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Front cover:

Dead standing black box Culturally Modified Tree along Kromelak (Outlet Creek) (Photo: Darren Griffin)

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Contents

Editorial note	5
Papers	
Murrup Tamboore: community-led archaeological investigations at the former Keilor Archaeological Area	7
Rebekah Kurpiel, Catherine La Puma, Alex Parmington, Paul Penzo-Kajewski, Ron Jones, Allan Wandin, Bobby Mullins, Nathan Jankowski, Zenobia Jacobs, Molly Thomas, Fleur King and Matthew Meredith-Williams	
‘Scarred for life too’: measuring girth and estimating ages of culturally modified trees using comparative examples from Wotjobaluk Country, Western Victoria	15
Darren Griffin and Abby Cooper	
Results of recent archaeological investigations at Pejark Marsh in Western Victoria	27
Asher Ford, Jocelyn DeJong Strickland and Linda Sonogo	
Investigating anthropogenic and natural disturbance in Aboriginal archaeological contexts: a case study of sand sheets in southeast Melbourne	35
Karen Kapteinis and Caroline Spry	
Update on the Radiocarbon Dating Visualisation Project for Aboriginal places in the State of Victoria, southeastern Australia: insights and issues	51
David Thomas, Caroline Spry, Jacqueline Tumney and Rebekah Kurpiel	
Investigating marsupial bone weathering: implications for understanding the taphonomy of Australian zooarchaeological assemblages	57
Kimberley Crabtree and Jillian Garvey	
Applications of XRD analysis in Australian archaeological contexts: introducing the Olympus TERRA portable XRD analyser	67
Alice Mora	
Cultural heritage significance – not to be muted or trifled with	73
David Tutchener, Rebekah Kurpiel, Bradley Ward, Elizabeth Toohey, Dan Turnbull and Robert Ogden	
A second look at the Langlands Iron Foundry: the engine behind Marvellous Melbourne’s phenomenal rise	79
Sarah Myers, Sarah Mirams and Natalie Paynter	
Going over old ground: modeling historical landscape change in Victoria using GIS	91
Greg Hil, Susan Lawrence and Diana Smith	

Abstracts

An update on research at Berribee Quarry: a dated silcrete extraction site in the Central Murray River Valley of northwestern Victoria	99
Jillian Garvey, Rebekah Kurpiel, Nathan Jankowski, Zenobia Jacobs, Paul Penzo-Kajewski, Darren Perry, Uncle Tinawin Wilson, Bengi Salvi, Austen Graham and Emmy Frost	
Therry (Munro Site) and Elizabeth Street excavations: Site formation along the former Williams Creek, Melbourne CBD	100
Christopher Clark, Sarah Janson, Rebekah Kurpiel, Caroline Spry, Paul Penzo- Kajewski, Brandon Kerrigan, Caroline Hawker, Birgitta Stephenson, Patrick Moss and Sam Player	
Dating the Sunklands; a complex picture	101
Martin Lawler, Aaron Dalla-Vecchia and Jim Wheeler	
Collaboration at the Creek: the Barongarook Creek Bridge Burial, Colac, Victoria	102
Michael Green, Craig Edwards, Owen Cavanough and Matt Grigg	
Indigenous data sovereignty	103
Fiona McConachie, and Renee McAlister	
Hoddle Grid Heritage Review: pre-contact archaeology	104
Petra Schell	
Hoddle Grid Heritage Review: contemporary Aboriginal connections	105
Chris Johnston	
2020 vision: historic artefact management in a new decade	106
Bronwyn Woff and Christine Williamson	
Trashed or treasure: a domestic assemblage from Fitzroy c1860-1880	107
Jennifer Porter and Sharon Lane	
The trouble with MNI – comparing assemblages across Chinese diaspora sites in Australasia	108
Paul Macgregor and Melissa Tsafkas	
A crowd-funded aviation archaeology survey	109
Meaghan L. Aitchison, Leah Byrne, Talia Green, James Kightly and Daniel J. Leahy	
Building a resilient education framework in Victoria archaeology	110
Georgia L. Roberts	
Ten years of OzArch	111
Gary Vines	
10 years of Aboriginal cultural heritage management training: outcomes and prospects	112
Maddy Maitri and Christina Pavlides	

Editorial note

The papers included in this ninth issue of *Excavations, Surveys and Heritage Management in Victoria* were presented at the annual Victorian Archaeology Colloquium held at La Trobe University on 1 February 2020. Once again we had over 150 participants whose attendance testifies to the importance of this fixture within the local archaeological calendar. It continues to be an important opportunity for consultants, academics, managers and Aboriginal community groups to share their common interests in the archaeology and heritage of the State of Victoria.

The papers published here deal with a variety of topics that span Victoria's Aboriginal and European past. While some papers report on the results of specific research projects others focus on aspects of method, approach, education and the social context of our work, and approach.

In addition to the more developed papers, we have continued our practice of publishing the abstracts of other papers given at the Colloquium, illustrated by a selection of the slides taken from the PowerPoint presentations prepared by participants. These demonstrate the range of work being carried out in Victoria, and we hope that many of these will also form the basis of more complete studies in the future. All papers were refereed by the editorial team. This year Elizabeth Foley managed this process and the sub-editing of this volume under the guidance of Caroline Spry. Layout was again undertaken

by David Frankel.

Previous volumes of *Excavations, Surveys and Heritage Management in Victoria* are freely available through La Trobe University's institutional repository, Research Online < www.arrow.latrobe.edu.au:8080/vital/access/manager/Repository/latrobe:41999 >. We hope that this will encourage the dissemination of ideas and information in the broader community, both in Australia and internationally.

We grateful to the Colloquium's major sponsors ACHM, Ochre Imprints, Ecology and Heritage Partners and Heritage Insight; sponsors Biosis, ArchLink, Christine Williamson Heritage Consultants and Extent; and to La Trobe University for continuing support. We would like to thank them, and all others involved for their generous contributions towards hosting both the event and this publication. Yafit Dahary of 12 Ovens was, as always, responsible for the catering.

Preparation of this volume was, like so much else in 2020, undertaken during the severe restrictions imposed because of the COVID-19 pandemic. We hope that 2021 will be a better year for all and that even if we are unable to hold our Colloquium at the usual time we will be able to do so later in the year.

The editors and authors acknowledge the Traditional Owners of the lands and heritage discussed at the Colloquium and in this volume, and pay their respects to their Elders, past and present.

A second look at the Langlands Iron Foundry: the engine behind Marvellous Melbourne's phenomenal rise

Sarah Myers¹, Sarah Mirams² and Natalie Paynter³

Abstract

A recent archaeological investigation yielded extensive remains from Victoria's first Iron Foundry. As only a handful of industrial sites investigated in the CBD, these results are important to our understanding of the archaeology of Melbourne. Of broader import, the results reveal multiple phases of development at the foundry, seemingly mirroring the incredibly rapid development of Melbourne into an international city. In this paper we examine the results of the excavation considering their contribution to an important chapter in the story of Melbourne's industrial manufacturing history and the city's transformation from a pastoral outpost to a manufacturing powerhouse.

Introduction

In 2018, ArchLink Archaeologists and Heritage Advisors undertook an archaeological excavation located in the southwest corner of Melbourne's CBD. Located at 9–27 Downie Street (**Figure 1**), the site is identified on the Victorian Heritage Inventory as H7822-1835 and falls within the former grounds of the Langlands Iron Foundry. Langlands Iron Foundry famously assembled the first iron paddle steamer, the *Vesta* and made the first locomotive boiler in the colony. Only two other iron foundries have been investigated in the Melbourne CBD compared to the hundreds of residential and commercial sites that have been investigated over the past 20 years.

A previous investigation of the Langlands Foundry which yielded few features and no structures, was reported in the *International Journal of Historical Archaeology* (Myers et al. 2018). The significance of the former foundry site was recognised for its association with John Batman's garden, one of the earliest European settlers in Victoria. Located at 556–560 Flinders Street (**Figure 1**), the site is identified on the Victorian Heritage

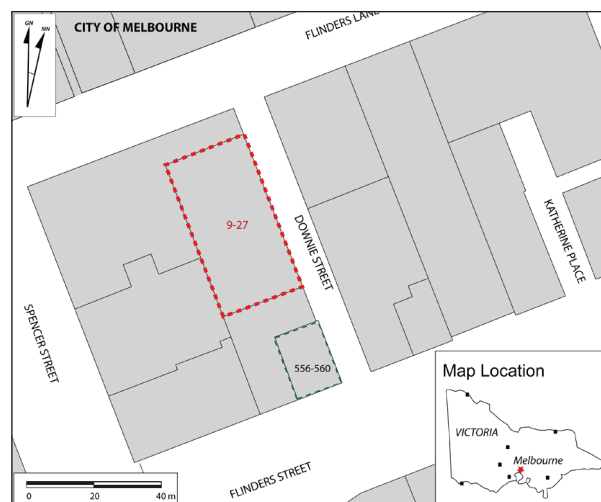


Figure 1. The location of the site at 9–27 Downie St (investigated in 2018/2019) and the site at 556–560 Flinders Street (investigated in 2015)

Inventory, H7822-1847, and also falls within the former grounds of the Langlands Iron Foundry. The Flinders Street site corresponded with the former yard area for the foundry while the Downie Street site corresponded with footprints for the foundry buildings.

The footings found within the Downie Street site were well preserved beneath layers of iron waste fill. Accumulation deposits, features and artefacts were also uncovered relating to three distinct stratigraphic phases attributable to the occupation and development of the site by the Foundry. Though no structures or features relating to Batman's garden were found, some artefacts were considered potentially to be from this period. Across the stratigraphic phases, changes were noted in the architecture of the foundry buildings, the technological innovations of the various foundry installations and typological trends in the foundry tools and objects. These changes are considered to reflect and represent the rapid development of Melbourne during the 19th century.

Historical Background

Langlands Iron Foundry was established in 1842 by Scottish immigrants Robert Langlands and Thomas

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Fulton, just seven years after Melbourne was first settled in 1835. The allotment was previously part of John Batman's garden located to the east of 'Batman's Hill' as indicated on Hoddles 1837 plan (Myers and Mirams 2018:8). Unfortunately, there is little information about Robert Langlands in the historical records. We know that Fulton, however, was born in Dundee in 1813 and served an apprenticeship as a machine-maker before migrating to Port Phillip in partnership with Robert Langlands (Brereton 1972). Fulton left the partnership after only a few years and established another foundry several blocks to the east, Fultons Foundry. He was replaced by Robert Langland's brother, Henry Langlands who arrived in Victoria from Scotland in 1846.

Henry Langlands became an influential figure in Melbourne colonial society. He was active in politics, industry and philanthropy. In Scotland, Henry Langlands had supported the anti-slavery Reform Bill and Catholic Emancipation movement. In Melbourne he supported the anti-transportation movement and provided financial support to the hospital, the Benevolent Asylum, the Immigrants Aid Society, Temperance Movement and the Yarra Aboriginal Mission (*The Age* 23 June 1863:5). He was a member of the Colonial Reform Association which lobbied for democratic and land reform. He chaired a protest meeting in the aftermath of the Eureka Stockade that spurred on democratic reform in Victoria (Serle 1977:171).

Langlands and Fulton purchased Allotment 2 adjacent to Flinders Street and the Yarra River for their foundry. It was close to Queens and Coles wharves where goods were loaded and unloaded. The Customs House was a block away on Queens Street. This was the commercial end of town in the 1840s where local industries, warehouses and businesses associated with import, export and shipping were located (Lewis 1995:23).

Despite the 1840s depression, Robert Langlands and Thomas Fulton purchased the property on Flinders Street and began manufacturing items with just a foot-powered lathe to hand (Milner 1990). Between 1842 and 1852, Langlands repaired and manufactured a wide range of agricultural implements as well as drays, carriages, buggies, axle-boxes, wool-presses, ornamental ironwork, cast iron bells and beams (Milner 1990:6). By this time, Langlands had purchased the neighbouring allotments, Allotment 3 and 4 and expanded the Foundry as Melbourne's population grew. In 1839, Melbourne's population was estimated to be 4,000, with almost 6,000 Europeans living across the Port Phillip District. By 1851 the population of Melbourne had risen to between 23,000 and 26,000. Victoria's population was 77,354 (Serle 1977:382; Shaw 1996:85).

The gold rush had seen metal workers flocking to Victoria, many who set up their own businesses during the 1850s. Enoch Chambers opened up Melbourne's

third foundry in Prahran in 1856 and by the early 1860s, dozens of engineering works, many specialising in particular products or working with different materials, were established across Melbourne (Churchward 2005). The scale of these foundries varied, some were set up in small factories producing domestic items such as kettles, lamps and tin cans.

Other Ironworks and Foundry studies

Other archaeological examples of Australian ironworks include the Fitzroy Ironworks in Mittagong excavated in 2005 (Goddin Mackay Logan 2007). The Fitzroy Ironworks operated from 1848 to 1910, mining and smelting iron ore, as well as producing pig-iron in a blast furnace. They also cast iron and made coke. The Fitzroy Ironworks is described in *Australia's Age of Iron: History and Archaeology*, Jack and Cremin's early history of iron smelting in Australia which examines historic blast furnaces across the south eastern states including Lal Lal in Victoria and Lithgow in NSW (Jack and Cremin 1989).

Kristie Altenberg and R. Ian Jack's comparative study of a traditional Portuguese foundry and the Phoenix Foundry in Uralla, NSW, describes a modest family brass and iron casting foundry which began operation in 1898 and employed six people (Altenberg and Jack 1990:53). John Hyett's comparative study of the archaeology of a blacksmith shop in Strathbogie, which operated from 1889-1991, explored the building layout, tools and equipment used in a stand-alone blacksmith shop and compared it with international examples (Hyett 2002:92).

Casey and Lowe completed an investigation of the PN Russell & Co Engineering Works during a larger investigation of the Darling Quarter, (formerly Darling Walk), in Darling Harbour, Sydney (Casey and Lowe 2013). The Works operated at the site from 1859 to 1875. Limited excavations within the yard area of the Works revealed information regarding the operations and transportation within the foundry complex. The remains of a weighbridge, which weighed wagons of raw materials and end products was identified. Few industrial artefacts or foundry related objects were recovered.

Another foundry investigation in Melbourne's CBD was undertaken in 2016 by Qu.A.C. Archaeology and Heritage (Lane et al. 2018). The site, H7822-2042, was located at 229-241 Franklin Street, Melbourne and contained remains of the Soho Iron Foundry. The site contained the full extent of a working foundry that operated from the early 1860s until about 1914. During fieldwork some structural features were uncovered allowing interpretation of the layout and workings of the foundry. Bluestone blocks forming engine beds and timber beams associated with foundry machinery

were excavated, while cuts, indentations and pits also indicated the location of foundry equipment (Lane et al. 2018:62). A flue network made of handmade bricks was revealed after removal of a thick layer of slag.

Two millstones were also excavated and the chimney stack location was revealed. Layers of black foundry sand with cuts suggested the location of the moulding shop (Lane et al. 2018:78). There were scarcely any complete iron tools recorded that were associated with foundry work (Lane et al. 2018:3). Metal was found across the site as heavily corroded concretions with tools embedded (Lane et al. 2018:116). The few artefacts included part of a small iron rake, an S-shaped open-ended spanner, and an iron pot. The lack of artefacts was attributed to the fact that foundry plant and equipment was sold off when the foundry ceased operation in 1913 (Lane et al. 2018:22–23).

Another small foundry, Rowden Bros in La Trobe Street, Melbourne, which specialised in tin and galvanised iron was excavated by Andrew Long and Associates during the Metro Rail project in 2018. The report for this investigation is still in preparation, however, the authors understand that the site yielded furnace features and many thousands of metal objects, possibly proving an important comparative assemblage.

Project Background

The previous investigation of the former Langlands Iron Foundry undertaken in 2014/2015, at 556–560 Flinders Street, Melbourne (see broken green outline in **Figure 1**) represented about 10% of the original foundry property. It happened to correspond with a yard area of the former foundry, so no structural evidence was uncovered during the archaeological excavations (Myers et al. 2015). Several significant features and deposits were identified, including a brick-lined well, extensive brick and gravel paving, barrels of black pitch, iron tools and many clay smoking pipes (Myers et al. 2018:86, 92). The finds revealed the need for hardstand areas and filling to combat the boggy nature of the land and frequent flooding events due to the proximity to the Yarra River. The finds also evoked scenes of a male-dominated industry, with the work crew finding time for a smoko in between the hard, hot, and dirty work of a foundryman. The investigation opened an important window into the former foundry, with research indicating it was the first established in Melbourne and Victoria, and potentially of high significance for its contribution to the growth of the Australian colonies. The massive quantities of ferrous waste that had been used to cover over and fill the site, made it clear there was also potential for extensive remains of the Langlands Iron Foundry preserved north of this allotment (Myers et al. 2018:84).

The more recent investigation of the Langlands foundry undertaken in 2018/2019, at 9–27 Downie

Street, Melbourne (broken red line in **Figure 1**) was located just 10 m north of the previously investigated site. The site area represents about 25% of the original Langlands Foundry grounds corresponding with the central and western portions where the earliest foundry buildings would have been located. This portion incorporated part of the original allotment purchased by Langlands. One of the few historical maps available that show the Foundry, indicate that several buildings were situated on the Downie Street site by the 1850s (Bibbs 1856) (**Figure 2**).

Extensive remains of the Langlands Iron Foundry were uncovered during the investigation of H7822-1835, including partial footings of all the buildings marked on the Bibbs Plan (**Figure 2**). The footings, features and deposits revealed the site was subject to continuous change and improvements over time. There were upgrades to, and adaptations of most buildings and many features. Early burnt timber footings were replaced with brick-on-stone footings. An early brick-lined single flue that delivered air to a small furnace was upgraded with a more substantial iron pipe, double flue. This flue was subsequently upgraded again, along with the building it was attached to, by an even larger, iron pipe, tri-flue delivering air to a new building. The new building was shown on a Dove Fire Insurance Plan (Dove c.1879?). These developments were noted in the taphonomy and stratigraphic phasing at the site. The findings illustrate the rapid development of the Langlands Iron Foundry into a manufacturing powerhouse mirroring the phenomenal rise of Melbourne.

Results by Phase

Six stratigraphic phases were identified during the investigation (**Table 1**). Phases 2, 2a and 3 were those associated with the occupation of the property by Langlands Iron Foundry from 1842 to 1881. Historical documentary evidence helped to clarify specific dates for each of these phases. This paper focuses on the findings from Phases 2, 2a and 3, which relate to the establishment, consolidation and subsequent expansion of the Foundry.

Phase 1

Soon after the arrival of Europeans in the southern part of Australia, John Batman built a homestead on the hill to the west of the subject site overlooking the Yarra River. Batman utilized the low-lying land to the east of Batman's Hill, including the study area as a garden and for agriculture. He, his family and workers, would have walked over the land and tended the gardens. As such, it may be that some post contact artefacts found at the natural ground surface could be attributed to his period of ownership. One artefact found that stands out as possibly relating to this Phase is a portion of a Mouth harp (also known as a Jews harp) found pressed



Figure 2. (a) Portion of the Bibbs Plan, 1856 and (b) the Dove Plan, c.1875? (sic) showing the 9–27 Downie Street site H7922-1835

Phase	Type	Date	Phase significance
Phase 1	Contact period – Batman's Garden	1835–1842	High
Phase 2	Langlands Iron Foundry (establishment)	1842–1851	High
Phase 2a	Langlands Iron Foundry (consolidation)	1851–1878	High
Phase 3	Langlands Iron Foundry (expansion)	1878–1881	Medium
Phase 4	West End Brewery, Mundells Warehouse & other businesses	1881–1928	Medium
Phase 5	Demolition - Vacant Redbrick warehouse & garage	1928–1938 1938–present	Low

Table 1. Historical and stratigraphic phases

into basal sediments (Myers et al. in prep.). A similar instrument was found by Ochre Imprints during excavations near the corner of Swanston and Flinders Streets for the Metro railway development.

Phase 2

An historic plan showing the layout of the Foundry for Phase 2, prior to 1850, has not been located. But the archaeological and historical evidence indicates that shortly after establishment, the layout of buildings at the Foundry would have been similar to the layout shown on the Bibbs plan, 1856 (Figure 2). This was corroborated by archaeological evidence for footings from Phase 2

and 2a that were found to correspond with the building layout shown on the Bibbs plan.

Rates records indicate that by 1845 the Langlands Foundry already comprised 'three dwelling houses, steam engine, workshops, foundry loft, sheds and yard' (Melbourne 1845). By 1846 the *Port Phillip Gazette and Settlers Journal* described the Foundry as the largest in the Australian colonies having machinery with straps and screws 'clanging away' connected to various lathes. There was also a turning shop where the model maker was preparing patterns for casting (*Port Phillip Gazette and Settlers Journal* 7 January 1846:2).

Toward the end of the excavation, beneath one

metre or more of fill deposits, evidence for this earliest period (Phase 2) was uncovered. Timber footings with the remains of intact wall frames were found (**Figure 3**). Some were blackened from fire. A soft organic deposit containing wood shavings and timber offcuts from lathe work was found between these footings, which were probably the remains of the turning shop and the activities that took place there.

Shipping records suggest Langlands imported building materials, specialist equipment and products needed for their manufacturing enterprise. Pig iron (the raw material needed for commercial production of iron) was initially imported as it was not until 1875 that the Lal Lal Iron Works and smelter was built (Jack and Cremin 1994:62, 63). In 1847, Langlands imported 20 tons of pig iron from Scotland along with 8 boxes and 15 bales of merchandise (*Sydney Chronicle* 4 November 1847:2). Langlands also imported 2,500 fire bricks, 6 sheets of lead, 114 bundles of bar iron, 19 bundles of sheet iron, 1 block of tin, 2 pairs of smiths bellows and 1 cask of clay (*Melbourne Times* 25 March 1843:2). Possibly the sheet iron was used for cladding and roofs on sheds. The fire bricks were most likely used for building furnaces. The ship *Nebudda* carried 261 deals and battens (used to

build structural frames before they were clad with sheet iron) and 92 pieces of sawn wood for Langlands in 1849 (*The Argus* 10 September 1849:2).

Samples of timber offcuts (DW-00127) from Phase 2 deposits at the site were scientifically tested by Know Your Wood and identified as Larch (*Larix* spp.), a timber from the Northern hemisphere valued for its tough, waterproof, and durable qualities (Ilic 2020). Larch was used in the construction of small boats and may have been purchased by Langlands for maritime repairs and construction orders. A timber artefact (DW-00932) possibly part of a batten or finishing for the Phase 2 building in Area A was tested for its species type and identified as Baltic pine (Ilic 2020). Baltic pine was the most widely imported timber in 19th century Victoria (Lewis c.1986).

Langlands also used local materials. In 1848, 2600 pieces of colonial slate were reportedly purchased from a quarry 50 miles from Melbourne; they did not have to import timber roofing shingles from Tasmania (Port Phillip Patriot 23 October 1848:2). Furthermore, the stumps on which the imported deals and battens were erected were found to be local timber. A rounded stump (DW 10634) was tested and identified as White

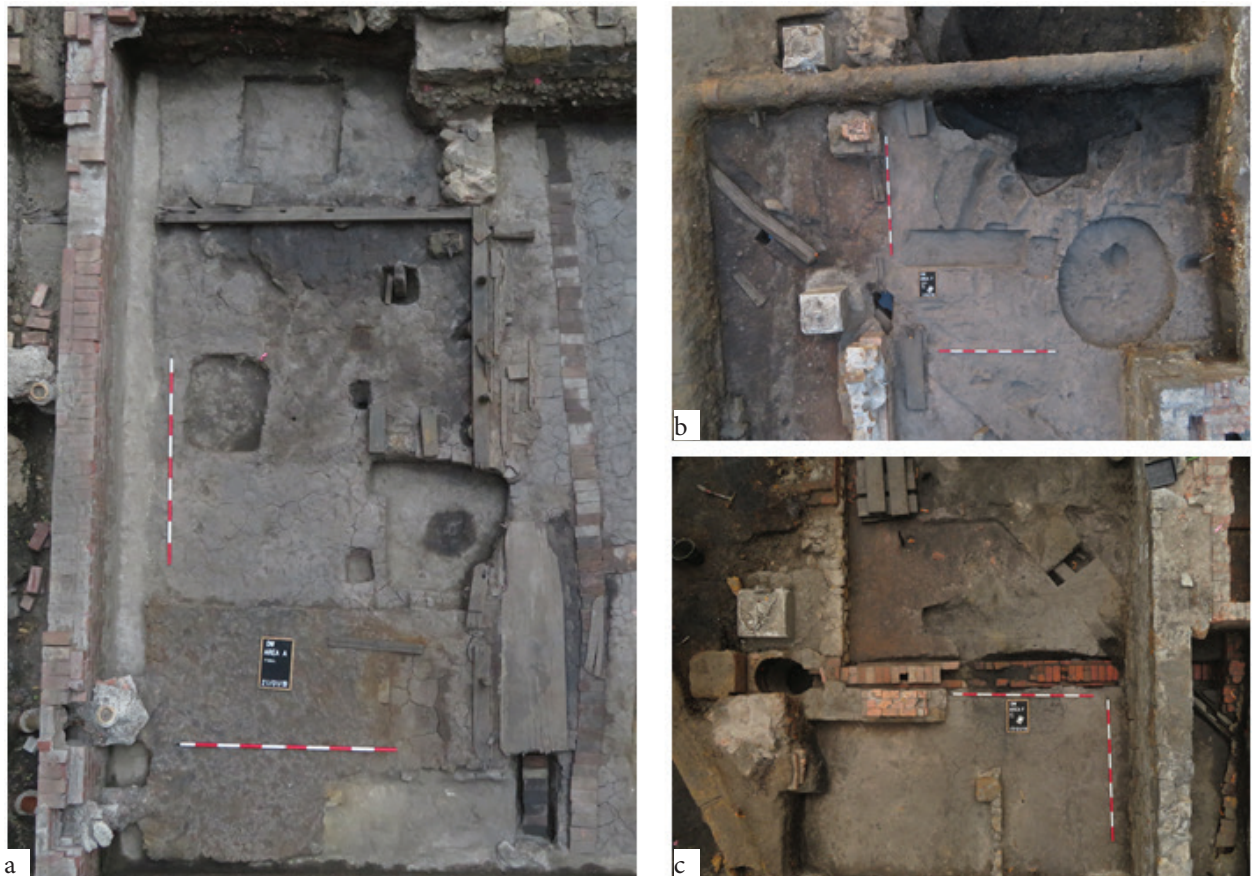


Figure 3. (a) the timber footings of what was likely the turning shop of Phase 2. (b, c) the brick-on-stone footings, brick-lined flue and cuts into the floor of what was likely the moulding room of Phase 2/2a. Later footings and features from Phase 3 (large stone footings and iron pipe that fed the tri-flue) and Phase 5 (concrete and redbrick footings and pylons) lie over and cut through the earlier phases

Stringybark (*Eucalyptus globoedia*), a local hardwood indigenous to the Melbourne area (Ilic 2020). A piece of worked timber (DW 00152), possibly a piece of flooring was identified as Southern Blue Gum (*Eucalyptus globulus*).

During the excavation brick-on-uncut stone footings from Phase 2 were also uncovered, built directly over basal clays. A brick-lined flue and barrel-lined chimney, connecting with a small forge (**Figure 3c**) was associated with one of these buildings. Criss-crossed timbers provided a machinery stand, possibly for a small crane. Between these footings was a deposit of grey foundry sand. Circular impressions were found cut into this deposit and the basal sediments. It was clear this building was the Foundry's earliest moulding room where molten iron was poured into moulds. The cuts in the ground indicate very large moulds were being cast (**Figure 3b**).

The base part of a furnace was also uncovered, constructed of handmade brick-on-stone, similar to other structures associated with Phase 2. The furnace was rectangular and divided into two halves: one side apparently functioning as an oven, and the other as a fire box. A laminated deposit of fine brick dust had collected in the second chamber perhaps because of the poor quality of the bricks used. In front of the firebox was the opening of an underground brick-lined, timber-topped, flue. The other end of this flue opened into a circular stone feature, possibly the base of another furnace, uncovered during the final monitoring stage of the investigation.

In the early years, working with these simple buildings and furnaces, Langlands prospered. The Foundry assembled Victoria's first iron paddle-steamer, the *Vesta*, from imported sections (Milner 1990:15). They also repaired and manufactured a wide range of agricultural implements as well as drays, carriages, buggies, wool presses, beams and street signs (Milner 1990:6).

There would have been great pressure to expand their operations, but in December 1850 an 'alarming fire' broke out in the Foundry yard and spread south towards Coles Wharf, igniting George Cole's sail loft and shop (*Port Phillip Gazette and Settlers Journal* 21 November 1850:2). The fire also ignited a barrel of gunpowder, which exploded and lit up the sky. According to Edmund Finn (1888:210), it could be seen from Flagstaff Hill. After the fire at the Foundry in 1850, Henry Langlands immediately applied to the Melbourne City Council under the *Melbourne Building Act* (1849) to make additions to his factory (Melbourne City Council 1850). These Notices of Intent to Build were required under the Act for any new building or major work but excluded privies and chimneys. Building regulations were introduced to Melbourne in 1849 to specify fireproof building materials to prevent 'mischief by fire' (Lewis 1995:39).

This fire marked the end of Phase 2, which was clear in the stratigraphic profile across several areas as a layer of charcoal over demolished structures. In other areas, fill layers, changes to structures and the addition of new structures heralded the onset of Phase 2a.

Phase 2a

In 1855, the property was mortgaged to William Downie for £1400, to raise money for the repairs and the new buildings (Officer of the Register General and the Office of Titles 1855).

In Phase 2a one of the burned-down workshop buildings (with the timber footings) was rebuilt, at least in part, with stone internal footings added. These overlie the charcoal layer, but within the same footprint as the underlying timber footings and the building marked on the Bibbs Plan. A second building (with timber footings) was removed altogether and capped with a bitumen pavement. A new building was added with brick-on-stone footings and internal timber supports that rested on timber base-plates. A sample of these (DW 10632) was identified as River Red Gum (*Eucalyptus camaldulensis*), a dense redwood highly prized for its durability and strength (Ilic 2020). Its use in this phase suggests a greater understanding of the potential of Australian timber species had been established by the gold rush.

The brick-on-stone moulding shop (shown in part in **Figures 3b, c**) was upgraded with a new, larger furnace powered by air delivered through iron pipe flues (**Figure 4**). The furnace was probably installed above the upright pipe flues. The change in flue type from brick-lined to iron-pipe represents an important change in technology at the site from manual to mechanised. A large stone machine-support was also added at this time, replacing or complementing the earlier timber version.

Artefacts found in association with this moulding room included an iron cauldron, graphitised ceramic crucible fragments and iron tools such as gagers and pinchers (for lifting hot crucibles), files, crank handles and hooks (**Figure 5**).

Economic demand and population growth since the early years of the gold rush was phenomenal. In four months of 1852, a total of 609 ships docked in Hobsons Bay carrying 55,075 passengers, all hoping to find their fortune in Victoria. The frontier port town of Melbourne grew into one of the richest cities in the world. Waves of immigration saw the population increase from 77,345 in 1851 to 540,322 in 1861 (Serle 1977:382). The city and hinterland developed at break-neck speed as new settlements opened up where gold was discovered. The demand for equipment to extract the gold in the decade following the initial discoveries saw Langlands flourish. Langlands fabricated and imported mining equipment including steam engines, stamp batteries, quartz-crushing machines, pumping equipment and winding



Figure 4. Evidence of the upgraded furnace and flues in Phase 2a, found at northern end of the moulding room building which was constructed during Phase 2

gear (Weickhardt 1983:48). They also manufactured the first tubular boiler for the first locomotive in Victoria (Milner 1990:16) as well as boilers, dredging and railway equipment, pipes and saw-mills (Weickhardt 1983:47; Milner 1990:6).

This period also presented unique challenges for the business. When the news of the gold discoveries in Buninyong reached Melbourne in 1851 almost every able-bodied man left Melbourne and headed for the goldfields. Businesses and offices were deserted and ships in the Yarra were abandoned as crews left their posts and went inland (Serle 1977:21). It appeared that Langlands Foundry may have lost employees to the lure of the gold in the early gold rush also. Between August 1851 and 1852 positions were advertised regularly in the Melbourne papers for engineers, patternmakers, moulders, wheelwrights, carpenters, boilermakers and blacksmiths. The advertisements specified that Langlands required skilled workers only and would provide them with liberal wages (*The Argus* 10 May 1852:5, 20 April, 1852:12, 12 August 1852:5). Wages for skilled workers by 1853 had grown 5 or 6 times greater than in 1851.

By 1861, the Foundry had become increasingly mechanised, with steam-driven machines such as slotting, boring and planing machines for finishing and smoothing the metal. There was also a self-acting screw cutter, plate bending machine, friction hammer and a machine for cutting plates and bars. Some of the orders in 1861 included 600 tons of 14-inch pipe for the

North Clunes Mining Company (*The Age* 14 December 1861:5). At this time, the foundry was described as 'one of the most extensive and important factories now in operation' (*The Age* 14 December 1861:5).

Langlands expanded in 1864, establishing a new foundry over the River at Southbank and consolidating the Flinders Street operation. The impetus for this move was a contract to build the caisson for the Alfred Graving Dock which required closer access to the port and specialised equipment (*The Argus* 8 February 1872:6). The Flinders Street and Flinders Lane frontages were subdivided and sold. The original foundry grounds had contracted by almost a third (Officer of the Register General and the Office of Titles 1864).

The wealth generated by gold, and the growth of regional cities and towns as well as an expanded population saw Victorian government and private enterprise invest in infrastructure projects such as housing, railways, water supplies, port facilities, as well as public building through the boom times of the 1870s and 1880s (Lewis 1995:60). As well as the Alfred Graving Dock, Langlands was also awarded the contract to manufacture bridge girders for the North Eastern Railway which ran from Melbourne to Albury (*The Age* 29 October 1870:3). It was a Victorian government contract to manufacture 200 wrought iron locomotive railway wheels for rolling stock in 1877 that was to see the Flinders Street Foundry site reshaped (*The Herald* 16 August 1878:3). Locomotive wheels until this time were imported. This was the first time they would be

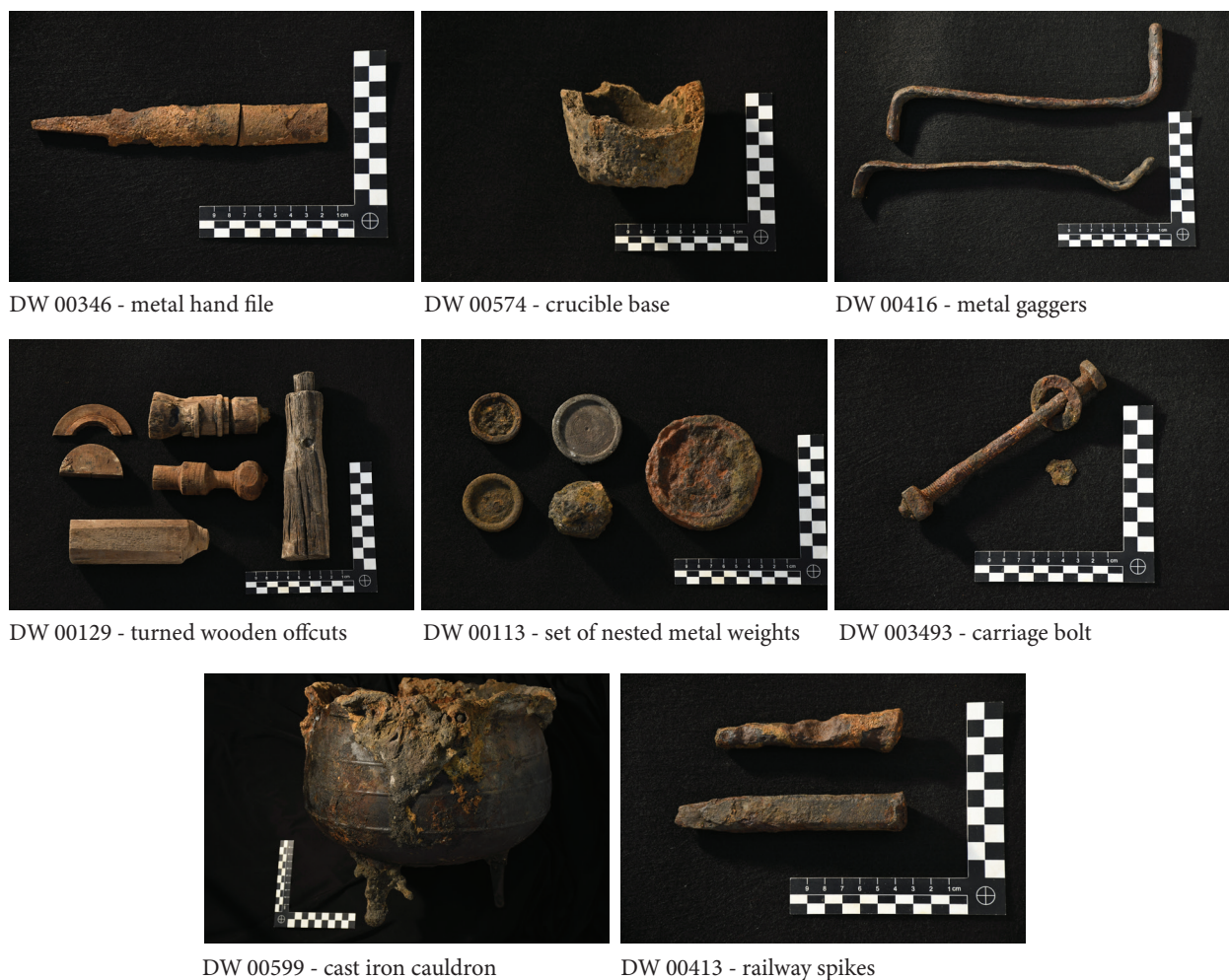


Figure 5. Artefacts collected from deposits associated with the turning shop and moulding rooms in Phase 2 and 2a

manufactured in Australia (*The Argus* 17 August 1878:5).

This contract would require new plant and equipment. The adaptations made to the moulding room in Phase 2a were likely done to allow for larger items to be made, but a larger building would be required to fulfill this contract. The end of Phase 2a at the site was marked by the demolition of all structures across the southern part of the site to make way for a new upgraded workshop building.

Phase 3

In 1878 Langlands submitted a building application to the Melbourne City Council (Melbourne City Council 1878). The Dove Fire Insurance Plan c. 1875? (sic) shows the site was completely reconfigured with fewer, much larger workshops (constructed of iron) and an extensive yard area (**Figure 2b**). These new buildings were oriented west to east across the site replacing the timber and iron buildings that were oriented north-south in the Bibbs Plan (**Figure 2a**).

The Dove Fire insurance plan is marked with a query '?' against the date 1875 which is hand-written on the

plan. The date provided was probably a guess at the likely date it was produced. The evidence in the historic record (the building application) paired with the archaeological evidence, indicated that the Dove plan must have been produced in 1878 (not 1875 as indicated on the plan and in the SLV database).

The new plant took several months to be constructed and prepared. Special sheds were fitted out for the work. The process was reported in the Melbourne press. The reports described some of the equipment used in the manufacture of the wheels, including furnaces and hydraulic machines to press the iron into the moulds, a blast furnace, a hanging cupola furnace, steam hammers and double-turning lathes. The blast furnace was fed from three underground air pipes, the air sourced from a fan in another building, (*The Herald* 16 August 1878:3; *The Argus* 17 August 1878:5).

This description explains why the remains of a large furnace structure associated with Phase 3 of the Foundry, seemed strangely absent at the site during the excavation. If the furnaces were hanging above the ground, then on removal, they would have left no

trace. Archaeologically, the new workshop building was represented by substantial, shaped, bluestone footings over a solid rubble base that cut through the older Phase 2 and 2a structures and deposits at the site, bedding in the basal sediments. Large, square-shaped bluestone crane mounts were also installed, tied together with metal pins. These were placed either side of a large, iron tank that was set into the ground (**Figure 7**).

Fewer small iron tools and timber moulds were found in Phase 3 deposits than had been found in Phases 2 and 2a. There were, however, more larger items found, including a large wrench DW-00408 and an industrial weight DW-08269 of approximately 28lb/ 12kg (**Figure 6**).

Substantial amounts of ferrous waste were dumped as fill around the new iron pipe tri-flue raising the

ground level across the site. A circular feature was cut into, or formed from, compacted foundry sand. It had a central iron-ball shaped axle cut into the natural clays in the centre of the ring. A dislodged iron wheel that lay alongside the iron ball may have originally rested on the axle. These features likely formed the remains of equipment used to move iron ingot moulds or other vessels around while each was filled with molten iron. The presence of this ring feature (or industrial sized 'Lazy Susan') together with the pad footings for the cranes and the large new iron tri-flue were indicative of a new technology being used at the Foundry (**Figure 7**).

Incredibly, despite the huge investment made, Phase 3 lasted only 4 years. The new workshop building, furnace and flue system appeared to have been constructed to complete the one important contract



DW 00308 - large wrench / spanner



DW 08269 - calibrated bar weight

Figure 6. Artefacts collected from deposits associated with the new moulding workshops of Phase 3



Figure 7. Features associated with Phase 3. (a) an aerial view of the large iron tri-flue, (b) a portion of the foundry sand-ring impression with central axle, (c) the new workshop footing in section showing the deep rubble base and shaped stone coursing, (d) the intact machine (or crane) footing

for the railway wheels. The elements found in Phase 3 were like those required for the Bessemer process. The Bessemer process was an invention by Henry Bessemer that enabled the inexpensive production of steel, a more reliable product than cast iron (but was previously more expensive to produce). The process involved forcing air through the molten iron to remove impurities from the iron by oxidation. It is considered one of the most important developments in steel making between the 1850s and 1950s.

However, a newspaper article indicates that the Langlands did not adopt the Bessemer process until 1887 when they had already moved to another factory across the Yarra (*The Goulburn Herald* Tuesday 7 June 1887: 2). Indeed, according to the article, when they did 'attempt' to introduce Davy's Bessemer process in 1887, it was the first time any Bessemer Process had been introduced in any of the Australian colonies. Although the features uncovered were probably not part of a Bessemer process, the presence of similar technologies being installed and used at the Flinders Street site, suggests that Langlands were moving toward more efficient processes in steel making during this phase. Advances were stimulated by being awarded the large contracts. By upgrading production systems, Langlands were perhaps attempting to maintain their position at the forefront of the iron foundry industry in Australia.

In 1880, Langlands purchased the Fulton Foundry located in South Melbourne for £27,000. All plant from Flinders Street was removed to this second premises. South Melbourne was where many heavy engineering and timber yards had moved from the mid-nineteenth century (Priestly 1984:245). The amalgamation of Fultons and Langlands created one of the most complete ironworks in Victoria (*The Australasian Sketcher* 28 May 1881:3). At this time, Langlands was amongst the biggest factories in Victoria, employing 300 people across their two operations (Serle 1971:70). They continued to manufacture iron and steel goods to build Victoria, including the water pipes connecting Melbourne to the Yan Yean Reservoir and the Kew tram lines (*The Age* 22 June 1888:7; *The Daily Telegraph* 30 May 1884:4). In 1889, the population of 'Marvellous Melbourne' had grown to 445,000.

Conclusion

The most recent investigation of the former Langlands Iron Foundry uncovered extensive remains from the earliest days of the Foundry in the 1840s through to its final days in 1881. The artefact assemblage demonstrates this industrial character, with hundreds of metal objects, including many foundry tools. This site differs from other investigations of ironworks and foundries, which have typically yielded few artefacts. This assemblage can now be the comparative assemblage against which

other foundry assemblages, yet to be recovered, can be compared. The assemblage will be housed at the Heritage Victoria's artefact laboratory.

The structural remnants of the Foundry included footings and industrial features made of wood, stone, brick and iron that were altered, adapted and reconstructed over three distinct phases (2, 2a and 3). This structural evidence together with historical information, accumulated deposits and material culture, has contributed to the interpretation of specific uses for each structure: the turning shop, moulding room, counting shop, pattern store, furnaces, flues and airpipes; as well as highlighted their adaptation, improvements and technological advances. It also pointed to a synchronistic development with the development of Melbourne, perhaps even a symbiotic relationship. An archival record including an extensive excavation report and photo database will be available through Heritage Victoria and the ArchLink website.

The findings from the excavation provide important insights into the development of the 19th century industrial manufacturing business, Langlands Iron Foundry. They reveal phenomenal change and adaptation of the business, to service the burgeoning population of Melbourne over the 39 years that Langlands occupied the site. Furthermore, they reveal the importance of this site to the story of Melbourne's industrial manufacturing history and the city's transformation from a pastoral outpost to a manufacturing powerhouse.

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