Former Cable Tram Engine House and Tram Substation (H2332)

Report on Geotechnical Investigations

253-263 Brunswick Road, Brunswick

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1. INTRODUCTION

This document presents the results of geotechnical investigations conducted within a place listed on the *Victorian Heritage Register* (VHR) – **Former Cable Tram Engine House and Tram Substation (H2332)**. These investigations were carried out in advance of the proposed construction of an eight-storey apartment building (excluding a basement level) at 253-263 Brunswick Road, Brunswick (the Project) by Bensons Property Group (BPG).

A Permit for the Project is currently under determination (P39543), however, BPG sought an addition to Permit under S. 93 of the *Heritage Act* 2017 (H Act) to expedite and undertake geotechnical investigations within specific locations to inform the design and development the Project Area (Figure 1).

An Archaeological Management Plan (AMP) was prepared that reviewed the scope of works (Section 1.1) and land-use history (Section 2) to assess whether the proposed geotechnical investigations were likely to impact on significant archaeological remain. Additionally, it provided a methodology to manage any works that may affect archaeological values, either through avoidance or recording in accordance with HV's *Guidelines for Investigating Historical Archaeological Artefacts and Sites (2015)* (the Guidelines).

The AMP included an analysis of historical land use, current site conditions, and archaeological significance to identify and assess the potential for archaeological remains (features, deposits, and artefacts) within the Project Area. An archaeological management strategy was outlined, responding to the conclusions of the Impact Assessment to ensure management of the site's archaeological values during the geotechnical investigations.

These investigations, which comprised of two (2) 1m x 6m test trenches and a total of seven (7) boreholes, were carried out in accordance with Permit (P40525) (Table 1 and Figure 1). This project report was prepared as required and stipulated by Condition 11 of P40525:

The archaeologist listed at condition 7 (Paul Pepdjonovic or Shane Willis from Ochre Imprints) must submit an electronic copy of the Permit Report to the Executive Director Heritage Victoria within one (1) year of the completion of fieldwork. The report must address the requirements of Heritage Victoria's Guidelines for Investigating Historical Archaeological Artefacts and Sites, and be to the satisfaction of the Executive Director Heritage Victoria. The report must include results of background historical research; plans and images; and project records, reporting and a synthesis or findings. If artefacts are discovered, the artefact catalogue, analysis of the assemblage, and details of any artefact conservation must also be included in the report. Any required additions or amendments to the submitted report must be made to the satisfaction of, and within the timeframe specified by, the Executive Director. If a subsequent Permit is issued within this timeframe, the results of the separate phases of archaeological works can be combined into one report, subject to the approval of the Executive Director. In this case the date of delivery of the project reporting and artefact management outcomes may be amended.

Table 1: H Act approvals

Site	Permit	Date Issued / Amended
H2332 - Former Cable Tram Engine House and Tram Substation	P40525	23/01/2025
	P39543	Under Determination

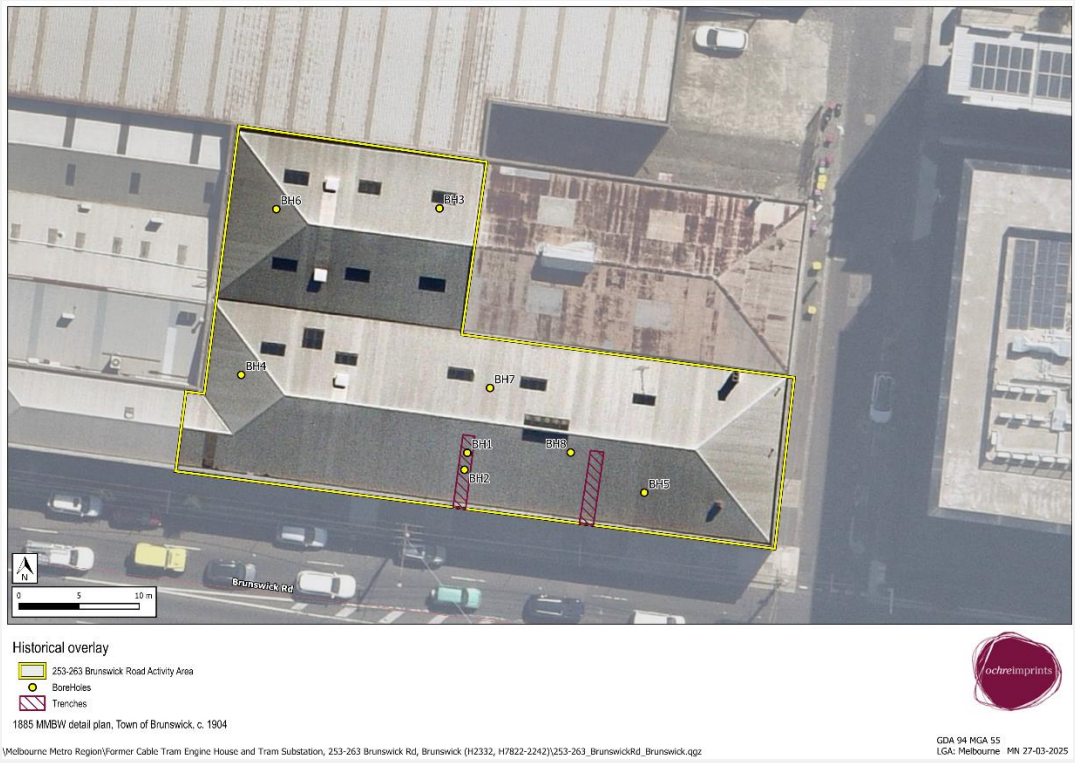


Figure 1: Aerial image of the Project Area, showing extent of H2332 and the locations of Trenches 1 and 2, as well as the geotechnical investigations (boreholes 1-7)

1.1 Scope of Works

The broader Project, as outlined in the P39543 application, involves constructing an eight-storey apartment building within the Project Area. The development is designed to integrate with the existing heritage structure of the Former Cable Tram Engine House and Tram Substation. While the design is under review and subject to the approval of P39543, BPG intends to minimise impacts on the site's archaeology as much as practicable. The current proposed design retains the existing concrete slab intact, with the majority of construction planned to occur above-ground to limit subsurface impacts. Nevertheless, certain activities proposed within the extant structure will result in some degree of subsurface disturbance, impacting the historical archaeological values of the site.

Geotechnical investigations were undertaken under P40525 to inform the design and development process and manage subsurface disturbance.

1.1.1 Geotechnical Investigations

The proposed geotechnical investigations aimed to identify and confirm the location and extent of the former cable tram pit to define its boundaries and avoid future impacts. Additionally, they sought to establish a general profile of the substrate conditions to guide the placement of concrete

columns. These investigations involved minor impacts to the VHR place, focusing on assessing load-bearing capacity, groundwater levels, potential hazards, and the soil profile within the Project Area. The data collected will inform the design, development process, and structural feasibility. The impacts to the VHR place were minor in nature and managed in accordance with the methodology outlined in Section 3, to minimise subsurface disturbance to the site's potential archaeological values.

The geotechnical investigation program required soil profiles, augured from a minimum of three (3) locations (boreholes), and a maximum of two (2) test pits to identify the cable pit (Figure 2). These investigations included the removal or cutting of concrete at these locations, as well as at the borehole sites as required.

The scope of the borehole investigations necessary to assess load-bearing capacity, groundwater levels, potential hazards, and the soil profile was as follows:

- Eight (8) boreholes were augured / drilled to a depth of approximately 16 m with diameter < 200 mm. The locations were confirmed on-site in consultation with the nominated archaeologist(s) to ensure the assessment's adequacy and to minimise potential impacts on archaeological remains.
- Borehole locations were adjusted as needed in consultation with the archaeologist(s) to ensure adequate coverage of the geotechnical investigations and to address instances of auger refusal. Where an auger terminated unexpectedly, the archaeologist(s) determined, where possible, the cause of the refusal and documented any archaeological remains likely responsible. The archaeologist(s) documented any and all changes to the number and location of the augers.
- Soil samples were collected by the geotechnical consultant and monitored by the archaeologist, the results of which are provided in Section 3.4.

The scope of the test pit investigations necessary to locate the cable was as follows:

- Two (2) test pits measuring approximate 1x6 m were excavated employing a combination of manual and mechanical excavation using a small machine under the supervision and control of the nominated archaeologist(s).
- The exact location of the test pits was confirmed on-site in consultation with the nominated archaeologist(s) to minimise the need for multiple interventions within the location of the cable pit.
- Excavation within each 1x6 m pit concluded upon the positive identification of intact archaeological remains, at a depth determined by archaeologist(s) to verify the presence of archaeological values.
- Archaeological recording was undertaken in accordance with HV's Guidelines (see Section 3.3).

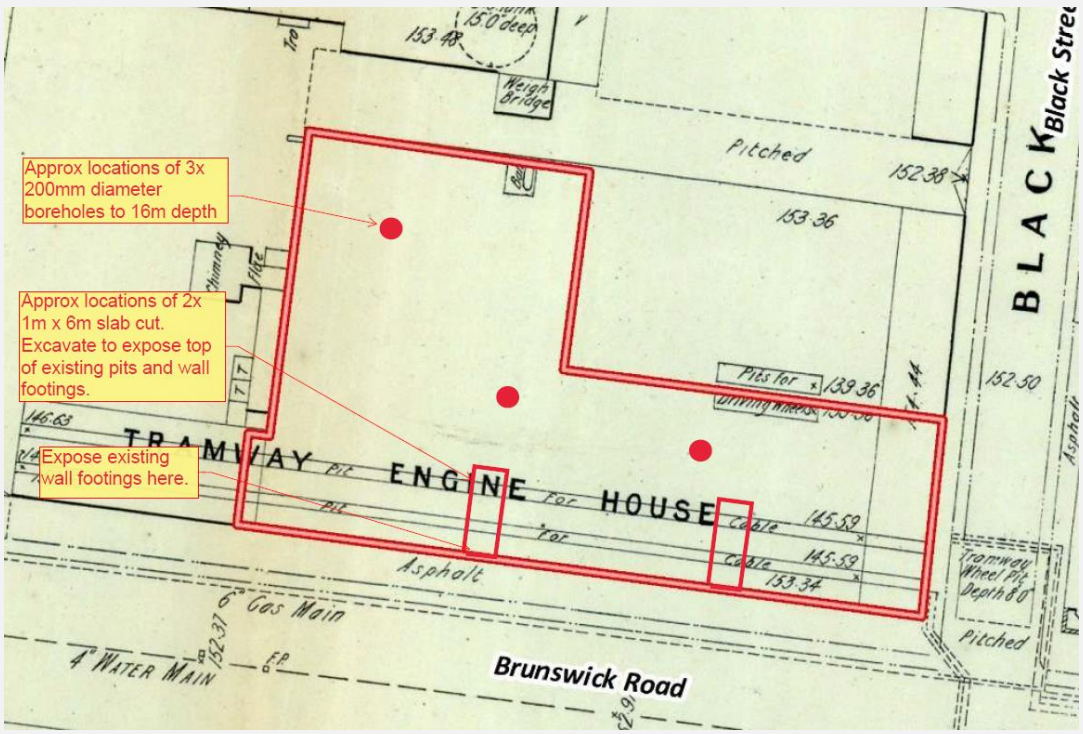


Figure 2: The Project Area overlain with the MMBW Plan (c.1904), showing the proposed location of boreholes and test pits relative to historically documented features (e.g., pit for cable)

1.2 VHR Place Details (Overview)

This section contains a summary of the VHR place, and the archaeological potential as described in the Victorian Heritage Database (VHD) Report[1] for the Former Cable Tram Engine House and Tram Substation (H2332) (see Appendix 1). The Statement of Significance is also provided in Section 1.2.1.

The cadastral details for the **Extent of Registration** are outline in Table 2, as described in the VHD:

> "*all of the place shown hatched on Diagram 2332 encompassing all of Lots 1 and 2 on Plan of Subdivision 346478 and all of Lot 2 on Lodged Plan 45051 and all of the fixed and non-fixed objects integral to the place listed in the inventory dated January 2020, held by the Executive Director, Heritage Victoria.*"

H2332 holds historical significance for its association with the development of Melbourne's transport system during the nineteenth and early twentieth centuries. Beyond its built form, the site is significant under Criterion C for its potential to contain archaeological remains and artefacts associated with the cable tram system, particularly beneath recent structures in the north and west of the site. Potential remains may include deep brick-lined pits, cable races (tunnels), an underground tank, a bath, and the footings of a chimney stack and weighbridge. Early underground DC power cables, which serviced the substation and entered from Brunswick Road / Sydney Road, may also be present.

[1] Victorian Heritage Database Report – Former Cable Tram Engine House and Tram Substation (H2332): https://vhd.heritagecouncil.vic.gov.au/places/2155 (accessed 17/12/2024).

Table 2: Place details

Item	Description
Place Name:	Former Cable Tram Engine House and Tram Substation
Victorian Heritage Register Number:	H2332
Municipal Council:	Merri-Bek City
Address:	253-263 Brunswick Road, Brunswick VIC 3056
Allotment:	1 and 2
Standard Parcel Identifier (SPI):	1\PS346478, 2\LP45051, 2\PS346478

1.2.1 Statement of Significance

The following section provides the statement of cultural heritage significance, as detailed by the VHD.

What is significant?

The Former Cable Tram Engine House and Tram Substation including the 1887 Cable Tram Engine House on the corner of Brunswick Road and Black Street and the 1925 Tram Substation on Black Street at Brunswick (exteriors and interiors), subsurface elements and all original rectification and associated equipment.

How is it significant?

The Former Cable Tram Engine House and Tram Substation is of historical and archaeological significance to the State of Victoria. It satisfies the following criterion for inclusion in the Victorian Heritage Register:

> Criterion A – Importance to the course, or pattern, of Victoria's cultural history.
>
> Criterion B – Possession of uncommon, rare or endangered aspects of Victoria's cultural history.
>
> Criterion C – Potential to yield information that will contribute to an understanding of Victoria's cultural history.
>
> Criterion D – Importance in demonstrating the principal characteristics of a class of cultural places and objects.

Why is it significant?

The Former Brunswick Cable Tram Engine House and Tram Substation is significant at the State level for the following reasons:

The Former Cable Tram Engine House and Tram Substation is historically significant for its association with the development of Melbourne's transport system in the nineteenth and early twentieth centuries. The building demonstrates two of the major stages in the development of Melbourne's tram system: the cable tram system developed from the 1880s and the electric tram system which began to replace it from the 1920s. The cable tram system played an important role in the development of Melbourne and its suburbs and was one of the largest and most complex in the world. The 1925 substation and its rotary converter rectification equipment were installed within the former engine house, rather than in a new free-standing building. The substation and remnant

rectification equipment are associated with the electrification of the old cable tram routes from the 1920s, and the supply of power to more than one tram route. (Criterion A)

The Former Cable Tram Engine House and Tram Substation is a rare and relatively intact surviving element of Melbourne's cable tram system, which began to be converted to electric power in the early twentieth century. It one of the few examples of the adaption of part of an existing engine house for use as an electrical substation, thereby demonstrating two major stages in the development of Melbourne's tram system. It is one of only two substations in Victoria to retain original rotary converter equipment. (Criterion B)

The Former Cable Tram Engine House and Tram Substation is significant for its potential to contain significant nineteenth century archaeological remains and artefacts relating to the cable tram system, including deep brick-lined pits and cable races (tunnels) that span the length of the building. Remains of an underground tank and bath, and footings of the chimney stack and weigh bridge may still exist under the more recent buildings on the west and north of the site. Early underground cables carrying DC power between the substation and Brunswick Road and Sydney Road may also remain. (Criterion C)

The Former Cable Tram Engine House and Tram Substation is significant as a notable example of the engine houses constructed by the Melbourne Tramways Trust from the 1880s to power Melbourne's cable trams. It is largely intact and features most of the external principal architectural characteristics of a cable tram engine house including a wide doorway to allow large items of steam driven machinery to be moved in and out, high ceiling, a bluestone plinth and brick walls with polychrome decoration. Tram cables travelled from the Engine House to Sydney Road through underground brick races (tunnels) which are still present. The retention of some of the original rectification equipment and fixtures give an indication of the original function of the substation building. (Criterion D).

1.3 Summary of Results

This document provides a summary of the geotechnical investigations conducted under P40525, with detailed soil profiles for all boreholes included in Table 3 for reference. These profiles evidence the sub-surface conditions encountered during the investigations.

The geotechnical investigation was commissioned by TF 253 Brunswick Pty Ltd and conducted by GeoAust Geotechnical Engineers Pty Ltd (Report 8257-2-R, dated 26 March 2025) to assess site conditions for a proposed student accommodation development at 253-259 Brunswick Road, Brunswick. The development involves the construction of two new structures (2 and 6 levels) inside an existing heritage-listed building, which was formerly a Tramway Engine House. Eight boreholes were excavated across the site between 19th to 21st February 2025, with depths ranging from 0.45m to 22.42m. The investigation revealed:

1. A consistent surface layer of concrete floor slabs (80-110mm thick) underlain by bituminous seal and gravel
2. Variable depths of fill material (0.45-3.3m below existing floor level), consistent with the historical backfilling of underground tramway inspection pits
3. The Melbourne & Metropolitan Board of Works plan confirmed the original location of these pits, which extended to approximately 4.5m depth
4. Natural geological deposits beneath the fill comprised:
5. Brighton Group Formation (silty sand, clayey silt)
6. Dargile Formation (weathered siltstone) at depths of 6.9-8.25m
7. Ground water level at approximately 7.0-7.1m below the existing floor surface (RL 39.27-39.35m AHD)

Table 3: Borehole log – soil profiles

BH (OI)	Size / Depth	Cultural material / Depth	Stratigraphy	BH (Geotech)
BH1	100mm diameter 22.32m	concrete, bitumen, brick, sandy silt (fill) 0-850 mm	0-0.11m: Concrete (Fill) 0.11-0.15: Bituminous seal, 10mm thick over gravel, medium to coarse grained, angular, igneous, grey (Fill) 0.15-0.30: Bricks (Fill) 0.30-0.42: Concrete (Fill) 0.42-0.85: Sandy silt, low plasticity, mottled grey and dark grey, with Clay fines (Fill) 0.85-2.00m: Clay, medium plasticity, yellow-brown mottled grey and orange brown 2.00-2.50: Silty Clay, low to medium plasticity, pale grey mottled yellow-brown, Silt content increasing with depth 2.50-4.30m: Clayey Silt, low plasticity, pale grey mottled yellow-brown, Clay content decreasing with depth, trace pockets of Clay 4.30-5.00m: Silty sane, fine to medium grained, pale grey with yellow-brown and orange-brown, Silt content decreasing with depth 5.00-7.00: Silty Sand, fine to coarse grained yellow-brown and pale grey, trace fine to medium grained rounded Quartzose Gravel 7.00-7.55: Siltstone, orange-brown and grey 7.55-8.43: Siltstone, orange-brown with grey, bedding poorly defined, fractured, defects are joints, 0˚ to 70˚, planar to irregular, rough, iron stained, trave Clay infill Quartz rich seam 260mm thick at 8.17m 8.43-8.80m: Core loss 8.80-9.46m: Silty Clay, low plasticity, mottled orange-brown and grey, with fine to medium grained Gravel 9.46-10.30: Core loss 10.30-10.47: Siltstone, grey and orange-brown, bedding dipping at approximately 70˚, fractured to slightly fractured, defects are joints, mostly 0˚ to 45˚, lesser 45˚ to 70˚, mostly planar, lesser irregular, iron stained, extremely weathered veneer or clear 10.47-10.70: Core loss 10.70-11.65: Siltstone, grey and orange-brown, bedding dipping at approximately 70˚, fractured to slightly fractured, defects are joints, mostly 0˚ to 45˚, lesser 45˚ to 70˚, mostly planar, lesser irregular, iron stained, clay veneer or clean 11.65-11.80: Core loss 11.80-13.26: Siltstone, grey and orange-brown, bedding dipping at approximately 70˚, fractured to slightly fractured, defects are joints, mostly 0˚ to 45˚, lesser 45˚ to 70˚, mostly planar, lesser irregular, iron stained, clay veneer or clean 13.26-13.39: Core loss	**BH1**

BH (OI)	Size / Depth	Cultural material / Depth	Stratigraphy	BH (Geotech)
			13.39-22.32: Siltstone, grey and orange-brown, bedding dipping at approximately 70˚, fractured to slightly fractured, defects are joints, mostly 0˚ to 45˚, lesser 45˚ to 70˚, mostly planar, lesser irregular, iron stained, clay veneer or clean	
BH2	127mm diameter 22.42m	concrete, bitumen 0-450 mm	0-0.11m: Concrete (Fill) 0.11-0.45m: Bituminous seal over gravel, medium to coarse grained, angular, igneous, grey (fill) 0.45-0.60m: Sandy Silt, low plasticity, yellow-brown 0.60-2.50m: Clay, medium plasticity, yellow-brown mottled grey trace red-brown Tending sand with depth from 2.00m 2.50-4.00m: Silty sand, fine to medium grained, with minor coarse grained fraction, orange-brown and yellow-brown with grey trace red-brown, with Clay fines and bands of Clayey Sand and Sandy Clay of hard consistency. 4.00-5.00m: Silty Sand, fine coarse grained, red-brown and yellow-brown 5.00-6.70m:Interbedded clayey sand, fine to coarse grained, pale grey with yellow-brown And Silty sand, fine to coarse grained, pale grey and yellow-brown, with gravelly seams, fine to medium grained, quartzose, and seams of Clayey silt and clay of very stiff to hard consistency 6.70-8.00m: Clayey silt, low to medium plasticity, yellow-brown and pale grey 8.00-8.68m: Siltstone, grey 8.68-11.77m: Siltstone, grey and orange-brown, bedding dipping at 45˚ to 55˚, fractured with highly fractured and fragmented seams, defects are joints, mostly planar or irregular, 0˚ to 90˚, smooth to rough, clean, iron stained or clay veneer or infill Fractured, trace fragmented seams at 11.35m 11.77-11.92m: Core loss 11.92-22.42m: Siltstone, grey and orange-brown, bedding dipping at 45˚ to 55˚, fractured, trace fragmented seams, defects are joints, mostly planar or irregular, 0˚ to 90˚, smooth to rough, clean, iron stained or clay veneer or infill Clay seam 11mm thick at 12.56m Clay seam 3mm thick at 12.70m Clay seam, 5mm thick at 12.72m Clay seam 9mm thick at 15.18m Clay seam 5mm thick at 15.76m Clay seam 15mm thick at 15.93m Clay seam 24mm thick at 17.36m Clay seam 6mm thick at 18.26m Clay seam 16mm thick at 18.49	**BH2**
BH3	100mm diameter 4.5m	concrete, bituminous seal, sandy clayey silt, sand and clay (fill), ash / slag, cobbles / gravel 0-3.00mm	0-0.11m: Concrete (Fill) 0.11-0.30m: Bituminous seal, 10mm thick over gravel, medium to coarse grained, angular, igneous, grey (Fill) 0.30-3.00m: Mixture of sandy clayey silt, low plasticity, grey trace brown; Sand, fine to coarse grained, and Clay, medium plasticity, grey, with gravel, trace ash / slag (Fill) Cobbles / Gravel 200mm thick at 2.60m	**BH4**

BH (OI)	Size / Depth	Cultural material / Depth	Stratigraphy	BH (Geotech)
			3.00-3.30m: Silty sand, fine to coarse grained, pale yellow-brown mottled pale grey, with fine to medium grained Quartzose gravel (Fill) 3.30-4.50m: Silty sand, fine to coarse grained, pale yellow-brown mottled pale grey, with fine to medium grained Quartzose gravel	
BH4	100mm diameter 1.8m	concrete, bituminous seal, sandy clayey silt, sand and clay (fill), ash / slag 0-1.80mm	0-0.11m: Concrete (Fill) 0.11-0.30m: Bituminous seal, 10mm thick over gravel, medium to coarse grained, angular, igneous, dark grey, with fine to coarse grained sand (Fill) 0.30-1.80m: Mixture of sandy clayey silt, low plasticity, grey trace brown; Sand, fine to coarse grained, and Clay, medium plasticity, grey, with gravel, trace ash / slag (Fill) Borehole terminated on initial contact with hard Fill.	**BH5**
BH5	100mm diameter 1.8m	concrete, bituminous seal, sandy clayey silt, sand and clay (fill), ash / slag 0-1.80mm	0-0.11m: Concrete (Fill) 0.11-0.30m: Bituminous seal, 10mm thick over gravel, medium to coarse grained, angular, igneous, dark grey, with fine to coarse grained sand (Fill) 0.30-1.80m: Mixture of sandy clayey silt, low plasticity, grey trace brown; Sand, fine to coarse grained, and Clay, medium plasticity, grey, with gravel, trace ash / slag (Fill) Borehole terminated on initial contact with hard Fill.	**BH6**
BH6	100mm diameter 0.7m	concrete, gravel 0-700mm	0-0.10m: Concrete (Fill) 0.10-0.20m: Gravel, medium to coarse grained, with bituminous binder, angular, igneous, black (Fill) 0.20-0.70m: Concrete (Fill) Two additional boreholes attempted within 1m radium of Borehole 6. Concrete depth varied from >0.26->0.70m.	**BH7**
BH7	100mm diameter 0.45m	concrete, bituminous binder, masonry 0-400 mm	0-0.08m: Concrete (Fill) 0.08-0.14m: Bituminous binder, 20mm thick over gravel, medium to coarse grained, angular, igneous, grey (Fill) 0.14-0.40m: Masonry (Fill) Two additional boreholes attempted within 1m radium of Borehole 7	**BH8**
BH8	127mm diameter 21.66m	concrete, bituminous seal, clay, silty sand, sandy silt (fill), cobbles 0-1.80m	0-0.10m: Concrete (Fill) 0.10-0.23m: Bituminous seal 20mm thick over gravel, medium to coarse grained, igneous, grey (Fill) 0.23-1.80m: Mixture of clay, medium plasticity, grey and brown, silty sand, fine to coarse grained, brown and sandy silt, low plasticity, grey and brown, trace fine to coarse grained gravel and cobbles (Fill) 1.80-2.70m: Clayey sand, fine to coarse grained, red-brown, clay content decreasing with depth 2.70-6.90m: Silty sand, fine to coarse grained mottled grey and brown, with fine to coarse grained Quartzose gravel, with clayey seams	**BH3**

BH (OI)	Size / Depth	Cultural material / Depth	Stratigraphy	BH (Geotech)
			6.90-8.25m: Sandstone, fine grained, red-brown, yellow-brown and grey, fractured, defects are joints, 0˚ to 90˚, planar, smooth, clean 8.25-8.65m: Siltstone, yellow-brown mottled grey, bedding dipping at approximately 60˚ 8.65-8.70m: Core loss 8.70-8.83m: Siltstone, yellow-brown and pale grey 8.83-9.00m: Core loss 9.00-10.06m: Siltstone, yellow-brown and pale grey 10.06-10.52m: Core loss 10.52-13.10m: Siltstone, yellow-brown and pale grey 13.10-13.46m: Core loss 13.46-14.94m: Siltstone, yellow-brown and pale grey 14.94-21.66m: Siltstone, pale grey with yellow-brown and red-brown, distinct bedding dipping at approximately 50˚, fractured with highly fractured zones, defects are mostly joints and bedding partings, 0 ˚ to 90 ˚, mostly planar, lesser curved or irregular, smooth lesser rough, mostly clean, lesser clay veneer or infill Clay seam 4mm thick at 19.65m	

Figure 3: Soil profile of borehole 1

Figure 4: Soil profile of borehole 2

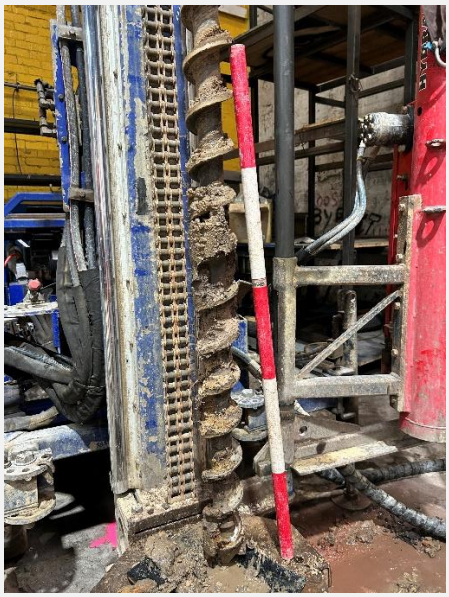


Figure 5: Soil profile of borehole 3

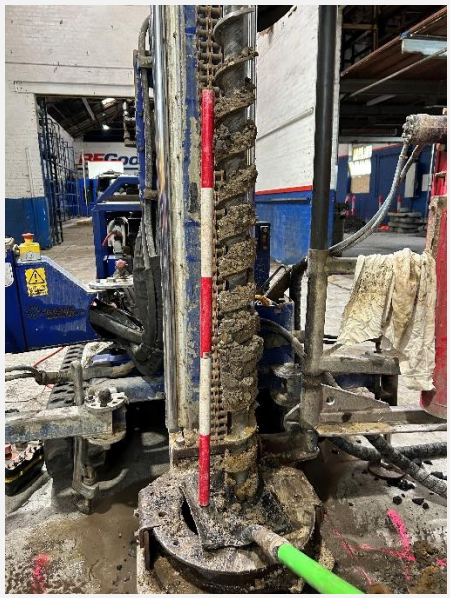


Figure 6: Soil profile of borehole 4

Figure 7: Soil profile of borehole 5

Figure 8: Profile of borehole 6

Figure 9: Profile of borehole 7

Figure 10: Soil profile of borehole 8

2. DESKTOP ASSESSMENT

The following section assesses the archaeological potential and sensitivity of the Former Cable Tram Engine House and Tram Substation (H2332) within the Project Area. This assessment incorporates a review of relevant literature, historical archaeological reports, primary sources, archival records, and mapping to predict the likelihood of historical archaeological features, deposits, and structural remains. Specifically, it includes:

- an analysis of primary resources, historical plans, land titles, planning documents, and other relevant records to identify heritage values, historical phases, and their significance; and
- a review of existing site conditions, services, and infrastructure that may preclude or affect archaeological sensitivity.

2.1 Limitations and Assumptions

This assessment has several limitations. No site inspection was conducted specifically for this application; rather, the existing conditions are based on the site inspection undertaken by Extent Heritage (Simons & Clark 2023) to assess archaeological potential and support the application for P39543. Therefore, while the assessment relied on historic plans and current aerial imagery to map known or potential heritage elements, these results could not be verified through physical inspection.

The resources reviewed as part of the land-use history serve as a guide to identify potential archaeological features located within the Project Area. While useful for assessing archaeological potential, the historical record is inherently incomplete, and historical plans may contain inaccuracies in mapping. Therefore, these assessments cannot be definitive. In the case of this site, examples from comparative sites is relied on heavily for interpretation and predictions about archaeological potential, in the absence direct detailed plans showing the layout of the Project Area in the past.

2.2 Existing / Site Conditions

A site inspection conducted by Extent Heritage (Simons & Clark 2023) confirmed that the entire structure's footprint is sealed by concrete slabs, likely installed during the decommissioning of the engine house in 1936 and maintained thereafter (refer to Section 2.3.1.3). While it is unclear if excavation or grading occurred prior to the concrete being laid, it is likely the slab was placed atop the previous ground surface, sealing archaeological resources beneath.

Key observations include:

- A visible course of bluestones beneath the brick superstructure in one corner of the site, suggesting shallow foundations and the likelihood of archaeological material immediately below the slab.
- A small pit in the northern part of the site, possibly made or expanded post-concrete installation, where bricks were observed beneath the slab.
- Two rooms in the eastern section featuring 19th-century detailing and an extant threshold, which may seal earlier surfaces beneath.

Extent Heritage concluded that the site has undergone minimal change since its use as the Former Cable Tram Engine House. The intact concrete surfacing likely protects significant archaeological remains, including cable lines, pits, and associated infrastructure. However, the degree of archaeological preservation and significance depends on factors such as the nature of infilling materials, the extent of disturbance during concrete installation, and any modifications made during the 1936 decommissioning process, which remain unconfirmed.

2.3 Literature Review

This following synthesises and evaluates the non-aboriginal historical heritage assessments conducted in the region encompassing the Project Area. The purpose is to provide context and understanding of the archaeological potential inferred from various heritage studies and reports, focusing on the Brunswick area. The following key reports form the basis of this review:

- Simons, E. & C. Clark. 2023. 253-259 Brunswick Road, Brunswick – Former Cable Tram Engine House (H2332) Desktop Historical Archaeological Assessment. Unpublished report prepared by Extent Heritage for Bensons Property Group.
- Johnston, C. 1990. Keeping Brunswick's Heritage: a report on the review of the Brunswick Conservation Study. Volumes 1-4. Unpublished report prepared by Context Pty Ltd for Brunswick City Council.
- Allom Lovell & Associates. 1999. City of Moreland Heritage Review. Volumes 1-4. Unpublished report prepared City of Moreland.
- Vines, G. 2011. Melbourne Metropolitan Tramway Heritage Study. Unpublished report prepared by Biosis Research for Heritage Victoria.

2.3.1 Extent Heritage 2023

Extent Heritage (Simons & Clark 2023) prepared a desktop historical archaeology assessment for the Project Area, ahead of proposed development. As part of this assessment, a brief field inspection was undertaken. At the time the assessment was carried out, the Project Area was located within the curtilage of Victorian Heritage Register (VHR) site H2332 'The Former Cable Tram Engine House & Tram Substation', as well as within the boundaries of former Victorian Heritage Inventory (VHI) site H7822-2242 – a listing which related specifically to the historical archaeology of the former engine house. The VHI listing is no longer extant, and archaeological values are instead protected by the Victorian *Heritage Act 2017* under the VHR listing H2332. When this assessment was undertaken, it was understood that the proposed development 'would result in the complete removal of archaeological resources within the study area and the alteration of the study area's built structures' (Simons & Clark 2023: 1). The aim of the assessment was therefore to assess the potential archaeology of the study area and 'to determine whether future management…will be required under current legislation' (Simons & Clark 2023: 1).

2.3.1.1 Land use and occupation Pre-1886 (Extent Heritage 2023)

The authors described the early post-contact history of the Project Area in the context of the establishment of the city of Melbourne, which began in the 1830s and 'expanded quickly with early

settlers squatting on large tracts of land, grazing sheep, and prospecting' (Simons & Clark 2023: 12). The discovery of gold in the 1850s saw dramatic increases in population growth, and (Simons & Clark 2023: 12)

> [i]n the 1850s, convict labour from Pentridge Prison built Sydney Road, establishing a rough thoroughfare from Melbourne to the prison, passing Royal Park, and bisecting the fertile area of Brunswick. The lack of formalised use is summarised in a newspaper extract from the time "Until the coming of the West Brunswick tramway the district was dotted with Chinese market gardens, with one or two worked by Spaniards" (*The Age* 22 July 1939: 26).

Described as 'officially un-occupied during much of this early phase' (Simons & Clark 2023: 12), the authors suggest that the Project Area may have been subject to 'ephemeral use' use prior to the coming of the tramways – for example, by market-gardeners. From 1880, evidence from Sands & McDougall directories suggests 'possible occupants within or in proximity to' the Project Area, as follows (Simons & Clark 2023: 23-4):

Table 4: Occupants of land in and/or around Project Area, late 1800s, per Sands & McDougall Directories

Year	Occupants
1880	Kelly, Miss [seminary]; Ricketts, George; Bridges, George
1885	Sweet, George [plasterer]; Benson, Christopher; Beckett, William
1890	Tramway engine house (Gill, Hugh L. [manager]); Knight, Miss A. [ladies schl.]; Younger, Alex [gatekeeper]

2.3.1.2 Brunswick Road Engine House c. 1880s-1936 (Extent Heritage 2023)

By the late 19th century, urban growth in Melbourne prompted the development of a public transport system, to serve the needs of the increasingly disparate populace and to combat issues of congestion caused by members of that populace being required to travel some distance to work (Simons & Clark 2023: 15). With the passing of the *Melbourne Tramway & Omnibus Co. Act* of 1883, the Melbourne Tramways Trust was established. The Trust had the responsibility of funding and constructing cable tram lines and associated infrastructure such as engine houses to serve the growing city, and '[i]n 1884, using the new cable system developed in San Francisco and Dunedin, the Melbourne Tramways Trust Act authorised the construction of tramways in Melbourne, Fitzroy, Jika Jika (Northcote), Collingwood, Richmond, Kew, Hawthorn, Brunswick, Hotham (North Melbourne), South Melbourne, Prahan and St Kilda' (Simons & Clark 2023: 15).

Simons & Clark's description of the construction of the Brunswick Road Engine House, within the Project Area, is provided in full below (Simons & Clark 2023: 15-16).

> By April 1886, the tract of land to the rear of the Sarah Sands Hotel, with 'considerable frontage to Brunswick-road west' was secured for the engine house servicing Brunswick (North Melbourne Advertiser, Sat 24 Apr 1886, 3). By December of the same year, construction of the engine house was well underway:
>
> > *"The engine-house at the rear of the Sarah Sands Hotel, a large and most extensive brick building, is being built at a rapid rate, the chimney stack of which will be a conspicuous object for many miles around." (The Argus, Mon 6 Dec 1886,4).*
> >
> > *"Mr. J. Sutherland, the contractor for the engine-house, is also well forward with the work. The whole of the brick work, with the exception of the chimney stack, is finished, and the roof is now being put on. A considerable amount of iron is being used, the pillars and girders being of great size, and of corresponding weight and strength. The chimney stack, which will rise to a height of 160ft, is finished for a distance of 40 ft. The cable which is about eight miles long, was brought to the sheds last week, and has been threaded upon*

> *two immense reels in the yard in readiness for the completion of the works. In addition to the thread cable there is also a spare length of about four miles, making in all 12 miles of wire cable. Messrs. Wright and Edwards, the successful tenderers for the machinery, are making preparations for an early start, and it is expected that in the course of a month or so a considerable portion of the machinery will be fixed in position." (The Argus Wed 19 Jan 1887, 6).*

By April of 1887, the chimney stack was complete, reaching 154 ft (47 m), topped with Waurn Ponds stone, and an iron railing (The Age, Thurs 21 Apr 1887, 6) (Figure 10). Because the engine house lay approximately 100 m from Sydney Road where the main tramway line ran, an underground culvert was constructed for the cable to run through: "The culvert is about 9 feet deep, to allow of workmen attending without inconvenience in the machinery, and is bricked on its four sides." (The Age, Thurs 21 July 1887, 7). The tramline and engine house officially opened in December 1887.

The conversion to electrification of the tram network began in the 1920s, during which time the Brunswick Road substation was constructed immediately north of the Project Area. During this time, structural features to the north of the Project Area were demolished, and 'a 500kW rotary converter was installed within the main engine shed in 1924 as a temporary measure' (Simons & Clark 2023: 21). The new substation was operational by 1925, and worked 'alongside the original cable tram engine house' (Simons & Clark 2023: 21), servicing the West Coburg tramway. Between 1925 and 1936, the Brunswick Cable Tram Engine House continued to operate, servicing the Brunswick line, until the completion of the substation meant that full electrification of both lines was possible.

There being no further need for the engine house, it (Simons & Clark 2023: 21)

> was decommissioned and sold in 1936. During decommission process, the cable lines and wheels were removed, and the brick-lined pits filled.
>
> The entire floor area is now covered by concrete slabs and has housed several iterations of mechanical workshops.

2.3.1.3 Site Inspection (Extent Heritage 2023)

As part of the assessment, a site inspection was undertaken by Extent Heritage in order to aid in the evaluation of the site's archaeological potential. This inspection found that the entire footprint of the former engine house is 'sealed by concrete slabs, likely installed during the decommissioning of the engine house in 1936 and maintained by subsequent owners' (Simons & Clark 2023: 25). The authors acknowledge that while the details of the demolition method for interior engine house features and subsequent slab construction are not known 'it's likely that it was laid atop the previous ground surface, sealing archaeology resources beneath' (Simons & Clark 2023: 25). This interpretation was supported by the presence of bricks underneath the concrete slab – observed in a small pit located in the northern part of the Project Area (Simons & Clark 2023: 25, 27).

A course of bluestone blocks exposed 'under the brick superstructure…suggests that the foundations of the extant structure may not be deep, indicating that if any archaeological material does remain in-situ, it would likely be present immediately below the concrete slab' (Simons & Clark 2023: 25). Two rooms in the eastern part of the Project Area, which are separated from the main workshop, were observed to contain '19th century detailing' and a bluestone threshold, 'suggesting the floor surface of these rooms may seal a separate surface (Simons & Clark 2023: 25). As a result of the site inspection, the authors concluded that the Project Area (Simons & Clark 2023: 25)

has undergone little change since its use as the Former Cable Tram Engine House. This suggests that the study area possesses high potential for archaeological remains associated with significant Cable Tram infrastructure, particularly given the apparent integrity of the extant concrete surfacing. It is likely that the cable lines, pits, and associated materials remain in-situ, sealed and protected by the extant concrete floor. However, it remains unclear as to how these pits were filled, if any disturbance was occurred during the instatement of the concrete floor, and whether any obscured modifications occurred during decommissioning process in 1936.

2.3.1.4 Statement of historical archaeological potential (Extent Heritage 2023)

The assessment by Extent Heritage found that the Project Area has high potential for historical archaeological material to be present, associated with its occupation and use as a Cable Tramway Engine House between the years of 1887 and 1936 (Simons & Clark 2023: 30). In particular, 'the mapped locations of the brick-lined cable pit, bath, and wheel pits...lie within the study area, and there is a high potential they exist in-situ, sealed by the extant concrete slab floor. Should these features remain in-situ, they would be of high archaeological significance' (Simons & Clark 2023: 31).

The potential for archaeological evidence to survive that was related to the pre-1880s use of the Project Area was considered to be comparatively low 'as it is likely the construction of the Engine House itself would have resulted in significant disturbance and modification of the pre-existing landscape. Should archaeological remains of these earlier phases of use be present, they would likely reflect ephemeral use of the site associated with informal use such as market gardens, and likely be in the form of drainage lines, post-holes, landscape modifications, and loose, isolated artefacts' (Simons & Clark 2023: 30).

The Project Area was defined by Extent (Simon & Clark 2023: 33) as having areas of high and moderate archaeological potential, as shown in a map which is reproduced in , below.

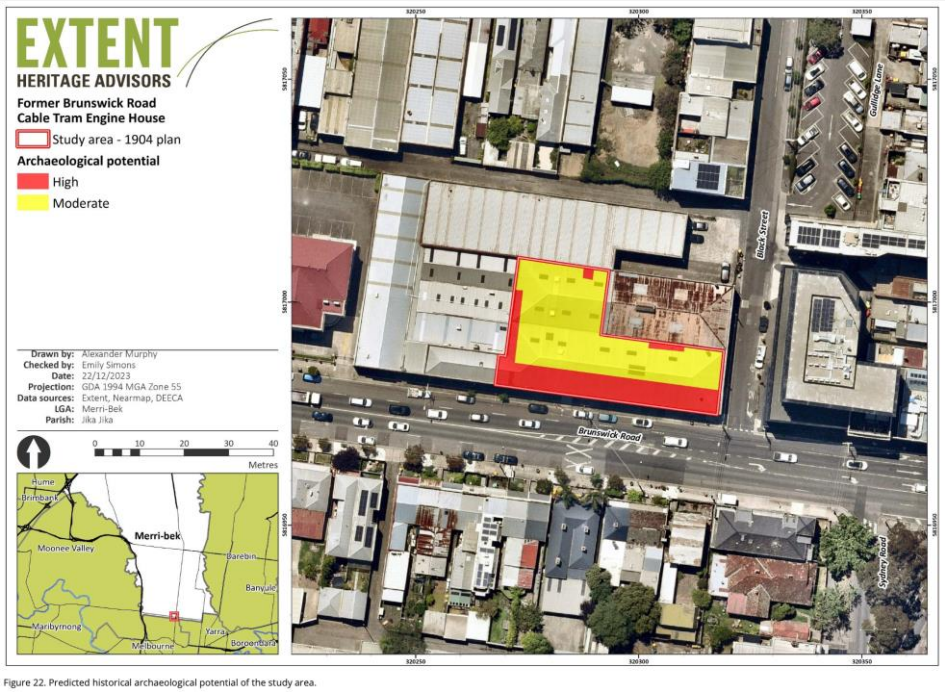


Figure 11: Areas of archaeological potential in the Project Area as defined by Extent (Simons & Clark 2023: Figure 22)

2.3.2 Heritage Studies

A heritage study was undertaken by Context Pty Ltd (Johnston 1990), which reported on a review of the Brunswick Conservation Study. This review identified the Former Cable Tram Engine House as a level 2 historical place (Johnston 1990 vol1: 68). The heritage citation for the engine house describes the Brunswick engine house 'often known as the Sarah Sands engine house, being close to that famous hotel' (Johnston 1990 vol2: 121) as 'a simple structure without the embellishments of some of the engine houses...Its chimney stack has been demolished and the Brunswick Road building is now used for car repairs and an office' (Johnston 1990 vol2: 121). The historical archaeological potential of the site is not mentioned in this citation.

According to a building citation in the City of Moreland Heritage Review (Allom Lovell & Associates 1999 vol2 part1: 155-8), by c. 1999 the building was in use as a tyre fitting centre and for the manufacture of clothing. The building was described as currently 'unrecognisable as an Engine House' (Allom Lovell & Associates 1999 vol2 part1: 156), but of 'metropolitan historical significance' (Allom Lovell & Associates 1999 vol2 part1: 158). It is reiterated in this citation that the Brunswick engine house was architecturally of simpler design than some of its contemporaries. No mention is made in the citation of historical archaeological potential.

The Metropolitan Melbourne Tramway Heritage Study (Vines 2011: 178) describes the Brunswick engine house as having 'unlike some of the later buildings...a fairly plain façade', reflective of it being one of the earlier engine house buildings, examples of which are 'now mostly lost with the demolition of the Richmond engine house' (Vines 2011: 179). Although the study was not archaeological in nature (Vines 2011: 16), the report highlights the archaeological potential of the former cable tram engine houses of Melbourne – recommending that archaeological assessment should be undertaken 'of any works likely to effect sites of demolished engine houses and cable runs' (Vines 2011: 218).

2.4 Land-Use History

The following land-use history reviews primary historical documents, illustrations, plans, and aerial and still photography to develop a predictive model.

The land-use history provides a chronology of historical land use within the Project Area, focusing on the development of transport infrastructure and the railway network, which transformed the area into a significant suburban hub. This context frames the predictive model, establishing a foundational understanding of the Project Area's archaeological sensitivity.

The land-use history also includes a summary of more recent (non-historical) land use and its potential impact on the Project Area's archaeology, along with a discussion of existing site conditions.

2.4.1 Pre-1886 Occupation and Land-Use

The earliest plan to locate the project area within an historical subdivision is a c. 1837 plan of surveyed lands north of Melbourne (Figure 12). At this time, the study area was located in the north western corner of a 640 Acre allotment identified as Section 5 in the Parish of Jika Jika. While early structures are shown on this mapping (see 'Sheep Station, Batman's Hut' to the south west and

'Maclean's House' to the east, adjacent Merri Creek), no historical features are mapped in or near the project area at this time. This surveyed subdivision does not appear to have been in place for long, and there is an annotation in the vicinity of the project area that states that 'the whole arrangement of this parcel was cancelled by subsequent survey'. The land around the project area is described on this early map as 'open forest and plain'.

A map produced a few years later, c. 1844, indicates that the land in which the project area was located had been further subdivided by this stage (Figure 13). This plan shows the activity area located in the south eastern corner of Section 91 in the Parish of Jika Jika, a 102 hectare allotment with Moonee Ponds Creek frontage in the west, which was purchased on 10 June 1840 by Charles Falconer (VPRS 16171/P0001/5). No annotations or indications of historical buildings are present on this plan.

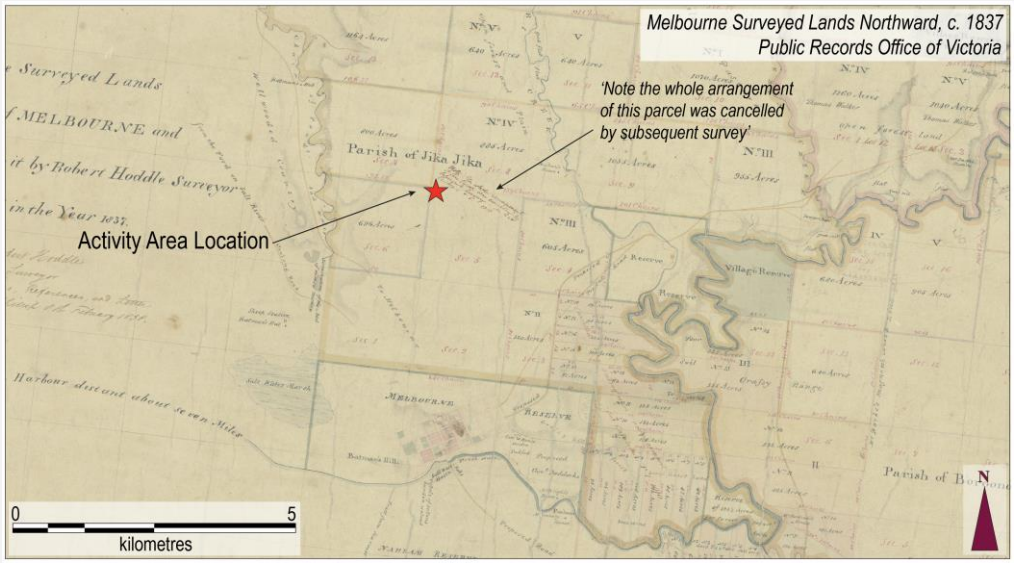


Figure 12: Survey plan c. 1837, with indicative location of study area overlain. Image source: PROV

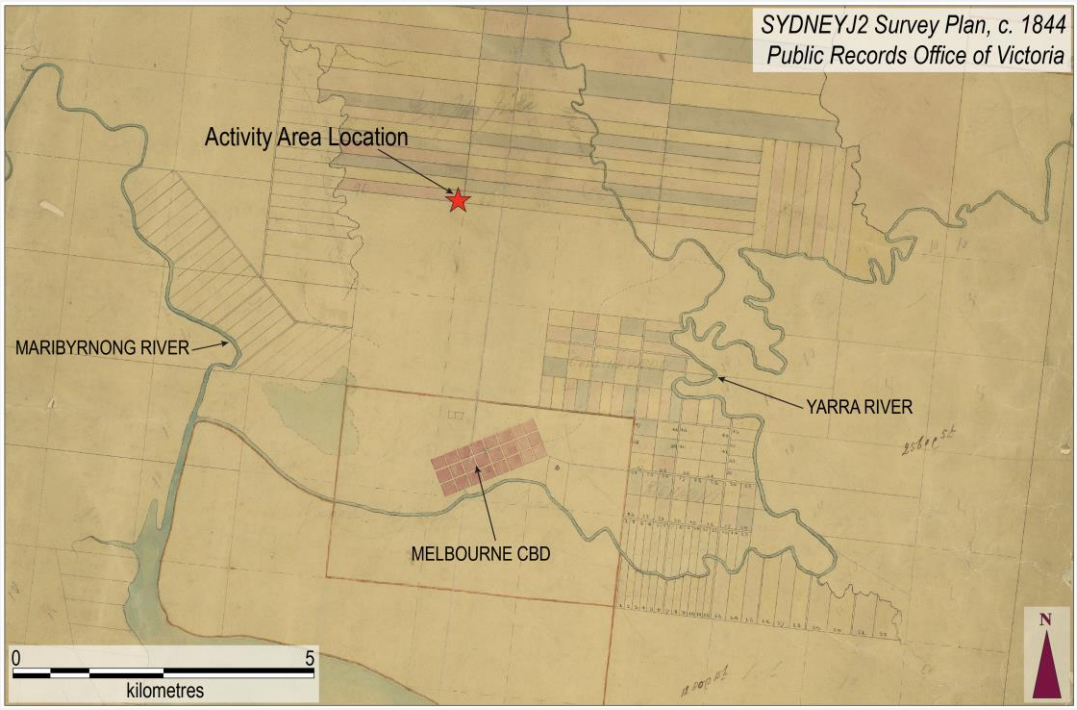


Figure 13: Parish Plan, Jika Jika, c. 1844, with indicative location of study area overlain. Image source: PROV

By the mid-1850s, evidence of the development and use of the land to the south and east of the project area was apparent. A c. 1856 parish plan (Figure 14) shows the future alignment of Sydney Road immediately to the east of the project area, as well as more closely subdivided allotments and a 'new cemetery' to the south. A geological survey plan from the same year (Figure 15) provides a more detailed picture of historical infrastructure present in the local area by this stage. Sydney Road, Brunswick Road and several other nearby roads have been surveyed in by this stage, and some are named on the map. The Sarah Sands Hotel, located to the east of the project area, on the corner of Brunswick and Sydney Roads, is extant by this stage – as are three other hotels nearby (Brunswick Hotel, Cornish Arms and Philipstown Hotels).

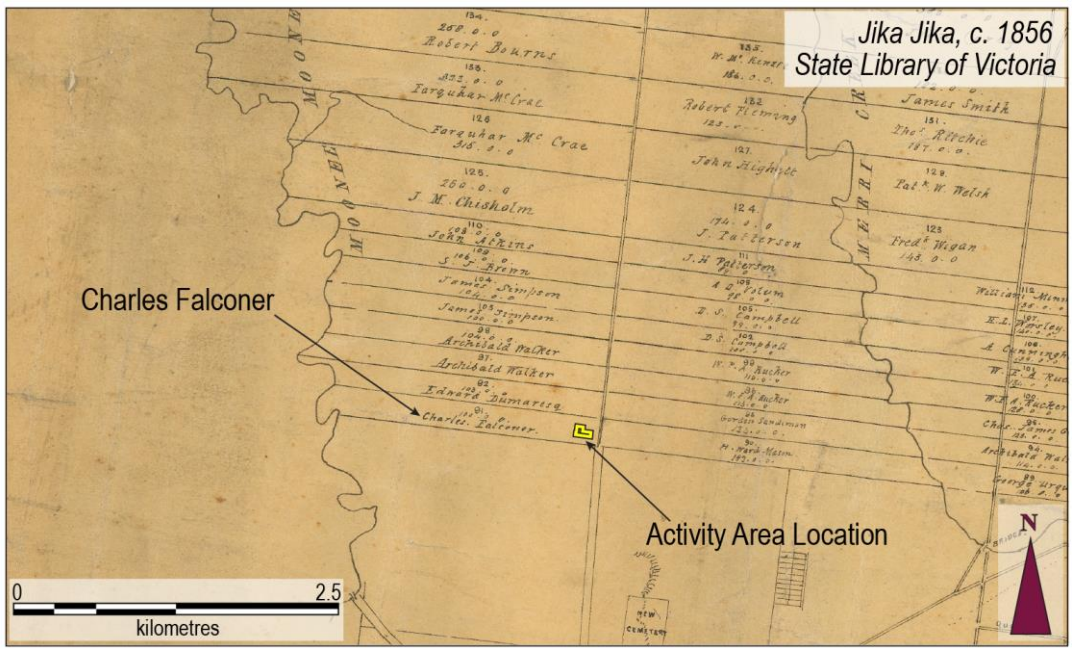


Figure 14: Parish Plan, Jika Jika, c. 1856, with indicative location of study area overlain. Image source: SLV

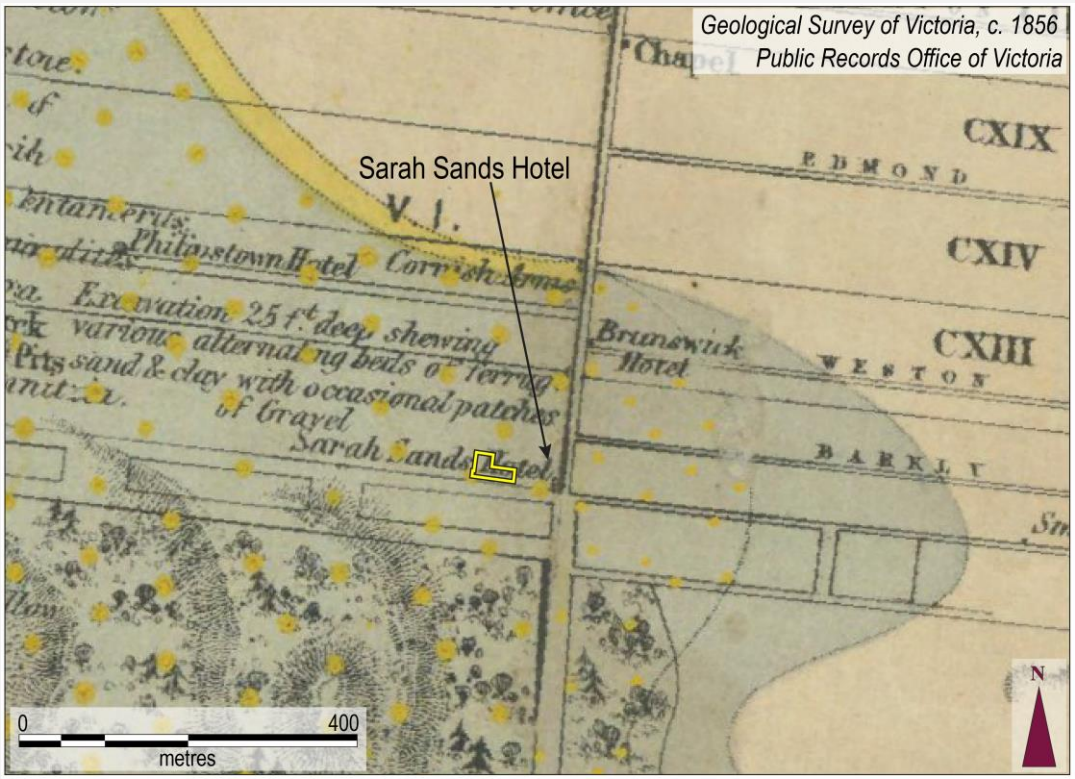


Figure 15: Parish Plan, Jika Jika, c. 1856, with indicative location of study area overlain. Image source: SLV

A hand-drawn plan of the north side of Royal Park c. 1859 (Figure 16) shows Brunswick Road, Park Street and Sydney Road surveyed in by this stage, and land between Park Street and Brunswick Road closely subdivided. A number of structures are depicted fronting Brunswick Road on this map, indicating that if built structures were extant in the project area, they would be shown. There are no built features depicted within the project area on this plan. The Sarah Sands hotel is mapped to the east of the project area (although it is placed slightly north of where the hotel is to be found today). A plan produced almost a decade later, c. 1868, similarly places the Sarah Sands to the north of its current location (Figure 17).

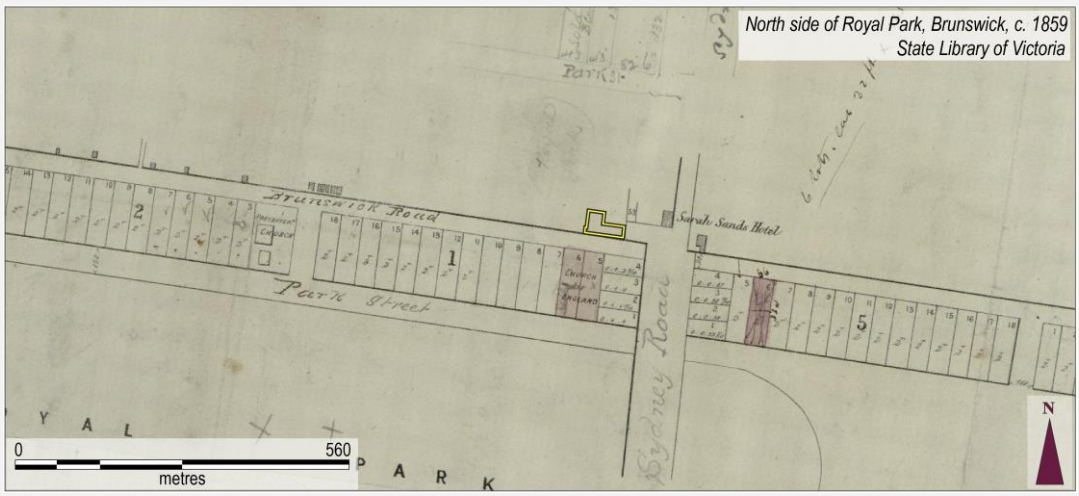


Figure 16: Plan of the north side of Royal Park c. 1859, with indicative location of study area overlain. Image source: SLV

Figure 17: Plan of villa sites, Royal Park c. 1868, with indicative location of study area overlain. Image source: SLV

The earliest available still photograph showing the project area dates to c. 1866 (Figure 18). This photograph shows a view northeast from Royal Park, with Park House Ladies Seminary (a two-storey bluestone building now the location of the Kingdom Hall of Jehovah's Witnesses at 265

Brunswick Road) in the foreground. The Sarah Sands Hotel is visible to the east in this photograph, as is the location of the former Austin's Hotel (later Phoenix Hotel) and Uniting Church building on Sydney Road. The project area is located between the seminary building and the Sarah Sands, and appears to consist of largely vacant land or treed land – although it is possible that some of the houses to the east may be located within the project area at this time. The perspective from which the photo was taken makes the project area difficult to distinguish with certainty.

Figure 18: Photograph of Park House Ladies Seminary c. 1866. Image source: SLV

Park House was a school for young ladies, run by Mrs and Miss Kelly (SLV Catalogue Record 9917198423607636), and records indicate that this building and its surrounding land were located outside of the project area, to the west. The earliest available rates books[2] for the land in and around the project area date to c. 1872, and a Miss Mary Kelly appears in this rates book, as the owner and occupier of what is described as a 'stone house 9 rooms, kitchen shed &c' (VPRS 11320/P0001 January 1872). An entry in c. 1874 describes Mary Kelly as a 'Schoolmistress' (VPRS 11320/P0001 October 1874), and by 1875 Kelly is described as owning a 'stone house, 11 rooms' as well as a separate rated portion of 'building land' (VPRS 11320/P0001, March 1875).

By 1878, the rated occupant is recorded as Amy Knight (a teacher), with the owner Mary Kelly, of 'Stone house and Land', and a separately rated portion of 'building land' is recorded as being owned

[2] A table detailing rates records in the vicinity of the project area, reviewed at staggered intervals between c. 1872 and c. 1892, is provided in Appendix 2.

by T. P. Kelly (VPRS 11320/P0001 1878). Kelly and Knight continue to appear in rates records until after the construction of the Cable Tram Engine House (see VPRS 11320/P0001 1892, for example). The rates book entry for this property and the Engine House record the length of the street frontage – with the Engine House frontage recorded as 235'2 feet (approximately 71 m), and the Kelly property as 135'10 feet (approximately 41 m). These measurements place the engine house property as originally being the length of the original engine house building, and the Kelly property including what is currently 265 Brunswick Road (SPI 1\TP223039), as well as part of 261-263 Brunswick Road (SPI 1\TP366599).

The earliest land title record available for the project area and surrounds indicate that most of the block between Sydney Road in the east, Wilson Street in the north, Brunswick Road in the south and for some distance beyond MacKay Street in the west, was owned by Peter John Wilson, Solicitor, from 15 July 1875. The exception to this is the land on which the seminary is believed to have been located, which appears to have been purchased by Mary Kelly some time earlier. The title document indicates that land to the west of Park House was sold by Wilson to Thomas Pierce Kelly on 1 August 1876, and the land surrounding the seminary itself, immediately adjacent to the project area, to the west, was sold to Mary Kelly on 4 January 1877 (LANDATA Cancelled Title 751/045).

An undated roll plan (Figure 19) thought to have been produced in the 1870s, shows the Sarah Sands in its current location, and a small number of other structures present in the vicinity of the Sydney Road / Brunswick Road intersection. One of these structures appears to be labelled 'Toll Bar', and it is speculated that there may have been a toll gate around this location in the mid-late 19th century, which may account for the position of the Sarah Sands slightly to the north in earlier mapping, and is also pointed to by a record of a 'gatekeeper' in the vicinity in directory records reviewed by Simons & Clark (see Table 4).

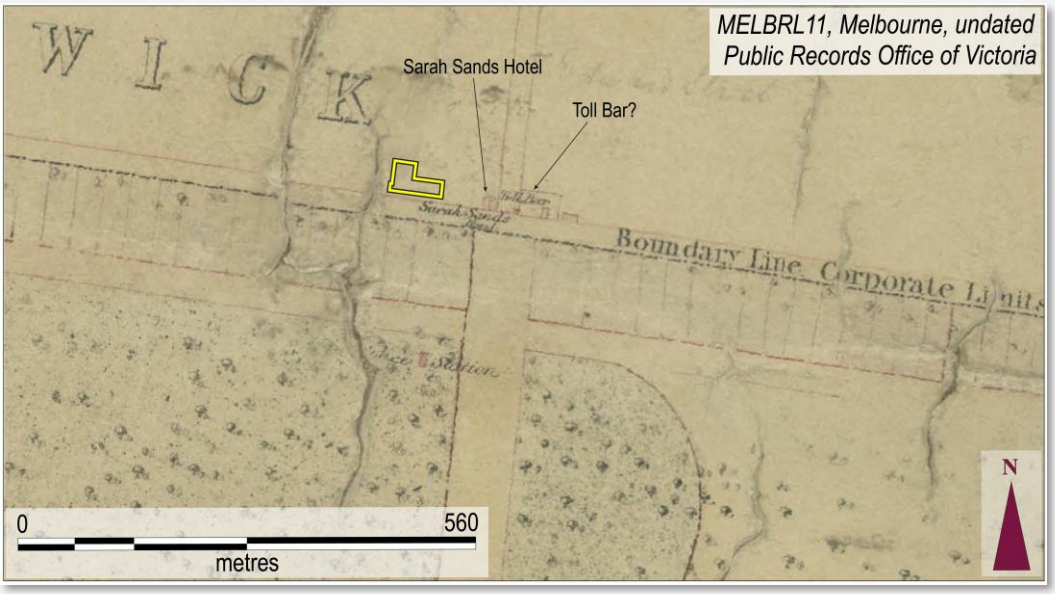


Figure 19: Undated Roll Plan (MELBRL11), with indicative location of study area overlain. Image source: PROV

A Rail Plan produced c. 1880 (Figure 20) seems to confirm the presence of the established Kelly property to the west of the project area, with no similar indication of the presence of an established property in the project area itself at this time.

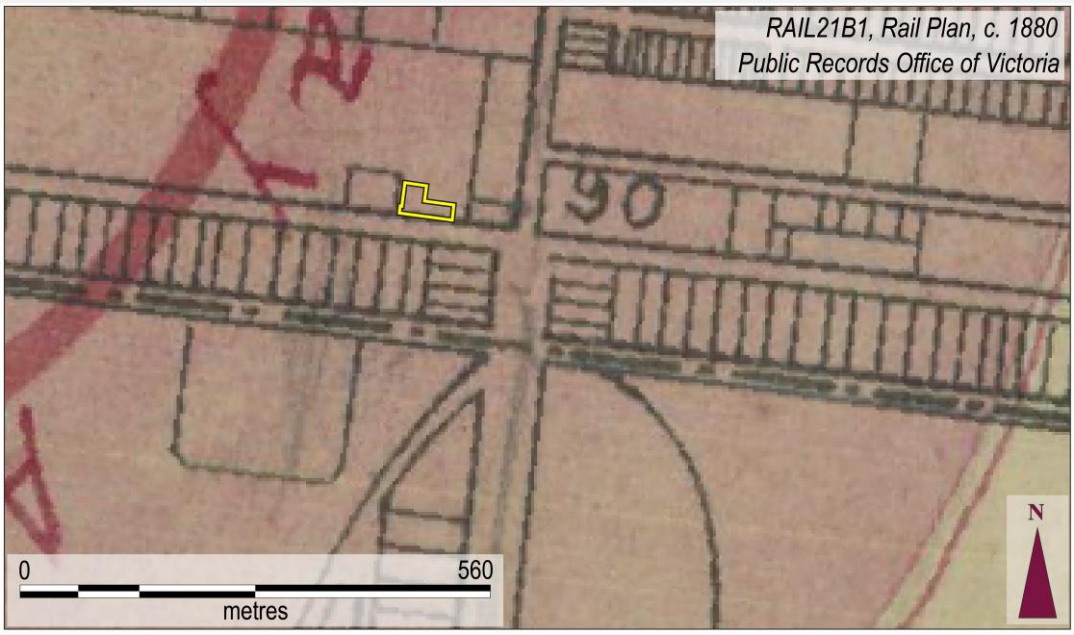


Figure 20: Rail Plan c. 1880 with the project area overlain. Image source: PROV.

In order to investigate possible use and occupation of the project area prior to its 1886 purchase (as three allotments) by the Melbourne Tramways Trust (LANDATA Cancelled Titles 1135/892, 1475/826 & 1816/177), a title history search was undertaken, as well as a staggered sample review of rates books records for Brunswick Road West and Black Street, Brunswick, between the years of 1872 and 1895. The earliest rate book records reviewed, from c. 1872 (VPRS 11320/P0001 1872) indicate the presence of two timber houses or two brick houses, as well as a large (12 acre) area identified as 'building land' located on Brunswick Road between Sydney Road and the Kelly property to the west of the project area. The exact locations of these houses are not known, and it is not known if any of these were located within the project area itself. The 12-acre lot referred to as 'building land' was owned by John Black, with the rated person identified as Joseph Jackson.

By 1874 (VPRS 11320/P0001 1874), rates books record Joseph Jackson, a 'Carter', as the occupant of John Black's 'Building land', with this the only entry listed east of the Kelly property. Rates book entries for 1875 record owners named Roddick, Prowse and Rufus owning rated 'building land' on Brunswick Road east of the Kelly property – records which accord with title documents showing the project area divided into three total properties prior to its purchase by the Melbourne Tramways Trust (LANDATA Canceled Titles 1816/177 & 8206/128). The description of these three properties as 'building land' or 'land' over several years of rates books entries, suggests that there were no extant structures on these properties, at least between the years of 1875 and 1886.

A review of rates books entries for Black Street between the years of 1876 and 1895 found that a number of structures were present around this location prior to 1886. These structures included a number of timber and brick houses, which were owned and occupied by a range of different people over the years . The number of houses and their general description remain fairly constant, however,

and the 1892 rates book provides street numbers for these houses. The street numbers in question (No. 2, 4, 6, 8, 14, and 22) match up with numbers that are shown on a c. 1904 MMBW plan of the area (Figure 21) – indicating that the houses in question were all located on the eastern side of Black Street, to the north east of the project area. Street numbers in the 1892 rate book for properties on Brunswick Road further confirm that the Kelly property (No. 38) was entirely located to the west of the project area.

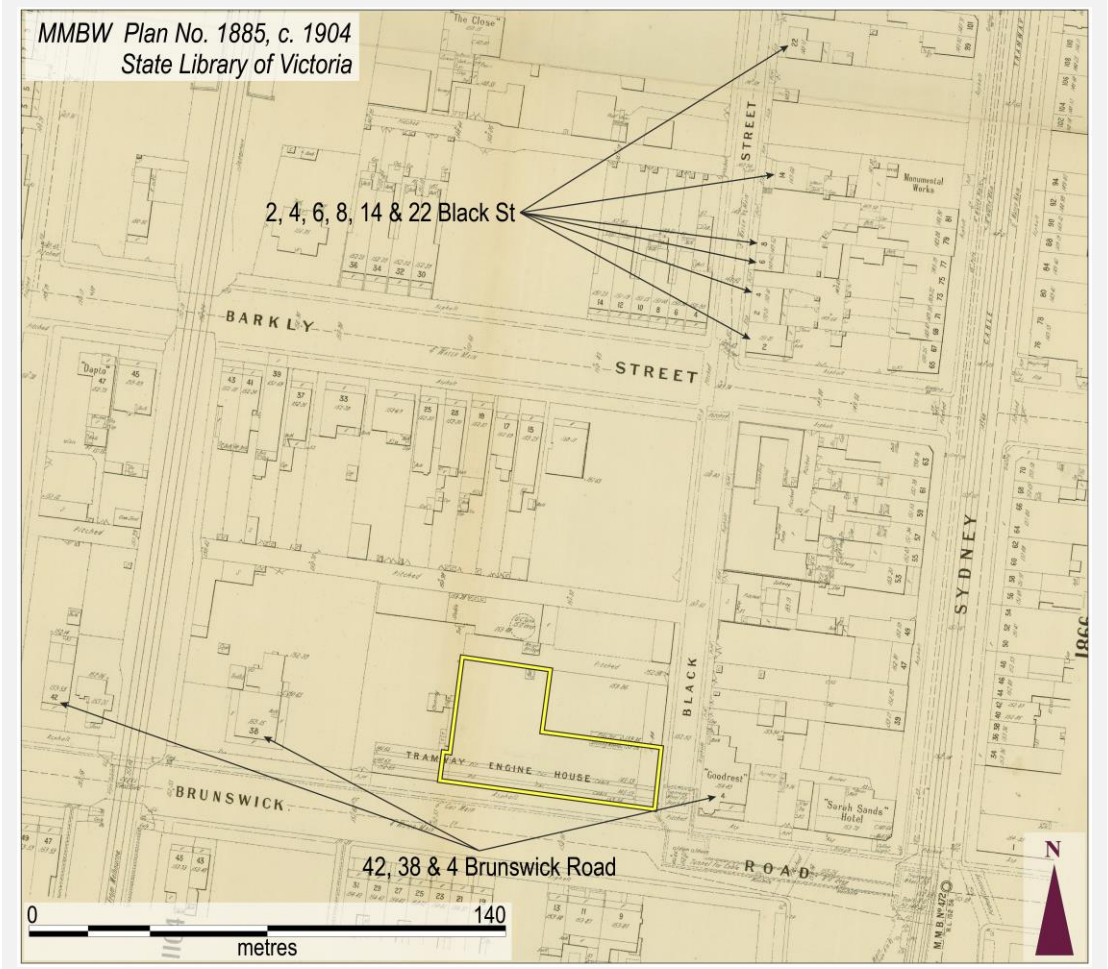


Figure 21: MMBW plan 1885, c. 1904, showing structures in the vicinity of the project area. Image source: SLV

The documentary record therefore accords with the findings of the preliminary desktop assessment undertaken by Extent – indicating that land use prior to the purchase of the property by Melbourne Tramways Trust and construction of the engine house was minimal, and no permanent or significant structural features appear to have been erected in the project area prior to c. 1886. It should be noted, however, that this cannot be stated for certain, and it may be the case that there were structures located within the project area prior to c. 1872, for example, about which records have not yet been identified.

2.4.2 Cable Tram Engine House c. 1886 – c. 1936

The three parcels of land that made up the project area in the late 19th century were purchased by the Melbourne Tramways Trust in 1886 (LANDATA Cancelled Titles 1816/177 & 762/391), ahead

of the construction of the engine house. A report in the *Herald* (26 September 1887: 3) described the Brunswick Cable Tram Engine House as the tramline neared completion:

> [t]he engine-house is situated in Brunswick road, and is a massive brick structure 90 feet square, with extensive pits for cable purposes. The chimney stack reaches to an altitude of 160 feet, and there is a capacious yard adjoining for the storing of materials. Mr J. Sutherland, the contractor, has carried out his work in a very satisfactory manner. The connection with the engine house to the sheave wheels on Sydney road is by means of two brick tunnels 9 feet high along the Brunswick road, and this has caused a considerable amount of work and additional machinery. Messrs. Wright and Edwards have erected all the driving gear, angle sheaves, etc., some of which are very massive, the driving wheels being 25 feet in diameter. There are two powerful high pressure engines fitted with Hartnell's governors and cut-off valves, cylinder, 20 inches, stroke, 40 inches. Messrs. Hughes, Pye, and Rigby, of South Melbourne, were the makers of the large driving wheels and engines.
>
> There are four multitubular boilers fitted with Fox's corrugated flumes, two having been made at Johnson and Co's foundry, and two at the Langlands foundry.

An MMBW plan dating to c. 1904 (Figure 22) shows the layout of the engine house, with a small number of interior features identified. These features include a bath in the north central section of the project area, cables pits in the south, offices (unlabelled but a wall defined) in the east, and pits for driving wheels in the north east. Reduced levels (in feet) on the plan indicate that the cable pits were approximately 2.3 m below the floor surface, and pits for driving wheels approximately 4.26 m deep.

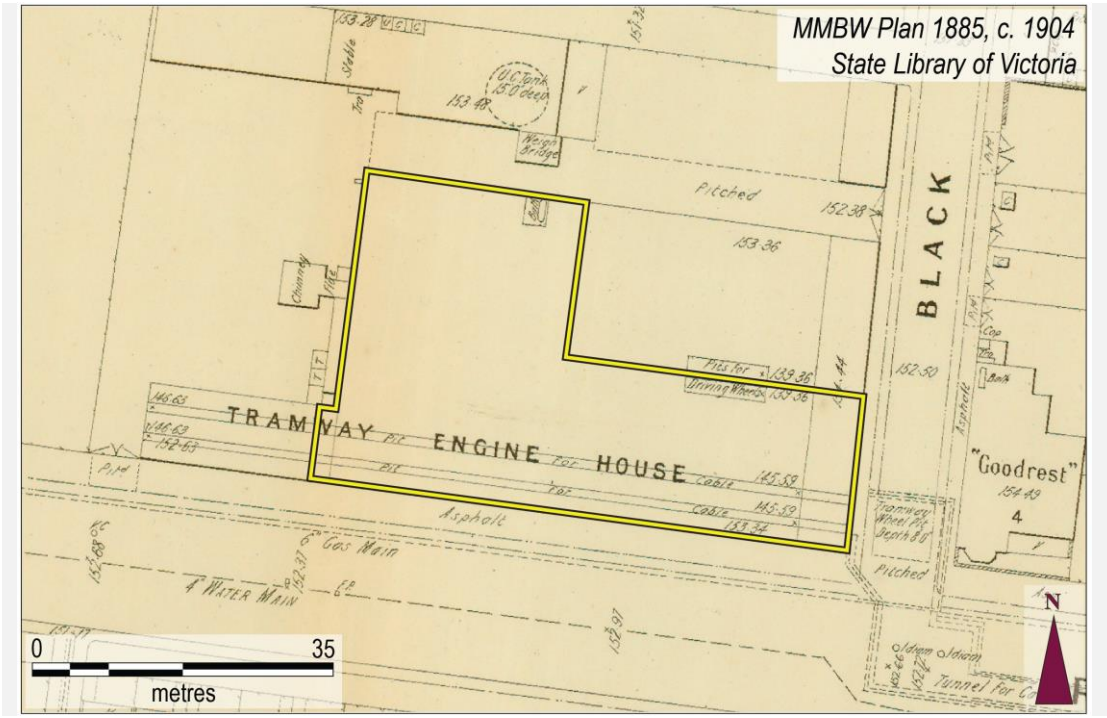


Figure 22: MMBW Plan 1885, c. 1904, with project area overlain. Image source: SLV

Another MMBW plan (Figure 23), dated to 1906, shows the project area unchanged.

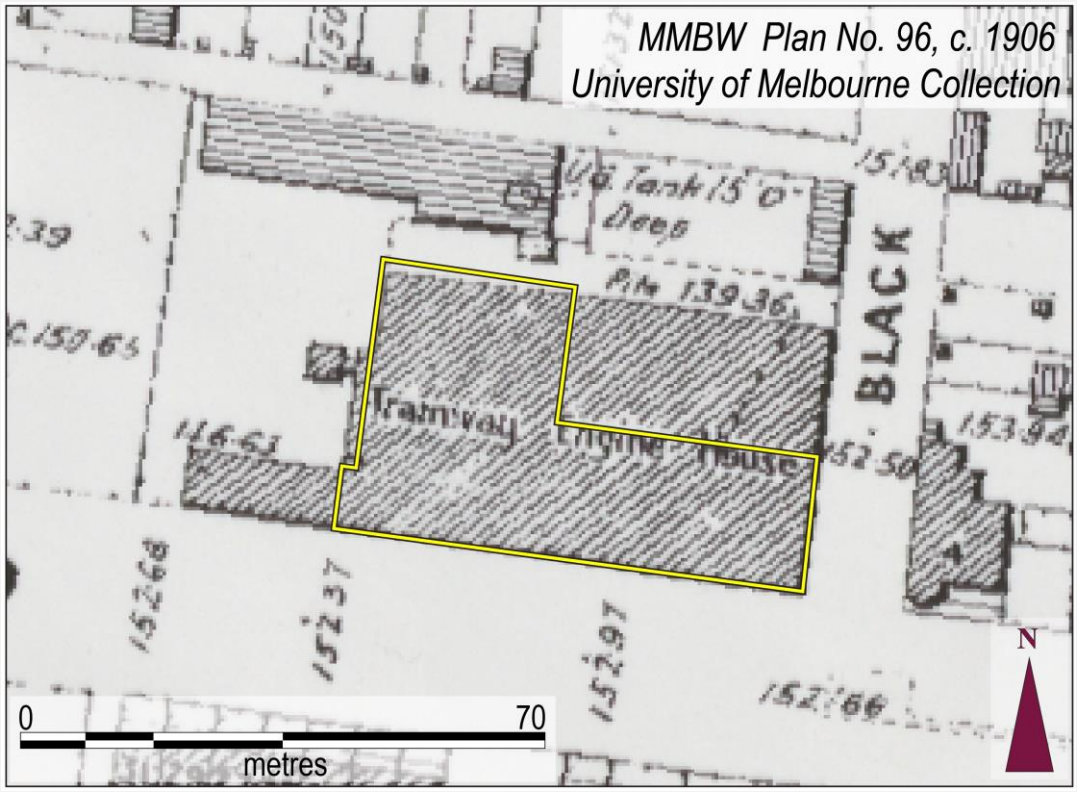


Figure 23: MMBW Plan 96, c. 1906, with project area overlain. Image source: UoM Collection

The engine house continued operation through the transition to electrification of the network, for a time housing machinery associated with, and then working alongside the adjacent substation, with one route being run as a cable tram, and one as electric. The engine house finally closed down in 1936, after full electrification was established. At the time its closure, Brunswick Cable Tram Engine House had been operating two cables of 32,000 and 16,000 feet, running at 12 & 13 miles per hour (MacMeikan 195?: 14). The building was not demolished following its decommissioning, but re-used for commercial purposes.

A document prepared by Heritage Victoria, recommending an amendment to the VHR listing for H2332 to include the place as a Registered Archaeological Place (Heritage Victoria 2020) included two plans, one dated to 1952, and one to 1937, that show part of the layout of the Former Cable Tram Engine House & Tram Substation. These plans both post-date the construction of the Engine House, and may reflect works that were undertaken around c. 1937, at the time of its decommissioning. It is not known when the works identified to the 'stores' at the eastern end of the structure took place – but it is likely that the room layout shown on these plans reflects the layout at the time of the Engine House operation (see Figure 24).

An aerial photograph c. 1946 (Figure 25) shows the tramway engine house building extant and surrounded on its western and part of its northern side with newer structural features.

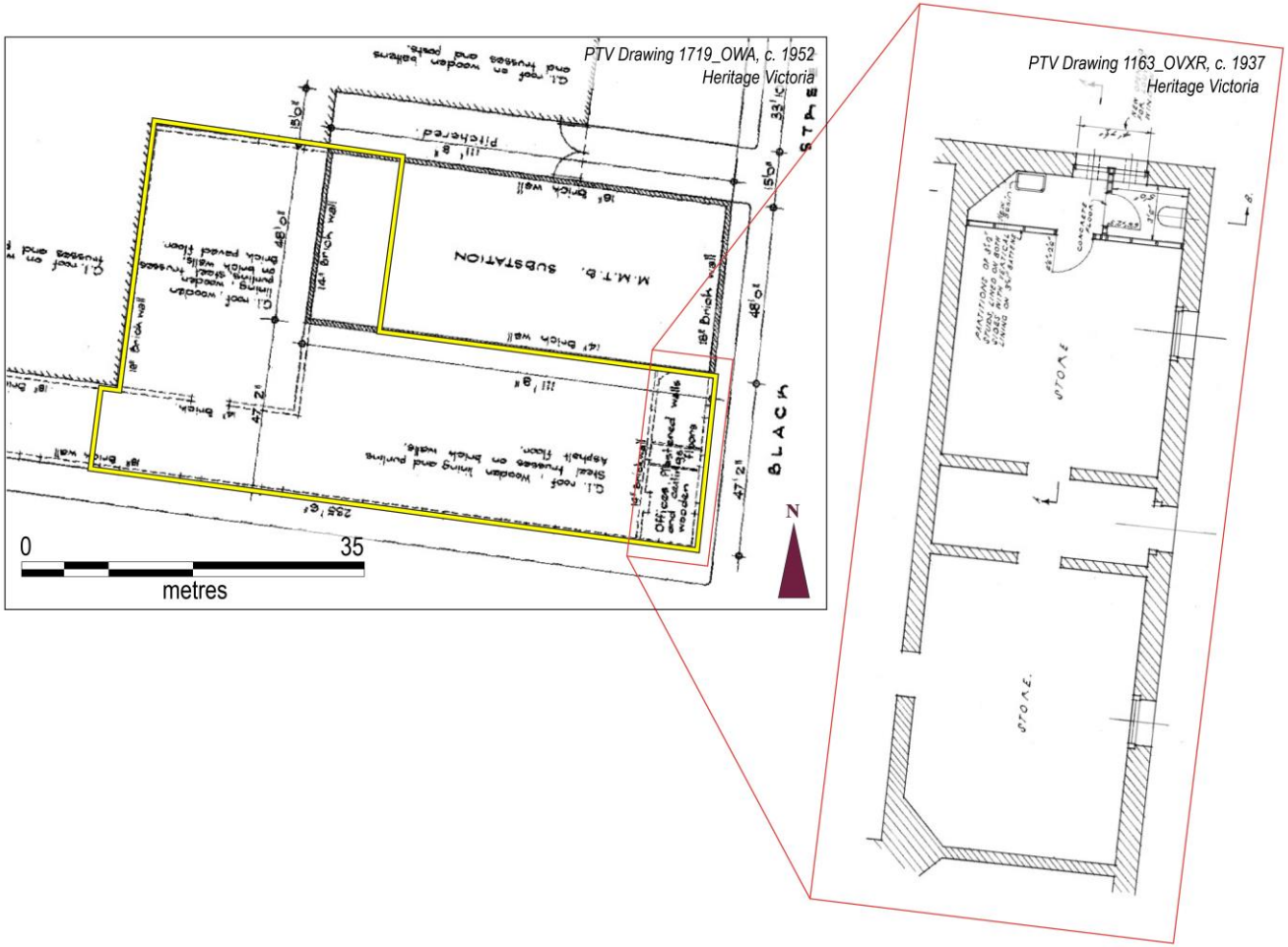


Figure 24: Plans of Brunswick Engine House c. 1952 and c. 1937. Image source: Heritage Victoria 2020

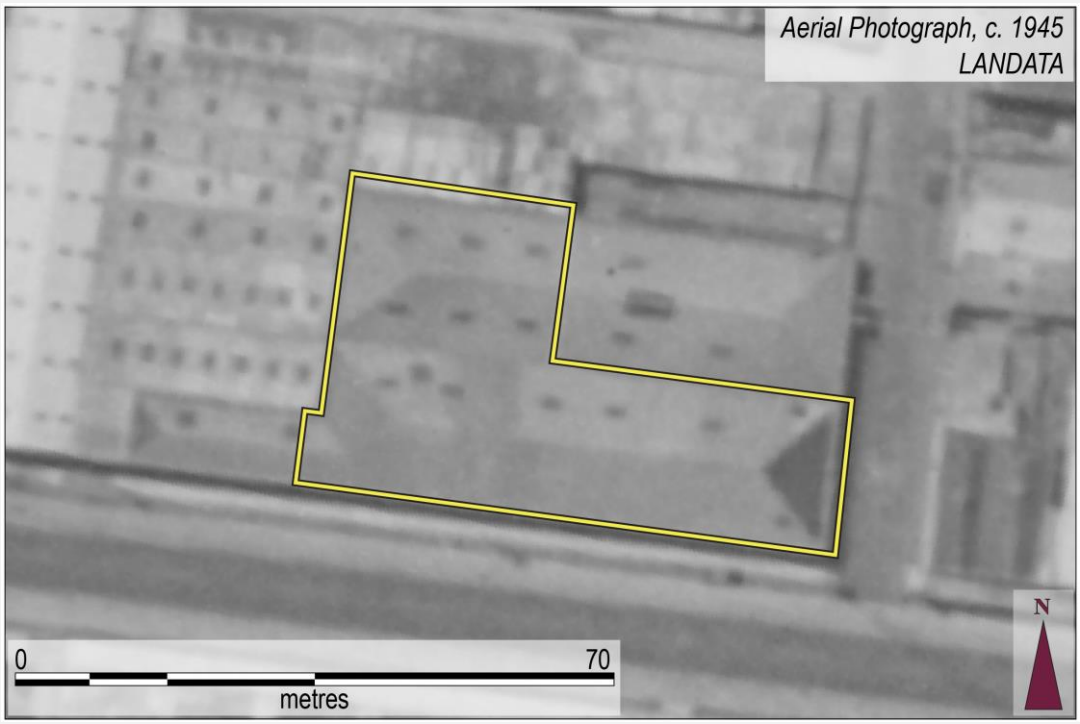


Figure 25: Aerial photograph c. 1945 with project area overlain. Image source: LANDATA

2.4.3 Cable Tram Engine Houses of Melbourne

Although no detailed plans or descriptions of the Brunswick Cable Tram Engine House have been identified as part of this land use history, a number of documents and images are available that describe the form and function of typical cable tramway engine houses. Some of these documents describe or illustrate facets of specific engine houses that formed part of the Melbourne Cable Tramways network – and may be particularly useful in informing predictions about the historical archaeological potential of the project area. A summary of the information revealed by these documents is provided in this section.

Descriptions of the engine houses and their workings focus on the layout and operation of the engine house proper – this being the part of the Brunswick Road facility that was located within the project area, and such descriptions are thus most relevant to its archaeological potential. There were also ancillary structures and features situated around the main engine house building that formed part of the Cable Tram Engine House workings more broadly, which are not described in this section.

Establishing the Melbourne cable tram network

Following the 1883 passing of the *Melbourne Tramway & Onmibus Co. Act*, the Metropolitan Tramways Trust were tasked with 'building and equipping the engine houses to power the traction cables, and for constructing the cable tunnels between the tram tracks' (Pierce 2017: 3) to service the new cable trams. The Tramways Trust 'was required by the Act to complete the tramways by the 12th of October 1899, and to grant a thirty year lease of the tramways to the company, dated from the 1st of July 1884...in all the Trust was to operate eleven Engine Houses' (Harding 1966: 3).

Engine houses form and function

The engine houses for the Melbourne Cable Tramway network (also called winding houses) were typically located near the mid-point of a given tram route, with separate cables 'running out and back to the respective 'up' and 'down' terminals' (Pierce 2017: 9). Described by Harding (1966: 5) as 'quite massive in size (varying according to the number of cables and length of each)... In most instances they were situated on corners (so ropes would have access to two different streets). An illustration of the typical way in which an engine house connected to the external tramway is shown in Figure 26.

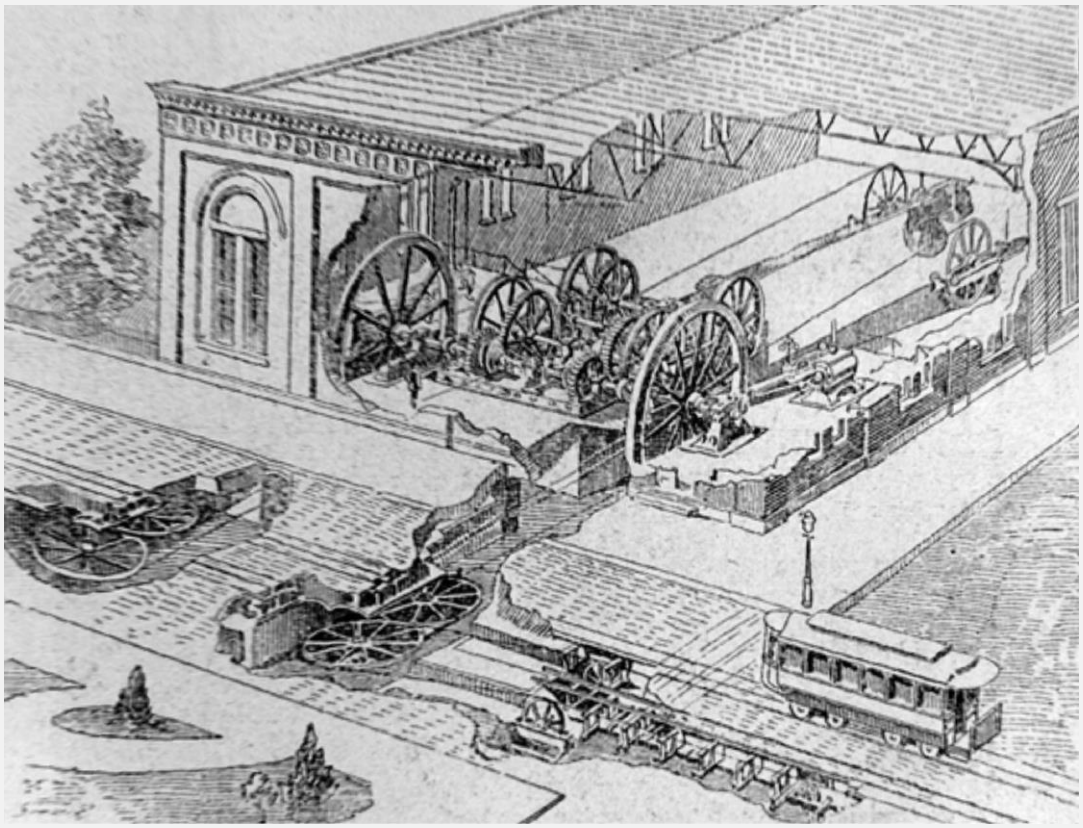


Figure 26: Undated illustration of a cable tram engine house showing connections to tramline. Image source: Yarra Libraries

Pierce (2017: 9-11) describes the infrastructure of the average engine house as follows:

> The main running cables are directed into and out of the engine house by large horizontal or inclined sheaves in an extensive pit beneath the roadway and a connecting tunnel into the building. Inside each engine house the cables ran around the timber lined grooved periphery of large diameter driving sheaves and then around a similar diameter sheave set on a rail mounted carriage that was dead-weight loaded so as to maintain a constant tension on the cable.
>
> The cable driving sheaves were in turn driven by horizontal, non-condensing steam engines via a speed reduction provision. At the first engine house this was achieved by helical gears but later the multiple-pass rope drive using grooved driving pulleys was preferred for its lower noise level and reduced maintenance requirements, and was ultimately used in all engine houses serving the MT&OC operated lines. This comprised a multi-grooved drive pulley on the common engine shaft linked to a larger diameter grooved pulley on the cable drive shaft via 16 – 18 manila rope passes...
>
> ...The cable tram steam engines exhausted to atmosphere via duplicated direct contact feed water heaters.

> The boilers to supply steam to the engines, also duplicated, were locally made multi-tubular marine type with a working gauge pressure of 100 psi (670 kPa) excepting for the Richmond and Fitzroy engine houses that had Babcock & Wilcox pattern water tube boilers. The boilers were manually fired with coal or gasworks coke and all of the original boilers reportedly lasted until closure of the respective engine houses...
>
> ...Based on comparative contemporary illustrations the dead weight cable tensioning arrangement used in the Melbourne engine houses was similar in principle to the arrangement first used on the 1883 San Francisco Market St line...The large diameter tensioning sheave was mounted on a wheeled carriage that ran on rails fixed on a larger carriage or trolley that itself ran along rails secured on each side of the long cable raceway trench. Chains affixed to the back of the tension wheel carriage ran over pulleys at the inner end of the lower carriage to a weight bucket of several tons suspended in the raceway. Movement to and fro of the tension wheel carriage enabled the maintenance of a constant tension as the cable length changed in response to load and temperature changes. The lower carriage was prevented from moving forward by pawls engaging in racks on each side of the raceway rails.
>
> When a new cable was installed, the lower carriage would be positioned close to the driving wheel end of the cable raceway. As the cable stretched with use, this could be compensated by first lashing the upper and lower tension wheel carriages together and then using a block and tackle to pull the lower carriage further out along the raceway tracks. This was facilitated by running the end of the tackle rope around a capstan drum on end of the tension wheel shaft after first slowing the cable drive. (Pollock, c1950).
>
> A prominent brick chimney stack to which the boiler flues connected marked the location of each of the engine houses that were themselves large single-story brick buildings. The facades of some engine houses in prominent locations, like the Nicholson St building, were given ornamental treatment. The operating staff immaculately maintained the engine houses and their machinery. In all there were eleven separate engine houses serving the MT&OC operated cable tram system. Each one powered from one to three main cables.

Examples of the interior and winding machinery at Cable Tramway Engine Houses are provided in Figure 27 and Figure 28. Figure 29 provides an illustration of the interior of the Fitzroy engine house. Figure 30 shows the boiler room at one of the Melbourne engine houses.

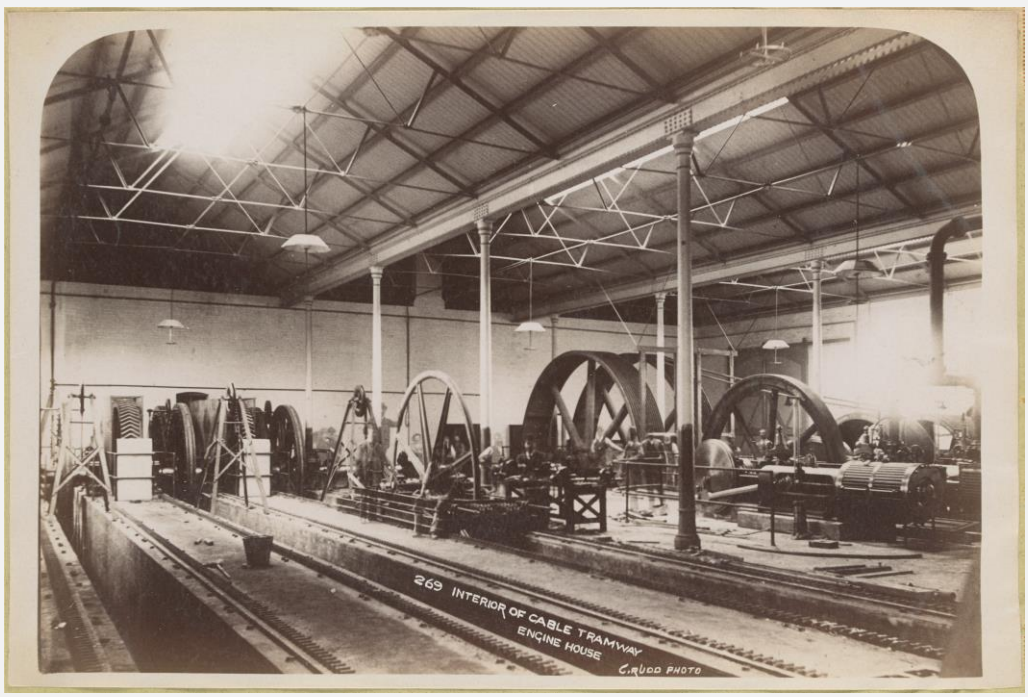


Figure 27: Interior of an engine house, showing cables and winding machinery (Rudd 1892)

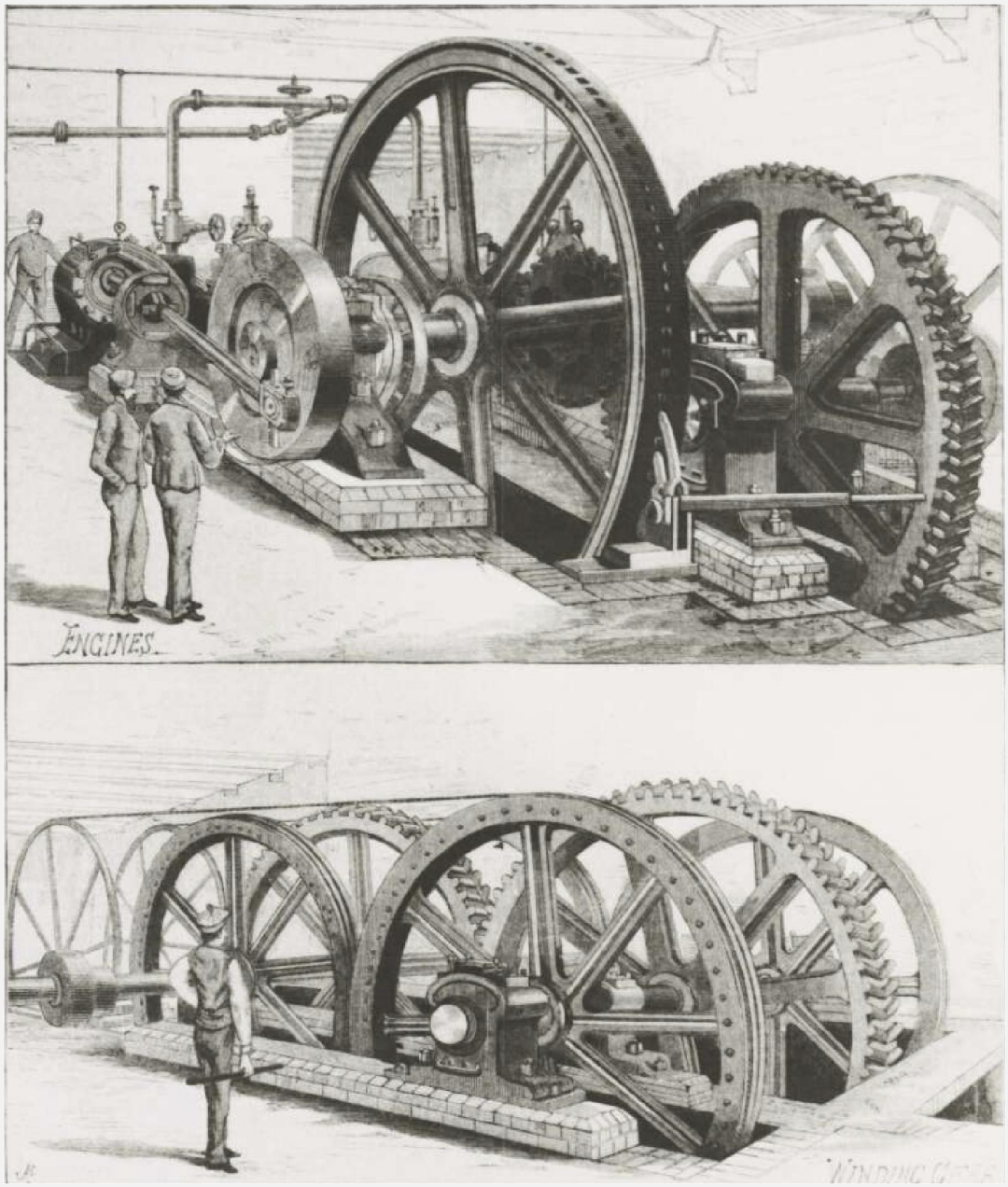


Figure 28: Illustration showing brick-lined pits and winding machinery (Howard 1885)

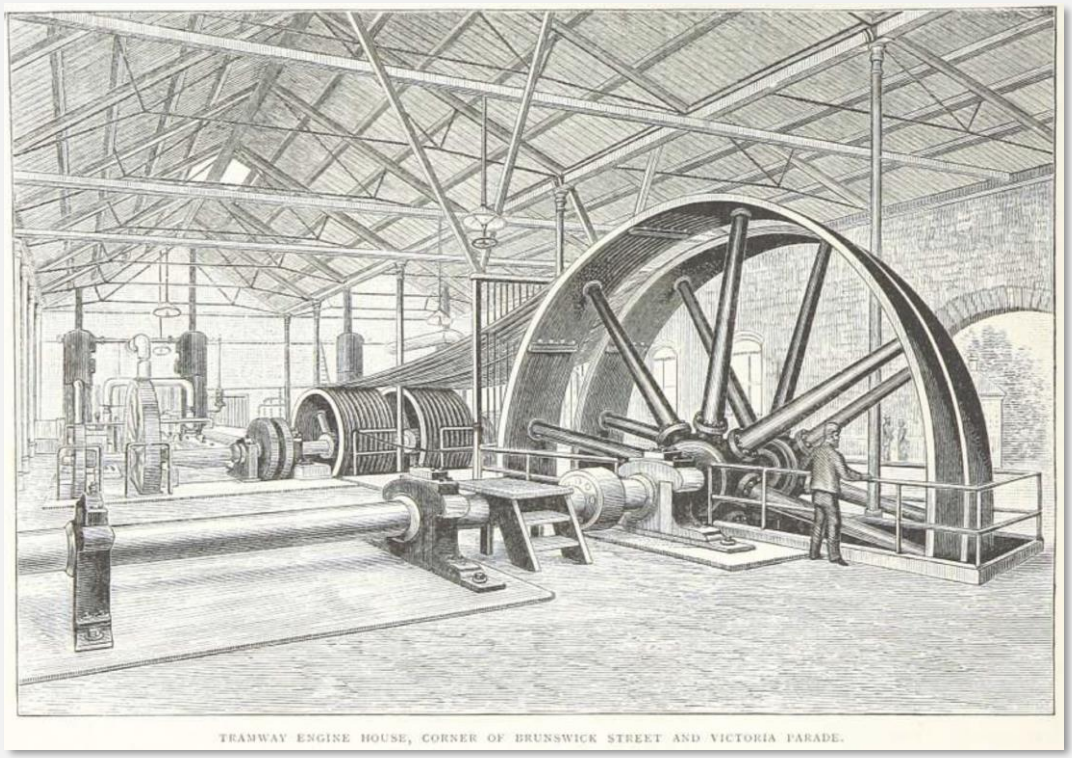


Figure 29: Illustration showing the interior of the Fitzroy Engine House. Image source: Ellery *et al* 1888: 20

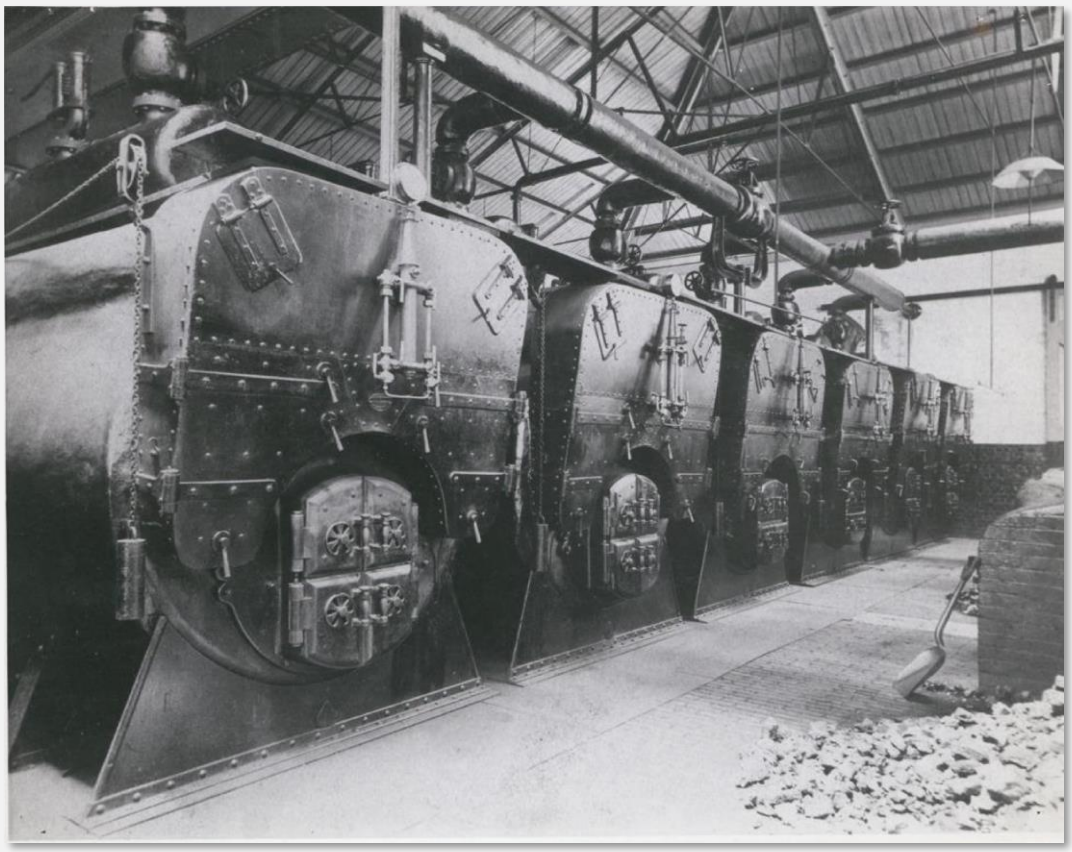


Figure 30: Photograph showing the boiler room at Toorak engine house, c. 1916. Image source: Pierce 2017: 11

Engine house layout

Harding (1966: 5) notes that the engine houses 'were all arranged in very much the same manner, with the offices along the front facing the street and having passages giving exit to the footpath. The area behind here is the location of the power source, where the air was "Filled with the strident din of machinery...and was heavy with the stench of oil". The tramway cable 'entered the Engine House from the tunnels in the street...through a pit or chamber situated below and in front of the Engine House...it contained a bewildering maze of huge pulleys' (Harding 1966: 7).

The typical layout of an engine house is provided by MacMeikan (195?: 11) in his report on the construction and operation of the Melbourne Cable Tramways (Figure 31). This general layout plan shows the location of offices and passages, as well as the standard machinery and built infrastructure within a typical engine house. If the image is rotated to align with the project area, informed predictions can be made about the location and/or likely presence of certain standard engine house features, and thus the nature of the project area's archaeological potential.

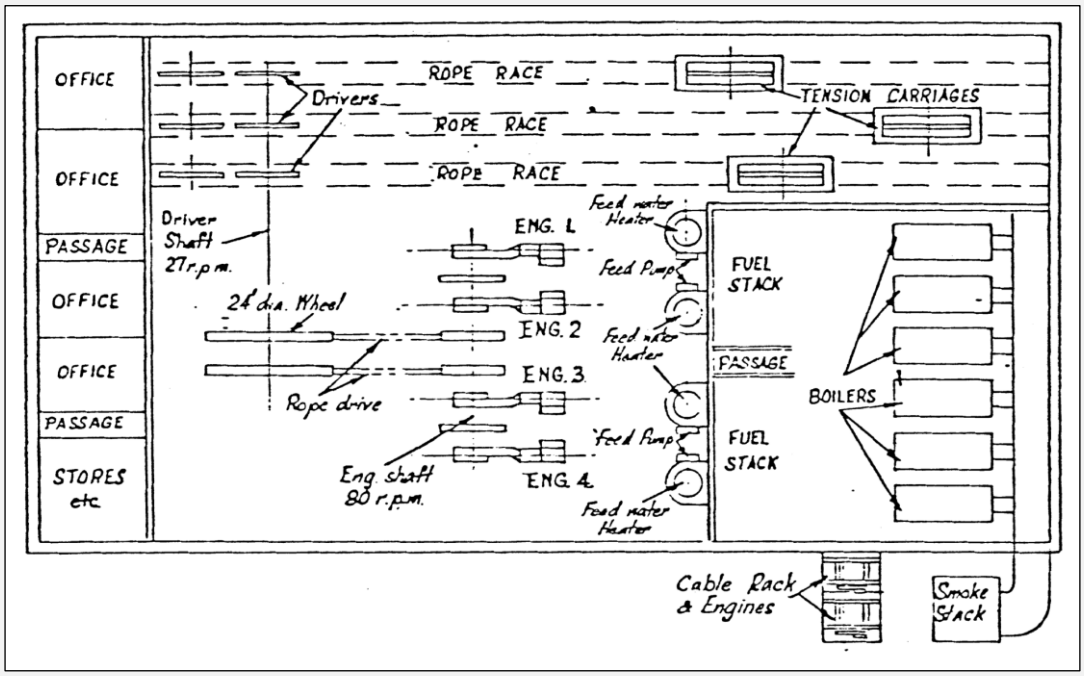


Figure 31: Typical engine house layout. Image source: MacMeikan 1950?: 11

Harding asserts that the cable pits within an engine house 'sometimes described as the "catacomb of the Engine House", can be up to fifteen feet or more in depth. Consequently, the walls can be up to sixteen inches thick, although in most cases, they were only twelve inches thick...As with the tunnels, the pits also were cast in solid concrete and because of their position, they were structurally of vital importance' (Harding 1966: 7). A hand drawn section through a series of these pits indicates their depth of over 14 feet, or approximately 4.26 metres (Figure 32).

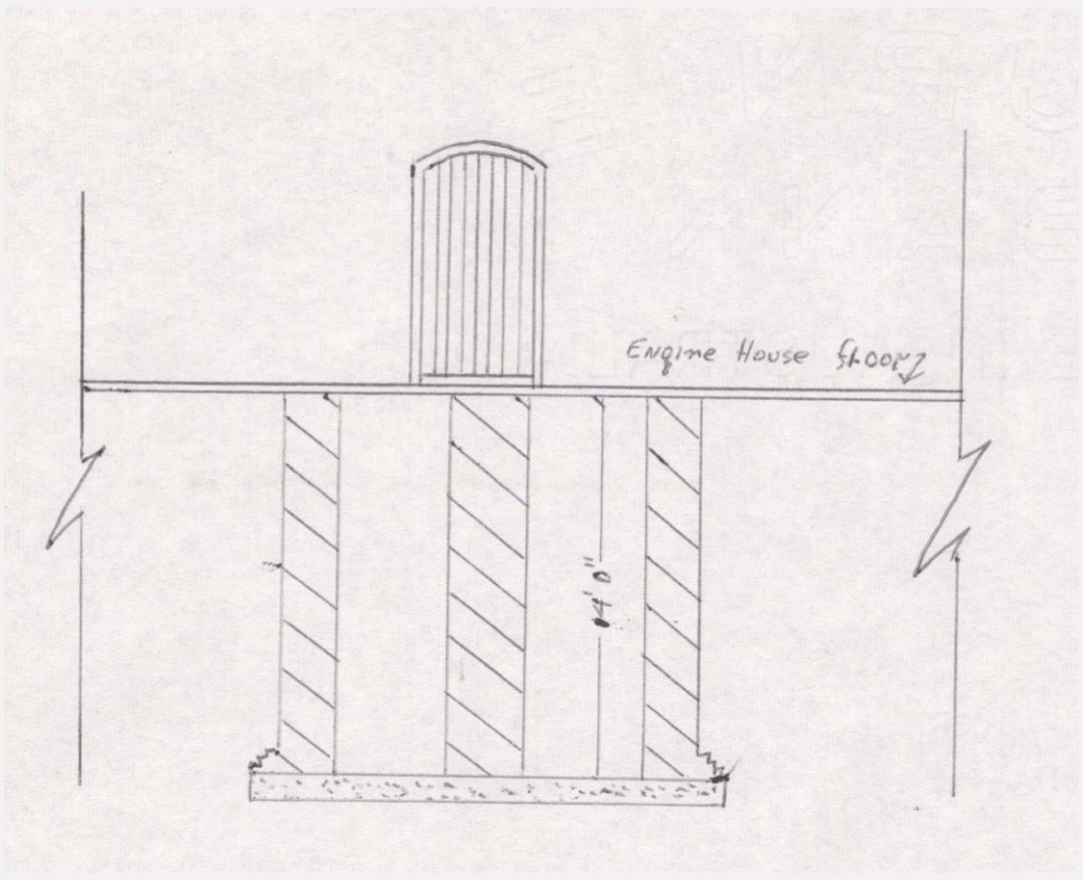


Figure 32: Hand-drawn section demonstrating engine-house pit depth. Image source: Harding 1966: 6

Harding (1966: 7-9) provides a useful and detailed description of the layout and operation of the engine house, as follows:

> from the pits the cable was fed up into the engine room itself...This room, filled with wheels spinning in circles, was dominated by one big wheel called the main driver...This striking feature was up to 25 feet in diameter, and weighed up to 50 tons.
>
> It drove the main shaft, which in turn rotated the driving wheels carrying the cables. It also, in drawing up the steel rope from the pit below, fed it onto a cast iron wheel. Then the cable ran away to a tightening wheel, supported on a carriage, and "urged" by a heavy weight, away from the other wheels. This is known as the tension carriage, which travelled along a race or railway 150 feet or more in length, thus taking up the variation in length of the cable due to stretching or expansion by heat or other causes. From here (the tension pits) the endless cable returned and passed under the mechanism it first encountered on entering the engine room, to the pit and then the tunnel in front of the Engine House, to make another of its endless journeys.
>
> Now the area of these tension pits was quite considerable. Often it was on the left hand side of the engine room, and extended from the offices (at the front) to the rear wall of the building. They were separated from the boiler house by a brick wall running from the engine room to the rear of the course, depended upon the number of cables (or lines), the Engine House was pulling.
>
> The power for the various wheels came from a pair of engines situated in the engine room along with all the wheel mechanism. Space had to be provided for these engines to be duplicated, so that one set were on standby when the other broke down...
>
> ...Now the source of power for these engines, came from steam generated in a series of boilers above large furnaces, situated at the rear of the boiler house..."the doors of these furnaces are occasionally opened for coaling, and given then a shock to the beholder in the amount of steam thrown out, and of coals shovelled

> in". These boilers were also duplicated, so giving a complete change over of all Engine House machinery. Then, the fumes from the furnaces were taken away by a flue to the tall chimney stack situated outside of the building.
>
> ...the office along the front (for the chief engineers and overseer), the tension carriage along the side, the engine room beside this as well as behind the offices, and the boiler house at the rear. The chimney stack, of course, is away from the building...
>
> ...The whole of the structure was, of course, made of brick – even the interior walls, which were painted white. The foundations for the building were bluestone, while the foundations for the engines were concrete. Wooden flooring existed in the offices while in the engine rooms, floors were of asphalt, and in the boiler rooms they were brick. The ancillary sheds were made of galvanized iron, and the surrounding paving was either of stone or asphalt.

The following plans of the Nicholson Street (Figure 33) and Johnston St (Figure 34) engine houses provide useful information about the type and layout of features in contemporary Melbourne Cable Tramways engine houses, and in some instances provide details about the materials used to construct different features, as well as their use.

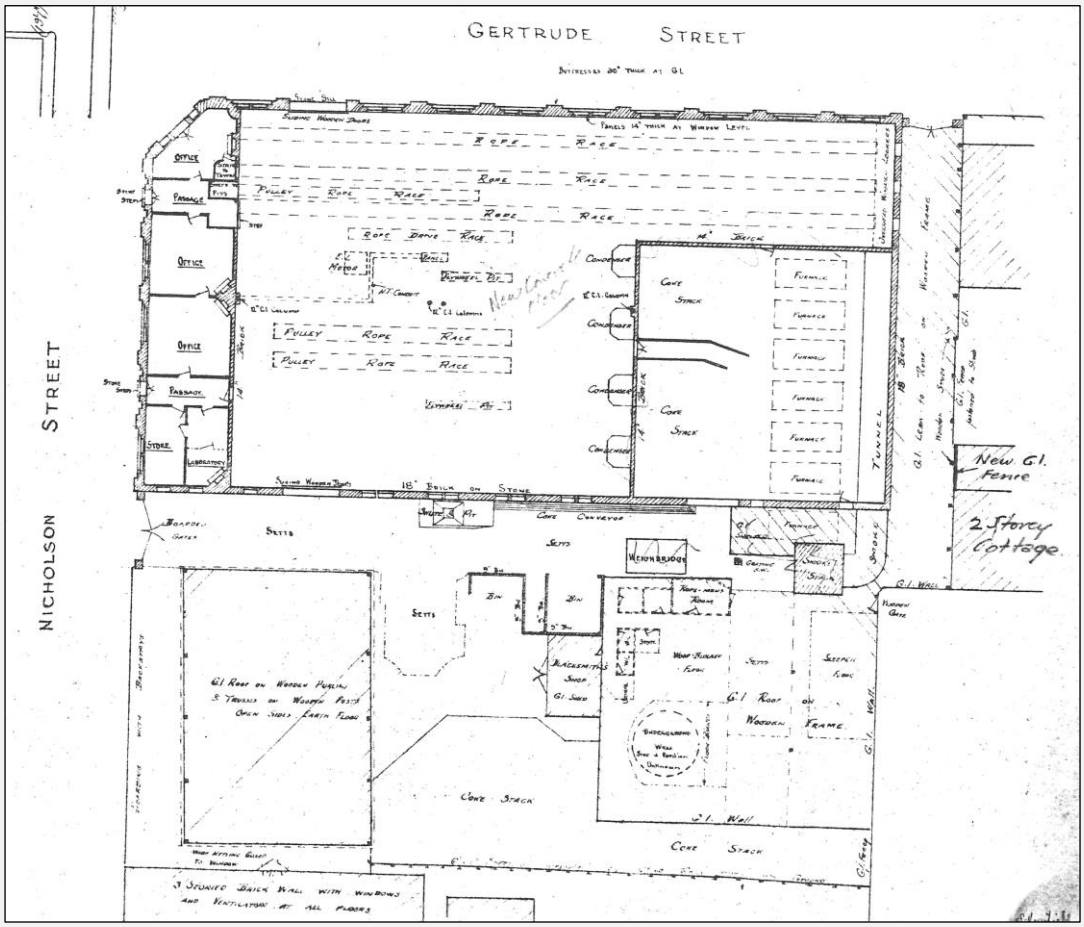


Figure 33: Plan of the Nicholson Street Cable Tram Engine House, c. 1938. Image source: Victorian Collections

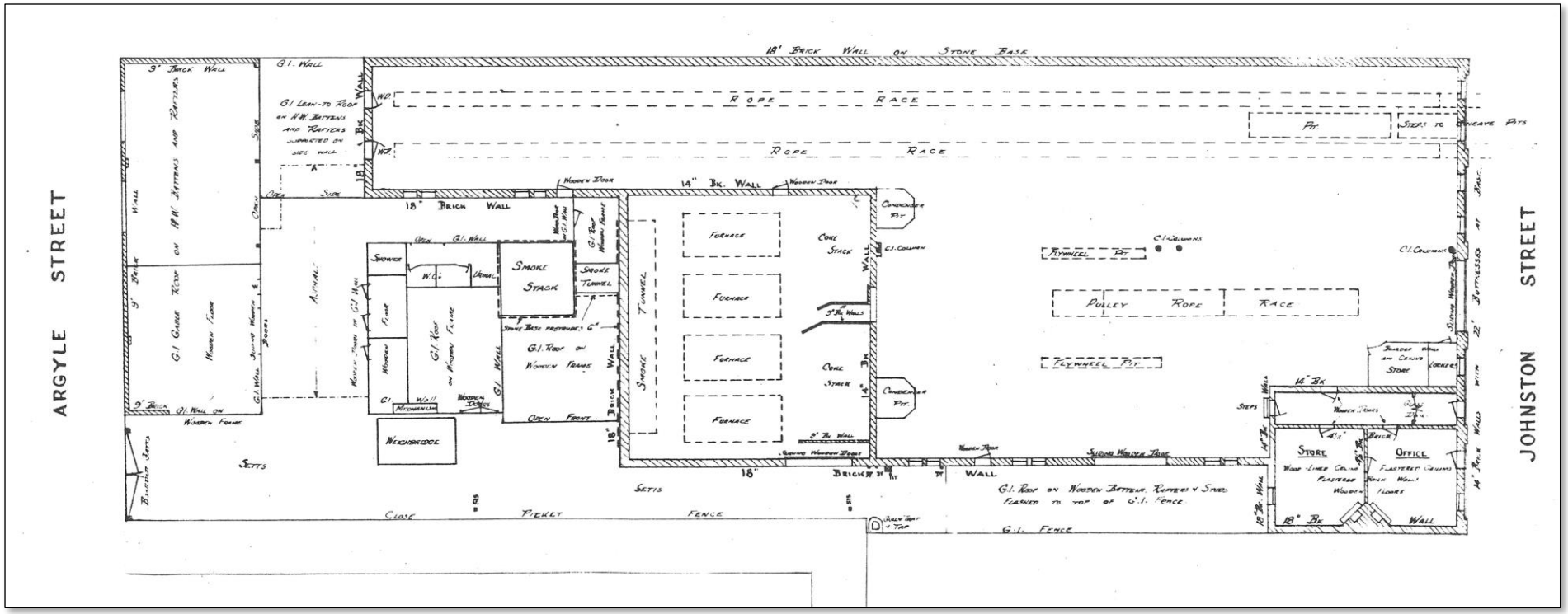


Figure 34: Plan of the Johnston Street Cable Tram Engine House, c. 1938. Image source: Victorian Collections

Differences between Engine Houses and signs of the times

As mentioned in the various heritage studies discussed previously, the Brunswick engine house was noted to be, architecturally speaking, one of the more 'plain' engine houses erected as part of the Melbourne Cable Tram Network. Despite the generally similar layout of each engine house, it seems that decorative features (architectural and interior) varied between the different sites. A photograph of the interior of the Toorak engine house perhaps demonstrates some of the personalized features that may have been present in one engine house but were not necessarily widespread – and at the same time places the engine house firmly within the fashions of the time. Decorative architectural features that don't appear to be present in other photographs of engine houses of the time are visible in this photograph – in the form of two decorative columns present located in the centre of the room, beneath a supporting beam.

Also present in this photograph are three tree-ferns, placed among the machinery. It is not known whether the ferns in this photograph were placed for a particular occasion, or whether they were planted in the engine house as features (possibly benefitting from the steam created by the boilers). It is interesting to note, however, that the mid-late 19th century saw a fashionable obsession with ferns in many places across the world, and in particular in countries and colonies associated with the British empire. This craze, known as 'fern fever' or 'pteridomania', 'reached the colony of Victoria shortly after the gold rush' (Williams 2015: 2) of the 1850s and can be seen in the 'widespread construction of impressively grand ferneries...associated with the exceptional affluence of the 1870s and 1880s in Victoria' (Williams 2015: 2). Ferneries, and the cultivation and maintenance of fern specimens 'were an expression of civic pride, municipal importance, and aggressive competitiveness' (Williams 2015: 2). It is not known whether such adornments were present in the Brunswick engine house – but it is noted that the MMBW plan of 1904 (see Figure 21) maps a fernery at the rear of the "Goodrest' building, opposite the tramway engine house, on the corner of Black Street and Brunswick Road.

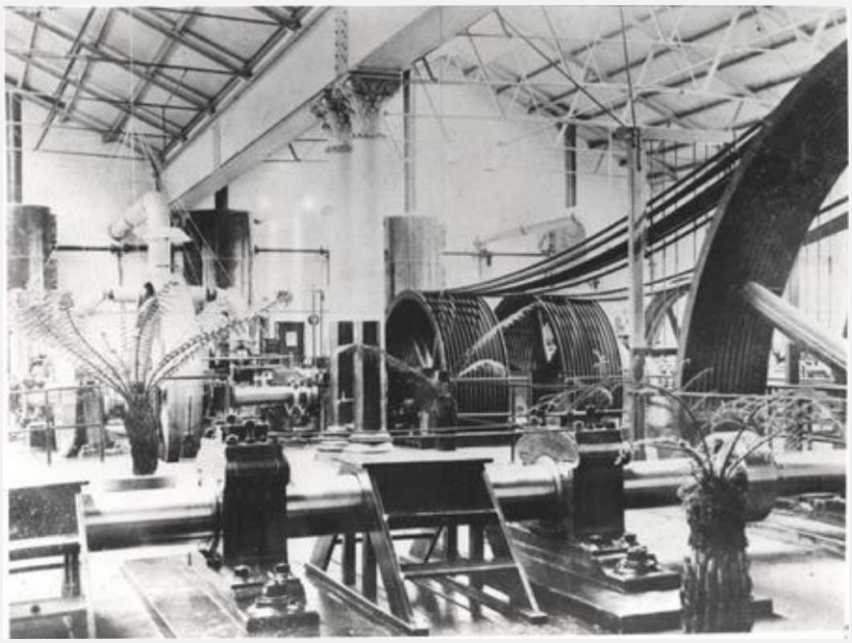


Figure 35: Photograph of the interior of the Toorak engine house, c. 1900. Image source: Victorian Collections

2.4.4 Project Area Land-Use and Disturbance – mid-20th Century Onwards

Since the closure of the engine house in the 1930s, the project area has been subject to use by a range of commercial enterprises, including as a tyre and vehicle repair centre, and as a clothing manufacturer. A photograph of the building c. 1976 (Figure 36) shows it in use as 'Exhaust City', a vehicle repair shop. Following the decommissioning of the engine house, its machinery was removed, the above-ground internal workings subject to demolition, and pits filled. A concrete slab was installed to create a new floor for the warehouse – to make it suitable for use as a commercial facility. It is not known what degree of excavation was undertaken as part of this process, or the methods of construction used to lay the concrete slab. According to the assessment informed by a field inspection by Extent Heritage (Simon & Clark 2023), it is likely that the concrete slab that forms the current warehouse floor has sealed in place archaeological remains associated with the cable tram engine house – which are potentially present in very shallow contexts, directly beneath the slab.

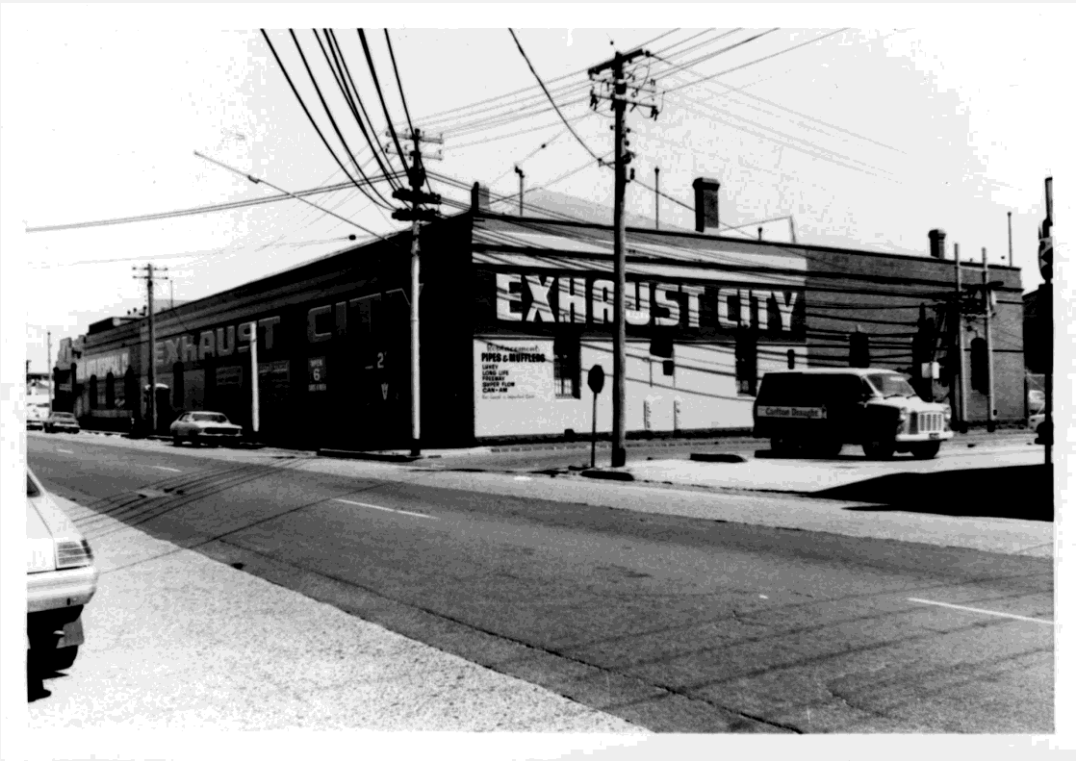


Figure 36: Photograph of the project area, c. 1976 (Collins 1976). Image source: SLV

A Before You Dig Australia [BYDA] enquiry (Job No. 36213279) for the project area was undertaken in March 2024. Information provided as a result of this enquiry can be used to identify areas of potential ground disturbance related to the installation and maintenance of utilities within the project area. The mapping provided as part of such an enquiry is not of sufficient accuracy or detail to pinpoint these areas, however. Rather, the information can be used to identify broad areas within the project area that may have been subject to more recent disturbance related to the installation, maintenance and use of utilities.

The BYDA enquiry identified the presence of active and abandoned water mains along the southern boundary of the project area, and it is likely that one or more connections to these mains extend within the project area – however the location/s of these connections is unknown. Similarly, an Optus communications

cable also extends along the length of the project area's southern boundary, and it is not known if connections relating to this cable extend into the project area. A Telstra cable is recorded as extending into the project area from Black Street, and a low voltage electrical cable is marked extending up to the northern boundary of the project area from the substation to the north. None of the information received as a result of the BYDA enquiry indicates extensive disturbance of the historical archaeology by utilities.

2.5 Archaeological Potential

The Desktop Assessment has identified areas of high, high-moderate, and moderate archaeological potential within the Project Area, relating to its use between c. 1886 and 1936 (refer to Table 6). These areas are shown in Figure 37, with each assigned a number corresponding to the type of remains predicted to occur in each location. It is unlikely that extensive damage has occurred to the archaeology since the decommissioning of the Engine House. In fact, the concrete slab that currently serves as the floor surface has likely acted as a protective seal, preserving the historical archaeology of the site.

Evidence from the land use history suggests that it is unlikely that the Project Area was developed or occupied in any intensive way prior to the purchase of the property by the Melbourne Tramways Trust and construction of the Cable Tram Engine House. Although it cannot be ruled out that built structures such as houses were present in the Project Area prior to 1886, the evidence suggests this is unlikely. Uses of the Project Area prior to 1886 are likely to have been largely 'ephemeral', as suggested by Extent's study (Simons & Clark 2023), and any traces they may have left have likely been camouflaged or destroyed by the construction and use of the Cable Tram Engine House.

The Project Area is predicted to contain areas of low archaeological potential for archaeological remains associated with the use of the land prior to its purchase by the Melbourne Tramways Trust and development as an Engine House. Archaeological material that may be identified relating to this period may include isolated artefacts or artefact deposits, post holes relating to early timber structures or fencing in the Project Area, and evidence of cultivation. The archaeological potential of the Project Area pre-1886 is shown on Figure 42.

The use of the Project Area between c. 1886 and c. 1936, on the other hand, resulted in heavy modification to the natural state of the Project Area, and is likely to have left extensive archaeological remains. Limited detailed plans of the Project Area during this time mean that the locations of most features within the engine house cannot be mapped with accuracy without archaeological investigation. Information provided in written descriptions of this and other Engine Houses, however, as well as comparisons to plans of 'typical' and contemporary examples of Melbourne Tramways Engine Houses, have allowed a relatively detailed predictive model to be developed.

Table 5: Areas of archaeological potential relevant to c. 1886 and c. 1936

Area	ID	Archaeological Potential
Known engine house feature locations	**1**	High archaeological potential for depths of up to 4.2 meters below the current ground surface (driving wheels and rope races)
	2	High archaeological potential for depths of up to 2.35 meters below the current ground surface (rope races and tension pits)
	3	High archaeological potential for features at unknown depths below the current ground surface (bath and interior dividing wall foundations)
	4	A combination of archaeological potential areas No. 3 and 5, and may include alterations undertaken c. 1937.
Likely engine house features – precise locations unknown	**5**	Moderate-high archaeological potential to unknown depth for archaeological features relating to offices, timber flooring & subfloor deposits, internal wall footings, stores, passages & stairwells (to pits). May include alterations undertaken c. 1937.
	6	Moderate-high archaeological potential to unknown depth for archaeological features including engine beds, asphalt flooring, pulley rope races, supporting columns, interior wall footings at western end, and vertical condenser bases adjacent the interior wall footings.
	7	Moderate-high archaeological potential to unknown depth for archaeological features including interior wall footings, brick flooring, passages, boiler bases (4 x boilers / furnaces along west wall), coke stack areas, smoke tunnel.
	8	Moderate-high archaeological potential to unknown depth for archaeological features including interior wall footings, brick flooring, passages, boiler bases, coke stack areas, smoked tunnel as well as moderate potential for timber flooring, storage rooms, offices & ablution facilities.

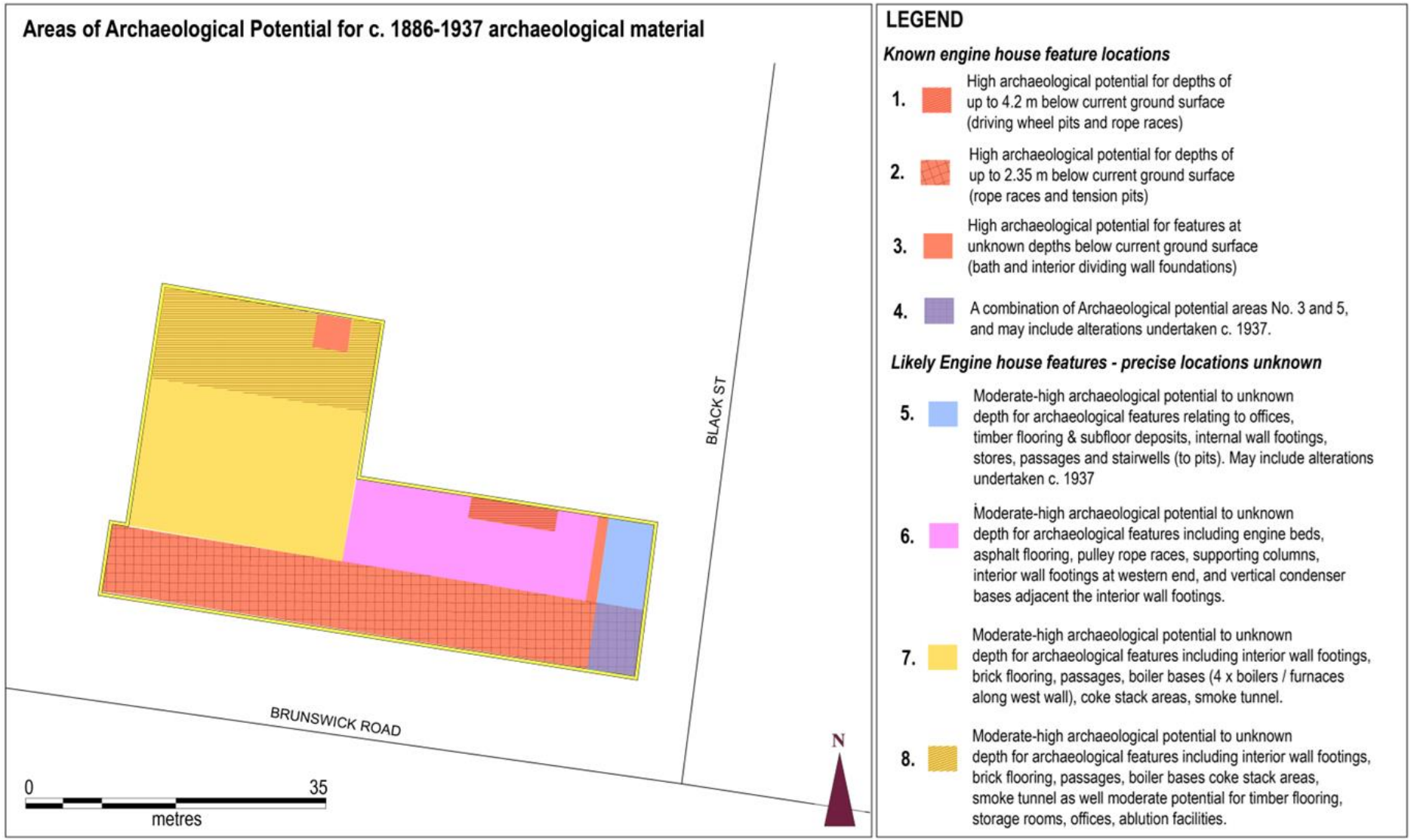


Figure 37: Archaeological Potential of the Project Area for c. 1886 - 1937 archaeological material

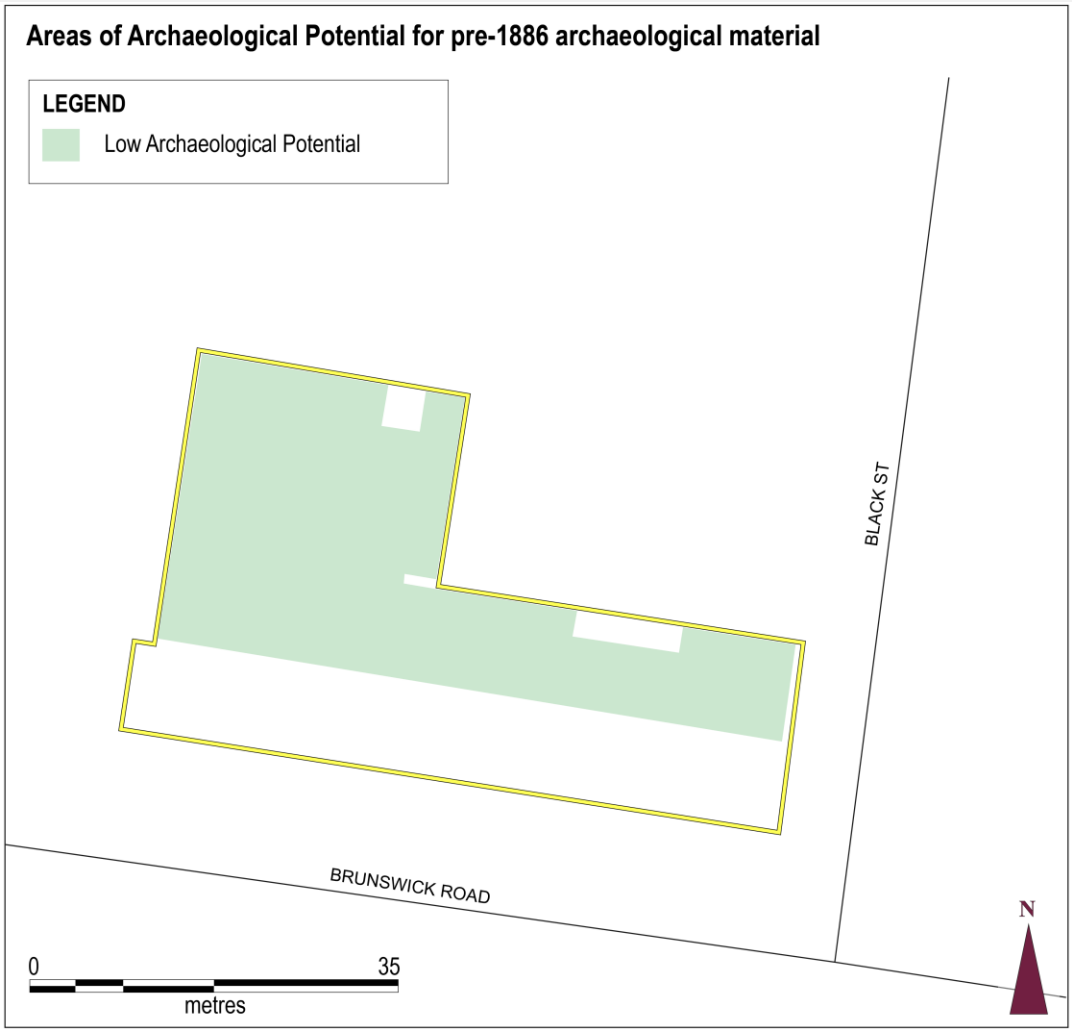


Figure 38: Archaeological Potential of the Project Area for pre-1886 archaeological material

3. INVESTIGATION AND MONITORING RESULTS

3.1 Permit P40525

This section outlines the results of the archaeological investigations and monitoring undertaken at the site. The investigation and monitoring phases were carried out in accordance with the methodology outlined in the supporting documentation submitted as part of the Permit application and subsequently approved by HV.

3.2 Limitations and Assumptions

The archaeological investigation and monitoring contained several methodological limitations inherent to the geotechnical investigation program. The nature of the boreholes, being limited in extent (diameter =/<200mm), meant only a small sample of subsurface deposits could be examined, providing narrow windows into the site's stratigraphy. The auguring methodology used resulted in non-contiguous soil profiles, requiring a degree of interpretation to understand stratigraphic relationships and site formation processes. Soil samples obtained through this method also lacked the contextual integrity of those recovered through controlled excavation.

The excavation methodology approved under Permit P40525 limited investigation to primarily exposing rather than fully investigating archaeological features. Once identified, features were documented in situ but not excavated further, limiting our understanding of their full extent, construction methods, and chronological relationships. Consequently, only a baseline understanding of the archaeological fabric was possible, with interpretations necessarily relying on documentary evidence rather than comprehensive investigation of the features themselves.

Additionally, while the test pits provided larger exposures than boreholes, their restricted dimensions (1x6m) still limited understanding of the spatial relationships between features and their broader site context. These constraints, while necessary for the protection of the archaeological resource, mean that interpretations presented should be considered preliminary and subject to refinement through any future investigations.

3.3 Methodology

The methodology for the geotechnical investigation program involved obtaining soil profiles from eight (8) borehole locations and the excavation of two (2) test pits to confirm the likely presence of the cable pit . The program included physical excavation, archaeological monitoring, and the management and collection of any and all artefacts recovered in the field.

The primary objectives of the program were to:

- **Position and monitor boreholes** to avoid archaeological features while documenting stratigraphic information.
- **Position and monitor / excavate test pits** to locate the cable pit or cable and record associated stratigraphic data.
- **Document archaeological features** uncovered during geotechnical investigations and collect artefacts for detailed analysis.

The methodology encompassed the collection and documentation of features, deposits, and artefacts encountered or impacted during the investigations. This included capturing stratigraphic and spatial data to contextualise historical activities and site phasing. The Monitoring and Investigation Program, detailed in Section 3.4, was conducted in accordance with an approved H Act Permit and the relevant Guidelines.

3.4 Monitoring and Investigation Program

The geotechnical investigations combined boreholes and test pits to assess subsurface conditions, locate key archaeological features, and minimise potential impacts on archaeological remains. A total of seven (7) boreholes were augured to a depth of approximately 16 m, with a diameter not exceeding 100 mm. The final locations were determined on-site in consultation with the nominated archaeologist(s) to ensure adequate assessment coverage and avoid impacts on archaeological features. Changes to the number or location of boreholes were documented by the archaeologist(s).

A total of two (2) test pits, each measuring approximately 1x6 m, were excavated mechanically under the supervision and control of the nominated archaeologist. The final locations of the test pits were determined on-site to minimise unnecessary interventions. Figure 39 shows the final locations of the boreholes and test trenches.

The field team included one (1) senior archaeologist and a mechanical excavator operator. Table 6Table 6 outlines the personnel likely to be involved in the geotechnical investigation program.

Table 6: Personnel involved in the geotechnical investigation program

Role	Name
Project Manager / Manager Historical Archaeology	Paul Pepdjonovic
Senior Archaeologist (Site Director)	Shane Willis
Artefact Manager	Jennifer Porter
Geomorphologist	Karen Kapteinis
Mechanical Excavator Operator	Luke Wallis

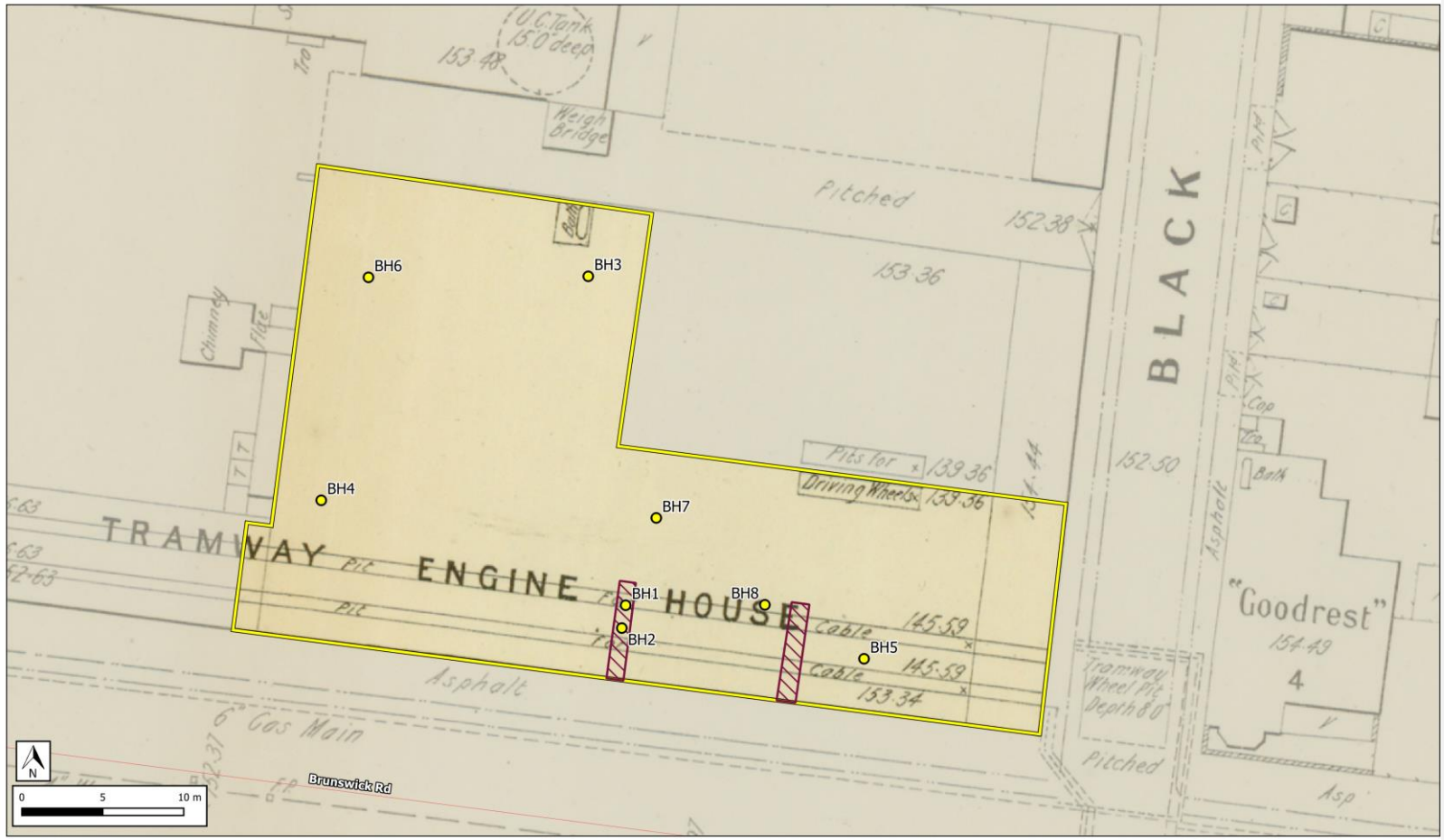


Figure 39: Map of the Project Area, showing the final locations of Trenches 1 and 2, as well as the geotechnical investigations (boreholes 1-8)

3.4.1 Test Pits – Targeted Excavation

Two test trenches were positioned against the southern wall of the building, both aligned north-south. Test Trench 1 was established 19m west of the exterior south-eastern corner of the extant building, with dimensions of 6m (north-south) x 1m (east-west). Following trench demarcation, a concrete cutter was employed to cut and penetrate the extant concrete surface comprising the building interior.

Test Trench 1

Excavation commenced with the removal of context <1000>, a concrete surface approximately 100mm in thickness with visible aggregate inclusions (10-20mm diameter) (Figure 40). This surface exhibited uniform consistency throughout and showed evidence of a single-pour installation. Removal of <1000> exposed a bitumen layer, context <1001>, which measured 40-50mm in thickness across the entire 6m² trench extent. This homogeneous bitumen deposit functioned as a construction bedding for the overlying concrete floor and displayed a distinctive hydrocarbon odor when disturbed. The bitumen also exhibited a hard, friable texture.

Mechanical excavation of context <1001> revealed an ephemeral deposit of crushed brick and demolition rubble, designated as context (1002). This deposit measured between 2-3cm in thickness with irregular boundaries and was primarily confined to the southern end of the trench. Context (1002) contained multiple fragments of what was likely late 19th/early 20th century window glass (pale blue-green tint, 2-3mm thickness, exhibiting characteristic surface devitrification) along with crushed brick fragments (<30mm, predominantly dry-pressed type with distinctive sharp arrises), iron oxide inclusions, and small mortar nodules (lime-based, off-white to pale gray). Stratigraphic analysis indicated that this deposit most likely represents demolition debris associated with the reduction of the upper course(s) of the adjacent cable pit brickwork.

Figure 40: Image showing the location of Trench 1, pre-excavation. View to the south east.

Continued mechanical excavation of the remaining bitumen revealed the upper portion of the anticipated cable pit infrastructure. The bitumen (context <1001>) exhibited remarkably strong adherence to the upper course of brickwork associated with the cable pits, requiring careful mechanical and manual separation to avoid damaging the archaeological features (Figure 41). Comprehensive removal of overlying deposits and subsequent cleaning with hand tools revealed the following stratigraphic sequence:

At the southern terminus of the trench, the external wall footing of the building consisted of roughly hewn basalt blocks. These blocks displayed evidence of hand-dressing on their faces and measured approximately 350mm in length × 250mm in height × undetermined thickness, arranged in an irregular bond pattern. A minimum of three courses of these basalt blocks were visible within cut [1011], though these foundations likely extended significantly deeper, consistent with the substantial load-bearing requirements of the external brick wall superstructure. The construction cut for this wall, [1011], displayed relatively vertical sides. The fill of this wall cut, context (1009), comprised moderately compacted orange-brown mixed clay (Munsell 7.5YR 5/6, strong brown) with occasional small subangular basalt inclusions (<5mm), isolated charcoal flecks, and occasional brick fragments. This fill material measured between 200-300mm in width and remained unexcavated during this phase of investigation.

Figure 41: Overview of Trench 1 post removal of concrete and bitumen <1000> with tops of brick walls for cable pits exposed. View to the south.

The external wall and its construction cut [1011] had been excavated into context (1014), a mid to light brown clayey sandy silt (Munsell 10YR 4/3, brown), which likely represents a remnant A1 topsoil horizon, albeit heavily modified and reworked. This deposit appeared moderately compacted with fine granular structure and contained occasional charcoal flecks (1-2mm). The deposit was relatively sterile from visual inspection and remained unexcavated during this phase of investigation. The southernmost cable pit (Pit 1) was also cut into context (1014), with its construction cut displaying a sharp interface with this deposit.

This masonry feature consisted of parallel dry-pressed brick footings running east-west, forming the southern and northern internal walls of the pit – contexts <1007> and <1008> respectively (Figure 42). Each wall comprised 3 courses of brickwork with a combined thickness of 580mm. The bricks measured 230mm × 110mm × 75mm and were laid in English bond pattern with pale cream-colored lime mortar joints (8-10mm). The brickwork on the interior faces exhibited remnants of white plaster/whitewash rendering (Munsell 10YR 8/1, white), which had degraded significantly since the decommissioning of the cable tram c.1930s. Approximately 60% of this rendering remained intact, primarily in the lower courses where they were exposed. Mortar was present on the upper course of brickwork, indicating at least one additional course had been present but subsequently demolished, likely corresponding to context (1002). The floor of the cable pit was not exposed during this phase of investigation.

Figure 42: View of southern cable pit (Pit 1) with exposed brick walls <1007> and <1008> and fill (1006). View to the west.

The cable pit was filled with context (1006), a mid to dark grey heavy clay deposit (Munsell 10YR 4/1, dark gray) with moderate plasticity and rare inclusions of small brick fragments, and occasional charcoal flecks. This homogeneous deposit presumably represents intentional infilling during the decommissioning of the cable pits c.1930s. Where partially excavated for preliminary investigation, the deposit displayed no evidence of stratification, suggesting a single infilling event rather than gradual accumulation.

A corresponding northern cable pit (Pit 2) was identified in its anticipated location (as indicated on the 1904 MMBW plan), positioned parallel to Pit 1 at a distance of approximately 1.8m to the north. This feature consisted of a northern brick wall/footing <1004>, southern brick wall <1005>, and a dark grey clay infill deposit (1003) (Munsell 10YR 4/1, identical to context (1006)) A sondage was mechanically excavated into

this deposit to a depth of 1.0m, to determine its nature and extent. However the deposit continued beyond the depth of 1.0m. and so the sondage was limited to this depth and no further excavation was undertaken. This feature exhibited identical construction techniques to Pit 1, including brick dimensions, bonding pattern, and rendering treatment (Figure 43). Mortar was present on the upper exposed course of brick, suggesting at least one additional course of height had been present in the original brickwork configuration before demolition.

Between the two brick-lined cable pits was context (1013), an orangey-light brown friable silty sand deposit (Munsell 7.5YR 6/4, light brown) exposed directly beneath the overlying bitumen layer. Examination of this deposit revealed scattered yellow clay nodules (Munsell 10YR 7/6, yellow), fragments of dry-pressed brick, and occasional small (5-8mm) mortar fragments. The deposit displayed a loose to moderately compacted structure with no evident stratification. A similar deposit, context (1012), was present at the northern terminus of the trench beyond cable pit 2, likely representing a subfloor deposit of the original engine house. This context comprised a mixed yellowish brown-orangey sandy clay (Munsell 10YR 5/6, yellowish brown), moderately compacted, with moderately sorted subangular pebble inclusions (5-10mm), and isolated patches of mortar and render. This material is likely derived from demolition of the upper courses of the cable pit brickwork and subsequent modifications to the engine house interior.

Figure 43: Overview of Trench 1 with exposed cable pits (Pit 1 and 2) and deposits. View to the west.

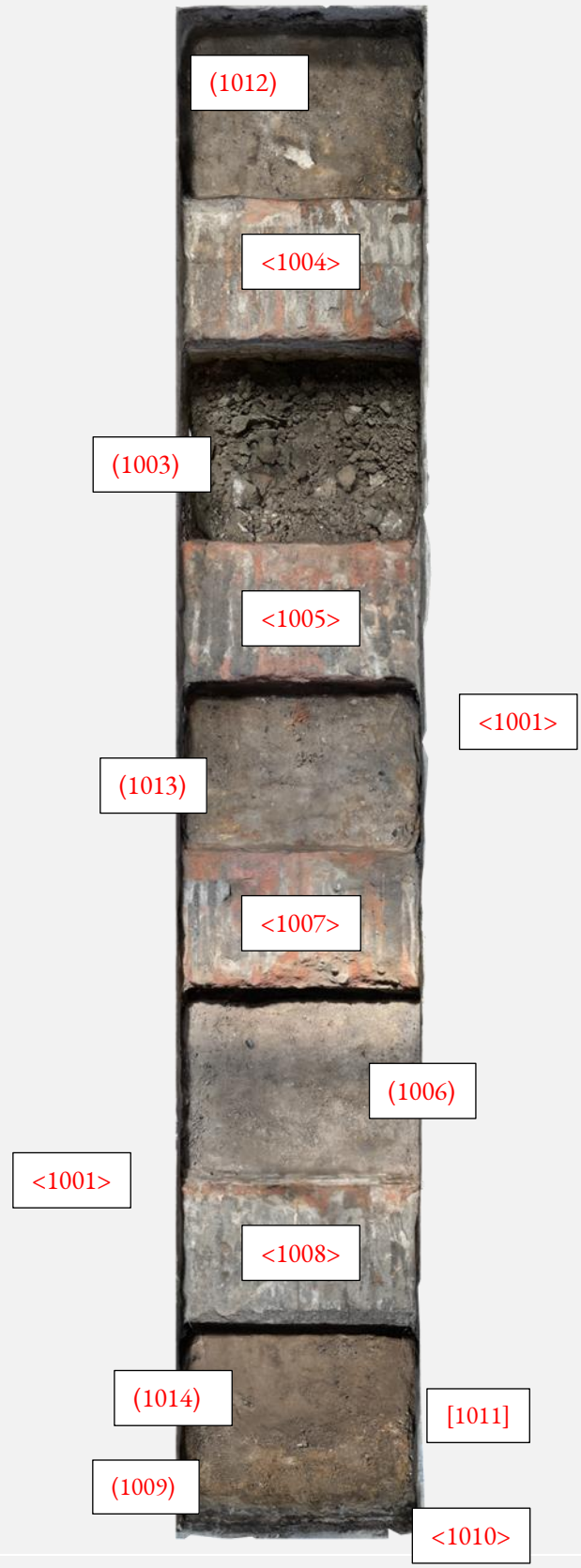


Figure 44: Top-down view of photogrammetry model of Trench 1 showing archaeological features and deposits.

Trench 2

Test Trench 2 was positioned approximately 7m east of Test Trench 1, with identical dimensions of 6m (north-south) x 1m (east-west), also abutting the southern wall of the building (Figure 45).

Excavation commenced with the removal of context <2000>, a concrete surface approximately 110mm in thickness at this location. Beneath this was a bitumen/asphalt layer, context <2001>, measuring 45-50mm in thickness across the entire trench extent. Mechanical removal of this bitumen exposed a thin layer of crushed brick and demolition debris, context (2002), with a maximum thickness of 3cm. This deposit like Trench 1, was concentrated toward the southern end of the trench. This material likely represents demolition debris from the upper courses of brickwork associated with the cable pit infrastructure. Removal of the overlying concrete and bitumen exposed the upper portions of archaeological features and deposits in trench 2, mirroring those observed in Trench 1 (Figure 46).

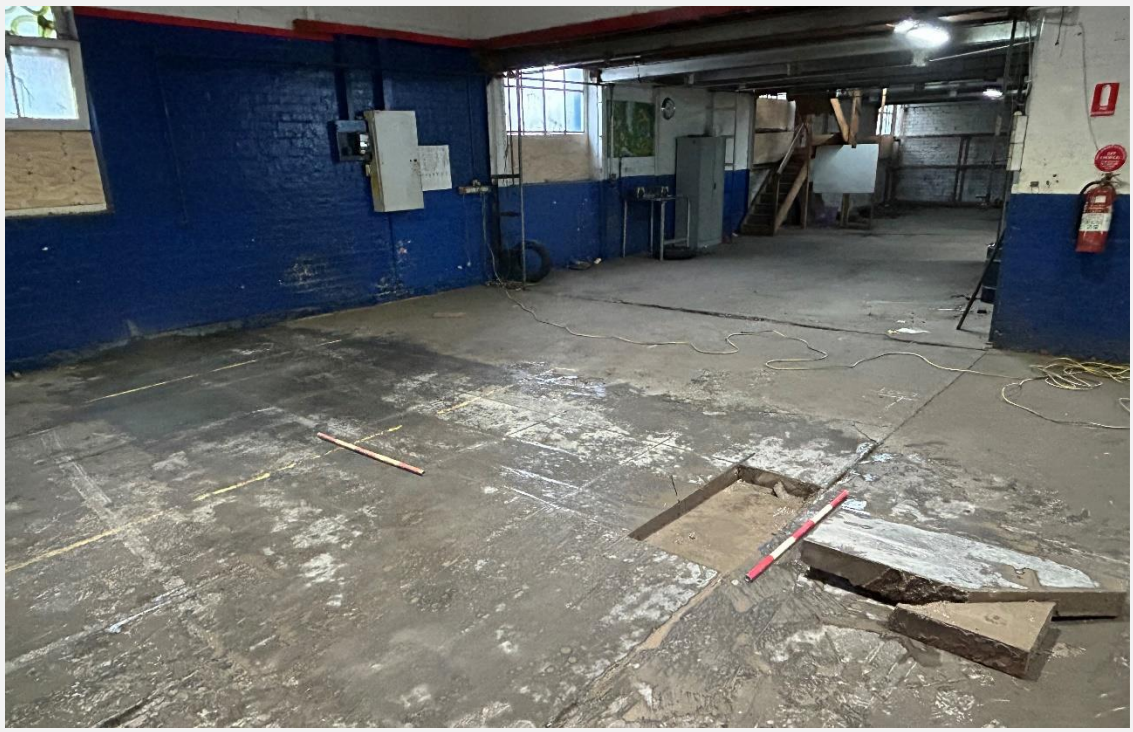


Figure 45: Image showing the location of Trench 2, pre-excavation. View to the south west.

Figure 46: Overview of Trench 2 post removal of concrete and bitumen <2000> with tops of brick walls for cable pits exposed. View to the west.

At the southern extent of the trench, the external wall footing of the building consisted of basalt blocks <2010>, measuring approximately 340-360mm in length x 240-260mm in height. At least three courses were visible within cut [2011], likely extending considerably deeper to support the substantial brick superstructure. The fill of this wall cut, context (2009), comprised moderately compacted orange-brown mixed clay (Munsell 7.5YR 5/6, strong brown) with occasional small angular to subangular stone inclusions, measuring 200-300mm in width. This context remained unexcavated.

The external wall had been cut into context (2014), a mid to light brown clayey sandy silt (Munsell 10YR 4/3, brown) representing modified remnant A1 topsoil. This deposit remained unexcavated based on visual assessment of its archaeologically sterile nature. The southernmost cable pit (Pit 1) was also cut into this deposit. The masonry configuration consisted of parallel dry-pressed brick footings running east-west, forming the southern and northern internal walls of the pit – contexts <2007> and <2008> respectively. Each wall comprised 3 courses of brickwork with a combined thickness of approximately 570-590mm. The interior brick surfaces exhibited degraded white plaster/whitewash rendering (Munsell 10YR 8/1, white), with mortar present on the upper course indicating at least one additional course had been present prior to demolition. The cable pit was filled with context (2006), a dark grey heavy clay deposit (Munsell 10YR 4/1, dark gray), consistent with the infilling observed in Trench 1.

A corresponding northern cable pit (Pit 2) was identified, consisting of northern brick wall/footing <2004>, southern brick wall <2005>, and a dark grey clay infill deposit (2003) (Munsell 10YR 4/1). The composition and dimensions of this feature were identical to the cable pits observed in Trench 1, including evidence for an additional course of brickwork that had been subsequently removed.

Figure 47: View of southern external wall and basal footing <2010> along with cable pit brickwork <2008>. View to the south.

Between the two brick-lined cable pits was context (2013), an orangey-light brown friable silty sand deposit (Munsell 7.5YR 6/4, light brown) with yellow clay nodules (Munsell 10YR 7/6, yellow) and fragments of dry-pressed brick. A similar deposit, context (2012), was present at the northern terminus of the trench beyond cable pit 2, comprising a mixed yellowish brown-orangey sandy clay (Munsell 10YR 5/6, yellowish brown), moderately compacted, with occasional subangular pebble inclusions (5-15mm) and isolated patches of mortar and render fragments, likely representing a subfloor deposit of the original engine house .

Figure 48: Overview of Trench 1 with exposed cable pits (Pit 1 and 2) and deposits. View to the west.

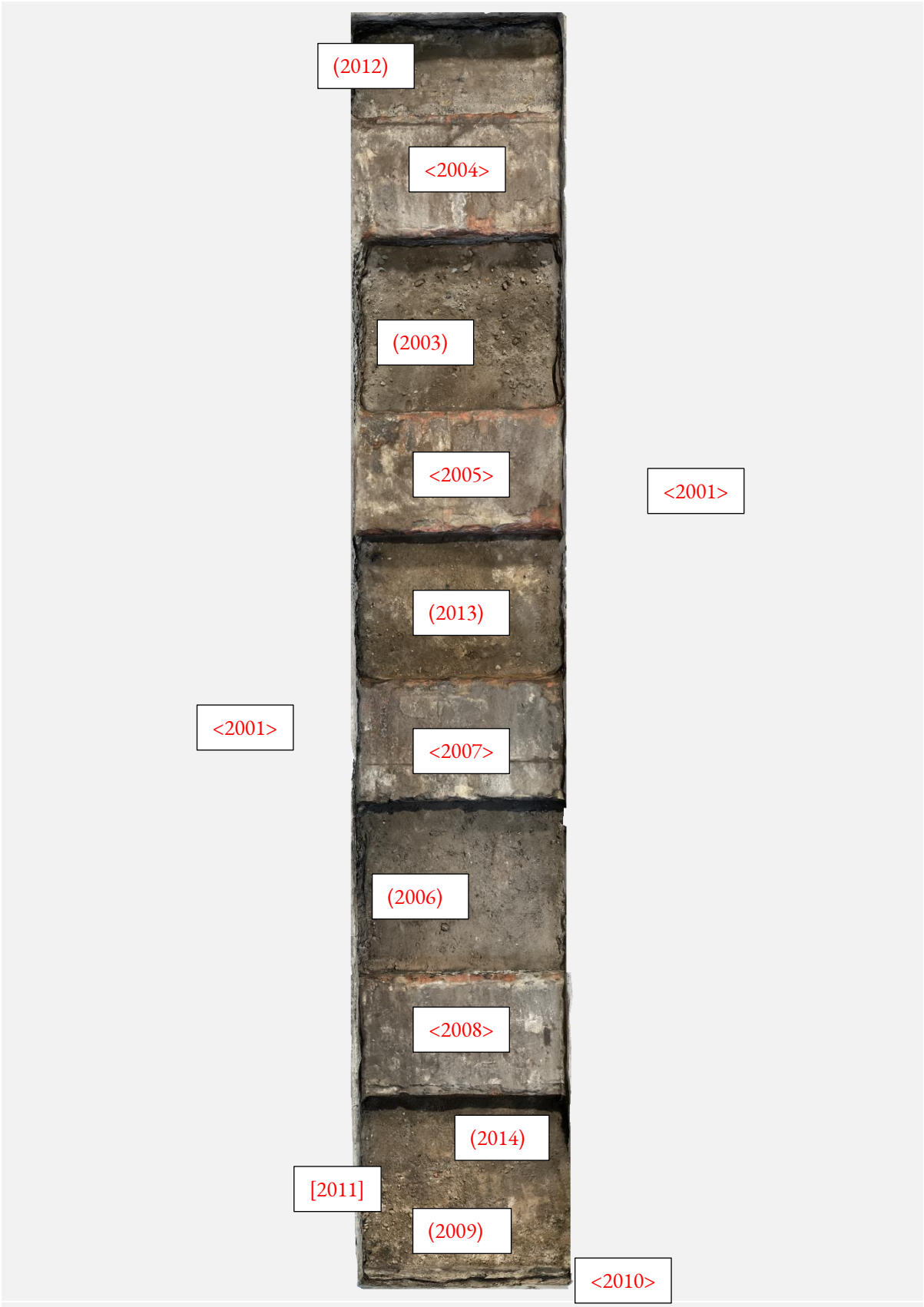


Figure 49: Top-down view of photogrammetry model of Trench 1 showing archaeological features and deposits.

3.4.2

3.4.2 Boreholes – Archaeological Monitoring

A total of 8 boreholes were monitored across the extent of the VHI site using a mechanical augur drill, with a diameter of 100mm on all augur holes. The investigation strategy comprised five relatively shallow boreholes (approximately depth 3m) and three deeper boreholes (intended to reach 16m) to comprehensively assess the subsurface conditions throughout the site.

Borehole 1 was strategically positioned within the interior fill of the northern cable pit in Test Trench 2 (Figure 50). Excavation proceeded to a depth of 1.8m before encountering significant resistance, almost certainly attributable to the masonry base of the cable pit structure. Borehole 2 was also situated within Test Trench 2 (Figure 50), positioned between the two parallel cable pits to investigate the stratigraphic relationship between these features, i.e., within context (2013). Consistent with the findings from BH 1, the auger reached a depth of 1.8m before encountering an impenetrable masonry surface. This evidence strongly suggests that both cable pits may constitute elements of a single integrated structure, constructed within a common foundation cut, with a contiguous masonry base.

Figure 50: Image showing locations of BHs 1 and 2 within Trench 2, pre-excavation. View to the southeast.

Borehole 3 was established in the northwestern quadrant of the tram house interior. The stratigraphic sequence revealed a concrete floor surface overlying an asphalt/bitumen layer approximately 100mm below the contemporary surface. This bitumen stratum measured approximately 50mm in thickness and directly overlay dry-pressed brick extending to a depth of 70mm (corresponding to approximately three courses). Beneath this brick layer lay a secondary concrete stratum measuring 120mm in thickness. The auger subsequently encountered a dark humic reworked A1 topsoil horizon approximately 150mm thick, followed

by 200mm of light yellowish-brown coarse-grained silty sand representing the A2 horizon, before transitioning into the underlying B horizon clay. This borehole reached a total depth of 3m.

Figure 51: Image showing location of BH 3, pre-excavation. View to the northeast.

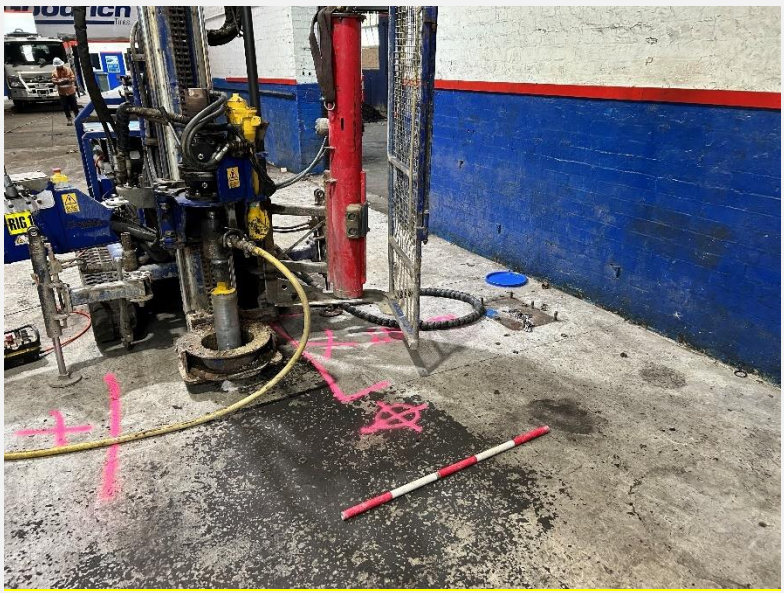
Borehole 4) was located in the western portion of the building interior, with a 100mm diameter penetration through the concrete floor surface. The underlying soil profile consisted of 1500mm of reworked A1 topsoil. Borehole 4 was established in the south-eastern section of the building interior, adjacent to the entrance roller shutter door and directly east of Test Trench 1, positioned between the two cable pit alignments. Borehole 5 was established in the southeastern section of the building interior, adjacent to the entrance roller shutter door and directly east of Test Trench 1, positioned between the two cable pit alignments. The 100mm auger initially penetrated the concrete floor surface. At a depth of 1.8m, a resistant surface was encountered, likely representing either the base of the pit cut or a masonry foundation associated with the cable pit infrastructure, similar to that encountered in Boreholes 1 and 2. This borehole was excavated to a total depth of 4.5m.

Borehole 6), located in the northwestern corner of the building interior, employed a larger mechanical drill with a 200mm diameter. The borehole penetrated the upper concrete slab to a depth of 600mm, at which point drilling was abandoned due to the exceptional thickness and density of the concrete, which resulted in auger refusal.

Borehole 7 was positioned immediately north of Test Trench 2, utilising a 200mm diameter auger. The uppermost 150mm consisted of a concrete surface overlying 50mm of asphalt/bitumen, mirroring the upper stratigraphy observed in the test trenches. The auger subsequently encountered brick coursing with a

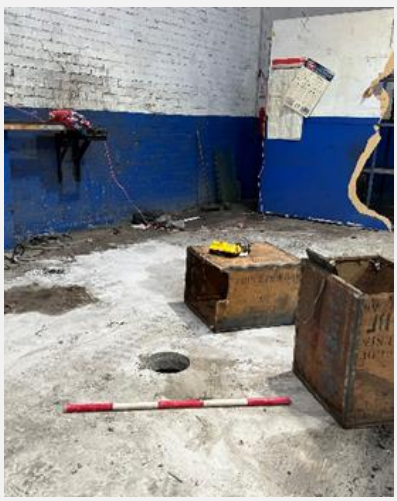
minimum thickness of two courses, indicative of a substantial subsurface masonry feature, possibly related to the cable pit infrastructure identified in the test trenches.

Borehole 8, positioned just west of Trench 1, reached a total depth of 21.66m below the existing concrete floor. The stratigraphic sequence began with a 230mm concrete slab and underlying bituminous seal, below which substantial fill material extended to 1.8m depth, comprising a heterogeneous mixture of clay, silty sand, and sandy silt with gravel and cobbles inclusions—likely representing post-1936 infilling activities. Beyond this depth, the profile transitioned from clayey sand natural B horizon to dense silty sand with quartzose gravel and clay seams, representing natural pre-Cable Tram Engine House deposits unmodified by industrial activities.



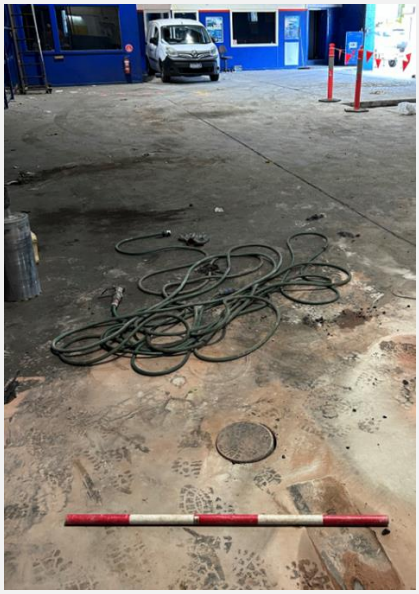
Location of Borehole 4. View to the east.

Location of Borehole 5. View to the east.



Location of Borehole 6. View to the northwest.

Location of Borehole 7. View to the north.



Location of Borehole 8. View to the east.

Figure 52: Images showing locations of Bhs 4-8. Various views.

3.5 Artefact Analysis

A total of 17 artefacts were recovered during the geotechnical testing at the Heritage registered site of Former Cable Tram Engine House and Tram Substation (H2332). These artefacts were collected from two contexts, context 1002 and 1003, described in Table 7:

Table 7: Description of contexts overlying or containing artefacts

Context	Trench	Context Description	Artefact count
<1001>	Trench 1	Asphalt / Bitumen forming base / bedding for concrete <1000> covering entire trench and beyond	0
1002)	Trench 1	Deposit of crushed brick material below <1001> located exclusively in south of Trench 1, contains fragmentary glass artefacts	13
(1003)	Trench 1	Dark grey clay - fill of Tram Cable Pit 2 (North) located between brick footing <1004> and <1005>	4

Context (1002) lay beneath an asphalt layer that covered the entirety of Trench 1. It was comprised of crushed brick material and contained 13 fragments of window glass that was 2.8mm in thickness. These appeared to all derive from the same window or series of windows. They had a veneer of mortar or similar that may have adhered to the fragments during the disposal process (Figure 53).

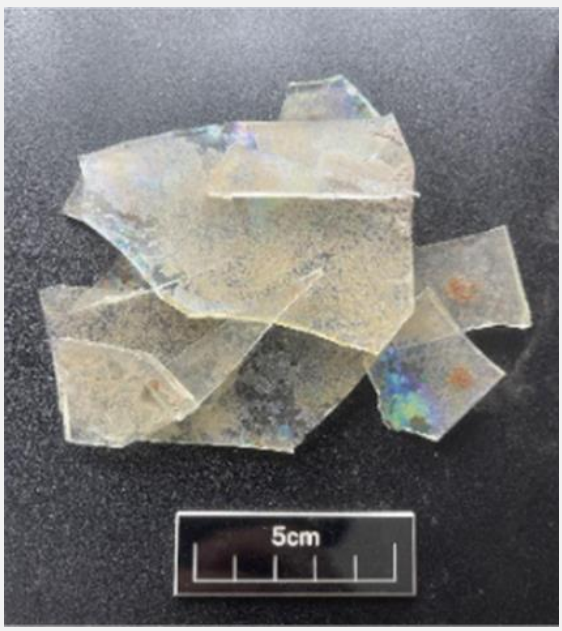


Figure 53: Image of window glass fragments from context (1002)

Context 1003 was described as dark grey clay and was a portion of the fill within Tram Cable Pit 2. This portion of fill was located between two brick footings. Artefacts comprised a press-moulded cream glazed ceramic earthenware wall tile, an olive green beer or wine or champagne bottle neck, a tiny glass chip with blue paint and green copper alloy corrosion adhered to it, and associated fragment of blue paint with copper alloy corrosion. The latter two artefacts could not be ascribed a form but they are likely related to architectural function. Artefacts from this context are shown in Figure 54 below.

Figure 54: Artefacts from context (1003). Top: glazed earthenware wall tile; Bottom: bottle neck fragment, glass fragment with adhered materials, paint fragment

None of the artefacts are datable but fit within the phasing ascribed by the Site Director, who posits that when the cable pits were decommissioned in c1936 the artefacts and fill were likely deposited. The artefacts may or may not be connected to the functioning of the Tram operations and associated buildings; as largely architectural remains, they may represent remnants of demolition, or alternatively, may have been a convenient location to discard unrelated rubbish. The assemblage is not large or diverse enough to make any interpretations.

Function/form/artefact description	(1002)	(1003)	Grand Total
architectural	13	3	16
tile		1	1
wall tile		1	1
unidentified		2	2
glass chip with blue paint adhered		2	2
window	13		13
Window glass fragments	13		13
kitchen		1	1
bottle		1	1
Olive green beer/wine bottle neck fragment		1	1
Grand Total	13	4	17

3.6 Interpretation of Results

The archaeological investigations at the former Brunswick Cable Tram Engine House have provided valuable data on subsurface conditions of H2332, aligning with documentary evidence for the site's historical function. Test Trenches 1 and 2 exposed remnants of parallel brick-lined cable pits, confirming the predicted location and orientation of these essential operational elements. This pattern of dual parallel cable pits matches the standard engine house layout as described by MacMeikan (1950?: 11) and further elaborated by Harding (1966: 7-9), who characterised such features as the "catacomb of the Engine House." The stratigraphic sequence observed in both trenches was remarkably consistent, suggesting a uniform construction methodology employed throughout the site.

In Test Trench 1, the parallel brick footings (contexts <1007> and <1008>) represent the southern and northern internal walls of the southernmost cable pit (Pit 1), with a corresponding set of footings (<1004> and <1005>) forming the northern pit (Pit 2). The English bond pattern with lime mortar joints and whitewash rendering on the interior faces demonstrates adherence to standard construction techniques of the period. The presence of mortar on the upper courses indicates post-decommissioning modification, specifically the reduction in height of these structures. This corresponds with context (1002), a thin demolition rubble deposit containing late 19th/early 20th century window glass and crushed brick fragments, which likely represents debris from the truncation of the pit walls. This interpretation is further supported by the recovery of 13 fragments of window glass (2.8mm thickness) from context (1002), all apparently deriving from the same window or series of windows with adhered mortar residue, suggesting architectural demolition activities during the decommissioning phase.

The homogeneous dark grey clay infill deposits (1006) and (1003), encountered in the cable pits of both trenches show no evidence of stratification, suggesting a single intentional filling event rather than gradual accumulation. This aligns chronologically with the documented decommissioning of the engine house c.1936, after which the building was repurposed for commercial use. The recovery of four artefacts from context (1003)—a glazed earthenware wall tile, an olive green bottle neck fragment, and glass fragments with blue paint and copper alloy corrosion—further confirms this interpretation. These predominantly architectural remains, while not precisely datable, are consistent with the c.1936 decommissioning timeframe. Their presence within the fill suggests opportunistic disposal during the filling event, potentially representing debris from modification works associated with the building's conversion to commercial use. The limited assemblage size (17 artefacts total) and lack of diversity precludes more detailed functional interpretation but

aligns with the broader site formation narrative. What was observed of the uniform nature of these deposits across both trenches indicates a systematic approach to decommissioning the facility.

The basalt block wall footings exposed at the southern extent of both trenches represent the substantial foundations necessary to support the load-bearing external brick wall superstructure. As noted by Harding (1966: 7), engine house walls "can be up to sixteen inches thick, although in most cases, they were only twelve inches thick," reflecting the structural demands of these industrial buildings. The construction cut [1011] and associated fill (1009) provides evidence of the original site preparation works undertaken during the 1886 construction phase.

Test Trench 2, positioned 7m east of Trench 1, revealed an identical arrangement of features and stratigraphy, confirming the consistent implementation of the engine house design along its east-west axis. The uniform dimensions of the brick footings (approximately 570-590mm thickness comprising 3 courses) and the spatial relationship between the parallel pits (approximately 1.8m separation) demonstrate strict adherence to engineered specifications necessary for the cable tram operation.

The contexts (1013)/(2013) and (1012)/(2012), comprising friable silty sand deposits with brick fragments and mortar inclusions, likely represent subfloor deposits of the original engine house. These deposits were sealed beneath the bitumen layer <1001>/<2001> and concrete surface <1000>/<2000>, which were installed during the post-1936 repurposing of the building.

The evidence from the boreholes provides crucial supplementary data concerning the depth and structural integrity of the cable pit features. Boreholes 1 and 2, positioned within Test Trench 2, encountered significant resistance at a depth of 1.8m, almost certainly attributable to a masonry base consistent with Harding's (1966: 7) assertion that cable pits could reach depths of "fifteen feet or more." The discovery of resistance in Borehole 2, positioned between the two parallel cable pits, suggests these features may constitute elements of a single integrated structure with a contiguous masonry base, rather than separate construction features.

Borehole 3, established in the northwestern quadrant of the building, revealed a more complex stratigraphic sequence than encountered in the trenches. The presence of a secondary concrete stratum 120mm thick beneath the brick layer suggests multiple phases of floor construction throughout the building's operational history. The identification of a dark humic reworked A1 topsoil horizon beneath this concrete indicates that the original construction preserved elements of the pre-1886 landscape in this area of the site.

Borehole 5, positioned between the cable pit alignments east of Test Trench 1, encountered resistance at 1.8m depth, consistent with findings from Boreholes 1 and 2. This confirms the extension of the cable pit infrastructure eastward across the site, maintaining a uniform depth. The exceptional concrete density encountered in Borehole 6 (northwestern corner) indicates specialized structural reinforcement in this area, possibly related to the engine mountings which Harding (1966: 9) notes had "foundations for the engines [of] concrete."

Borehole 7 revealed brick coursing with a minimum thickness of two courses beneath the concrete and bitumen layers, indicating substantial masonry features extended across the northern portion of the building. This evidence aligns with MacMeikan's (195?: 11) typical engine house layout, which places substantial machinery supports throughout the central areas of these facilities.

The deep stratigraphic sequence revealed in Borehole 8 (21.66m depth) provides a comprehensive profile extending from the post-1936 infilling materials to natural pre-Cable Tram Engine House deposits. The heterogeneous mixture of clay, silty sand, and sandy silt with gravel and cobble inclusions to 1.8m depth corresponds to the documented repurposing of the building after its decommissioning as an engine house.

The archaeological features documented during this investigation align precisely with the 1904 MMBW plan, which depicts the cable pits in the southern portion of the building. The measured width of the pits (580mm in Trench 1) and their parallel configuration corresponds to standard engine house design as illustrated in MacMeikan's (195?: 11) typical layout. The evidence indicates that while the upper portions of the engine house infrastructure were modified during decommissioning, substantial subterranean features remain intact, sealed beneath the concrete slab installed during the building's conversion to commercial use.

The absence of archaeological material predating the engine house construction supports the land-use history assessment that the area was not intensively developed prior to its purchase by the Melbourne Tramways Trust in 1886. The presence of context (1014)/(2014), a mid to light brown clayey sandy silt likely representing a remnant A1 topsoil horizon (albeit heavily modified and reworked), provides the only evidence of the pre-1886 landscape. This aligns with historical records suggesting that prior to development, the parcels comprising the project area were described as "building land" in rates books between 1875 and 1886, with no significant structures recorded.

The construction methodology, materials, and spatial arrangement of the cable pits conform to descriptions of engine house infrastructure provided by Pierce (2017: 9-11), who detailed the "extensive pit beneath the roadway and a connecting tunnel into the building" and how "inside each engine house the cables ran around the timber lined grooved periphery of large diameter driving sheaves." The archaeological evidence confirms this specialized industrial design, demonstrating the site's high integrity as a significant component of Melbourne's historical transportation network.

3.7 Conclusion

The geotechnical investigation and archaeological monitoring program at the Former Cable Tram Engine House and Tram Substation (H2332) has successfully identified, documented, and characterised significant archaeological features relating to the site's operation as a Cable Tram Engine House between c.1886 and c.1936. The archaeological investigation and monitoring, despite the inherent limitations of a geotechnical investigation framework, has provided substantial insights into the subsurface conditions and archaeological potential of the site.

The investigation confirmed the presence of intact, well-preserved cable pit infrastructure consistent with documentary sources and contemporary descriptions of cable tram engine houses. The parallel brick-lined cable pits exposed in both test trenches display consistent construction techniques, dimensions, and spatial relationships, demonstrating adherence to standardised engineering requirements for cable tram operations. The identification of these features at predicted locations verifies the accuracy of the 1904 MMBW plan and confirms the site's high archaeological integrity.

Boreholes provided complementary data on the likely vertical extent of subsurface features, revealing a masonry base at approximately 1.8m depth and suggesting the cable pits constitute elements of an integrated structural system. The stratigraphy documented across the site indicates systematic decommissioning c.1936,

with homogeneous clay deposits filling the cable pits and architectural remnants incorporated within demolition rubble. The limited artefact assemblage, while small, supports the interpretation of a single-phase filling event associated with the building's conversion to commercial use.

The investigations have demonstrated that the concrete slab installed during the building's repurposing has effectively sealed and preserved the archaeological remains, with minimal disturbance from subsequent activities. This protective capping has contributed significantly to the site's exceptional archaeological integrity, with features remaining in situ and largely intact beneath the current floor surface.

The documented archaeological remains provide tangible evidence of Melbourne's late 19th and early 20th century transportation infrastructure and industrial technology. The cable pits, wall footings, and associated structural elements represent a significant archaeological resource that complements the surviving above-ground fabric of H2332. Together, these elements constitute an important material record of Melbourne's cable tram network, which was crucial to the city's suburban development and represented a significant engineering achievement.

This investigation has providing baseline archaeological data to inform future management decisions. The findings confirm the high archaeological potential identified in previous desktop assessments and demonstrate that any future ground-disturbing works within the site must be carefully managed to mitigate impacts on significant archaeological features. While the current investigation was necessarily limited in scope, it has established a sound foundation for potential future archaeological research that could address more detailed questions about construction techniques, operational modifications, and decommissioning processes at this important historical site.

4. FUTURE MANAGEMENT RECOMMENDATIONS

These works demonstrated high archaeological potential and preservation, consistent with the land-use history. Archaeological remains were identified and should be investigated further under main Permit P39543. While not demonstrated during the geotechnical results, there is considered an increased likelihood for previously undocumented features deposits and artefacts.

The following section outlines future management recommendations for the Former Cable Tram Engine House and Tram Substation (H2332).

4.1 Recommendation 1: Determination of Permit P39543

The results outlined herein should be used to inform the determination of main Permit P39543.

4.2 Recommendation 2: Further Archaeological Investigation

Should impacts be proposed, as per Permit P39543, an AMP should be conditioned which outlines an investigation methodology proportionate to results of the impact assessment and proposed impacts. The high potential for further archaeological findings was demonstrated by these findings, and this is necessary to ensure the appropriate level of investigation in areas likely to be affected by the project works.

4.3 Recommendation 3: Synthesis of Artefact Catalogue

As this report was prepared to inform the determination of Permit P39543, only a brief discussion of the artefacts recovered under this permit has been provided. A full artefact catalogue, along with analysis, will be provided in – and synthesised with – the findings of main Permit P39543 should works go ahead.

If works do not proceed, the full catalogue and analysis will be provided as an addendum within the stipulated timeframes of this permit (P40525, condition 11).

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6. APPENDICES

Appendix 1: Permit P40525

Appendix 2: Geotechnical Investigation Report

Appendix 1: Permit P40525

HERITAGE PERMIT

GRANTED UNDER SECTION 102 OF THE HERITAGE ACT 2017

Permit No: P40525

Applicant: Alberto Palombaro

NAME OF PLACE/OBJECT:	FORMER CABLE TRAM ENGINE HOUSE & TRAM SUBSTATION
HERITAGE REGISTER NUMBER:	H2332
LOCATION OF PLACE/OBJECT:	253 - 263 BRUNSWICK ROAD BRUNSWICK, MERRI-BEK CITY

THE PERMIT ALLOWS: Targeted excavation of up to two 1m x 6m trenches (to identify subsurface features associated former tram activities) and up to ten 200mm diameter x 16m deep boreholes, subject to archaeological monitoring in accordance with the following documents, as endorsed by the Executive Director Heritage Victoria and forming part of this permit:

- *Archaeological Management Plan* (Ochre Imprints, 20 December 2024).

THE FOLLOWING CONDITIONS APPLY TO THIS PERMIT:

1. The permission granted for this permit will expire if one of the following circumstances applies: the permitted works have not commenced within one (1) year of the original date of issue of this permit, or are not completed within two (2) years of the original date of issue of this permit. Commencement of the permit begins with on-site physical works.
2. The Executive Director Heritage Victoria is to be given five (5) working days' notice of the intention to commence the approved works.
3. The Executive Director Heritage Victoria must be informed when the approved works have been completed.
4. The works approved by this permit must be carried out in their entirety unless otherwise agreed in writing by the Executive Director.
5. Should minor changes **(including variation to the amount, dimensions, or locations of boreholes or trenches)** in accordance with the intent and approach of the endorsed documentation become necessary, correspondence and supporting documentation must be prepared and lodged in accordance with the permit condition for endorsement by the Executive Director Heritage Victoria. If the Executive Director considers that the changes are not minor, an amendment to the permit or a new application will be required.
6. All staff and contractors involved in any ground disturbing or subsurface works or activities are to attend an archaeological induction prior to their commencement. The induction, developed and presented by the archaeologist listed on this permit (Paul Pepdjonovic or Shane Willis from Ochre Imprints), must summarise the types of archaeological deposits, features and artefacts which may be discovered, the process of reporting the discovery, and the relevant provisions of the *Heritage Act 2017*.

Appendix 1: Permit P40525

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GRANTED UNDER SECTION 102 OF THE HERITAGE ACT 2017

Permit No: P40525

Applicant: Alberto Palombaro

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THE PERMIT ALLOWS: Targeted excavation of up to two 1m x 6m trenches (to identify subsurface features associated former tram activities) and up to ten 200mm diameter x 16m deep boreholes, subject to archaeological monitoring in accordance with the following documents, as endorsed by the Executive Director Heritage Victoria and forming part of this permit:

- *Archaeological Management Plan* (Ochre Imprints, 20 December 2024).

THE FOLLOWING CONDITIONS APPLY TO THIS PERMIT:

1. The permission granted for this permit will expire if one of the following circumstances applies: the permitted works have not commenced within one (1) year of the original date of issue of this permit, or are not completed within two (2) years of the original date of issue of this permit. Commencement of the permit begins with on-site physical works.
2. The Executive Director Heritage Victoria is to be given five (5) working days' notice of the intention to commence the approved works.
3. The Executive Director Heritage Victoria must be informed when the approved works have been completed.
4. The works approved by this permit must be carried out in their entirety unless otherwise agreed in writing by the Executive Director.
5. Should minor changes **(including variation to the amount, dimensions, or locations of boreholes or trenches)** in accordance with the intent and approach of the endorsed documentation become necessary, correspondence and supporting documentation must be prepared and lodged in accordance with the permit condition for endorsement by the Executive Director Heritage Victoria. If the Executive Director considers that the changes are not minor, an amendment to the permit or a new application will be required.
6. All staff and contractors involved in any ground disturbing or subsurface works or activities are to attend an archaeological induction prior to their commencement. The induction, developed and presented by the archaeologist listed on this permit (Paul Pepdjonovic or Shane Willis from Ochre Imprints), must summarise the types of archaeological deposits, features and artefacts which may be discovered, the process of reporting the discovery, and the relevant provisions of the *Heritage Act 2017*.

7. The approved works are to be planned and carried out in a manner which prevents damage to the registered place, and as detailed in the *Archaeological Management Plan* (Ochre Imprints, 20 December 2024) submitted as part of this permit. The works are subject to archaeological monitoring by an archaeologist listed at condition 7 of this permit (Paul Pepdjonovic or Shane Willis from Ochre Imprints). Once archaeological material is exposed, the works must cease at the direction of the archaeologist so that they can clean and record the find. Any significant archaeological features, deposits and/or artefacts are to be recorded using close-range photogrammetry, where possible. **This permit does not authorise the disturbance to or removal of archaeological features.** Approved works include with reference to the *Archaeological Management Plan* (Ochre Imprints, 20 December 2024):
    - excavation of up to two 1m x 6m trenches, as detailed in Section 4.1.2 and shown in the locations identified in Figure 31. The excavation must cease upon identification of the cable tram pit or to a depth which confirms the absence of the cable tram pit.
    - excavation of up to ten 200mm diameter x 16m deep boreholes by drilling, as detailed in Section 4.1.1, Table 4 and Figure 31. The location of each borehole is to be in areas unlikely to impact subsurface archaeological features and allocated in consultation with the listed archaeologist.
8. All archaeological works, including excavation and monitoring, recording, reporting, and artefact management, must be in accordance with Heritage Victoria's *Guidelines for Investigating Historical Archaeological Artefacts and Sites* (July 2015), and to the satisfaction of the Executive Director Heritage Victoria.
9. The applicant is liable for all expenses arising from the conservation, storage, management and curation of any significant historical archaeological artefacts that are recovered and retained as a result of the project works.
10. All historical archaeological artefacts collected/discovered are to be initially retained, with the exception of building materials which can be sampled and disposed of following recording, and hazardous material which can be recorded on-site and appropriately disposed of. An Artefact Retention and Discard Policy (ARDP) and Artefact Catalogue will be required within four (4) months of the completion of fieldwork unless a subsequent permit is obtained within one (1) year of the completion of fieldwork, in which case the matter can be addressed in the subsequent permit. The ARDP must consider artefact condition, research value, sampling, representativeness and other relevant factors. Artefacts can only be discarded once the submitted ARDP has been approved by the Executive Director Heritage Victoria. If any artefacts requiring urgent conservation treatment are discovered, Heritage Victoria must be contacted for direction. In the event significant artefacts requiring conservation treatment are discovered, an Artefact Conservation Proposal (ACP) must be prepared by the archaeologist and a suitably qualified conservator (as approved by the Executive Director Heritage Victoria), and submitted to the Executive Director Heritage Victoria within **six (6) months** of the completion of fieldwork, for approval. The ACP must be informed by the post-excavation evaluation of site and context significance.
11. The archaeologist listed at condition 7 (Paul Pepdjonovic or Shane Willis from Ochre Imprints) must submit an electronic copy of the Permit Report to the Executive Director Heritage Victoria within one (1) year of the completion of fieldwork. The report must address the requirements of Heritage Victoria's *Guidelines for Investigating Historical Archaeological Artefacts and Sites,* and be to the satisfaction of the Executive Director Heritage Victoria. The

report must include results of background historical research; plans and images; and project records, reporting and a synthesis or findings. If artefacts are discovered, the artefact catalogue, analysis of the assemblage, and details of any artefact conservation must also be included in the report. Any required additions or amendments to the submitted report must be made to the satisfaction of, and within the timeframe specified by, the Executive Director. If a subsequent Permit is issued within this timeframe, the results of the separate phases of archaeological works can be combined into one report, subject to the approval of the Executive Director. In this case the date of delivery of the project reporting and artefact management outcomes may be amended.

NOTE THAT PERMISSION HAS BEEN GIVEN FOR INSPECTIONS OF THE PLACE OR OBJECT TO BE UNDERTAKEN DURING THE CARRYING OUT OF WORKS, AND WITHIN SIX (6) MONTHS OF NOTIFICATION OF THEIR COMPLETION.

TAKE NOTICE THAT ANY NATURAL PERSON WHO CARRIES OUT WORKS OR ACTIVITIES NOT IN ACCORDANCE WITH THE PERMIT OR CONDITIONS IS GUILTY OF AN OFFENCE AND LIABLE TO A PENALTY OF 120 PENALTY UNITS ($23,710.80 FROM 1 JULY 2024) OR IN THE CASE OF A BODY CORPORATE 600 PENALTY UNITS ($118,554 FROM 1 JULY 2024) UNDER s104 THE HERITAGE ACT 2017.

WORKS UNDERTAKEN WITHOUT A PERMIT OR PERMIT EXEMPTION CAN INCUR A FINE OF UP TO 4800 PENALTY UNITS ($948,432 FROM 1 JULY 2024) FOR A NATURAL PERSON OR 5 YEARS IMPRISONMENT OR BOTH AND UP TO 9600 PENALTY UNITS ($1,896,864 FROM 1 JULY 2024) IN THE CASE OF A BODY CORPORATE UNDER SECTION 87 OF THE HERITAGE ACT 2017.

THE ATTENTION OF THE OWNER AND/OR APPLICANT IS DRAWN TO THE NEED TO OBTAIN ALL OTHER RELEVANT PERMITS PRIOR TO THE COMMENCEMENT OF WORKS.

Date Issued:

23 January 2025

Signed as delegate for the Executive Director, Heritage Victoria pursuant to the Instrument of Delegation

Nicola Stairmand
Manager, Statutory Approvals
Heritage Victoria

Appendix 2: Geotechnical Investigation Report