

Figure 121. Plan of PAS 1 showing the original impact area with relation to assessed levels of historical archaeological potential. Note the area marked as having 'high' potential represents the core of the Luddenham Estate brewery and mill complex. Impacts on this red zone have been substantially reduced through redesign (see Figure 122). Source: Near Map, Sydney Water, Extent



Figure 122. Plan of PAS 1 showing impact area with relation to assessed levels of historical archaeological potential and significance. As compared to the original design (Figure 121), note that all impacts are now focused away from areas of high archaeological potential and the core of the Luddenham Estate brewery and mill complex. Source: Near Map, Sydney Water, Extent



Figure 123. Plan of PAS 2 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



Figure 124. Plan of PAS 3 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



Figure 125. Plan of PAS 4 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



Figure 126. Plan of PAS 5 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



Figure 127. Plan of PAS 6 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent

Impact assessment—brine pipeline

Trenching to accommodate brine pipelines will result in complete removal of the archaeological resource within the impact area footprint.

The extent of the impact area resulting from trenching for each PAS, as well as the proposed placement of the pipeline relative to assessed levels of archaeological potential, are presented in Figure 128 through Figure 130. Table 18 presents an overview of impacts anticipated within each PAS and provides recommendations to mitigate these impacts.

Table 18. Assessment of impacts arising from installation of the brine pipeline.

PAS	Archaeological potential	Archaeological significance	Impact discussion	Recommended mitigation
8 (Upper Canal)	Low-moderate	State or local	The area spanning the Upper Canal will be under bored to a depth of 7 in metres. While under boring is unlikely to impact on significant archaeological remains, excavation of entry and exit pits would result in removal of any significant archaeological remains within their footprints. Similarly, trenching in areas of low-moderate potential may result in removal of significant historical archaeological remains.	Archaeological monitoring of ground disturbance in areas of low-moderate potential.
			Overall, the brine pipeline may have a minor adverse archaeological impact and should be mitigated.	
	High	Local	Trenching will likely result in the removal of historical archaeological remains of local significance associated with an outbuilding constructed to support the operations of the Upper Canal. This would result in an adverse impact to the study area's archaeological resources, and these impacts must be mitigated	Avoid impacts in areas of high potential, if possible. Archaeological salvage excavation of remains of local significance within the impact
	Low	Local	Installation of the brine pipeline in these areas would result in little to no archaeological impact.	Works to proceed under an 'unexpected finds protocol'.
9 (Lennox Reserve)	High	Local	Trenching to install the brine pipeline would result in partial or complete removal of significant archaeological evidence associated with a mid to late-nineteenth century cottage or large outbuilding.	Avoid impacts in areas of high potential, if possible. If impact cannot be avoided, complete archaeological testing

PAS	Archaeological potential	Archaeological significance	Impact discussion	Recommended mitigation
				to confirm potential and significance.
				Archaeological salvage excavation of remains of local or state significance within the impact area.
	Low	Local	Installation of the brine pipeline in these areas would result in little to no archaeological impact.	Works to proceed under an 'unexpected finds protocol'.
10 (Lansvale Park)	Moderate to high	Local	Trenching to install the brine pipeline would extend through the centre of two historical structures, one associated with Knight's Butcher Shop, the other an unidentified late nineteenth-century cottage or outbuilding, and result in the removal of any associated archaeological evidence. Installation of the brine pipeline through PAS 10 would result in an adverse impact to the study area's archaeological resources.	Archaeological testing to confirm potential and significance. Archaeological salvage excavation of remains of local or state significance within the impact area.
	Low	Local	Installation of the brine pipeline in these areas would result in little to no archaeological impact.	Works to proceed under an 'unexpected finds protocol'.



Figure 128. Plan of PAS 8 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



Figure 129. Plan of PAS 9 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



Figure 130. Plan of PAS 10 showing impact areas with relation to assessed levels of historical archaeological potential and significance. Source: Near Map, Sydney Water, Extent



15. Mitigation strategies

The significance of the historical archaeological resources that may still survive within the study area is primarily based on its research potential and ability to tell the story about the site. Therefore, the adverse impact of the proposed project could be mitigated by appropriate archaeological investigation, recording and interpretation for the benefit of the general public and future generations.

A range of mitigation strategies have been presented in Table 17 and Table 18 in Section 14 above. A brief description of each strategy, and relevant sites, is presented below.

15.1.1 Avoidance

Three sites present the opportunity for minor redesign to avoid impact to areas of moderate to high archaeological potential:

- PAS 3 (Blaxland's Crossing)
- PAS 7 (Fleurs Radio Telescope Site)
- PAS 8 (Upper Canal)
- PAS 9 (Lansvale Park).

Avoiding impacts in areas of high archaeological potential as will render it unnecessary to complete archaeological test and/or salvage excavation of associated deposits and features. As the areas of high potential are just within the current study area, the proponent redesign to avoid ground disturbance in these areas in the first instance.

15.1.2 Test excavation

Test excavation enables the confirmation of the assessed levels of historical archaeological potential and significance. Completion of test excavation at key sites will enable more certainty in estimating project costs and timeframes, minimising disruption or delays to the construction program. Should test excavation uncover evidence of substantial historical archaeological remains, their management would include one of the following:

- Salvage after thorough recording;
- Archaeological monitoring; or
- An avoidance strategy.

Testing to inform further archaeological requirements is recommended for the following sites:

- PAS 1 (Blaxland's Farm)
- PAS 2 (Blaxland's Gardens)



- PAS 9 (Lennox Reserve) (if impacts cannot be completely avoided by redesign)
- PAS 10 (Lansvale Park).

Archaeological testing will only be triggered if areas of with moderate or high potential for historical archaeological remains of at least local significance will be impacted. Archaeological testing must be completed in accordance with the Archaeological Research Design and Excavation Methodology (ARDEM) (Appendix A).

PAS 1 extends through a highly significant archaeological site. Archaeological testing of PAS 1 should be completed in the earliest instance to inform detailed design of the treated water pipelines and discharge structures, enabling avoidance of significant structures or deposits where possible.

PAS 1 (Blaxland's Farm) and PAS 2 (Blaxland's Gardens) are also situated within areas of Aboriginal archaeological sensitivity (KNC Consulting 2020:46). Historical archaeological test excavation of these sites should be coordinated with Aboriginal archaeological test or salvage excavations to ensure holistic management of each PAS's archaeological resources.

15.1.3 Salvage excavation

Salvage excavation would be completed prior to or as part of the construction program. It would enable detailed recording and analysis of archaeological remains of at least local significance, ensuring that their research potential is fully realised.

The need for archaeological salvage excavations would be informed by the results of archaeological testing for the PAS identified in Section 14.4.2. It is anticipated that salvage excavations may be required at the following sites:

- PAS 1 (Blaxland's Farm)
- PAS 2 (Blaxland's Gardens)
- PAS 8 (Upper Canal)
- PAS 9 (Lennox Reserve)
- PAS 10 (Lansvale Park).

If impacts cannot be avoided by redesign, salvage excavation of localised areas of high archaeological potential in PAS 7 (Fleur's Radio Telescope Site) and PAS 8 (Upper Canal) is recommended in advance of or during construction works.

Salvage excavations must be completed in accordance with the ARDEM. Sufficient time must be allowed for in the construction program to ensure that significant archaeological remains are thoroughly recorded, and their research potential realised.



15.1.4 Archaeological monitoring

Monitoring is completed during the construction program and enables archaeological recording to be completed as construction works proceed, with a mechanical excavator working under the guidance of the archaeological excavation director.

Archaeological monitoring of ground disturbance must be completed in areas of moderate potential within PAS 3 (Blaxland's Crossing) and low-moderate potential within PAS 8 (Upper Canal).

Further PAS may require archaeological monitoring, and this will be informed by the results of archaeological test excavations. Archaeological monitoring must be completed in accordance with the ARDEM.

15.1.5 Unexpected finds protocol

An unexpected finds protocol should be established and delivered as part of a heritage induction. The unexpected finds protocol should establish a cease works and reporting procedure in the instance that unanticipated archaeological remains are uncovered during construction works. It will also provide a basic understanding of archaeological materials to help contractors understand what might constitute an archaeological find. This mitigates the risk of unanticipated archaeological remains of local or state significance being destroyed without proper archaeological recording and investigation.

The documented, hands-on heritage induction would also assist contractors with identifying what may qualify as an unexpected archaeological find as they work.

15.1.6 Management of Aboriginal objects

In the event that any Aboriginal objects are identified during historical archaeological investigations they should be managed in accordance with the management measures specified in the Upper South Creek Aboriginal Cultural Heritage Assessment (KNC 2021).

Note that where areas of non-Aboriginal heritage identified for excavation overlap with areas of potential Aboriginal heritage identified for investigation, as identified in the Upper South Creek Aboriginal Cultural Heritage Assessment (KNC 2021), excavation works will be consistent with the Aboriginal heritage salvage excavation methodology. The Aboriginal and non-Aboriginal excavation methodologies should be developed in consultation with each other.

15.1.7 Post-excavation reporting

The excavation director would prepare a post-excavation report that presents a detailed description of the works performed and their results, illustrated by photographs, survey plans, and an artefact catalogue, as appropriate. The report would include a response to research questions developed for the study area, as well as individual PASs.

Preparation of the post-excavation report would include:



- Artefact cleaning, sorting and cataloguing;
- Processing of scientific samples;
- Digitisation of site records and plans;
- A description of the results of the investigation, including a discussion of the nature of the archaeological remains recorded;
- A response to the research questions developed for the study area;
- The results of any post-excavation analysis undertaken, including artefact or sample analysis;
- Site records, including artefact catalogues, measured drawings, and photographs, where appropriate;
- Conclusions relating to the nature and extent of surviving archaeological remains; and
- Identification of the repository for material recovered from the site.

The final archive of archaeological material should consist of all site records produced throughout the physical investigation, which may include context sheets, artefact sheets, photographs, drawings, and artefacts (inventoried, boxed, labelled, and catalogued), as well as a final copy of the post-excavation report.

15.1.8 Interpretation and public engagement

In addition to archaeological investigation, mitigation measures may also include interpretation of the archaeological evidence found during archaeological investigations. Interpretation would communicate the history and significance of the site to the community throughout various mediums as determined, appropriate to the significance of the resource found. Interpretation may include digital media, signage or some other type of interpretation considered to be appropriate for the relevant sites.

Significant archaeological finds must be included in the interpretation developed for the site(s). A range of appropriate mediums could be used to communicate the history and significance of select sites, including through signage, digital media, ground inlays or other forms of interpretation appropriate to the site.

Consideration should be given to hosting open days during archaeological excavations, particularly for those completed in parks and reserves, to enable community engagement outcomes. Preparation and distribution of brochures or booklets may further support these community engagement initiatives.



15.1.9 Artefact assemblage and site documents

A repository must be identified and nominated for the storage of the artefact assemblage resulting from archaeological investigations. A copy of the final post-excavation report and all excavation documents must accompany the artefact assemblage.

Consideration should be given to lodging digital copies of the site documents, including artefact catalogue, with an open-access repository to enable future research of the resulting archaeological record.



16. Conclusions

- This report has been prepared to satisfy SEAR number 25 issued for the Upper South Creek Advanced Water Recycling Centre project (SSI-8609189).
- Desktop assessment of existing heritage studies and detailed review of historical plans and aerials for the study area identified 10 Potential Archaeological Sites (PAS), including:
 - PAS 1 (Blaxland's Farm), which has moderate to moderate-high potential for state significant archaeology associated with John Blaxland's brewery and mill complex at Luddenham Estate from c.1830.
 - PAS 2 (Blaxland's Gardens), which has moderate potential for archaeological evidence of local or state significance associated with early colonial gardens at Luddenham Estate.
 - PAS 3 (Blaxland's Crossing), which has a localised area of moderate potential for locally significant archaeological evidence of an early colonial road, causeway and timber bridge.
 - PAS 4 (McMaster Field Station), which has low-moderate potential for disturbed and ephemeral archaeological evidence of grazing and cultivation which is unlikely to meet the threshold for local significance.
 - PAS 5 (McGarvie Smith Farm), which has low potential for disturbed and truncated historical archaeological evidence associated with agricultural activities which is unlikely to meet the threshold for local significance.
 - PAS 6 (Exeter Farm), which has low potential for historical archaeological evidence of local significance associated with James Badgery's c.1812 Exeter Farm.
 - PAS 7 (Fleurs Radio Telescope Site), most of which has low to high potential for disturbed archaeological evidence from all phases of use unlikely to meet the threshold for local significance. There are two localised areas with high potential for archaeological evidence of local or state significance associated with two timber bridges on South Creek.
 - PAS 8 (Upper Canal), which has low-moderate potential for archaeological evidence of local or state significance associated with the Upper Canal system. There is one localised area with high potential for archaeological remains of local significance.
 - PAS 9 (Lennox Reserve), most of which has low potential for archaeological evidence of local significance associated with ephemeral agricultural use. A localised area within PAS 9 has high potential for archaeological evidence of local significance associated with a mid to late-nineteenth cottage or substantial outbuilding.



- PAS 10 (Lansvale Park), which has moderate to high potential for archaeological evidence of local significance associated with a late nineteenth-century butcher's shop and separate cottage or large outbuilding.
- The impact assessment has identified that historical archaeological remains of at least local significance will be impacted at the following PAS:
 - PAS 1 (Blaxland's Farm)
 - PAS 2 (Blaxland's Gardens)
 - PAS 3 (Blaxland's Crossing)
 - PAS 7 (Fleur's Radio Telescope Site)
 - PAS 8 (Upper Canal)
 - PAS 9 (Lennox Reserve)
 - PAS 10 (Lansvale Park).
- To mitigate the impacts of development, archaeological investigations must be completed at PAS 1, 2, 3, 7, 8, 9, and 10 (unless impacts to areas of archaeological potential can be avoided). These works must be completed in accordance with the Archaeological Research Design and Excavation Methodology developed to satisfy SEAR 25 (attached at Appendix A).
- The mitigation strategies presented at Section 15 must be enacted to ensure appropriate management of the study area's historical archaeological resources.



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Appendix A. Upper South Creek AWRC— Archaeological Research Design and Excavation Methodology



Upper South Creek Advanced Water Recycling Centre Project Archaeological Research Design and Excavation Methodology

Prepared for Sydney Water

June 2021—Final

Sydney Melbourne Brisbane Perth Hobart

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1. Project initiation

Sydney Water is constructing a wastewater treatment plant, known as the Upper South Creek Advanced Water Recycling Centre (hereafter 'the Centre'), Western Sydney. The works will also include the construction of treated water pipelines to discharge into the Nepean and Warragamba Rivers, and brine pipelines to connect to the Malabar wastewater system at Lansdowne. The Centre and the associated treated water and brine pipelines will be referred to through this report as the 'project'.

The project is State Significant Infrastructure (SSI) and is being assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EPA Act). The Planning Secretary's Environmental Assessment Requirements (SEARs) have been issued for the project (SSI-8609189) and include requirements for historical archaeology. SEAR 25 requires the following:

A historical archaeological assessment prepared by a suitably qualified historical archaeologist in accordance with the guidelines *Archaeological Assessment* (1996) and *Assessing Significance for Historical Archaeological Sites and Relics* (2009). This assessment should identify what relics, if any, are likely to be present, assess their significance and consider the impacts from the project on this potential archaeological resource. Where impact is likely to occur, it is recommended that the significance of the relics be considered in determining an appropriate mitigation strategy. If harm cannot be avoided in whole or part, an appropriate **Research Design and Excavation Methodology** should also be prepared to guide any proposed excavations or salvage programme.

Extent Heritage Pty Ltd (Extent Heritage) prepared a Historical Archaeological Assessment (HAA) for the project to satisfy the requirements of SEAR 25. The HAA identified ten Potential Archaeological Sites (PAS) and found that seven had the potential for archaeological relics of at least local significance that would be impacted by the project, including:

- Blaxland's Farm (PAS 1);
- Blaxland's Gardens (PAS 2);
- Blaxland's Crossing (PAS 3);
- Fleurs Radio Telescope Site (PAS 7);
- Upper Canal (PAS 8);
- Lennox Reserve (PAS 9); and
- Lansvale Park (PAS 10).

Since harm to relics at these sites cannot be avoided in whole or part, an Archaeological Research Design and Excavation Methodology (ARDEM) is required to fully satisfy the requirements of SEAR 25. Extent Heritage has been engaged by Sydney Water to prepare an



ARDEM for the above listed archaeological sites. It provides a detailed research framework and excavation methodology to guide historical archaeological investigations at each site.

This ARDEM should be read in conjunction with the HAA prepared for the project (Extent Heritage 2021).

1.1 Site location and identification

The impact assessment area for the project extends across Western Sydney (Figure 1). The Centre is on part of Lot 21 DP 258414, in Kemps Creek.

The associated treated water and brine pipelines will extend from the centre at Kemps Creek to the Malabar wastewater system at Lansdowne in the east, and discharge into the Nepean and Warragamba Rivers in the west. This work will extend through multiple LGAs including, from east to west: Canterbury-Bankstown, Fairfield, Liverpool, Penrith and Wollondilly.

The location of each site is presented in below and illustrated in Table 1.

Site	Address	Lot/DP	LGA
Blaxland's Farm (PAS 1)	2595 Silverdale Road, Wallacia, NSW	Lot 1 DP 1154130	Wollondilly
Blaxland's Gardens (PAS 2)	2720 Silverdale Road, Wallacia, NSW	Lot 12 DP 573571	Wollondilly
Blaxland's Crossing (PAS 3)	1A Shelley Road, Wallacia, NSW	Lot 36 DP 248614	Wollondilly
Fleurs Radio Telescope Site (PAS 7)	885A Mamre Road, Kemps Creek, NSW	Lot 21 DP 258414	Penrith
Upper Canal (PAS 8)	Elizabeth Drive, Cecil Hills, NSW	Lots 11 and 12 DP 1055232	Liverpool
Lennox Reserve (PAS 9)	Hume Highway, Canley Vale, NSW	Lot A DP 33027	Fairfield
Lansvale Park (PAS 10)	 2-20 Hume Highway, Lansvale, NSW 22-36 Hume Highway, Lansvale, NSW Knight Street, Lansvale, NSW 14 and 14A Knight Street, Lansvale, NSW 1B Day Street, Lansvale, NSW 	Lot 1 DP 653719 Lot 10 DP 774392 Lots 1 and 2 DP 556916 Lots 2 and 3 DP 561588 Lots 1 and 2 DP 121121 Lot 5 DP 238490	Fairfield

Table 1. Location and lot designation for each archaeological site addressed in this ARDEM.



1.2 Project description

Sydney Water proposes to deliver new wastewater infrastructure to service the South West and Western Sydney Aerotropolis Growth Areas in stages, with Stage 1 comprising:

- Building and operating the Centre to treat an average dry weather flow of up to 50ML per day.
- Building all pipelines to their ultimate capacity, but only operating them to transport and release volumes produced by the Stage 1 Centre.

The timing and scale of future stages will be phased to respond to drivers including population growth rate and the most efficient way for Sydney Water to optimise its wastewater systems.

Advanced Water Recycling Centre

- A wastewater treatment plant with the capacity to treat up to 50ML of wastewater per day, with ultimate capacity of up to 100ML per day.
- The Advanced Water Recycling Centre will produce:
 - High-quality treated water suitable for a range of uses including recycling and environmental flows.
 - Renewable energy, including through the capturing of heat for cogeneration.
 - Biosolids suitable for beneficial reuse.
 - Brine, as a by-product of reverse osmosis treatment.

Treated water pipeline

- A pipeline about 17 km long from the Advanced Water Recycling Centre to the Nepean River at Wallacia Weir, for the release of treated water.
- Infrastructure from the Advanced Water Recycling Centre to South Creek to release excess treated water and wet weather flows.

Environmental flows pipeline

A pipeline about five kilometres long from the main treated water pipeline at Wallacia to a location between the Warragamba Dam and Warragamba Weir, to release high-quality treated water to the Warragamba River as environmental flows.

Brine pipeline

A pipeline about 24 km long that transfers brine from the Advanced Water Recycling Centre to Lansdowne, in south-west Sydney, where it connects to Sydney Water's existing Malabar wastewater network.



1.3 Previous reports and investigations

This ARDEM has drawn on a number of previous reports and heritage studies, including the following:

- Extent Heritage (2021) 'Upper South Creek Advanced Water Recycling Centre Project, Historical Archaeological Assessment', draft report prepared for Sydney Water.
- Kass, T. (1993) 'Thematic history of Fairfield, Fairfield City heritage study, volume 1', report prepared for Perumal Murphy Wu Pty Ltd.
- Neustein and Associates (1992) 'Liverpool Heritage Study, Part 1', report prepared for Liverpool City Council, April 1992.
- JRC Planning. 1991. 'Wollondilly Heritage Study Inventory: The Oaks, Theresa Park, Thirlmere, Wallacia, Warragamba, Werombi, Wilton, Yerranderie', prepared for Wollondilly Shire Council and the Department of Planning.
- Government Architects Office (2016) 'Upper Canal Pheasants Nest to Prospect Reservoir Conservation Management Plan', report prepared for Water NSW, May 2016.
- O'Sullivan, C (1977) 'John Blaxland's Luddenham Estate, including the Mulgoa Industrial Site', unpublished report prepared by the Workers' Educational Association of NSW.

These reports are also listed in the references in Part 10 of this report.

1.4 Report layout

Since this ARDEM considers multiple archaeological sites, each site has been allotted a section which includes a site-specific research design, including historical timeline, summary statements of archaeological potential and significance, and a research framework, and the excavation strategy to mitigate the development impacts. The following sections provide site-specific research designs and excavation strategies:

- Section 2—Blaxland's Farm (PAS 1);
- Section 3—Blaxland's Gardens (PAS 2);
- Section 4—Blaxland's Crossing (PAS 3);
- Section 5—Fleurs Radio Telescope Site (PAS 7);
- Section 6—Upper Canal (PAS 8);
- Section 7—Lennox Reserve (PAS 9); and
- Section 8—Lansvale Park (PAS 10).



Section 9 presents a detailed excavation methodology to be enacted in accordance with the excavation strategy presented in Sections 2 through 8.

Section 10 provides conclusions and recommendations.

1.5 Author identification

This ARDEM was prepared Dr Jennifer Jones-Travers, Senior Associate. Jennifer is an approved Excavation Director for sites of local and state significance and has 17 years' experience and a PhD specialising in Australian historical archaeology. She is the current Member with Expertise in Archaeology on the Tasmanian Heritage Council.

It was reviewed by Anita Yousif, Associate Director and National Technical Lead, Historical Archaeology. Anita Yousif is an approved Excavation Director for sites of local and state significance with over 20 years' experience in Australian historical archaeology, who fully satisfies all requirements of the NSW Heritage Council's *Excavation Director Criteria* (2019). Anita is the current President of the Australasian Society for Historical Archaeology.

1.6 Limitations

This report addresses only the project's historical archaeological resources. Aboriginal heritage requirements are addressed in a separate report (Kelleher Nightingale Consulting 2021).



- Treated Water Pipeline
- Brine Pipeline
- Environmental Flows Pipeline

Projection: GDA 1994 MGA Zone 56 Project infrastructure locations are indicative and will be refined during design

Figure 1. Plan showing the location of the impact assessment area. Source: Sydney Water





Figure 2. Locations of the six PAS included in this ARDEM.



2. Blaxland's Farm (PAS 1)

2.1 Overview

PAS 1 (Blaxland's Farm) is located at 2595 Silverdale Road, Wallacia (Lot 1 DP 1154130), within the Wollondilly Shire Council LGA (Figure 3). It is currently listed on the *Wollondilly LEP 2011* (Item I269).



Figure 3. Location and extent of PAS 1. Source: LPI, Extent

2.2 Historical timeline

Date	Event
1804	John Blaxland sold his land in England to begin a pastoral enterprise in the colony of New South Wales, with his family landing in Sydney in April 1807 (O'Sullivan 1977:16).
1807	John Blaxland and his brother Gregory wanted to establish a distillery but were opposed by Governor Bligh, and John was later involved with the overthrow of Bligh as a result of several disagreements with the governor. The brothers operated a slaughtering and butchering business in Sydney during



Date	Event		
	their early years in the colony, though this partnership ended in August 1813 (O'Sullivan 1977:16).		
November 1813	John Blaxland is granted 6,710 acres of land by Governor Macquarie, with the initial grant spanning an area bounded to the west by the Nepean River and to the east by the western branch of South Creek.		
	Blaxland was allotted an 800-acre parcel of land located at the confluence of the Nepean and Warragamba Rivers (including PAS 2) by Governor Brisbane (O'Sullivan 1977:1). This land and six other parcels accumulated prior to 1840 comprised Blaxland's Luddenham Estate.		
1825	Luddenham was only one of four large estates owned by John Blaxland, the others being:		
	 Newington in Parramatta (1,410 acres) where Blaxland lived, had a large saltworks, a meat works and blanket factory; 		
	 Gannon Plains (15,692 acres); and 		
	 Fordwich on the Wollombi Break (12,000 acres) which also included a flour mill, saw mills and a dairy (O'Sullivan 1977:16). 		
	Blaxland had commenced grinding wheat at Luddenham by 1830, and by 1834 was using a stone-built water mill powered by a dam built across the river, described as follows:		
1830	at the point where the river makes its exit from the Mulgoa Valley, and at the mouth of a high precipitous rocky gorge; a strong wooden dam formed of heavy beams bolted together, supported with great logs of timber as stays, and packed with earth and stones. (O'Sullivan 1977:18)		
1839	Blaxland imported two copper vats from England, and by April that year both the flour mill and brewery had been established at Luddenham with a total value of £5,000.		
	A valuation of the entire Luddenham property was completed and provides insight into the activities occurring on the property. The following are some of the many improvements were listed:		
	 Water mill and dam 		
	 Brewery, malting house and outbuildings attached 		
5 March 1840	 Barn and threshing machine 		
	 Bridge over the river 		
	 Buildings of old Establishment. 		
	In addition to the items listed in the inventory, another account describes 'A brewery and Malthouse with Brewing Coppers, Vats, Steam engine, Refrigerator, Coolers, Malt mill, Casks and all Brewing Utensils valued at £7000' (<i>Blaxland Papers 1824-1883</i> , p 89).		


Date	Event
1841	A large labour force operated at Luddenham under John Blaxland, and in 1841 the estate employed 69 people, including 27 freemen, 13 convicts, 19 women and 20 children (O'Sullivan 1977:7).
1851	John Blaxland died in 1845 and the Australian Trust Company sold the property to Sir Charles Nicholson in 1851.
1852	The brewery was damaged by flooding and later rendered inoperable by flooding in 1871 (O'Sullivan 1977:4).
	Luddenham Estate was subdivided, with George Henry and Archibald Bell Cox purchasing the land including the impact assessment area in 1861 (O'Sullivan 1977:1-2). George Henry Cox was a politician, pastoralist and sheep breeder born in Mulgoa in 1824. He declared the first rural municipality in NSW (Mudgee) and became its first mayor (Teale 1969).
1859	Descriptions of the land sold included the following summary of 'improvements' made to the site:
	The buildings consist of those large premises known as the 'Brewery', which were erected at an immense cost by the Messrs/ Blaxland being built out of cut stone containing brewhouse, malt house, stores, cellars, etc. There are also two neat cottage residences, an excellent flour mill, men's huts, yards and a number of outbuildings (O'Sullivan 1977).
1871	According to local oral history, some of the stones from the brewery were recycled to construct a cottage on the hill to the west of the site in the late nineteenth century (O'Sullivan 1977:12).
1931	The Primary Application (31007) for the land was made by William Edward Baines, farmer, on 18 September 1931, and this application provides some insight into land transfer activities associated with the property. Through the later parts of the nineteenth century, the estate became known as 'Mulgoa Forest'. Thomas Icely and Caroline Lawson became mortgagees of the property on 23 February 1869 and the land was purchased by James Edward Baines on 1 January 1871. William Edward Baines, likely the same person who made the Primary Application, took ownership of the property on 19 November 1912.
1950s and 1960s	William Edward Baines still owned the property in 1942, but several lots were annexed from the property through the 1950s and 1960s, reducing the overall size of Baines' landholdings (Vol. 5355 Folio 216). Several easements were established through Baines' property, including water sewerage and drainage board easements and a 'right of way' (road) (Vol. 4501 Folio 209). Further easements were made to the Metropolitan Water Sewerage and Drainage Board in 1962, followed by resumption of land for easement of a transmission line in 1964. These easements are situated to the south and west of the impact assessment area.



The land was purchased by John Ruth Fowler, Headmaster, and Lionel Rupert Fowler, Pharmacist, in 1965 (Vol. 8125 Folio 77). The property remains in the possession of the Fowler family.1965	Date
No development has occurred within the impact assessment area since Blaxland's mill and brewery were abandoned in the 1860s or 1870s and it has generally remained as agricultural land near the edge of the Nepean River.	1965

2.2.1 Phases of development

The following phases of development were identified for PAS 1:

- Phase 1: 1788-1825 (Ephemeral Use)
- Phase 2: 1825-1851 (Luddenham Estate)
- Phase 3: 1851-1911 (Nicholson and Cox)
- Phase 4: 1912-1964 (Mulgoa Forest Estate)
- Phase 5: 1965-Present (Fowler's Estate).

2.3 Summary statement of archaeological potential

Historical plans and the survey of the impact assessment area indicates that the core of the Blaxland's Farm site is situated immediately west of the current impact assessment area, and these areas have high potential for historical archaeological evidence of the watermill and brewery. Evidence associated with convict accommodation is also most likely located to the west of the watermill and brewery, well outside of the current impact assessment area.

The impact assessment area likely contains evidence associated with Blaxland's brewery and operations of his Luddenham Estate in Phases 2 and 3, including land clearing and levelling. The southern part of the impact assessment area has moderate archaeological potential due to historical disturbance resulting from regular ploughing and cultivation following abandonment of the brewery. The northern part of the impact assessment area has moderate-high archaeological potential as it has not been subjected to any known historical disturbance, but fewer areas of historical modification or use were identified through analysis of LiDAR data or site survey.

The anticipated archaeological resource would include ancillary structures were constructed in association with the brewery and operation of Luddenham Estate, including cellars, a malthouse, stores, a steam mill, and stables for the working horses. Landscape evidence may include working yards, drains, and paths. A well or cistern would have been necessary to enable to flow of fresh water to the brewery, while cesspits may have been constructed to provide facilities to workers. Sealed artefact deposits might be anticipated within rubbish pits or dumps, accumulated on paved surfaces, in underfloor deposits, or discarded in wells,



cesspits, cisterns or drains. There may also low-moderate to moderate potential for evidence of agricultural activities or cultivation, including ephemeral agricultural structures, field drains, palynological and ethnobotanical evidence of species grown, and plough marks.

The impact assessment area has low potential for archaeological evidence associated with use in Phases 1, 4 or 5. A summary of PAS 1's potential archaeological resource is presented in Table 2.

Phase	Site feature or activities	Potential remains	Location	Likelihood of survival
1: 1788– 1825	Loss or discard of materials during ephemeral use, such as survey or exploration	Isolated artefacts	All of PAS 1	Low
2: 1825– 1851	Land elegring and lavelling	Tree boles	North part of PAS 1	Moderate
	Land cleaning and levening	Cutting and filling episodes	South part of PAS 1	Low- moderate
	Blaxland's brewery	Brewhouse Malt house Steam mill	North part of PAS 1	Moderate- high
		Stables Agricultural and industrial outbuildings (barns, piggery, stores, sheds, etc.)	South part of PAS 1	Moderate
2:1825- 1851 and 3: 1851- 1911		Underfloor deposits Cut and filled rubbish pits	North part of PAS 1	Moderate- high
	Sealed artefact deposits (rubbish disposal)	Fills in wells, cesspits, drains and cisterns Accumulated on paved surfaces	South part of PAS 1	Moderate
		Drains Paths	North part of PAS 1	Moderate- high
	Landscaping	Yards or working surfaces (paved or unpaved)	South part of PAS 1	Moderate

Table 2. Summary of historical archaeological potential.



Phase	Site feature or activities	Potential remains	Location	Likelihood of survival
	Agricultural use and	Field drains Ephemeral agricultural structures	North part of PAS 1	Moderate
	cultivation	Palynological and ethnobotanical evidence Isolated artefacts	South part of PAS 1	Low- moderate
3: 1851- 1911	Repair, extension and	Sandstone and brick footings Postholes indicating re-	North part of PAS 1	Moderate- high
	brewery buildings	alignment Demolition rubble, wash debris	South part of PAS 1	Moderate
	New agricultural or industrial structures	Barns Piggeries	North part of PAS 1	Moderate
		Stores Sheds	South part of PAS 1	Low- moderate
4: 1911– 1964 and 5: 1965- Present	Agricultural use and cultivation	Field drains Ephemeral agricultural structures Palynological and ethnobotanical evidence Isolated artefacts Services	All of PAS 1	Low- moderate

2.4 Summary statement of archaeological significance

Blaxland's brewery at Luddenham Estate was a sizeable enterprise associated with a prominent NSW family producing beer in a rural area of the greater Sydney region in the early nineteenth century. Historical archaeological evidence associated with Blaxland's brewery at Luddenham Estate in Phase 2 (1825-1851) would be of state significance for its historical, associative and research values, as well as its rarity. Archaeological evidence of the steam mill at the brewery would also be of state significance for its technical values.

Historical archaeological evidence of Blaxland's gardens at Luddenham Estate, including palynological and paleoethnobotanical evidence, would demonstrate changing agricultural practices and crops being cultivated in western Sydney. Archaeological evidence of Blaxland's



gardens would be of state significance for its historical values and local significance for its research values.

Archaeological remains of later use of Luddenham Estate, including repair to and modification of the brewery buildings, by Nicholson and Cox would be of local significance for its historical and research values. Archaeological evidence that could be associated with George Henry Cox would be of local significance for its associative values.

2.5 Research framework

2.5.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the documented occupation of PAS 1 are listed below (Table 3). Details of the phases of occupation associated with each theme are also included.

Australian theme	NSW theme	Local themes	Occupation phase
Peopling Australia	Convict	Activities relating to incarceration, transport, reform, accommodation and working during the convict period in NSW.	Phase 2 (1825- 1851)
Developing local, regional and national economies	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes, can include aquaculture	Phases 2-5 (1825-Present)
	Industry	Activities associated with the manufacture, production and distribution of goods	Phases 2 and 3 (1825-1911)
Working	Labour	Activities associated with work practices and organised and unorganised labour.	Phases 2 and 3 (1825-1911)

Table 3. Historical themes relevant to PAS 1.

2.5.2 Research questions

Test excavation

Archaeological testing is recommended to inform final design of the treated water pipeline and discharge structure to avoid impacts where possible. The following questions will guide the testing program:

- What is the nature and extent of archaeological remains uncovered within the site?
- Are exposed archaeological remains well preserved and at a level of significance that retention *in situ* is recommended?



- Do the exposed remains warrant salvage excavation or monitoring of the remainder of the site in a second stage of investigations to fully realise their research potential?
- Can the level of archaeological significance outlined in this report be reassessed as a result of historical archaeological test excavations?

Salvage excavation and monitoring

The following broad and site-specific research questions will guide archaeological salvage excavations and monitoring, where required.

Broad research questions

- Were intact structural remains uncovered during excavations? What do the layout and materials used indicate about their date of construction and function? Is there any evidence of modifications or extension?
- How has the site developed through time?
- Is there any temporal differentiation in occupation and use phases within the site? What differences are evident in the structural remains and artefact assemblages between phases? Do these reflect broader historical trends in the region?

Site specific research questions

- What evidence of brewing practices (or ancillary industries) were uncovered during excavations? What can they teach us about colonial brewing at Luddenham Estate?
- Was any palynological evidence associated with Blaxland's Gardens uncovered? What plants and crops were growing in the area?
- Can the artefact assemblage provide any insight into the people working at Luddenham Estate (in the brewery or gardens), including their diet, age, class, gender, or ethnicity?
- Is there any evidence of historical Aboriginal use of the site, as either a contact site or workplace?

2.6 Excavation strategy

2.6.1 . Test excavation

Test excavations will be conducted with the following objectives:

- Investigate anomalies potentially representing structures or features in the LiDAR and DEM plans;
- Identify the intactness and integrity of archaeological remains;
- Inform minor redesign to avoid impacts to highly significant archaeological remains;



 Determine the extent of areas with remnant archaeological potential and define zones requiring further archaeological management.

To accomplish this, it is proposed that excavation of up to five test trenches across the impact assessment area be undertaken in places with moderate or moderate-high archaeological potential. Excavation of these test trenches would provide information on the nature, integrity, and extent of the archaeological resource at the impact assessment area, allowing for clearer identification of areas requiring further archaeological management during implementation of the masterplan. This may also allow for avoidance of future impacts through minor redesign.

The rationale for the placement of the test trenches is presented in Table 4, and the proposed trench alignment is presented in Figure 4.

Trench No.	Size	Orientation	Objective
1	Up to 25m x 2m	East-West	Sample terraced landform visible in DEM, similar landforms to the west contained structural remains.
2	Up to 5m x 2m	East-West	Investigate rectilinear stone footing visible in contemporary aerial photographs.
3	Up to 25m x 2m	Northeast- Southwest	Sample terraced landform visible in DEM, similar landforms to the west contained structural remains.
4	Up to 10m x 4m	North-South	Investigate linear form evident in DEM and LiDAR data.
5	Up to 25m x 2m	North-South	Investigate rectilinear form evident in DEM and LiDAR data.

Table 4. Rationale for test trench placement, PAS 1.

Test excavations must be completed in accordance with the excavation methodology presented in Section 9.1.



Figure 4. Proposed test trench placement in PAS 1 to target key landforms and features. Source: Near Map, Extent



2.6.2 Salvage excavation and monitoring

Following test excavation, salvage excavation must be completed in areas with intact and legible archaeological remains of at least local significance that would be impacted by the proposed works. Given the particularly high significance of PAS 1, sufficient time and resources must be provided to the archaeologists to ensure that the research potential of the impact assessment area is fully realised.

Ground disturbance works in areas with dispersed or truncated archaeological remains or relics, as identified by testing, must be subject to archaeologically monitoring and recording until the Excavation Director is satisfied that the area's research potential is fully realised, or nil potential remains.

Archaeological salvage excavations and monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.



3. Blaxland's Gardens (PAS 2)

3.1 Overview

PAS 2 (Blaxland's Gardens) is located at 2720 Silverdale Road, Wallacia (Lot 12 DP 573571), within the Wollondilly Shire Council LGA (Figure 5).



Figure 5. Location and extent of PAS 2. Source: LPI, Extent

3.2 Historical timeline

Date	Event
1804	John Blaxland sold his land in England to begin a pastoral enterprise in the colony of New South Wales, with his family landing in Sydney in April 1807 (O'Sullivan 1977:16).
November 1813	John Blaxland is grated 6,710 acres of land by Governor Macquarie, with the initial grant spanning an area bounded to the west by the Nepean River and to the east by the western branch of South Creek.
1825	Blaxland was allotted an 800-acre parcel of land located at the confluence of the Nepean and Warragamba Rivers (including PAS 2) by Governor Brisbane (O'Sullivan 1977:1).



Date	Event
	This land and six other parcels accumulated prior to 1840 comprised Blaxland's Luddenham Estate.
1827	A public road was built through Luddenham Estate (now Silverdale Road), for which Blaxland was compensated by construction of a two to three rail fence on either side of the road (O'Sullivan 1977:2).
1859	A subdivision plan of Luddenham Estate shows PAS 2 as being situated within an area marked 'Garden' on the plan, with two structures situated to the west.
	George Henry and Archibald Cox purchased land including the impact assessment area (O'Sullivan 1977:1-2).
1861	George Henry Cox was a politician, pastoralist and sheep breeder born in Mulgoa in 1824. He declared the first rural municipality in NSW (Mudgee) and became its first mayor (Teale 1969).
1909	A plan of the site in 1909 shows no identified historical development within PAS 2, though it does present it as being in close proximity to Silverdale Road and Wallacia Bridge (also referred to as 'Blaxland's Crossing').
1929	A plan of the site in 1929 shows the establishment of a road along the western edge of the site (now Bent Basin Road), as well as a telegraph or telephone line extending north-south through PAS 2.
1955	An aerial photograph of PAS 2 illustrates the continued lack of development within the impact assessment area. PAS 2 remained a partially cleared area adjacent to the Nepean River.

3.2.1 Phases of development

The following phases of development were identified with regard to PAS 2:

- Phase 1: 1812-1859 (Blaxland's Gardens, Luddenham Estate); and
- Phase 2: 1859-Present (Ephemeral land use).

3.3 Summary statement of archaeological potential

Most of PAS 2 has moderate potential for historical archaeological evidence associated with the gardens established as part of John Blaxland's Luddenham Estate. The impact assessment area was established as a delineated early colonial garden and appears to have been subjected to little or no disturbance following the cease of cultivation activities. The anticipated archaeological resource includes evidence within garden soils (palynological and ethnobotanical evidence, plough marks, artefact deposits from kitchen scraps), ephemeral structures used to support crop cultivation or grazing activities, evidence of landscape modifications (field drains, fence lines, garden bed edging) and may potentially include isolated artefacts resulting from loss or discard. There is also low-moderate potential for evidence of early land clearing (burnt tree boles, wash deposits).



The western edge of the impact assessment area has low archaeological potential as a result of construction of Bents Basin Road, as it is likely to have impacted or removed more ephemeral evidence associated with Blaxland's gardens.

3.4 Summary statement of archaeological significance

PAS 2 is associated with Luddenham Estate and likely contains evidence of Blaxland's gardens established as a dedicated area of cultivation at the core of the colonial estate along the Nepean River. Evidence of land clearing, establishment and operation of the gardens, and landscape management techniques associated with Blaxland's Luddenham Estate would be of state significance for its historical and research values, and of local significance for its rarity.

3.5 Research framework

3.5.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the documented history of PAS 2 are listed below (Table 5). Details of the phases of occupation associated with each theme are also included.

Australian theme	NSW theme	Local themes	Occupation phase
Developing local, regional and national economies	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes, can include aquaculture	Phases 1-2 (1812-Present)
	Environment – cultural landscape	Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings.	Phase 1 (1812-1859)

Table 5. Historical themes relevant to PAS 2.

3.5.2 Research questions

Test excavation

Archaeological testing is recommended to confirm the assessment of archaeological potential and significance. The following questions will guide the testing program:

- What is the nature and extent of archaeological remains uncovered within the site?
- What areas of future impact warrant salvage excavation or monitoring in a second stage of investigations to fully realise their research potential?
- Can the level of archaeological significance outlined in this report be reassessed as a result of historical archaeological test excavations?



Salvage excavation and monitoring

The following broad and site-specific research questions will guide archaeological salvage excavations and monitoring, where required.

Broad research questions

- Were intact structural remains uncovered during excavations? What do the layout and materials used indicate about their date of construction and function? Is there any evidence of modifications or extension?
- How has the site developed through time?
- Is there any temporal differentiation in occupation and use phases within the site? What differences are evident in the structural remains and artefact assemblages between phases? Do these reflect broader historical trends in the region?

Site specific research questions

- Was any palynological evidence associated with Blaxland's Gardens uncovered? What plants and crops were growing in the area?
- Do archaeological remains recovered, including landscaping features and structural remains, provide any insight into the landscape of Blaxland's Gardens?
- How do the archaeological or artefact assemblages compare with those from other sites associated with Luddenham Estate or Blaxland's other landholdings?
- Can the artefact assemblage provide any insight into the people working at Luddenham Estate (in the gardens), including their diet, age, class, gender, or ethnicity?

3.6 Excavation strategy

3.6.1 Test excavation

Test excavations will be conducted with the following objectives:

- Identify the intactness and integrity of archaeological remains;
- Confirm the assessment of archaeological potential and significance; and
- Determine the extent of areas with remnant archaeological potential and define zones requiring further archaeological management.

To accomplish this, it is proposed that excavation of up to four test trenches across the impact assessment area be undertaken in places with moderate archaeological potential. This will confirm whether any evidence of Blaxland's Gardens remain intact within PAS 2. The rationale for the placement of the test trenches is presented in Table 6, and the proposed trench alignment is presented in Figure 6.



Trench No.	Size	Orientation	Objective
1	Up to 25m x 2m	Northeast- Southwest	
2	Up to 25m x 2m	Northeast- Southwest	Confirm presence, as well as intactness
3	Up to 25m x 2m	Northeast- Southwest	and integrity, of soil deposits and features associated with Blaxland's Gardens.
4	Up to 25m x 2m	Northeast- Southwest	

Table 6. Rationale for test trench placement, PAS 2.

Test excavations must be completed in accordance with the excavation methodology presented in Section 9.1.

3.6.2 Salvage excavation and monitoring

Following test excavation, salvage excavation must be completed in areas with intact and legible archaeological remains of at least local significance that would be impacted by the proposed works.

Ground disturbance works in areas with dispersed or truncated archaeological remains or relics, as identified by testing, must be subject to archaeologically monitoring and recording until the Excavation Director is satisfied that the area's research potential is fully realised, or nil potential remains.

Archaeological salvage excavations and monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.



Figure 6. Proposed test trench placement in PAS 2 to target key deposits and features. Source: Near Map, Extent



4. Blaxland's Crossing (PAS 3)

PAS 3 (Blaxland's Crossing) is located at 1A Shelley Road, Wallacia (Lot 36 DP 248614) within the Penrith City Council LGA (Figure 7). Blaxland's Crossing is listed on Schedule 5 of the *Wollondilly LEP 2011* (Item I289).



Figure 7. Location and extent of PAS 3. Source: LPI, Extent

4.1 Historical timeline

Date	Event	
1804	John Blaxland sold his land in England to begin a pastoral enterprise in the colony of New South Wales, with his family landing in Sydney in April 1807 (O'Sullivan 1977:16).	
November 1813	John Blaxland was granted 6,710 acres of land by Governor Macquarie, including PAS 3, with the initial grant spanning an area bounded to the west by the Nepean River and to the east by the western branch of South Creek.	
	This land and six other parcels accumulated prior to 1840 comprised Blaxland's Luddenham Estate.	



Date	Event
	A public road (now Silverdale Road) was built through Luddenham Estate, for which Blaxland was compensated by construction of a two to three rail fence on either side of the road (O'Sullivan 1977:2).
1827	A crossing associated with this road was likely constructed around this time and referred to as 'Blaxland's Crossing'. The crossing was a ford roughly paved by bringing up river pebbles and consolidating them to form a causeway (JRC Planning 1991).
c1850	The original crossing was replaced by a bridge constructed c.1850 (JRC Planning 1991).
1859	A subdivision plan of Luddenham Estate shows PAS 3 as being situated in the vicinity of an area marked 'Bridge', with no other development identified.
	A regional plan, while somewhat difficult to discern, does not appear to show any development within PAS 3.
1906	Photographs showing areas near the impact assessment area indicate early use for recreational purposes, with a large number of people gathered near the river's edge in images taken between 1900 and 1927.
1929	Another historical regional plan that shows the general location of structures does not show any development within PAS 3 but identifies ample development along Greendale Road to the east.
	The line of what is now Silverdale Road extends through the north end of PAS 3.
1955	An aerial photograph of PAS 3 shows development within the impact assessment area along the Silverdale Road frontage, as well as along the western boundary down to the south end of the site. Historical images of the site show active use for recreation from the early twentieth century. The buildings depicted in the historical aerial may represent a range of public amenities (shade structures, picnic enclosures), services (restaurants, guesthouses) and residences.
	The property north of PAS 3, on the opposite side of Silverdale Street, appears to have been used as a campsite, with a single service building and tents scattered across the property visible in aerial photographs.
	The line of the original roadway and creek crossing is evident and remains marked by telephone or electrical lines spanning the Nepean River.
Late twentieth	The line of Silverdale Road was amended and moved to the north of PAS 3, forming its northern boundary. A new bridge was constructed as part of this new alignment, with the c.1850 bridge demolished.
century	All structures built between 1929 and 1955 within PAS 3 were demolished, with the site declared a reserve (Fowler Reserve).



4.1.1 Phases of development

The following phases of development were identified with regard to PAS 3:

- Phase 1: 1788-1827 (Ephemeral use);
- Phase 2: 1827-1859 (Blaxland's Crossing);
- Phase 3: 1859-1929 (Wallacia Bridge);
- Phase 4: 1930-c.1970 (Residential development); and
- Phase 5: c.1970-Present (Fowler Reserve).

4.2 Summary statement of archaeological potential

Most of PAS 3 has low potential for archaeological evidence associated with land clearing (burnt tree boles, wash deposits) and grazing (fence lines, isolated artefacts resulting from loss and discard) in Phases 2 and 3 as part of Luddenham Estate. The northwest corner of PAS 3 has moderate potential for archaeological evidence of earlier iterations of Silverdale Road and possibly the start of the Phase 2 Blaxland's Crossing rubble causeway and ford.

4.3 Summary statement of archaeological significance

Historical archaeological evidence of a road and rubble causeway constructed c.1827, as well as a timber bridge constructed in 1859, would provide insight into early colonial thoroughfares and the traverse of large waterways and could be of local significance for its historical and research values. Evidence of the causeway and bridge would also be of local significance for its rarity.

Disturbed and ephemeral evidence of grazing and agricultural activities associated with Luddenham Estate would not meet the threshold for local significance.

4.4 Research framework

4.4.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the historical development of PAS 3 are listed below (Table 7). Details of the phases of occupation associated with each theme are also included.

Australian theme	NSW theme	Local themes	Occupation phase
Peopling Australia	Convict	Activities relating to incarceration, transport, reform, accommodation	Phase 2 (1827- 1859)

Table 7. Historical themes relevant to PAS 3.



Australian theme	NSW theme	Local themes	Occupation phase
		and working during the convict period in NSW.	
Developing local, regional and national economies	Transport	Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements.	Phases 2-3 (1827-1929)

4.4.2 Research questions

The following broad and site-specific research questions will guide archaeological monitoring, where required.

Broad research questions

- How has the site developed through time?
- Were any sealed artefact deposits recovered? What insight do they provide in terms of activities occurring on site, or the diet, age, class, gender or ethnicity of its occupants?

Site specific research questions

 Was evidence of the c.1850 timber bridge or the original causeway constructed c.1827 uncovered? What information does this provide with regard to construction techniques and materials, and how does this compare with other sites of a similar age?

4.5 Excavation strategy

4.5.1 Monitoring

Based on the low level of archaeological potential and ephemeral nature of potential remains (e.g. dirt road surface and cuttings, displaced or decomposed timber elements) archaeological monitoring would be the most appropriate mitigation method for any ground disturbance in areas with moderate potential for archaeological evidence of the c.1827 causeway and c.1850 timber bridge and approach (Figure 8). Archaeological monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.



Figure 8. Archaeological management requirements for PAS 3. Ground disturbance in areas of moderate archaeological potential must be monitored.



5. Fleurs Radio Telescope Site (PAS 7)

5.1 Overview

The former Fleurs Radio Telescope Site is located at 885A Mamre Road, Kemps Creek, Lot 21 DP 258414 (Figure 9) in the Penrith City Council LGA. The study area for the project is limited to the eastern half of the property. The site is listed on Schedule 5 of the *Penrith LEP 2014* (Item 832) and Schedule 2 of *SEPP (Western Sydney Aerotropolis) 2020* (I1).



Figure 9. Location and extent of PAS 7. Source: LPI, Extent

5.2 Historical development

Date	Event
1805	The land comprising PAS 7 was first granted to Nicholas Bayly. Bayly had arrived in NSW in 1798 as a member of the NSW Corps, though he resigned in 1803. He also played a central role in the coup against Governor Bligh and was barred from public office by Governor Macquarie.
	Bayly accumulated over 2,500 acres of land in the Kemps Creek area, with the name 'Bayly Estate' applied to the entire combined estate (CRM 2019, 51).



Date	Event		
1814	The house associated with Bayly's estate was built in 1814 and still exists in greatly modified form at 919-929 Mamre Road, Kemps Creek, to the east of the study area (CRM 2019, 51).		
	There is no evidence for what improvements Bayly made within PAS 7, other than he may have cleared it (CRM 2019:51).		
1826	The property comprising PAS 7 is purchased by Richard Jones, who is credited with naming it 'Fleurs'.		
	A detailed catalogue of the property in 1852 offers some insight into the activities occurring on the estate, and the 'improvements' to the site included the following:		
	 stone dwelling house; 		
	 stone outbuildings, including a sunken dairy, store, butcher's shop, harness room, still room and wine room with cellar; 		
	 equine-associated outbuildings, including a large coach house, large and small stables, extensive cart sheds, and loose boxes for horses; 		
1852	 tool room; 		
1032	 brick-built smith's shop; 		
	 staff accommodation, including four brick rooms for labourers, brick gardener's cottage, and four huts for men; 		
	 two large barns, including one Dutch barn; 		
	 further agricultural outbuildings, including calf pens, pig sties, fowl houses, milking yards and stock yards (CRM 2019, 53). 		
	Nearly all these outbuildings were situated within a 15-acre area centred on the house, outside PAS 7 and the study area on the opposite (east) side of Kemps Creek.		
1882	The land comprising Fleurs Estate was first subdivided, with 200 acres of the estate divided into 20-acre rural allotments. Further subdivision occurred in 1888, 1894, 1895, and 1906, though not all allotments were taken up.		
1890s	Much of the homestead and surrounding buildings, to the east of the study area, were modified to enable their use as a commercial dairy and the Fleurs Butter Factory.		
	Construction of the Fleurs Aerodrome began to the southeast of PAS 7 during World War II on behalf of the Royal Australian Air Force (RAAF). 'Parent' aerodromes were major bases or had many satellite aerodromes or landing grounds.		
1942	The Fleurs Aerodrome formed part of a proposal to establish a base of the United States Navy Fleet Air Wing in Sydney, should the need arise (Roads and Maritime Service 2019:104).		
	Activities associated with construction and use of the aerodrome are evident within PAS 7 in an aerial photograph, with evidence of potential land clearing to establish a second landing strip along the northeast site boundary. There is no evidence of structures associated with the aerodrome within PAS 7 (Figure 10).		



Date	Event
1945	The property was purchased by butchers Joseph Bawn and Richard Stone, with the study area presumably used to run cattle (CRM 2019, 54-59).
1954	Work by Bernard Mills with the CSIRO identified that the Kemps Creek area was the most suitable location in Sydney to establish a cross- antenna for use in radio astronomy research.
	Land for construction of the Mill Cross Telescope was leased from Bawn and the telescope was operational from 1956.
1956-1958	A second (Shain Cross) and third (Chris Cross) telescope were constructed on the Fleurs property.
1959	Further property was leased from Bawn to increase the size of the field station (CRM 2019, 61-65).
1963	The University of Sydney leased the land from Bawn and was gifted the existing radiophysics field station by the CSIRO.
1991	Several cross installations were removed and the Fleurs Radio Telescope Site was effectively closed.
1998	The station was assessed as being surplus to the requirements of the university.





Figure 10. Aerial photograph of PAS 7 in 1947 showing land clearing and levelling in association with the Fleurs Aerodrome.

5.3 Phases of development

The following phases of development were identified with regard to PAS 7:

- Phase 1: 1805-1826 (Bayly's Estate);
- Phase 2: 1826-1846 (Fleurs Estate);
- Phase 3: 1846-1954 (Ephemeral agricultural use); and
- Phase 4: 1954-1991 (Fleurs Radio Telescope Site).

5.4 Summary statement of archaeological potential

The impact assessment area remained on the periphery of the former Fleurs Estate. PAS 7 has generally low potential for historical archaeological evidence associated with land clearing (burnt tree boles and wash deposits), landscaping (fence lines, dams, tracks), and pastoral activities (isolated artefacts) from the early nineteenth century through to the middle of the twentieth century. There is high potential for evidence of two timber bridges constructed crossing South Creek, likely in Phase 1 to 3, including headwalls, spans, approaches, piers, struts, bolsters, and shoring in two localised areas along South Creek.

There is high potential for archaeological evidence of the Fleurs Radio Telescope Site, including subsurface cables, machinery foundations, service pits, remnants of staff accommodation, and structural evidence of the former telescopic arrays. This evidence is, however, likely highly fragmentary, truncated and of generally poor intactness and integrity as a result of site clearing and remediation in the early twenty-first century.

5.5 Summary statement of archaeological significance

Disturbed ephemeral evidence of pastoral activities and landscape modifications associated with Fleurs Estate is unlikely to demonstrate any significant associations or provide new information relating to historical activities at the site. Most of the anticipated archaeological resource for Fleurs Estate is not likely to meet the threshold for local significance.

Evidence of the collapsed timber bridges on South Creek have the potential to demonstrate historical construction techniques, selection of building materials, and more broadly the management of the landscape on large colonial estates. If constructed in Phases 1 or 2, archaeological evidence of the timber bridges would be of state significance for their historical and research values, as well as their rarity. If the timber bridges were constructed in Phase 3, they would be of local significance for their historical and research values.

The Fleurs Radio Telescope Site has been previously assessed as being a cultural landscape of national significance (CRM 2019:116). The landscape and former radio telescope installations have strong historical and associative values, as well as rarity. The resulting



archaeological resource is, however, highly disturbed and truncated as a result of previous clearing activities and remediation. The associated archaeological resource does not sufficiently demonstrate historical significance or significant associations, nor is it likely to resolve any useful or insightful research questions. The archaeological resource associated with Fleurs Radio Telescope Site is unlikely to meet the threshold for local significance.

5.6 Research framework

5.6.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the historical development of PAS 7 are listed below (Table 8). Details of the phases of occupation associated with each theme are also included.

Australian theme	NSW theme	Local themes	Occupation phase
Developing local, regional and national economies	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes, can include aquaculture	Phases 1-3 (1805-1954)
Developing local, regional and national economies	Transport	Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements.	Phases 1-3 (1805-1954)

Table 8. Historical themes relevant to PAS 7.

5.6.2 Research questions

The following broad and site-specific research questions will guide archaeological salvage excavations, where required.

Broad research questions

- How has the site developed through time?
- Were any sealed artefact deposits recovered? What insight do they provide in terms of activities occurring on site, or the diet, age, class, gender or ethnicity of its occupants?

Site specific research questions

- Approximately when was each timber bridge constructed? Is there any evidence of modification or repair through time?
- What construction techniques and materials are evident? How does this compare to timber bridges of a similar age?



5.7 Excavation strategy

5.7.1 Salvage excavation

Salvage excavation must be completed in areas with high potential for archaeological evidence of the timber bridges that would be impacted by the proposed works (Figure 11).

Archaeological salvage excavations must be completed in accordance with the excavation methodology presented in Section 9.2.



Figure 11. Archaeological management requirements for PAS 7. Salvage excavation must occur in areas of high potential where ground disturbance will occur.



6. Upper Canal (PAS 8)

6.1 Overview

The portion of the Upper Canal system comprising PAS 8 is located at Elizabeth Drive, Cecil Hills, and includes parts of Lots 11 and 12 DP 1055232 (Figure 12) within the Liverpool City Council LGA. The Upper Canal is listed on the NSW SHR (SHR No. 01373), Schedule 5 of the *Liverpool LEP 2008* (Item 15), and Schedule 1 of the *SEPP (Western Sydney Parklands) 2009* (Item 7), which also includes the Liverpool Offtake Reservoir (Item 12).



Figure 12. Location and extent of PAS 8. Source: LPI, Extent

6.2 Historical timeline

Date	Event
1816	The site comprised part of a 2,000 acre land grant made to John Wylde. Wylde's 'Cecil Hills Farm' was one of the earliest farms in the Liverpool district. He was also granted 50 acres of land on Pott's Point, Sydney, where he built a palatial home which he kept for many years (McKay 1967). Sir John Wylde was born in London in 1781 and developed a successful legal career after studying at Trinity College, Cambridge. He accepted a



Date	Event	
	position as deputy judge advocate of New South Wales in 1815 and was appointed Vice-Admiralty Court there (McKay 1967).	
	He and his family arrived in Sydney on 5 October.	
	The Cecil Hill homestead was constructed with a range of ancillary outbuildings. The house and many of the outbuildings remain extant, including a kitchen block, stables, cow bails, shearing shed, privies and farm sheds (Neustein and Associates 1992:4.9; OCP Architects 2013:12)	
1010-1024	The site was generally used as a cattle farm, with much of the 2,000 acre grant used for grazing (OCP Architects 2013:13). The farm itself was operational by 1818, as Wylde was contracted that year to supply 6,000 pounds of meat to the government stores (OCP Architects 2013:31).	
1822	Wylde applied to clear further land on his estate and was employing convict clearing gangs to undertake this work by February (OCP Architects 2013:32).	
1825	Wylde departed the colony for England, but the estate remained highly successful with a substantial number of staff (OCP Architects 2013:32).	
1827	Wylde was knighted and appointed chief justice of the new court of the Cape of Good Hope, South Africa (McKay 1967).	
1859	Ownership of Cecil Hills Farm passes to Wylde's ex-wife Elizabeth following his death (OCP Architects 2013:29).	
1864	Following Elizabeth Wylde's death, Cecil Hills Farm became badly run down. At the time of her death there were very few staff and the stock comprised only a heifer, a mare and her foal (OCP Architects 2013).	
1880-1881	Land resumed for construction of the Upper Canal system.	
7 April 1891	Ten acres of land and site of the Liverpool Dam resumed for the Liverpool Water Supply, with the dam in operation that year (County of Cumberland LTO Charting Map, 1894).	
1892-1900	Gradual subdivision of the land comprising Cecil Hills Farm north of Mulgoa Road (OCP Architects 2013:1).	
11 July 1893	Eighteen acres of land surrounding Liverpool Dam resumed for the Liverpool Water Supply.	
1930	An aerial photograph of PAS 8 in 1930 shows the dam following construction, as well as the site of a maintenance worker's cottage to the south.	
July 1932	Unemployed relief workers were employed to raise the earth bank of the dam by 10 feet, at which time it was also faced with concrete slabs on upstream face (Government Architects Office 2016:126).	
1947	An aerial photograph of PAS 8 in 1947 shows two small structures within the impact assessment area.	



6.2.1 Phases of development

The following phases of historical development were identified with regard to PAS 8:

- Phase 1: 1816-1881 (Cecil Hills Farm); and
- Phase 2: 1881-Present (Upper Canal).

6.3 Summary statement of archaeological potential

The site has low to no potential for historical archaeological evidence associated with Cecil Hills Farm in Phase 1, with the anticipated resource limited to evidence of land clearing, landscaping to accommodate grazing, and isolated artefacts resulting from loss or discard.

The areas within the immediate vicinity of the Upper Canal have low-moderate potential for historical archaeological evidence associated with operation and maintenance of the Upper Canal, including flumes, culverts, trash racks, control installations, and offtakes diverting to the Liverpool Dam. To the south and east of the Upper Canal, the site has moderate potential for evidence of cutting and filling to construct the Liverpool Dam, surfaces associated with former tracks, and high potential for remains of a c.1940 shed or maintenance structure.

6.4 Summary statement of archaeological significance

The Upper Canal system was a feat of engineering and provided a consistent supply to the greater Sydney region utilising gravity-fed technology for over 125 years. Archaeological evidence associated with the early stages of construction and operation of the Upper Canal system would be of state significance for their historical, associative, technical and research values, as well as their rarity.

Archaeological evidence of progressive changes to the Upper Canal to enable its ongoing maintenance and use through the twentieth century is of local significance for its historical and research values.

6.5 Research framework

6.5.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the documented occupation of PAS 8 are listed below (Table 9). Details of the historical phases associated with each theme are also included.



Table 9. Historical theme relevant to PAS 8.

Australian theme	NSW theme	Local themes	Occupation phase
Building settlements, towns and cities	Utilities	Activities associated with the provision of services, especially on a communal basis	Phase 2 (1881-Present)

6.5.2 Research questions

The following broad and site-specific research questions will guide archaeological monitoring, where required.

Broad research questions

- Were intact structural remains uncovered during excavations? What do the layout and materials used indicate about their date of construction and function? Is there any evidence of modifications or extension?
- How has the site developed through time?
- Is there any temporal differentiation in occupation and use phases within the site? What differences are evident in the structural remains and artefact assemblages between phases? Do these reflect broader historical trends in the region?

Site specific research questions

- Was early evidence of the Upper Canal system, such as flumes, culverts, or trash racks, uncovered during excavations? What construction materials were used, and what does this tell us about the features age? How does it compare with extant examples within the Upper Canal curtilage?
- Do the deposits and archaeological remains uncovered provide any insight into the construction of the Liverpool Dam?

6.6 Excavation strategy

6.6.1 Monitoring

Archaeological monitoring is required for any ground disturbance in areas with moderate potential for archaeological evidence associated with the construction and operation of the Upper Canal system. Monitoring is also required for ground disturbance in the area with high potential for a structure associated with maintenance of the Upper Canal or Liverpool Dam (Figure 13).

Archaeological monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.



Figure 13. Archaeological management requirements for PAS 8. Excavation in areas coloured yellow and red must be archaeologically monitored.



7. Lennox Reserve (PAS 9)

PAS 9 is located within Lennox Reserve on the Hume Highway, Canley Vale, within the Fairfield City Council LGA (Lot A DP33027). Lennox Reserve is associated with construction of the Lansdowne Bridge, which spans Prospect Creek to the east of PAS 9. Lansdowne Bridge was constructed using convict labour between 1834 and 1836 (RTA 2002:9).



Figure 14. Location and extent of PAS 9. Source: LPI, Extent

7.1 Historical timeline

Date	Event
1806	The Great Southern Road, now Hume Highway, was partly formed in 1806, and a low-level timber bridge known as 'Bowler's Bridge' was erected ('Historic Lansdowne Bridge', <i>The Biz,</i> 10 July 1957:23).
1807	James Bowler arrived in the colony of NSW as a convict on the <i>Duke of Portland</i> and was granted a Ticket of Leave (<i>Convicts Index 1791-1873</i> , INX-65-88495).
1811	James Bowler was emancipated or offered a pardon (<i>Tickets of leave, emancipation and pardon records 1810-1819</i> , INX-37-150).



Date	Event
1830	James' son Samuel Bowler is listed as the Publican's license holder for The Greyhound (<i>Publicans' Licenses Index</i> 1830-1861, INX-69-365).
	Publican licenses are only available from this date, and the pub could have been established significantly earlier.
Prior to 1832	The Bowler family conducted the Greyhound Inn on the southwest side of Bowlers Bridge, which crossed Prospect Creek (Kass 1993:6). The inn was located west of the impact assessment area within what is now residential development.
	This was the first inn established in the Fairfield district, and it stood near the rough timber bridge which carried the Southern Road across Prospect Creek. It was the ideal location for an inn, as all travellers headed to Sydney had to cross the bridge, while it was also near Dog Trap Road (now Woodbridge Road), which led to Parramatta (Vance 1991).
1832	David Lennox, who was born in Scotland in 1788 and trained as a stonemason, emigrated to Australia. He immediately found employment with the government (RTA 2002:9).
	The timber bridge at Southern Road and Prospect Creek was frequently flooded and damaged, and a decision was made to construct a stone bridge and a sum of £1,083 was allocated for its construction. Lennox was appointed as overseer because of his success on other works projects (RTA 2002:10).
	Lennox asked to retain the convicts who had worked well on the Lapstone Bridge and asked the Governor to permit removal of their irons for the remainder of their sentences (RTA 2002:10).
June 1833	Lennox was appointed 'Superintendent of Bridges' by Governor Bourke (RTA 2002:9).
August 1833	The Bowlers had been running the Greyhound Inn for several years when they received the first in a series of land grants that amounted to 120 acres on the Southern Road, adjacent to the bridge on the southern side (including PAS 9) (Primary Application 13788). The land grant of 40 acres including PAS 9, and site of the Greyhound Inn, was made to emancipated convict James Bowler.
1 January 1834	The foundation stone for the new bridge was laid by Governor Bourke, and construction of the bridge commenced.
26 January 1836	The bridge was nearing completion, and Governor Bourke established a date for an opening ceremony. The bridge actually opened several months later following completion of the toll house, also designed by Lennox, and constructed on the north side of the bridge (RTA 2002:10). The complex also included milestones associated with Turnpike Road (Higginbotham 1993:9).
	Recollections of the bridge opening indicate a committee of 'country gentlemen and other important settlers' was appointed to make arrangements for a ceremony, including a luncheon, agricultural display and procession across the bridge. An improvised banquet hall of tree boughs was created for the elite, and



Date	Event
	the 'Guvment men' were given extra rations. The Greyhound Inn ran out of rum (Cramp 1934:123).
c1840	Samuel Bowler remained the licensed publican, but the inn was renamed 'The Queen Victoria' (<i>Publicans' Licenses Index</i> 1830-1861, INX-69-377).
00 lulu 1000	The land including PAS 9 was purchased from Samuel Bowler by John Higgerson (Primary Application 13788).
20 July 1000	There is no indication of development within PAS 9 during the mid to late nineteenth century.
1 June 1871	The 40-acre parcel of land (including PAS 9) was purchased by William R. Piddington (Primary Application 13788).
12 February 1875	The land including PAS 9 was purchased by Thomas L. Peate (Primary Application 13788)
1890	A subdivision plan shows PAS 9 marked as being in cultivation.
December 1921	Two photographs were taken of the former Greyhound Inn, one showing the front of the structure, the other showing it in the distance relative to Lansdowne Bridge.
	Orientation of these photographs and matching key features has confirmed that the Greyhound Inn was the structure west of the impact assessment area.
1930	A historical aerial of the site shows that much of PAS 9 was under cultivation. One structure is shown along the northern impact assessment area boundary, at the end of a long access drive.
1943	An aerial photograph shows all structures within PAS 9 cleared and the fields no longer under cultivation. The impact assessment area appears to be an open paddock.
16 September 1954	Land granted to Wilfred Edgar Thompson, Norman Ewan Archibald Thompson and Lachlan Ian Scott Thompson as joint tenants under the <i>Closer Settlements</i> <i>Act</i> (Vol. 6843 Folio 236).
	No further development was identified within PAS 9, and the area was eventually declared the Lennox Reserve.

7.1.1 Phases of development

The following phases of development were identified with regard to PAS 9:

- Phase 1: 1806-1840 (Bowler's Greyhound Inn)
- Phase 2: 1840-1866 (Bowler's Queen Victoria Inn)
- Phase 3: 1866-c.1940 (Queen Victoria Inn and Residence)



Phase 4: c.1940-Present (Lennox Reserve).

7.2 Summary statement of archaeological potential

PAS 9 has low potential for ephemeral evidence of agricultural and pastoral activities in Phases 1 and 2, as a result of more intensive agricultural practices evident in Phase 3. The anticipated archaeological resource might include evidence of land clearing of land clearing (burnt tree boles, wash deposits), remains of ephemeral structures associated with agricultural or pastoral activities, isolated artefacts, and landscape evidence associated with cultivation (plough marks, palynological evidence, field drains) and grazing (fence lines).

There is high potential for evidence of a late-nineteenth or early-twentieth century cottage or agricultural outbuilding constructed along the northern edge of PAS 9. Anticipated archaeological remains may include structural evidence of the building (brick or sandstone footings, timber posts and beams, floor surfaces), and artefact deposits (rubbish pits, underfloor deposits, accumulated in gardens and yard surfaces).

While PAS 9 formed part of the property associated with the Greyhound Inn, all development associated with the inn (and associated artefact deposits) was focused west of PAS 9 and the impact assessment area has low potential for archaeological evidence associated with the Greyhound Inn. Similarly, there is low potential for evidence of construction of the Lansdowne Bridge, as the bridge was located to the northeast a considerable distance from the impact assessment area.

7.3 Summary statement of archaeological significance

PAS 9 was associated with the family of emancipated convict James Bowler and predominantly used for grazing and cultivation from the 1830s onwards. Historical archaeological evidence of a mid to late-nineteenth century cottage or substantial agricultural outbuilding identified within the impact assessment area would be of local significance for its historical and research values, as well as potentially its representativeness, given its likely high levels of intactness and integrity. Disturbed ephemeral evidence of agricultural activities in Phases 1 and 2 would be unlikely to meet the threshold for local significance.

7.4 Research framework

7.4.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the documented occupation of PAS 9 are listed below (Table 10). Details of the phases of occupation associated with each theme are also included.


Table 10. Historical themes relevant to PAS 9.

Australian theme	NSW theme	Local themes	Occupation phase
Developing local, regional and national economies	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes, can include aquaculture.	Phases 2-3 (1840-c.1940)
	Pastoralism	Activities associated with the breeding, raising, processing and distribution of livestock for human use.	Phases 2-3 (1840-c.1940)
Building settlements, towns and cities	Accommodation	Activities associated with the provision of accommodation, and particular types of accommodation	Phases 2-3 (1840-c.1940)
Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living and working around houses and institutions.	Phases 2-3 (1840-c.1940)

7.4.2 Research questions

Test excavation

Archaeological testing is recommended to confirm the assessment of archaeological potential and significance. The following questions will guide the testing program:

- What is the nature and extent of archaeological remains uncovered within the site?
- What areas of future impact warrant salvage excavation or monitoring in a second stage of investigations to fully realise their research potential?
- Can the level of archaeological significance outlined in this report be reassessed as a result of historical archaeological test excavations?

Salvage excavation and monitoring

The following broad and site-specific research questions will guide archaeological salvage excavations and monitoring, where required.

Broad research questions

- Were intact structural remains uncovered during excavations? What do the layout and materials used indicate about their date of construction and function? Is there any evidence of modifications or extension?
- How has the site developed through time?



Is there any temporal differentiation in occupation and use phases within the site? What differences are evident in the structural remains and artefact assemblages between phases? Do these reflect broader historical trends in the region?

Site specific research questions

- What is the function of the sizeable structure located near the northern boundary of the impact assessment area, visible in photographs from the 1920s?
- Can the artefact assemblage provide any insight into the people living or working in PAS 9, including their diet, age, class, gender, or ethnicity? How does this compare to sites of comparable age and scale in the greater Sydney region?

7.5 Excavation strategy

7.5.1 Test excavation

Test excavation will not be required if the impact area is redesigned to avoid ground disturbance in areas with high archaeological potential.

If required, test excavations will be conducted with the following objectives:

- Identify the intactness and integrity of archaeological remains;
- Confirm the assessment of archaeological potential and significance; and
- Determine the extent of areas with remnant archaeological potential and define zones requiring further archaeological management.

To accomplish this, it is proposed to excavate up to two test trenches across the impact assessment area in the area with high archaeological potential. This will confirm whether any evidence of the mid to late-nineteenth century cottage or large outbuilding remains intact within PAS 9. The rationale for the placement of the test trenches is presented in Table 11, and the proposed trench alignment is presented in Figure 15.

Trench No.	Size	Orientation	Objective
1	Up to 10m x 4m	Northeast- Southwest	Verify the nature and extent of archaeological remains, including potential function and age.
2	Up to 10m x 4m	Northwest- Southeast	Verify the nature and extent of archaeological remains, including potential function and age.

Table 11. Rationale for test trench placement, PAS 9.

Test excavations must be completed in accordance with the excavation methodology presented in Section 9.1.



7.5.2 Salvage excavation and monitoring

Following test excavation, salvage excavation must be completed in areas with intact and legible archaeological remains of at least local significance that would be impacted by the proposed works.

Ground disturbance works in areas with dispersed or truncated archaeological remains or relics, as identified by testing, must be subject to archaeologically monitoring and recording until the Excavation Director is satisfied that the area's research potential is fully realised, or nil potential remains.

Archaeological salvage excavations and monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.



Figure 15. Proposed test trench placement in PAS 9.



8. Lansvale Park (PAS 10)

8.1 Overview

The extension of the impact assessment area within Lansvale Park extends through parts of several properties within the Fairfield City Council LGA, including:

- 2-20 Hume Highway, Lansvale (Lot 1 DP 653719);
- 22-36 Hume Highway, Lansvale (Lot 10 DP 774392);
- Knight Street, Lansvale (Lots 1 and 2 DP 556916);
- 14 and 14A Knight Street, Lansvale (Lots 2 and 3 DP 561588); and
- 1B Day Street, Lansvale (Lots 1 and 2 DP 121121; Lot 5 DP 238490) (Figure 16).



Figure 16. Location and extent of PAS 10. Source: LPI, Extent



8.2 Historical timeline

Date	Event			
	PAS 10 forms part of a 170-acre parcel of land granted to Colonel George Johnston, who received his first grant of land on this date (Primary Application 4904).			
1793	Johnston was a soldier and farmer born in Annandale, Scotland, in 1764, son of Captain George Johnston, aide-de-camp to Lord Percy, later Duke of Northumberland. Johnston had an extensive military career and sailed in the <i>Lady Penrhyn</i> with the marine detachment in the First Fleet, reportedly the first man on shore in January 1788. Johnston held several positions with high levels of responsibility in the military administration, though he regularly quarrelled with both Governors King and Bligh. He led the suppression of the armed rising of Irish Convicts at Castle Hill in 1804, and in 1808 he assumed the lieutenant- governorship and arrested Governor Bligh as part of the Rum Rebellion (Yarwood 1967).			
	Johnston received his first land grant of 100 acres and established Annandale Farm at Petersham. By 1802 Jonhston had 602 acres at Annandale and Bankstown, with 160 acres sown in wheat and maize, seven horses, 27 horned cattle, 136 sheep, 85 goats, and 29 hogs. He was also granted 2,000 acres at Cabramatta for his part in quelling the 1804 insurrection.			
	Over the course of his life Johnston received grants amounting to 4,162 acres, including the impact assessment area (Yarwood 1967).			
9 Eobruon/ 1921	George Johnston's landholdings passed to his son, David Johnston (Primary Application 4904).			
	David was formally granted the land comprising PAS 10 in 1842 (Vol. 736 Fol. 136, Vol. 1053 Fol. 11).			
5 January 1823	George Johnston died and was buried in the Greenway-designed family vault at Annandale Farm, where years earlier he had planted the colony's first Norfolk Island pines (Yarwood 1967).			
	The property remained in the possession of the Johnston family.			
28 April 1886	Ownership of the property transferred to Ebenezer Vickery from George Rob Johnston and Arthur Alfred Johnston (Vol. 786 Fol. 136).			
Late 1880s	A plan of the site prepared in the 1880s shows two structures in PAS 10, with one at the northeast corner of the impact assessment area and the other at the southwest corner fronting Knight Street. As this is a sketch plan, however, the locations of structures depicted are not reliable.			
	The presence of Knight Street suggests that this plan post-dates subdivision of the property.			
1890s	The northwest portion of the site is shown as belonging to George Knight, w most of the land under cultivation with a structure marked 'Knight's Butcher Shop' delineated. Subdivision of properties across PAS 10 occurred after th transfer of the Johnston family estate to Ebenezer Vickery.			



Date	Event		
	The land at the southeast end of PAS 10 is marked 'Moreton Vineyard', with no structures marked within the impact assessment area but a cottage situated to the southwest. The land was transferred to Charles William Henry Morton from Ebenezer Vickery on 13 April 1892 (Vol. 1053 Fol. 11).		
	Several vineyards were established in Canley Vale in the mid to late nineteenth century due to the rich volcanic soils in the region (Kass 1993:7-8), and Moreton's vineyard continued that trend.		
1930	An aerial photograph of PAS 10 in 1930 shows the structures associated with Knight's Butcher Shop, as well as possibly the structure shown in the post-1836 plan. Access to the butcher shop appears to be via the Hume Highway.		
	There appear to be no structures associated with Moreton's landholdings along the southern half of the site, with an associated cottage fronting Knight Street located just outside the impact assessment area (likely the structure shown as being within PAS 10 in the post-1836 plan).		
4042	An aerial photograph from 1943 illustrates the continued presence of the Knight's Butcher Shop building, with expanded outbuildings to the rear, as well as demolition of the structure potentially depicted in the post-1836 plan.		
1943	The southern half of the impact assessment area contains no development and appears to be partly under cultivation, though the former vineyards appear to have been cleared away.		
1955	An aerial photograph from 1955 shows no substantial changes to PAS 10, with the Knight's Butcher Shop complex remaining intact.		
	The formerly cultivated fields at the south end of the site appear to have been converted to open paddock.		

8.2.1 Phases of development

The following phases of development were identified with regard to PAS 10:

- Phase 1: 1812-1886 (Ephemeral use);
- Phase 2: 1886-c.1960 (Subdivision and Knight's Butcher Shop); and
- Phase 3: c.1960-Present (Lansvale Park).

8.3 Summary statement of archaeological potential

PAS 10 has generally low historical archaeological potential for evidence of pastoral activities in Phase 1, including evidence of land clearing (burnt tree boles, wash deposits), isolated artefacts resulting from loss or discard, and landscape modifications (fence lines, dams). There is also low potential for evidence of cultivation activities in Phase 2 as part of Moreton's vineyard.



The site has moderate to high potential for historical archaeological evidence of Knight's Butcher Shop, associated outbuildings and features (slaughterhouses, cools rooms, sheds, stores, cesspit, well, cistern), a residence (likely as part of the shop), and sealed artefact deposits in underfloor spaces, rubbish pits, or as fill within cesspits, wells, cisterns and drains.

There is also moderate to high potential for a second structure constructed to the northwest of Knight's Butcher Shop, likely in Phase 2, though the function of this structure has not yet been identified (likely a cottage or large outbuilding). Structural remains of the building (brick, sandstone or concrete footings, timber posts, beams, paved surfaces) might be anticipated, as well as ancillary features and sealed artefact deposits in surrounding yard spaces or as fill within wells, cisterns, cesspits or drains.

8.4 Summary statement of archaeological significance

Historical archaeological evidence associated with Knight's Butcher Shop, likely established within PAS 10 in the 1880s or 1890s, would provide insight into a local commercial enterprise and source of an important dietary component for nineteenth-century Australians. Archaeological evidence of Knight's Butcher Shop would be of local significance for its historical and research values, as well as its rarity.

Historical archaeological evidence of a late-nineteenth century cottage or substantial agricultural outbuilding identified within PAS 10 would be of local significance for its historical and research values.

8.5 Research framework

8.5.1 Research themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the documented occupation of PAS 10 are listed below (Table 12). Details of the phases of occupation associated with each theme are also included.

Australian theme	NSW theme	Local themes	Occupation phase
Developing local, regional and national economies	Commerce	Activities relating to buying, selling and exchanging goods and services.	Phases 2 (1886-c.1960)
	Pastoralism	Activities associated with the breeding, raising, processing and distribution of livestock for human use.	Phases 2 (1886-c.1960)
Building settlements, towns and cities	Accommodation	Activities associated with the provision of accommodation, and particular types of accommodation	Phases 2 (1886-c.1960)

Table 12. Historical themes relevant to PAS 10.



Australian theme	NSW theme	Local themes	Occupation phase
Working	Labour	Activities associated with work practices and organised and unorganised labour.	Phase 2 (1886-c.1960)
Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living and working around houses and institutions.	Phases 2 (1886-c.1960)

8.5.2 Research questions

Test excavation

Archaeological testing is recommended to confirm the assessment of archaeological potential and significance. The following questions will guide the testing program:

- What is the nature and extent of archaeological remains uncovered within the site?
- What areas of future impact warrant salvage excavation or monitoring in a second stage of investigations to fully realise their research potential?
- Can the level of archaeological significance outlined in this report be reassessed as a result of historical archaeological test excavations?

Salvage excavation and monitoring

The following broad and site-specific research questions will guide archaeological salvage excavations and monitoring, where required.

Broad research questions

- Were intact structural remains uncovered during excavations? What do the layout and materials used indicate about their date of construction and function? Is there any evidence of modifications or extension?
- How has the site developed through time?
- Is there any temporal differentiation in occupation and use phases within the site? What differences are evident in the structural remains and artefact assemblages between phases? Do these reflect broader historical trends in the region?

Site specific research questions

- Are activity areas discernible in the Knights Butcher Shop complex? What activities were
 occurring on site? How does this compare with other butcher shops or butchery
 complexes in the greater Sydney region?
- What is the function of the second large structure identified within PAS 10 (preliminarily identified as a cottage or large outbuilding associated with the butcher shop)?



 Can the artefact assemblage provide any insight into the people living or working in PAS 10, including their diet, age, class, gender, or ethnicity? How does this compare to sites of comparable age and scale in the greater Sydney region?

8.6 Excavation strategy

8.6.1 Test excavation

Test excavation will not be required if the impact area is redesigned to avoid ground disturbance in areas with high archaeological potential.

If required, test excavations will be conducted with the following objectives:

- Identify the intactness and integrity of archaeological remains;
- Confirm the assessment of archaeological potential and significance; and
- Determine the extent of areas with remnant archaeological potential and define zones requiring further archaeological management.

To accomplish this, it is proposed to excavate up to three test trenches across the impact assessment area in areas of moderate and high archaeological potential. This will confirm whether nature and extent of archaeological remains associated with Knights Butcher Shop and a late nineteenth-century cottage or outbuilding. The rationale for the placement of the test trenches is presented in Table 13, and the proposed trench alignment is presented in Figure 17.

Trench No.	Size	Orientation	Objective
1	Up to 10m x 4m	Northwest- Southeast	Verify the nature and extent of archaeological remains associated with Knights Butcher Shop.
2	Up to 10m x 4m	Northeast- Southwest	Verify the nature and extent of archaeological remains associated with Knights Butcher Shop.
3	Up to 10m x 4m	North-south	Verify the nature and extent of archaeological remains, including potentially function and age.

Table 13. Rationale for test trench placement, PAS 10.

Test excavations must be completed in accordance with the excavation methodology presented in Section 9.1.



Figure 17. Proposed test trench placement in PAS 10.



8.6.2 Salvage excavation and monitoring

Following test excavation, salvage excavation must be completed in areas with intact and legible archaeological remains of at least local significance that would be impacted by the proposed works.

Ground disturbance works in areas with dispersed or truncated archaeological remains or relics, as identified by testing, must be subject to archaeologically monitoring and recording until the Excavation Director is satisfied that the area's research potential is fully realised, or nil potential remains.

Archaeological salvage excavations and monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.



9. Excavation methodology

The excavation methodology outlined in this section of the report responds to impacts arising from the works proposed in the impact assessment area, which was provided in early 2021. Impacts may be further minimised or avoided as the final project plans are developed. If the impacts can be reduced or avoided, the requirement for archaeological test trenches and open area excavation outlined in this ARDEM may be similarly reduced. This will ensure that areas with the potential for significant historical archaeological remains are not unduly impacted by unnecessary archaeological investigations.

9.1 Test excavation

The following methodology would apply to test excavations in PAS 1, 2, 9 and 10:

- Excavation of test trenches would be completed using a mechanical excavator (up to 13 tonnes in size) fitted with a flat bucket unless compacted modern fills or hard surfaces are encountered. A toothed bucket would be used to break up hard surfaces or loosen compacted modern fills.
- A Dial Before You Dig (DBYD) and utilities search would be completed prior to ground disturbance occurring to ensure that no live utilities were impacted by the mechanical excavator.
- Mechanical excavation would be undertaken under the Excavation Director's direction and supervision.
- Where mechanical excavation is not feasible, manual excavation by qualified archaeologists will occur where required. Small hand tools such as pointing trowels, picks, shovels, brushes, and pans will be used in manual excavation, either for cleaning excavated areas or revealing exposed features or deposits.
- Significant archaeological remains would be cleaned and exposed by hand. They would be located and recorded but not removed.
- Sealed artefact deposits of local or state significance will be left in situ and not excavated during testing. Diagnostic artefacts from fill deposits will be collected to assist with site phasing.
- In the event that structural fabric or significant deposits are not located, excavation will cease when the depth of impact is reached, or where culturally sterile or natural deposits are identified.
- At the cessation of test excavations, trenches with significant structural remains and deposits will be covered by geofabric prior to backfilling. This will allow for significant evidence to be relocated with minimal impact during later stages of excavation, if required. It will also ensure significant remains are protected if they are to be retained in situ.



Following the completion of test excavations, a succinct summary report must be prepared outlining the findings of the testing program. The findings of the test excavation program will also inform the requirement for areas requiring further archaeological investigations to mitigate the impacts of the project. The summary report will also make recommendations for:

- Minor redesign options (where possible) to avoid impacts to highly significant archaeological relics;
- Areas with intact and legible archaeological remains and deposits requiring salvage excavation;
- Areas with dispersed and truncated archaeological remains requiring archaeological monitoring; and
- Areas of with low potential for significant archaeological remains or relics where work could proceed under an unexpected finds protocol.

If substantial archaeological remains are not identified and further investigations are not warranted, a full post-excavation report must be prepared for the test excavation program (see Section 9.6). Where a summary report is prepared to inform a second stage of investigations, the findings of the test excavation must also be incorporated into the final post-excavation report (see Section 9.6) for each site.

Archaeological salvage excavation and monitoring must be completed in accordance with the excavation methodology presented in Section 9.2.

9.2 Salvage excavation and monitoring

The following methodology would apply to salvage excavation and monitoring:

- Excavation in the areas of archaeological potential would be carried out by using a mechanical excavator fitted with a flat bucket unless compacted modern fills or hard surfaces are encountered. A toothed bucket would be used to break up hard surfaces or loosen compacted modern fills.
- Mechanical excavation would be undertaken under the Excavation Director's direction and supervision. All of the exposed archaeological remains would be cleaned by hand.
- Where mechanical excavation is not feasible, manual excavation by qualified archaeologists will occur where required. Small hand tools such as pointing trowels, picks, shovels, brushes and pans will be used in manual excavation, either for cleaning up excavated areas or revealing exposed features or deposits.
- Where an *in situ* historic feature that is the target of the excavation is located, mechanical excavation will cease. The feature will then be cleaned by hand and recorded. The archaeologist will endeavour to expose and identify all significant historic features and deposits in order to fully realise their archaeological research potential.



- In the event that structural fabric is not located, excavation will stop when the depth of impact is reached, or where culturally sterile or natural deposits are identified.
- The Excavation Director will have the authority to direct site works throughout the ground works, as required, in order to undertake all necessary investigation, detailed recording and/or preservation of exposed relics.
- The need for detailed investigation and recording of specific deposits or features would be determined by the Excavation Director throughout the course of the investigation to ensure that important parts of the site are adequately investigated and recorded, and that resources are not employed in areas that do not warrant further investigation.
- All artefacts excavated from sealed artefact deposits will be collected for detailed analysis by an artefact specialist. For deposits with lower research potential, such as imported fills or disturbed/mixed deposits, only diagnostic artefacts will be collected to enable phasing.
- Where possible, artefacts will be cleaned, dried and sorted on site during salvage excavation to reduce the scope of post-excavation work.

9.3 Site recording

Generally, the archaeological recording of the site would be conducted according to the following methods:

- A site datum, keyed to Australian Height Datum (AHD) would be established to record the levels of extant deposits and features.
- Where any archaeological remains are exposed, measured drawings would be prepared. These will be keyed into the master site plan.
- The location of archaeological remains would also be plotted by a surveyor to assist with readily relocating them if a second stage of archaeological investigations is required.
- All archaeological deposits and features will be allocated a unique context number and recorded in detail on pro-forma context sheets. This will be supplemented by preparation of a Harris Matrix showing the stratigraphic relationships between features and deposits.
- Significant soil deposits will be recorded with reference to the Munsell soil chart.
- Photographic recording of all phases of work on site would be undertaken, using a scale bar and north arrow.
- If suitable deposits are found during archaeological investigation, soil samples will be collected for further archaeobotanical analysis.
- Specific to test excavations, findings from each test trench excavated will be recorded on a 'Trench Sheet' providing an overview of key finds and related contexts to assist with decision-making around areas requiring open-area excavation or monitoring. The trench



sheet should indicate the depth of significant deposits and features, as well as the trench's stratigraphic profile.

9.4 Artefact management

- Any artefacts retrieved from sealed artefact deposits during the on-site works will be collected, cleaned, and catalogued in accordance with the investigation methodology recommended in this report and best archaeological practice.
- Bulky artefact types, such as building materials, may be sampled. Fill deposits will also be sampled, with diagnostic and dateable artefacts recovered to assist with phasing.
- Any artefacts retrieved would be provenanced according to their contexts.
- Artefacts will be bagged in suitable polyethylene bags, tagged with labels, and put in an agreed temporary, secure storage location.
- All artefacts will be retained for analysis during the post-excavation phase of archaeological works in order to fully answer the research questions that guide the archaeological investigation. This analysis would take place off site and would be conducted by various qualified specialists. The results of the analysis would be included as part of a final report.
- At the conclusion of the project, the artefacts will be handed over to the client for retention and/or lodgement in an appropriate storage facility.

9.5 Management of Aboriginal objects

In the event that any Aboriginal objects are identified during historical archaeological investigations they should be managed in accordance with the management measures specified in the Upper South Creek Aboriginal Cultural Heritage Assessment (KNC 2021).

Note that where areas of non-Aboriginal heritage identified for excavation overlap with areas of potential Aboriginal heritage identified for investigation, as identified in the Upper South Creek Aboriginal Cultural Heritage Assessment (Kelleher Nightingale, 2021), excavation works in this ARDEM may need to be adapted slightly to be consistent with the Aboriginal heritage salvage excavation methodology.

9.6 Post excavation reporting

Upon completion of the program of all required on-site works and artefact analysis, the Excavation Director would prepare a post-excavation report that presents a detailed description of the works performed and their results, illustrated by photographs, survey plans, and an artefact catalogue, as appropriate. The report would include a response to the research questions raised in this document.

The report of the results of all archaeological fieldwork would be produced in accordance with standard conditions of approval. The report would include:



- A description of the results of the investigation, including a discussion of the nature of the archaeological remains recorded;
- A response to the research questions raised in this report;
- The results of any post-excavation analysis undertaken, including artefact or sample analysis;
- Site records, including artefact catalogues, measured drawings, and photographs, where appropriate;
- Conclusions relating to the nature and extent of surviving archaeological remains; and
- Identification of the repository for material recovered from the site.

The final archive of archaeological material should consist of all site records produced throughout the physical investigation, which may include context sheets, artefact sheets, photographs, drawings, and artefacts (inventoried, boxed, labelled, and catalogued), as well as a final copy of the post-excavation report.

9.7 Team

All archaeological investigation works would be managed by a suitably qualified senior archaeologist. Extent's suitably qualified senior archaeologists, include Anita Yousif (Associate Director), Graham Wilson (Principal Heritage Advisor) and Dr Jennifer Jones-Travers (Senior Associate).

Anita Yousif, Associate Director and National Technical Lead, Historical Archaeology, will be the nominated Primary Excavation Director for all sites of State significance, including PAS 1 (Blaxland's Farm) and PAS 2 (Blaxland's Gardens). Anita Yousif is an approved Excavation Director for sites of local and state significance with over 20 years' experience in Australian historical archaeology, who fully satisfies all requirements of the NSW Heritage Council's *Excavation Director Criteria* (2019). Anita is the current President of the Australasian Society for Historical Archaeology.

Dr Jennifer Jones-Travers, Senior Associate, or Graham Wilson, Principal Heritage Advisor, would be nominated Secondary Excavation Directors for all sites of State significance. Graham and Jennifer are both approved Excavation Directors for sites of local and State significance in NSW. Graham has more than 30 years of experience as an archaeologist supervising and directing excavations, while Jennifer has 17 years of experience. Anita, Graham and/or Jennifer would be nominated as Primary or Secondary Excavation Director for all remaining sites of local significance, depending on project timing and availability.

Site surveying and planning would be undertaken by Kerry Platt. A team of assistant archaeologists would be drawn from the Extent Heritage pool of permanent staff and subconsultants, on an 'as needed' basis.



9.8 Unexpected finds protocol

The unexpected finds protocol details the actions to be taken when a previously unidentified historical heritage feature/relic/site is found during ground disturbance activities. This procedure is applicable to all activities conducted by project personnel that have the potential to uncover an historical feature/relic/site. The unexpected finds protocol delivered to site contractors as part of a heritage induction will be developed with regard to Sydney Water's SWEMS009.

A standard unexpected finds protocol is provided below.

- **STOP ALL WORK** in the vicinity of the find and <u>immediately</u> demarcate the area to protect the feature/relic/site.
- The Excavation Director is to record the details, take photos of the find and ensure that the area is adequately protected from additional disturbance.
- If the Excavation Director advises that the find is not a significant historical relic, work will
 recommence in consultation with the Site Supervisor.
- If the Excavation Director advises that the find is a significant historical archaeological item, the affected area will remain protected from any further ground disturbance until the item is fully excavated and recorded so that its research potential is fully realised.

9.8.1 Procedure for discovery of possible human skeletal remains

- In the unlikely event that human remains are discovered in the course of the proposed work the protocols, the Site Supervisor/Manager notify the NSW Police by calling '000' and the Office of the NSW State Coroner by calling '(02) 8584 7777'. They must also engage a forensic specialist to confirm the discovery.
- Should the NSW Police determine the remains to not be of a criminal nature, the Excavation Director should notify Heritage NSW, DPC to determine if the remains are of Aboriginal ancestry. If the remains are Aboriginal in origin, Heritage NSW and/or the Excavation Director in liaison with the Registered Aboriginal Parties would determine the most appropriate course of action, which may include deviation of the construction works, or the careful removal of the remains and reburial elsewhere.
- Should Heritage NSW determine the remains to be of historic ancestry, the most appropriate course of action, which may include deviation of the construction works, or the careful removal of the remains and reburial elsewhere, would be decided in consultation with the Site Supervisor/Manager and the Excavation Director.
- Should the remains determined to be of non-human origin, construction works may proceed.



10. Conclusions

- This ARDEM has been prepared in conjunction with the HAA for the Upper South Creek Advanced Water Recycling Centre (Extent Heritage 2021) to satisfy the requirements of SEAR 25 of the SEARs issued for the project (SSI-8609189).
- Historical archaeological test excavations at PAS 1 (Blaxland's Farm) should be completed at the earliest opportunity to enable minor redesign to reduce impacts to the site's highly significant historical archaeological resources.
- More broadly, historical archaeological test excavations at PAS 1 (Blaxland's Farm), PAS 2 (Blaxland's Gardens), PAS 9 (Lennox Reserve), and PAS 10 (Lansvale) should be completed as part of early works to provide more certainty in estimating project costs and timeframes, minimising disruption or delays to the construction program.
- The results of test excavations will inform further requirements for archaeological salvage excavation and monitoring for each site.
- Archaeological monitoring of ground disturbance in areas of archaeological potential in PAS 3 (Blaxland's Crossing) and PAS 8 (Upper Canal) should be completed during the main works program to mitigate the impacts of the project.
- Archaeological investigations must be completed in accordance with the research frameworks and methodologies presented in this ARDEM.
- A final post-excavation report must be budgeted for and completed for archaeological investigations at each site, presenting the findings of the excavation, the results of any specialist analysis (artefact, soil, timber, etc), and responses to the research questions in this ARDEM.
- A copy of each post-excavation report must be lodged with Heritage NSW, DPC, as well as the relevant local studies library.



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