being back-filled relatively late in late 19th century (see also Notes for **Sample 14**). The age range potentially can be improved if archaeological or documentary evidence exist to confirm when pines were first planted in large numbers in parks in the Parramatta CBD. For the same reason, it is probable that the *Cyathea* and casuarina counts represent planted tree-ferns and she-oaks.

The data help confirm previous conclusions that eucalypts did not grow on this or adjacent allotments during the mid-late 19th century. Sedges, ferns such as the rainbow fern (*Calochlaena*), and hornworts almost certainly were growing on damp brick- or stonework lining, or sediment within, the box drain. Built structures connected to the drain upslope are likely to include stables.

The combined evidence (frequent to abundant fungal and hornwort spores, the egg cases of unidentified soil microfauna, and pollen of sedges, cereal, native grasses and diverse exotic weeds) indicate the area was grazed despite being poorly-drained and support previous conclusions (Section 2) that samphire-dominated microfloras from Lots A and B reflect soil salinization related to the disposal of waste such as salty water.

Sample 14 (Casey & Lowe 128)

Context number:	**16931**
Context:	fill in a 'large rectangular pit', possibly 'used for storage or an unknown' industrial activity'.
Age range:	mid-late 19th century
Abundant taxa:	fungal spores, *Phaeoceros*
Common taxa:	Cerelia (mature and immature? grains), *Allocasuarina/Casuarina*, Chenopodiaceae, Cyperaceae, native Poaceae
Frequent taxa:	*Cyathea*, Pinaceae, Liguliflorae, *Polygonum aviculare*, *Acacia*, Asteraceae (low spine types), Cyperaceae, trilete fern spores, *Anthoceros*, *Mediaverrunites*

Exotics:	Pinaceae, Asteraceae (high spine types), Cerelia, Liguliflorae, *Polygonum aviculare*, *Stellaria*
Edible taxa:	Cerelia
Sewage:	*Cloacasporites* (11%)
Microfauna:	dental plates, other insect parts (2%), egg cases (22%)

Notes: The significant relative abundance of pine pollen (probably representing several Pinaceae genera) indicates the 'pit' was infilled during the mid or late 19th century. However, unlike **Sample 13**, this age range can be tested by the changing purposes for which the pit was used as well as by the archaeological associations. For example, the microflora closely mimics that from **Sample 13** [fill in a box drain] except for minor occurrence of wattle pollen and higher relative abundances of daisy (Asteraceae) pollen.

The microflora indicates that although the 'pit' was infilled with salinized soil from waste, weed-infested ground, and although it initially might have had 'storage' or 'industrial' uses, the high relative abundance of *Cloacasporites* (11%) confirms that it became used for the disposal of human sewage. This interpretation, however, does not preclude the pit being attached to a building used for industrial or related domestic activities, e.g. a kitchen, workshop or stables. Other evidence for the disposal of domestic waste includes frequent (2%) *Mediaverrunites*, a fungal spore associated with discarded fat or other oily waste. Given the 'sewage' context, it is probable that the high cereal count (up to 16%) comes from coarse bread, not stock feed or early agricultural activities.

Sample 15 (Casey & Lowe 37)

Context number:	**16564**
Context:	water-affected sand (infill or sediment build-up) within box drain CTX 16563
Age range:	early-mid 19th century

Abundant taxa:	fungal spores, *Allocasuarina/Casuarina*
Common taxa:	-
Frequent taxa:	Liguliflorae, native Poaceae, unassigned trilete fern spores, *Mediaverrunites*
Exotics:	Pinaceae, Liguliflorae, *Stellaria*
Edible taxa	-
Sewage:	-
Microfauna:	dental plates (1%), egg cases (6%)

Notes: The microflora differs markedly from the microfloras recovered from **Samples 13** (box drain) and **Sample 14** ('cesspit') and, on present indications, sediment infilling this box drain (CTX 16563) pre-dates deposits sampled in box drain (CTX 16608) or the large rectangular pit (CTX 16931]. Reasons include (i) pine pollen are rare, (ii) the microflora is wholly dominated by casuarina (78%), and (iii) the majority of rare shrubs and herbs recorded in **Samples 13** and **14** are uncommon or absent. Examples are native Poaceae (3% vs 12-19%) while cereal pollen and *Anthoceros* spores are absent. However, the data are inadequate to show whether the box drain was attached to a specific built structure or merely being used to drain a perennially damp area (cf. Fig. 14, Plate 2).

Pollen of native drum-sticks (*Isopogon*) is suggested to represent flowers picked for household decoration or its cone-heads were being used for another domestic activity since the genus is mostly restricted to dry sclerophyll forests in the Parramatta district. The very high casuarina count provides firm evidence that she-oaks were growing on the site during the period of record. Given the date range it is possible the deposit incorporates 1790s or older soil; otherwise the sources were planted trees.

Fig. 14: Brick-lined drain leading from the *White Horse Inn* stables or outbuilding and meandering across Lot 32 towards Macquarie Street (from Casey & Lowe 2016)

Table 3C: Relative abundance data of identifiable microfossils in Area C, Lot 32

Sample Number. (MKM)		**13**	**14**	**15**
Sample Number (Casey & Lowe)		**47**	**128**	**39**
Context Number.		**16611**	**16931**	**16564**
Depositional environment		**drain**	**pit**	**drain**
Definite & probable exotic taxa				
Pinaceae	pine	1%	1%	+
Asteraceae (high spine)	exotic daisy?			+
Cerelia	cereal grasses	4%	9%	
Cerelia?	immature cereal?	6%	7%	
Liguliflorae	dandelion	2%	3%	4%
Persicaria	dock	+		
Polygonum aviculare	knotweed	1%	2%	
Stellaria	starwort	+		+
tricolpate spp.	unknown	+		
tricolporate spp.	incl. Fabaceae, Solanaceae?	+	+	
Non-local taxa				
Cyathea	rough tree-fern	1%	1%	
Trees, shrubs				
Acacia	wattle		1%	
Allocasuarina/*Casuarina*	casuarina	24%	25%	78%
casuarina pollen masses	casuarina		+	
Eucalyptus pollen monads	eucalypt	2%		
Eucalyptus pollen masses	immature eucalypt	+		
unassigned Myrtaceae	-	+		
unassigned Proteaceae	protea family	+		
Herbs				
Asteraceae (low spine)	daisy/daisy bush	+	2%	
Brassicaceae	crucifer family	+		
Chenopodiaceae	samphire	18%	24%	+
Cyperaceae	sedge family	7%	7%	+
Gonocarpus	raspwort	+	+	+
Poaceae (<30μm)	native grass	19%	12%	3%
Ferns & fern allies				
Asplenium-type	birds nest fern			+
Calochlaena	rainbow-fern	2%	2%	+
Gleichenia	coral fern		+	+
Microsorium-type	kangaroo fern	+		
monolete ferns	numerous ferns	+	+	
Pteris	tender brake		+	
unassigned trilete ferns	incl. filmy ferns	6%	2%	1%
POLLEN SUM		**248**	**192**	**157**
Hornworts				
Anthoceros	hornwort	6%	4%	
Phaeoceros	hornwort	22%	31%	10%
Fungal spores				
Diporisporites	-		1%	
Mediaverrunites	-		2%	2%
unassigned spores	-	230%	455%	155%
Freshwater algal cysts				
Debarya	Zygnemataceae	2%		1%
Maculatasporites	Prasinophyta		+	
Zygnema	Zygnemataceae		+	
Saline algal cysts	(not recorded)			
Other microfossils				
Cloacasporites	[sewage indicator]		11%	
dental plates/jaw apparatus	(microfauna)	+	+	1%
egg cases	(microfauna)	30%	22%	6%
insect setae & body parts	(microfauna)		2%	

5.4 Area D Lot 28 [former site of Civic Place]

Sample 16 (Casey & Lowe 323)

Context number: **17854**
Context: Silt at the base of an artificial pond
Age range: 1836-1895

Abundant taxa: *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa: Cerelia, native Poaceae
Frequent taxa: immature Cerelia?, Liguliflorae, *Polygonum aviculare*, *indeterminate tricolporate taxa, Acacia, Allocasuarina/Casuarina pollen aggregates*, *Eucalyptus* monads and pollen masses, Cyperaceae, *Gonocarpus*, native Poaceae pollen aggregates, unassigned trilete fern spores, *Anthoceros*, *Mediaverrunites*
Exotics: Cerelia, Liguliflorae, *Lonicera*, *Polygonum aviculare*, indet tricolpate and tricolporate taxa
Edible taxa Cerelia
Sewage: *Cloacasporites* (2%)
Microfauna: egg cases (4%)

Notes: Although identified as a pond, the basal silt yielded significant numbers of *Cloacasporites* (2%). Miospores of aquatic and semi-aquatic herbs are conspicuous by their absence apart from Cyperaceae (2%) and trace numbers of cord-rush (Restionaceae) and swamp selaginella (*Selaginella uliginosa*. For these reasons, without archaeological context data, **Sample 16** would be interpreted as infill in a feature used for the disposal of sewage (although not necessarily a formal cess-pit), and other waste in which the cereal count comes from coarse bread. Given the abundant casuarina pollen (49%), the silt deposit includes pre-1788 topsoil or she-oaks had been planted on Lot 28 after 1836.

This interpretation does not preclude the dug-feature had multiple uses over the period of record, e.g. as a fenced pond during the period the allotment was occupied by the residents of House 4 or, after c. 1884, by the occupants of *Cranbrook.* For example, the microflora includes significant numbers of *Mediaverrunites*, which indicates the pit was being used for kitchen waste at the time the silt accumulated (cf. **Samples 7**, **11**) as well as trace numbers of honeysuckle pollen (*Lonicera*), a 'weed' vine that was common on fences during the late 19th and 20th century. She-oaks almost certainly were growing close to or on the site but otherwise the microflora is typical of weed-infested grassland growing on disturbed, grazed or formerly-burnt vacant land. .

Unusual aspects of the microflora include (i) frequent wattle (2%), traces of rice-flower (*Pimelea*) and cord-rush (Restionaceae) pollen, and one of two records of a swamp selaginella (*Selaginella uliginosa*) found in this study, and (ii) insect body parts (1%). The rarity of fungal spores is best explained by water-logged conditions.

Sample 17 (Casey & Lowe 269)

Context number: 1**7823**
Context: Black sludge at the base of the Town Drain on Lot 28
Age range: 1860-1888?

Abundant taxa: fungal spores
Common taxa: unidentified tricolporate taxa, *Allocasuarina/Casuarina*
Frequent taxa: Cerelia, Liguliflorae, *Plantago lanceolata*-type, unidentified Rosaceae, *Stellaria*, Brassicaceae, Chenopodiaceae, Cyperaceae, *Geranium*, *Gonocarpus*, Liliaceae, native *Plantago*, native Poaceae, an unidentified monocot, *Phaeoceros*

Exotics:	Cerelia, Liguliflorae, *Plantago lanceolata*-type, *Stellaria*, unidentified Rosaceae, unidentified tricolpate and tricolporate taxa
Edible taxa	Cerelia
Sewage:	trace
Microfauna:	egg cases (4%)

Notes: As expected, miospores recovered from the black sludge include numerous unidentified tricolpate and tricolporate pollen types that are likely to represent ornamental plants as well as identifiable and unidentified weed species. Ornamentals may have included a geranium (*Geranium*) and a probable member of the rose (Rosaceae) family while *Cloacasporites* and casuarina and eucalypt pollen occur rarely and pine pollen are absent.

Based on the date assigned to the drain, native species surviving 'upstream' of Lot 28 included the tall aquatic herb bul-rush (*Typha*), native blue bell (*Wahlenbergia*), broom spurge (*Amperea xiphoclada*) and rice flower (*Pimelea*) as well as at least 5 genera of ferns. The sample shares with **Samples 1** and **2** the distinction of preserving reworked gymnosperm pollen and spores derived from the Triassic Ashfield Shale bedrock.

The combined data imply the 'sludge' post-dates the informal use of the Town Drain as a sewer by the occupants of House 4 but is likely to pre-date the construction of *Cranbrook* if, like their neighbours in *Northiam* and *Harleyville*, the residents used brick-lined cess pits. The area to the west and southwest of the Lot 28 were weed-infested waste ground although by this time, the Site was subsumed within urban Parramatta.

Sample 18 (Casey & Lowe 320)

Context number:	**17852**
Context:	Sediment infilling the buried creek line below the Town Drain
Age range:	c. 1830-1840 (see Notes)
Abundant taxa:	fungal spores, native Poaceae
Common taxa:	Cerelia, *Allocasuarina/Casuarina*, *Phaeoceros*
Frequent taxa:	Liguliflorae, *Polygonum aviculare*, unidentified tricolpate and tricolporate taxa, *Eucalyptus*, Asteraceae (low spine types) *Gonocarpus*
Exotics:	Liguliflorae, *Plantago lanceolata*-type, *Polygonum aviculare*, *Silene*, *Trifolium*, unidentified tricolpate and tricolporate taxa
Edible taxa	Cerelia
Sewage:	-
Microfauna:	egg cases (4%)

Notes: The microflora is distinguished by the highest relative abundance of cereal pollen (14%) recorded in the Study although the diversity of 'weed species, including a clover (*Trifolium*), is against the infill primarily being 1790s or older topsoil.

If the 1830-1840 age range assigned to the deposit is correct, then the high cereal (14%) and native grass (52%) is more likely to represent grassland which included naturalized cereal spp., rather than providing evidence that cereal crops were grown on Lot 28 during the 1790s. For the same reason, it is possible that the tricolpate/tricolporate count (7%) is evidence that plantings around House 4 included ornamental spp. although the only identifiable candidate is geranium (a genus that includes native semi-aquatic species as well as cultivated species). Alternatively, if the cereal pollen does represent early agricultural activity, then the silt included material dating to the 1790s, a conclusion that is supported by numbers of pollen produced by native shrubs imply banksia (*Banksia serrata*-type), a native hops (*Dodonaea*) and heath (Epacridaceae).

Sample 19 (Casey & Lowe number 335)

Context number:	17855
Context:	Sample collected from a plough line from the southern excavated area on Lot 1 (181)
Age range:	1830s based on sherds of transfer-printed pottery in the infill.

Abundant taxa:	fungal spores, *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa:	Liguliflorae, native Poaceae, *Cloacasporites*
Frequent taxa:	immature Cerelia?, *Cyathea*, *Allocasuarina/Casuarina* pollen aggregates, *Eucalyptus* pollen and immature pollen aggregates, Asteraceae (low spine types), unassigned monolete and trilete fern spores, *Anthoceros*
Exotics:	Liguliflorae (Cerelia?)
Edible taxa	-
Sewage:	*Cloacasporites* (5%)
Microfauna:	egg cases (46%), dental plates and other insect parts (3%)

Notes: The regular spacing and straight linearity suggest that the plough lines are due to the use of a horse or ox-drawn plough with 3-5 tines (M. Casey pers. comm.), whose first use in the Parramatta area presumably has been recorded in early 19th century Colonial documents.

Despite the archaeological evidence, the microflora is typical of the early 1790s clearance/early agricultural phase (compare Macphail & Casey 2008, Casey 2009, **Sample 21**). For example, the microflora is dominated by fungal spores (1000%), hornwort spores (55%) and casuarina pollen (52%), with relatively low abundances of dandelion pollen (6%) and what might be immature cereal pollen (1%). At present the only equivocal microfossil evidence supporting a date in the 1830s is the significant relative abundance (2%) of *Cyathea* spores unless documentary evidence exists to confirm these had been planted in the grounds of Old Government House on Rose Hill in the early 1790s.

A compromise interpretation is the plough lines incorporate soil predating European settlement as well as organic matter, including human sewage (5%) might have been used to fertilize the ground during the period the area was under cultivation after c. 1830.

Sample 20 (Casey & Lowe 344)

Context number:	17855
Context:	Sample collected from a plough line F from an excavated area on Lot 1 (181) 28
Age range:	1830s (see Sample 19)

Abundant taxa:	fungal spores, *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa:	Liguliflorae, native Poaceae, *Calochlaena*, *Anthoceros*, Zygnemataceae
Frequent taxa:	*Cyathea*, *Acacia*, Asteraceae (low spine types), Cyperaceae, *Microsorium*-type, unassigned trilete fern spores,
Exotics:	Liguliflorae, *Stellaria*
Edible taxa	-
Sewage:	*Cloacasporites*?
Microfauna:	egg cases (40%)

Notes: The microflora closely resembles that recovered from **Sample 19** and there is little doubt both represent the same landscape and are subject to the same caveats regarding their interpretation. Minor differences include (i) the absence of confirmed *Cloacasporites* and (ii) frequent sedge pollen (2%) and rainbow fern spores (6%) might be circumstantial evidence that ferns were being used as fertilizer on the site or the area was damp, before ploughing. The significant occurrence of *Acacia* pollen (2%) is difficult to explain given the pollen type is absent in the correlative context **Sample 19** whilst known groves of wattles recorded by the early Colonial farmer in Parramatta, George Suttor (1774-1859) growing near Church Street about 1800 seems equally improbable as the source.

5.5 Pre-European subsoil (Area A)

Sample 21 (Casey & Lowe 362/R. Lawrie 1)

Context number:	16190
Context:	The sample of pre-1790 subsoil is labelled as coming from 65-70 cm depth in a soil profile in the 'north' sector of Area A, TT18.
Age range:	pre-1790
Abundant taxa:	fungal spores, *Allocasuarina/Casuarina*, *Phaeoceros*
Common taxa:	native Poaceae
Frequent taxa:	*Eucalyptus* pollen and immature pollen aggregates, *Calochlaena*, *Anthoceros* (Cerelia?)
Exotics:	Cerelia (1 definite specimen only)
Edible taxa	Cerelia
Sewage:	-
Microfauna:	egg cases (10%)

Notes: Pollen of introduced plants are absent apart from one definite specimen of cereal pollen and low numbers (1%) of a small Poaceae pollen type that might represent immature cereal pollen. Otherwise, the microflora broadly resembles those recovered from the plough lines (**Samples 19**, **20**) on Lot 1 (181), e.g. in being wholly dominated by casuarina (82%).

Whether or not the single specimen of cereal pollen is *in situ*, there is little doubt that (1) the absence of Liguliflorae is compelling evidence the soil sample predates European settlement at Parramatta in November 1788 and (2) the microflora is further evidence the site was located in savanna grassland where eucalypts and sclerophyll shrubs were uncommon and she-oaks and ferns lined the local creek line. In this instance, the high relative abundance of *Phaeoceros* + *Anthoceros* (89%) and fungal (104%) spores could indicate either the clay subsoil was carbon-rich due to wildfires (ash-bed effect) and/or that the site included extensive areas of damp mineral soil suited to colonization by hornworts.

The absence of pollen of shrubs other than wattle (1 specimen) is circumstantial evidence that the 'extensive' stands of wattle on Church Street (see **Sample 19**) may have begun to colonize the local landscape following the changed fire regimes after c. 1788.

Table 3D: Relative abundance data of identifiable microfossils in Area D, Lot 28

Sample Number. (MKM)		**16**	**17**	**18**	**19**	**20**	**21**
Sample Number (Casey & Lowe)		**323**	**269**	**320**	**355**	**344**	**'North'**
Context Number.		**17854**	**17823**	**17852**	**17855**	**17855**	**16190**
Depositional environment		**pond**	**T/drain**	**creek**	**plough**	**plough**	**subsoil**
Definite & probable exotic taxa							
Pinaceae	pine			+			
Anacardiaceae-type	pepper tree family			+			
Asteraceae (high spine)	exotic daisy?	+					
Asteraceae (sharp spine)	thistle?			+			
Cerelia	cereal grasses	12%	4%	14%			+
Cerelia?	immature cereal?	4%	4%	3%	1%	+	1%
Liguliflorae	dandelion	2%	1%	2%	6%	6%	
Lonicera	honeysuckle	+					
Oleaceae	privet family		+				
Plantago lanceolata-type	plantain		4%	+			
Polygonum aviculare	knotweed	2%	+	2%			
Silene	silene			+			
Rosaceae-type	rose family?		2%				
Rutaceae-type	boronia family			+			
Stellaria	starwort		+			+	
Trifolium-type	clover			+			
tricolpate spp.	unknown	+	1%	3%			
tricolporate spp.	incl. Fabaceae, Solanaceae?	1%	29%	4%			
Non-local taxa							
Cyathea	rough tree-fern		+	+	2%	2%	+
Dicksonia antarctica	soft tree-fern		+			+	
Trees, shrubs							
Acacia	wattle	2%	+			2%	+
Allocasuarina/*Casuarina*	casuarina	49%	8%	12%	72%	70%	82%
casuarina pollen masses	casuarina	2%			2%		
Amperea xiphoclada	broom spurge		+				
Banksia cf. *serrata*	banksia			+			
Dodonaea viscosa-type	native hops			+			
Epacridaceae	heath			+			
Eucalyptus pollen monads	eucalypt	2%	+	2%	1%	+	3%
Eucalyptus pollen masses	immature eucalypt	1%	+		2%		3%
Hibbertia-type	guinea flower			+			
Leptospermae	incl. ti-tree			+			
Pimelea	rice-flowers	+	+				+
Herbs							
Asteraceae (low spine)	daisy/daisy bush	+	+	2%	1%	3%	+
Brassicaceae	crucifer family	+	5%				
Chenopodiaceae	samphire		1%	+	+		+
Cyperaceae	sedge family	3%	2%	+		2%	+
Geranium	geranium		+	+			
Gonocarpus	raspwort	2%	3%	1%	1%	+	+
Libertia	grass flag			+			
Liliaceae	lily family		+	+			
Plantago	plantain		12%				
Poaceae (<30μm)	native grass	14%	16%	52%	9%	5%	5%
Poaceae pollen masses	native grass	1%	+	1%			
Restionaceae	cord rush	+					
Typha	bul-rush		+				
Wahlenbergia	native blue-bell		+				
unassigned monocot	-		1%				
Ferns & fern allies							
Asplenium-type	birds nest fern		+			+	+
Calochlaena	rainbow-fern	+	+			6%	3%
Gleichenia	coral fern				+		
Microsorium-type	kangaroo fern	+	+			1%	+
monolete ferns	numerous ferns		+	+	2%	+	+
Pteris	tender brake						
Selaginella uliginosa	swamp selaginella	+					+
unassigned trilete ferns	incl. filmy ferns	3%	+	+	2%	1%	+
POLLEN SUM		**311**	**281**	**385**	**196**	**187**	**279**

Table 3D (cont.)

Sample Number. (MKM)		**16**	**17**	**18**	**19**	**20**	**21**
Sample Number (Casey & Lowe)		**323**	**269**	**320**	**335**	**334**	**Area A**
Context Number.		**17854**	**17823**	**17852**	**17855**	**17855**	**16190**
Depositional environment		**pond**	**T/drain**	**creek**	**plough**	**plough**	**topsoil**
Hornworts							
Anthoceros	hornwort	7%	+	3%	4%	13%	3%
Phaeoceros	hornwort	43%	4%	9%	51%	129%	86%
Fungal spores							
Diporisporites	-	+		+			
Mediaverrunites	-	1%		+			+
unassigned spores	-	+	32%	90%	1000%	605%	104%
Freshwater algal cysts							
Botryococcus	Botryococcus						
Circulisporis parvus	Zygnemataceae					6%	+
Debarya	Zygnemataceae	+				4%	2%
Zygnema	Zygnemataceae	+			+		
Saline algal cysts							
Cobricoperidium	Dinophyaceae	cf.					
Other microfossils							
Cloacasporites	[sewage indicator]	2%			5%	cf.	
dental plates/jaw apparatus	(microfauna)	1%		+	2%		+
egg cases	(microfauna)	15%	4%	4%	46%	40%	10%
insect setae & body parts	(microfauna)	2%			1%		
Permo-Triassic spp.							
Protohaploxypinus spp.						2%	
unassigned bisaccates			+				
unassigned spores			+				

6. REFERENCES

Benson, D & Howell, J. (1990). *Taken for Granted: The bushland of Sydney and its suburbs.* Kangaroo Press/Royal Botanic Gardens, Sydney.

Campbell, J.F. (1927). Rose Hill Government Farm and the founding of Parramatta. *Journal of the Royal Australian Historical Society* **12**: 353-377.

Casey, M. (2009). Parramatta's archaeological landscape (www.caseyandlowe.com.au/research/casey-parramatta-2009.pdf).

Casey & Lowe Pty Ltd. (2013). *S140 Research Design – Non-Indigenous Archaeology*. Report to Alfasi Property Development and Parramatta City Council. June 2013.

Casey & Lowe Pty Ltd. (2016). *Parramatta Square PS3 153 Macquarie Street, Parramatta – Preliminary results of the historical archaeological investigation*. Report to Parramatta City Council, March 2016.

Egan, J. (1999). *Buried Alive*. Allen & Unwin, St. Leonards.

Higginbotham, E. (1983). The excavation of a brick barrel-drain at Parramatta. *Australian Historical Archaeology* **1**: 35-39.

Kass, T., Liston, C. & McClymont, J. (1996). *Parramatta − A Past Revealed*. Parramatta City Council, Parramatta.

Lawrie, R. (1982). Soils – archaeological studies at Parramatta, Australian Society of Soil Scientists (ACT Branch) Soils Science Conference.

Lawrie, R. (2006). Report on soil properties: Parramatta hospital archaeological site. Report prepared for Casey & Lowe Pty. Ltd.

Lewis, S. E., Sloss, C. R., Murray-Wallace, C. V., Woodroffe, C. D. & Smithers, S. G. (2013). Post-glacial sea-level changes around the Australian margin: a review. *Quaternary Science Reviews* 74: (115-138).

Macphail, M.K. (1999). A hidden cultural landscape: Colonial Sydney's plant microfossil record. *Australasian Historical Archaeology* **17**: 79-115.

Macphail, M.K. (2000). *Palynological analysis of soil samples, Castlereagh St. Fire Station archaeological site*. Report prepared for *Cultural Resources Management* Pty. Ltd.

Macphail, M.K. (2013). *'Tares amongst the wheat?': Pollen analysis of carbonized seed and related samples. Barangaroo South archaeological site, Darling Harbour, Sydney.* Report prepared for *Casey & Lowe* Pty. Ltd.

Macphail, M.K. (2014). Pollen analysis of samples from a prehistoric Indigenous earth oven (dindal) and associated soils, East Leppington precinct archaeological site, Sydney. Report prepared for *Godden Mackay Logan* Pty. Ltd.

Macphail, M.K. (2015). *'Life on the edge' in Australia's first inland township: Pollen analysis of stratified alluvium, 184-188 George Street, Parramatta*. Report prepared for *Dominic Steele Consulting Archaeology* Pty. Ltd.

Macphail, M.K. & Casey, M. (2008). News form the Interior: What can we tell from plant microfossils preserved on historical archaeological sites in colonial Parramatta. *Australasian Historical Archaeology* **26**: 45-66.

Macphail, M.K., Casey, M. & Kelly, M. (2012). Not for the squeamish: A new microfossil indicator for the presence of humans. *Terra Australis* **34**: 193-196.

McMinn, A (1992). Pliocene through Holocene dinoflagellate cyst biostratigraphy of the Gippsland Basin, Australia. In: M.J. Head & J.H. Wren (Editors). *Neogene and Quaternary Dinoflagellate Cysts and Acritarchs*. American Association of Stratigraphic Palynologists Foundation, Dallas, pp. 147-161.

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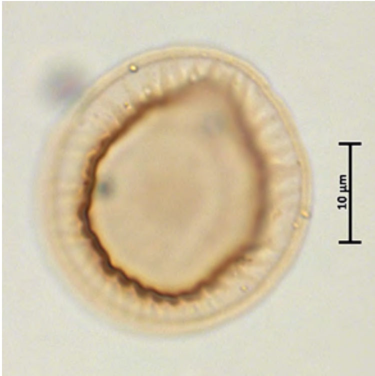
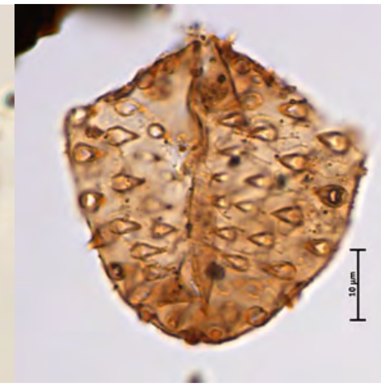
APPENDIX 1

(Photomicrographs of plant and animal microfossils)

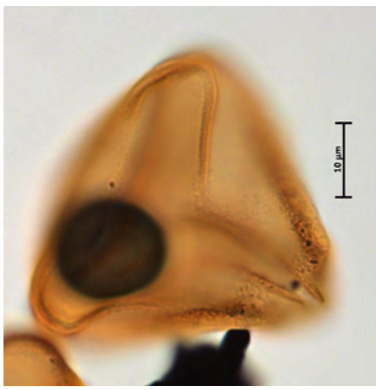
1. Algae and fungi

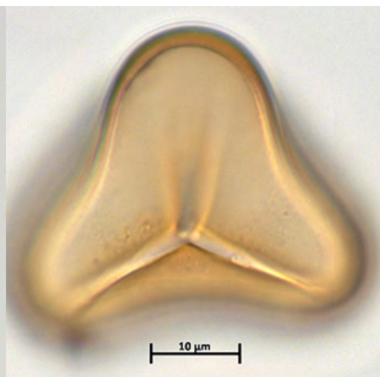


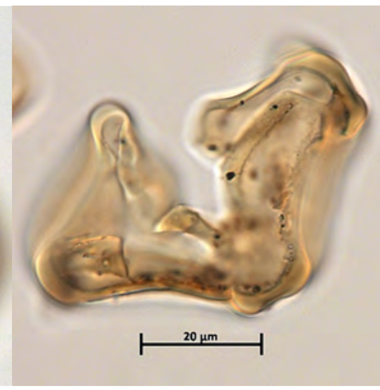


Debarya (Lawrie Sample 2) unidentified fungi (Casey & Lowe Samples 188, 128)

2. Ferns and tree-ferns



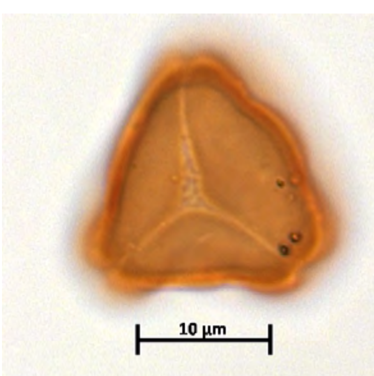




Gleicheniaceae (topsoil -Lawrie Sample 2) *Cyathea* (topsoil -Lawrie Sample 2) *Dicksonia* (sludge at base of Town Drain)

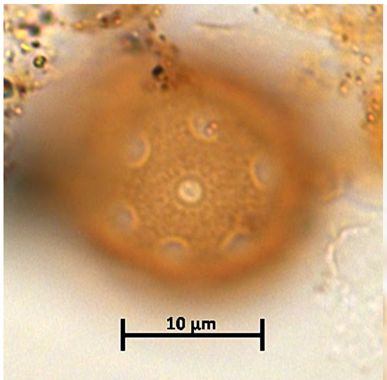
3. Native trees and shrubs

Acacia (in base of cess pit) *Allocasuarina/Casuarina* (topsoil-Lawrie Sample 2) *Banksia serrata*-type (infill in creek)

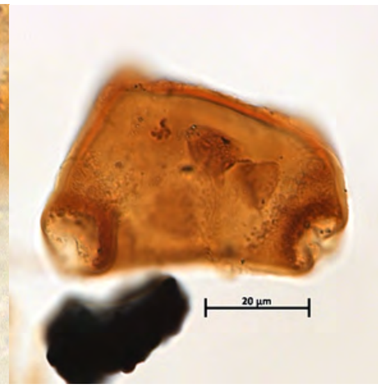


Eucalyptus (topsoil-Lawrie Sample 2) *Isopogon* (box drain CTX 16563) Leptospermae (infill in creek line)

4 Native herbs



Chenopodiaceae (infill in buried pond)

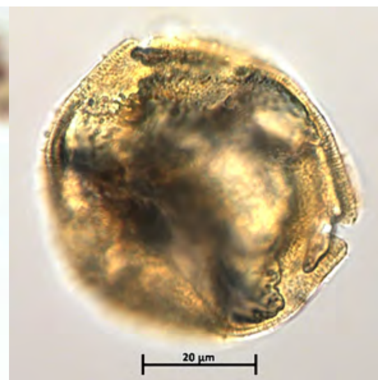


Epilobium (infill in buried pond)

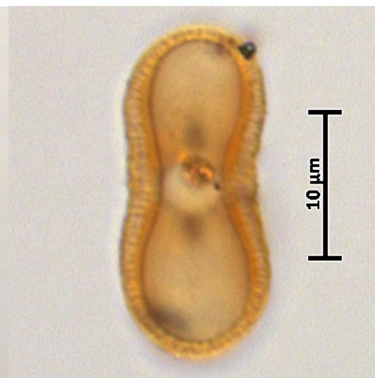
native Poaceae (large cut (CTX 17228)

5. Definite and probable exotic plants

Pinus (brick/sandstone sump CTX 16187)

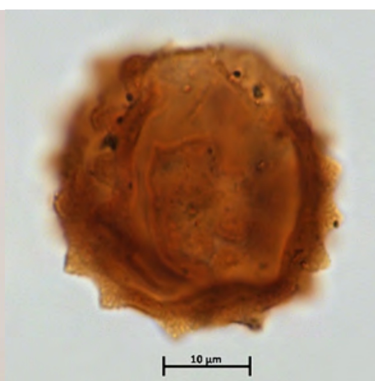


Lonicera (silt at base on pond)



Apiaceae ((brick/sandstone sump CTX 16187)

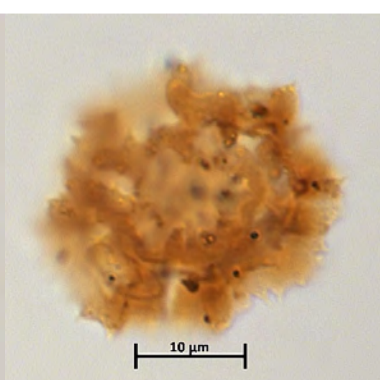
Amaryllidaceae (sludge in Town Drain)



Centaurea-type (infill in buried pond)

Cerelia (topsoil-R. Lawrie sample 2)

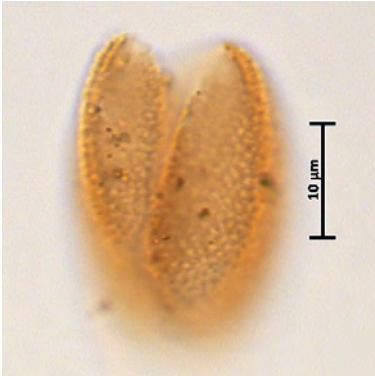
Cucumis (fill in box drain CTX 16608)



Liguliflorae ('original' topsoil)

Polygonum aviculare (large cut CTX 17228)

6. Angiosperms producing monosulcate pollen



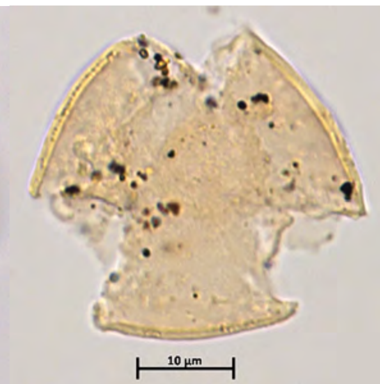
Liliaceae (sump infill CTX 16187)

cf. Amaryllidaceae (sludge in Town Drain)

monocot (infill in buried pond)

7. Angiosperms producing tricolpate pollen

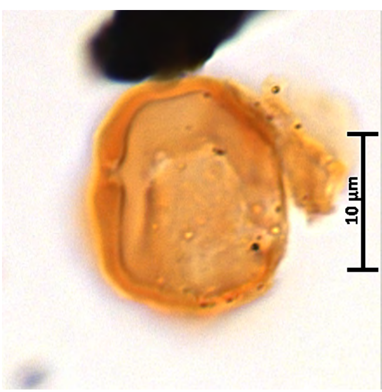
tricolpate sp. (large cut (CTX 17228)



tricolpate sp. (fill in box drain CTX 16608)

(tricolpate sp. (fill at base of pond)

8. Angiosperms producing tricolporate pollen



tricolporate sp. (south verandah)

Rutaceae-type (fill at base of pond)

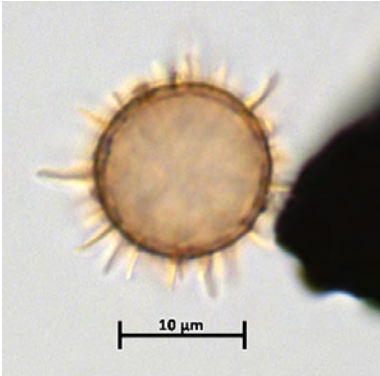
tricolporate sp. (infill in creek line)

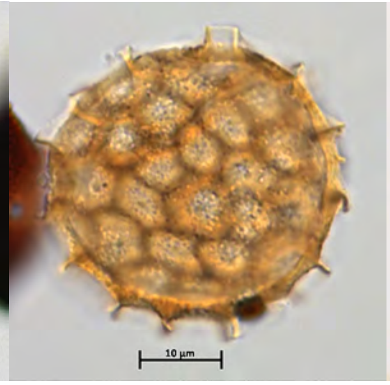
Mutisia-type (base of cess pit CTX 16915)

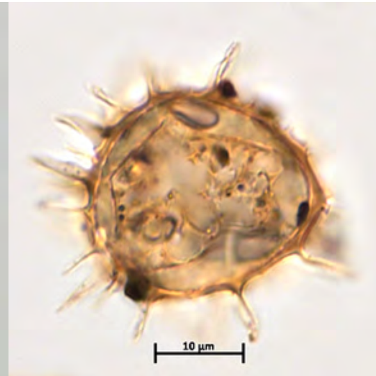
Citrus-type (sludge at base of Town Drain)

tricolporate sp. (infill in buried pond)

9. Animal microfossils





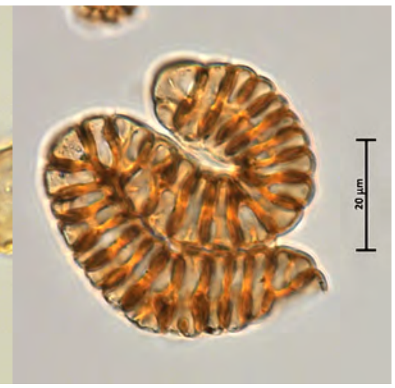


egg cases (topsoil in *Comber* trench)

egg case and dinocyst-like microfossil (lowest fill in box drain CTX 16608)

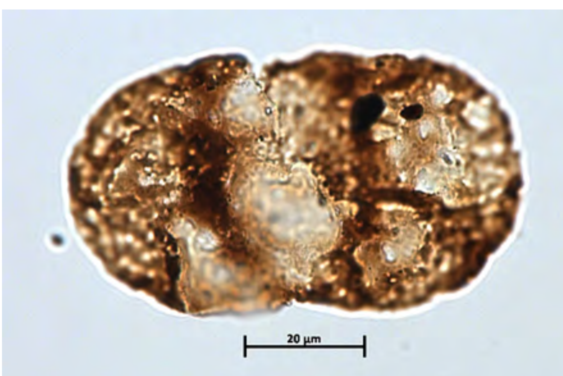
egg case? (large rectangular pit)

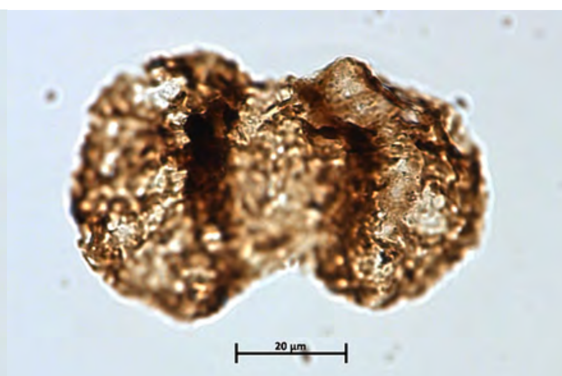
jaw (topsoil in *Comber* trench)



nematode? (fill at base of pond)

10: Reworked Palaeozoic pollen





reworked Palaeozoic gymnosperm pollen (*Alisporites/Protohaploxypinus* spp). (plough line F)