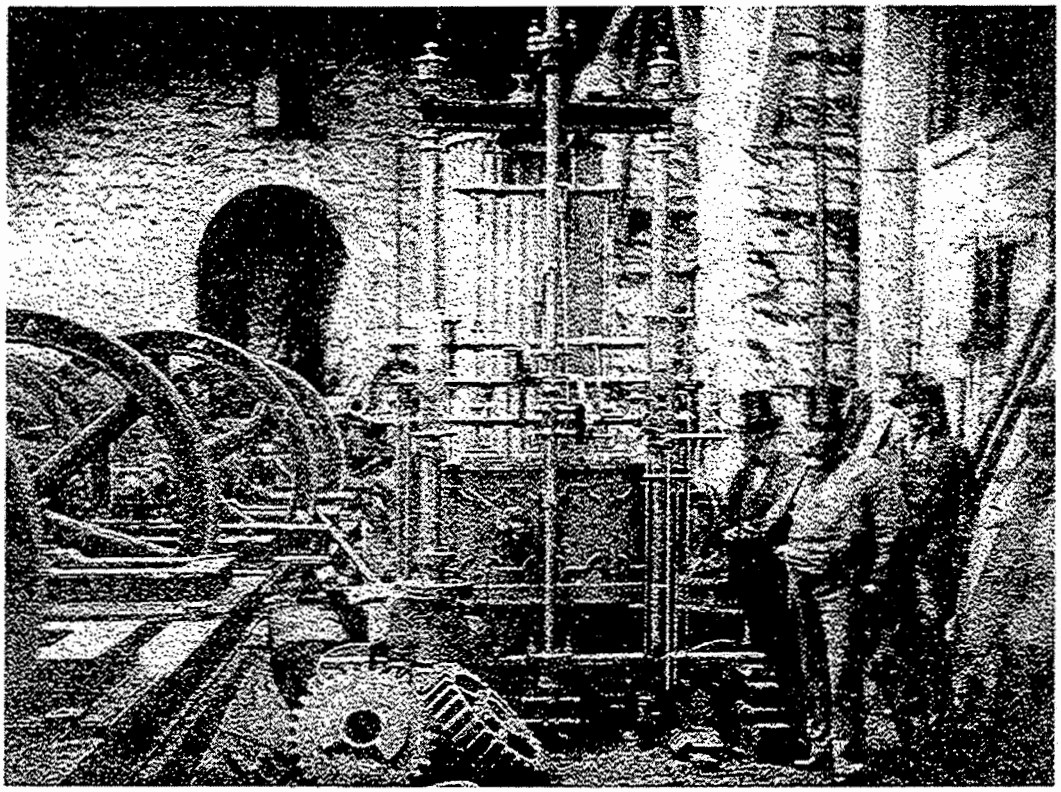
# FOUNDRY SQUARE HAYLE

## AN ARCHAEOLOGICAL AND HISTORICAL EVALUATION



Cornwall Archaeological Unit
Planning Department
Cornwall County Council

# FOUNDRY SQUARE, HAYLE

# ARCHAEOLOGICAL AND HISTORICAL EVALUATION, 1995

John R Smith

and

Colin Buck

*"I have always made it a rule, whenever I find myself deficient in ability, to endeavour to make it up by industry and perseverance"* (Henry Harvey)

Cornwall Archaeological Unit

**Planning Department**

**Cornwall County Council**

## Site Investigation Team

**Project Director**: John R Smith

**Site Archaeologist and Documentary Research**: Colin Buck

**Excavation Assistants**: Anne Reynolds, Anna Jones

## Acknowledgements

Cornwall Archaeological Unit and the Authors would like to thank the following for their assistance in the preparation of this report: The staff at the County Record Office; the staff at the County Museum, Truro; and the staff at the Redruth Local Studies Library.



Cornwall Archaeological Unit, Planning Department, Cornwall County Council, County Hall, Truro, Cornwall

CONTENTS

## REPORT SUMMARY


- In October 1991 Penwith District Council approved an outline application for the redevelopment of land at Foundry Square, Hayle. The application consisted of an outline plan for low-cost housing and associated car parking. The area affected by the proposal was until 1903 part of Harvey's Foundry, the oldest, largest and most important engineering works in Cornwall. As a condition of consent for detailed planning approval, the Applicant was required to commission an Archaeological Evaluation and Site Investigation.
- Harvey's was an international and greatly respected firm, and the Foundry site in its entirety has a long history of development and redevelopment over a period of 124 years. Its reputation was built on the design and manufacture of Cornish beam engines, but these machines were merely the most spectacular and visible portion of a great range of mining machinery and equipment.
- The proposed housing scheme would occupy the cleared area to the front of the Foundry Barn, including the site used by Philps Bakery as a car park. It would also involve the demolition of the existing Farm buildings and Stables to the rear of the Barn, and the building of new housing units on this site. The Boring Mill walls would be retained.
- The purpose of the Site Investigation was to establish the character and extent of any below-ground archaeological deposits in advance of a Detailed Application for the site, and to determine whether these might form an archaeological constraint which should be taken into account by the Applicant and Local Authority. The Site Investigation trenches were confined to those areas of the site which were likely to be directly affected by the proposed development, and which were accessible to the CAU team.
- Although relatively few structures were revealed by the trenches, the Site Investigation proved to be of great value in confirming the history of this part of the foundry site. The map and documentary evidence collected prior to the excavation was shown to be correct in its essential detail, and there are no "hidden" phases or structures beneath the known and documented buildings.
- This report makes detailed recommendations to the Client and Local Authority based on the findings of the Site Investigation in Section 6, page 34.

# 1. INTRODUCTION

In October 1991 Penwith District Council approved an outline application for the redevelopment of land at Foundry Square, Hayle. The application was made by Aldersgate Developments Ltd and consisted of an outline plan for low-cost housing and associated car parking. The area affected by the proposal was until 1903 part of Harvey's Foundry, the oldest, largest and most important engineering works in Cornwall. As a condition of consent for detailed planning approval, the Applicant was required to commission an Archaeological Evaluation which would have the following objectives:

- To carry out documentary research on the history and development of the site.
- To research the sequence of building on the area affected by development, and identify the function of each structure.
- To investigate the impact of the development on below-ground archaeological layers.
- To make a full record of all surviving structures which are to be affected, altered or demolished during the course of the development.

The Cornwall Archaeological Unit (CAU) was asked on 22 June 1993 to carry out an initial assessment of the Foundry Square site at Hayle on behalf of Andrew Downie and Partners and Mowlem (E Thomas Construction). The report was prepared in July 1993 and briefly outlines the historical significance of the site; considers the major phases of development; examines the extent and nature of present-day surviving buildings; considers the location and possible survival of remains below the present ground surface; and makes recommendations for further site recording and research (*Foundry Square, Hayle, Archaeological Assessment*, Smith J R, for Cornwall Archaeological Unit, Cornwall County Council, July 1993).

Further documentary research was undertaken by CAU in November 1993, but the Site Investigation by trial trenching was delayed until the property had been acquired by E Thomas on behalf of the client, the Guinness Trust. The Site Investigation took place during two weeks from March 20th 1995, and involved the opening of seven exploratory trenches. This (second) CAU report details the findings of the Documentary Research and the Site Investigation.

# 2. HISTORICAL BACKGROUND

## 2.1 Overview

John Harvey (1720-1803) was a blacksmith at Gwinear who moved to Hayle in 1779 (Barton, 1969). He had the vision and commercial instinct to realise that the Cornish mining industry would welcome and benefit from a county-based foundry and engineering works capable of supplying their needs. Although his business remained localised and small-scale for the first few years, by 1800 50 men were employed by Harvey (Barton 1969, 149). The early years of the 19th century were characterised by the establishment of many Cornish industrial enterprises set up to serve mining and quarrying, where previously such services had of necessity been

sought outside the county. Gunpowder manufacture, fuse-making, brick-making, engineering and iron-founding all flourished with the great expansion of hard-rock mining as the century progressed.

John Harvey's son, Henry Harvey (1775-1850), expanded the Foundry business and made Harvey's an international and greatly respected firm. Close family ties with Trevithick and later professional partnerships with great engineers such as Arthur Woolf and William West gave the firm a level of expertise unmatched by other engineering works in Cornwall. Their reputation was built on the design and manufacture of Cornish beam engines, but these machines were merely the most spectacular and visible portion of a great range of mining machinery and equipment. The bedrock of the business was not the great engines, splendid though they were, but the wholly mundane though essential import and sale of coal, timber, and building materials through the now rapidly expanding port of Hayle.

Harvey's influence and prosperity peaked from around 1820 to 1870 (Barton 1969, 150), and 464 were employed in the Foundry in 1841 (see Appendix, p36). Engines were built for mines not only in Cornwall, but for many other mines in Britain, Australia, South Africa, South America and Spain; engines were also supplied to waterworks in Britain and Holland (the Haarlem Mere engines). During this period the works in Foundry Square was adapted and expanded to cope with an ever-increasing volume of work; by the 1870s the Foundry included a forge and smithy, two machine shops, a boring mill, two fitting shops, hammer mills, pattern shops and stores, gasworks, erecting shops, and the casting shops with five cupolas and two air furnaces.

Harvey & Co's main competitors during this period were the Copperhouse Foundry of Hayle, and the Perran Foundry at Perran Wharf between Truro and Falmouth. By 1880 both of these had gone, victims of the decline in Cornish mining, and Harvey's itself was forced to diversify in order to survive. A new shipbuilding yard was constructed in 1888 with slipways and boilerworks, intended to compete on a national level with other yards producing vessels up to 4000 tons. This venture was not a success, and the foundry was gradually run down as the century ebbed; final closure came in 1903. The firm of Harvey & Co continued to trade as builder's merchants, and merged with UBM in 1969.

**2.2 Timeline**

| | |
|---|---|
| 1779 | John Harvey (1730-1803) moved to Hayle (Carnsew) and built his small iron foundry. |
| 1780 | Lease from Henry Lord Arundell to J N. Harvey *"to build canal for new foundry on Penpoll wastrell and to use riverlet"*. |
| 1783 | Tehidy Estate of Lord de Dunstanville: *"To John Harvey for cast iron stoves for Tehidy kitchen, £1.9.2"*. |
| 1792 | Henry Harvey wrote *"Another fire engine to be built in the foundry immediately"* (possibly a Newcomen design). |
| 1801 | Castings for Richard Trevithick's first locomotive made. |
| 1803 | John Harvey died (October). Henry Harvey (1775-1850) took over ownership. |

| | |
|---|---|
| 1815 | Harvey could not make the cylinders and cases of engines - but *"can make every other part"*. |
| 1816 | Arthur Woolf became superintendent of the foundry and promoted the development of the foundry into an engine manufactory; as a result the foundry was expanded and re-equipped. |
| 1817 | Cylinders bored up to 63 ins diameter. |
| 1821 | So much work carried out at the foundry that new orders were turned away. |
| 1824 | White Hart Hotel (original) built for Jane Trevithick. |
| 1825ca | Foundry Barn built. |
| 1825 | 232 employees. |
| 1833 | Arthur Woolf retired. |
| 1834 | Carnsew Pool completed to sluice Harvey's harbour entrance. |
| 1838 | New White Hart Hotel built. |
| 1841 | 464 employees (344 over 18 yrs; 75 between 13-18 yrs; 45 under 13 yrs). |
| 1842 | New steam Boring Mill completed, capacity 150 inch diameter cylinders. |
| 1847 | Henry Harvey had a stroke and could not walk unaided. |
| 1850 | Henry Harvey died in May. |
| 1866 | 633 employees. |
| 1870s | Mining Depression, forcing closure on many foundries; Harvey's attempt to diversify. |
| 1879 | Foundry workers on 10% pay reduction and mechanics on part time. |
| 1885 | Harry Harvey took charge of engineering works. |
| 1888 | 1200 employed (shipbuilding took many). |
| 1888 | Further expansion in forge, machine, shipbuilding and boiler works. |
| 1892 | Harry Harvey died. |
| 1894 | Directors' decide to wind up the foundry and concentrate on the mercantile side of the business. |
| 1903 | Foundry closed in June, and dismantled for scrap in November. |

## 2.3 The Significance of the Foundry Site

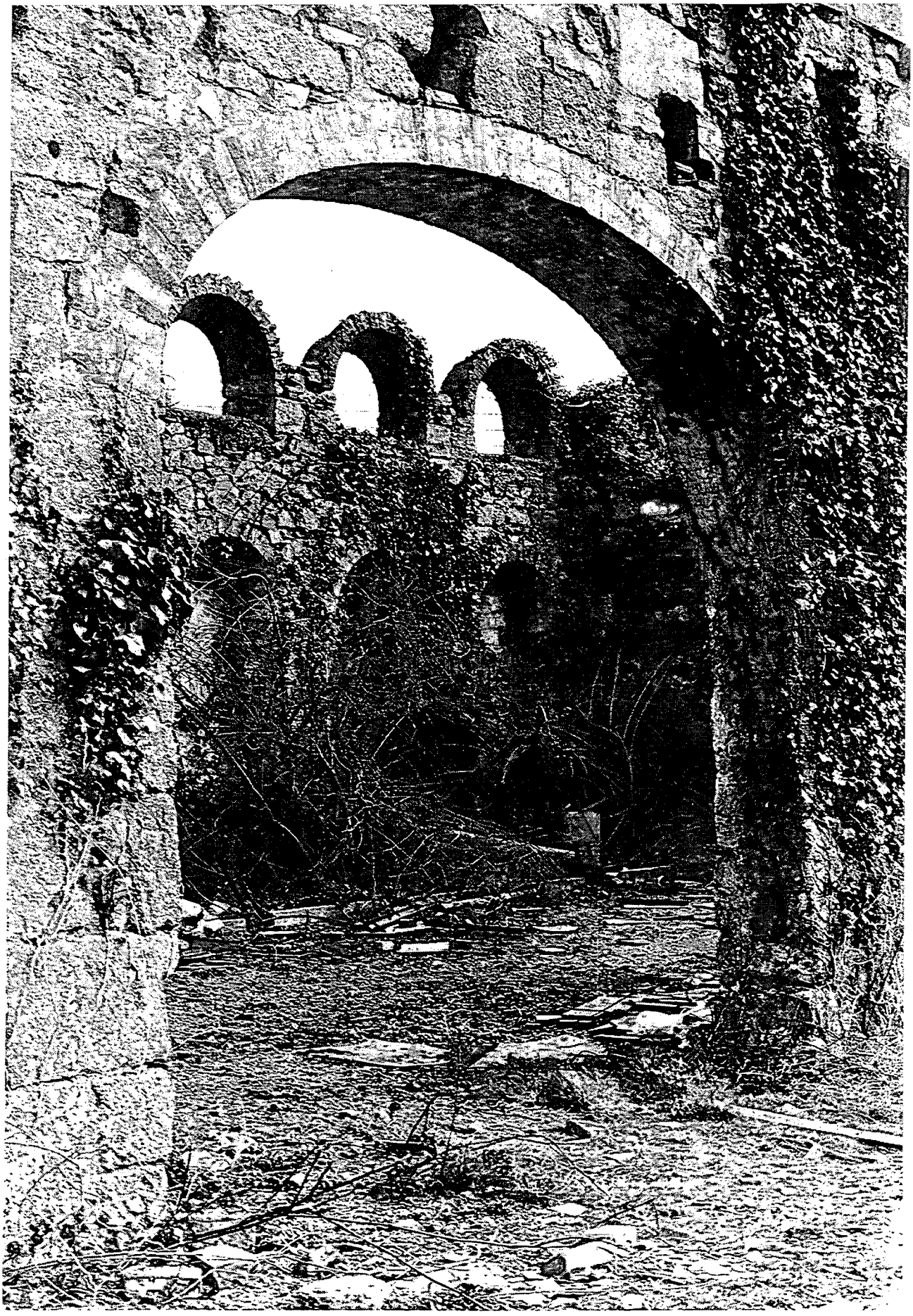
Until Boulton and Watt's patent expired in 1800, the Soho (Birmingham) foundry had a monopoly on the market for beam pumping and winding engines installed on Cornish Mines. As the 18th century came to an end, the new Cornish foundries such as Harvey's and Perran Foundry were poised to take advantage of a new period of free competition within the now rapidly expanding market for mining equipment. At first, however, there was neither the skill or experience available within the county for the building of complete beam engines, and a great deal of work was contracted out to other foundries such as the Neath Abbey works in South Wales.

By 1830 the three leading Cornish foundries (Harvey's, Perran, and Copperhouse) were producing work equal to that anywhere in Britain (Barton 1969, 148), and in another ten years were pre-eminent in their field:

*"Not only did they supply virtually every one of the very numerous engines used on the Cornish mines from about 1820 onwards, but they supplied collieries and ironworks in South Wales, the Midlands and the North, waterworks in London and elsewhere, metal mines in Ireland, Wales and Derbyshire as well as Spain, France, South America, Mexico, Australia, the West Indies, South Africa and all other countries abroad where deep mining was carried on."* (Barton 1969, 149).

The Cornish foundries were known and respected by engineers and miners throughout the world; their stature was on a par with the great railway workshops of Swindon and Crewe, or the shipbuilding yards on the Clyde. Harvey's stood among the top three, and was arguably the greatest, with its close association with Trevithick and other great engineers such as Arthur Woolf and William West. The decline and dissolution of the Cornish foundries was due solely to the collapse of Cornish mining in the later years of the century and the loss of their home market; it did not represent a loss of workmanship or skill.

The story of Harvey's Foundry is unique in many respects, the story (as is so often the case in Cornish history) of the vision and enterprise of a single individual and his family. For John Harvey the blacksmith to move to Hayle at the age of 59, an age when most would have been contemplating retirement, and then to establish a foundry on a green-field site in a county where there was at that time no similar works, was extraordinary enough. To then survive determined attempts by the Cornish Copper Company to ruin his business, recover from the death of his eldest son and natural successor, and to make the works a success was further achievement. That his younger son Henry Harvey was subsequently able to make the Foundry one of the foremost engineering works not only in Cornwall but in the world within the space of forty years, was a feat which stands comparison with any other heroic tale from the nineteenth century.



*The "Coliseum" before demolition, 1983*

# 3. PHASED DEVELOPMENT OF THE FOUNDRY SITE

Documentary research undertaken as the first part of the Archaeological Evaluation has produced far more material than can reasonably be included in this report. Some is contained in the expanded Timeline (Appendix, p36). A great deal of map evidence has been re-interpreted, drawn to a common scale, and is here reproduced as a series of phase maps showing the development of this part of Harvey's Foundry from its inception to closure. The phase maps, being tied to the specific requirements of this Archaeological Evaluation, do not cover the full extent of the foundry complex, and do not include the Hammer Mill and early Boring Mill, Ropewalk, Gasworks, Shipyard and Boiler Works or Quay areas. This map series was a vital tool in determining the exact location for the site investigation trenches.

## 3.1 Phase 1

**1779-1815** The Early Years

Two maps, one from ca 1790 and the other of 1815, combine to give an excellent view of John Harvey's small foundry. The foundry buildings enclosed a small yard, gated on two sides; the casting floors were on the west. The foundry would have possessed at least one air (reverberatory) furnace, and was already producing both iron and brass components for steam engines, iron pipes for pumps, cast stoves, and a range of mining equipment. Fronting the road opposite Penpol Pool was a coal yard and a lime kiln, a reminder that Harveys were general and builder's merchants as well as iron founders and engineers. At the back of the yard were erecting and machine shops. Henry Harvey had built (ca1790) a house for himself to the south of the Farm, which had a lawn and drive fronting onto the Helston Road and the Hammer Mills. Elsewhere, quays had been built on Penpol Creek.

Survival

From this early period almost nothing survives within the evaluation area. The arched entrance to one side of the present-day *Excaliburs* restaurant is almost certainly on the site of the gated opening shown on the 1815 map. Otherwise, all these early buildings were swept away in the massive redevelopments of succeeding years. Nothing remains of Henry Harvey's House other than the small outbuildings against the Farm wall at the rear. Two trenches (6 and 7) located the surface of the early 19th century coal yard which survives in places some 0.5 metres below the present surface.

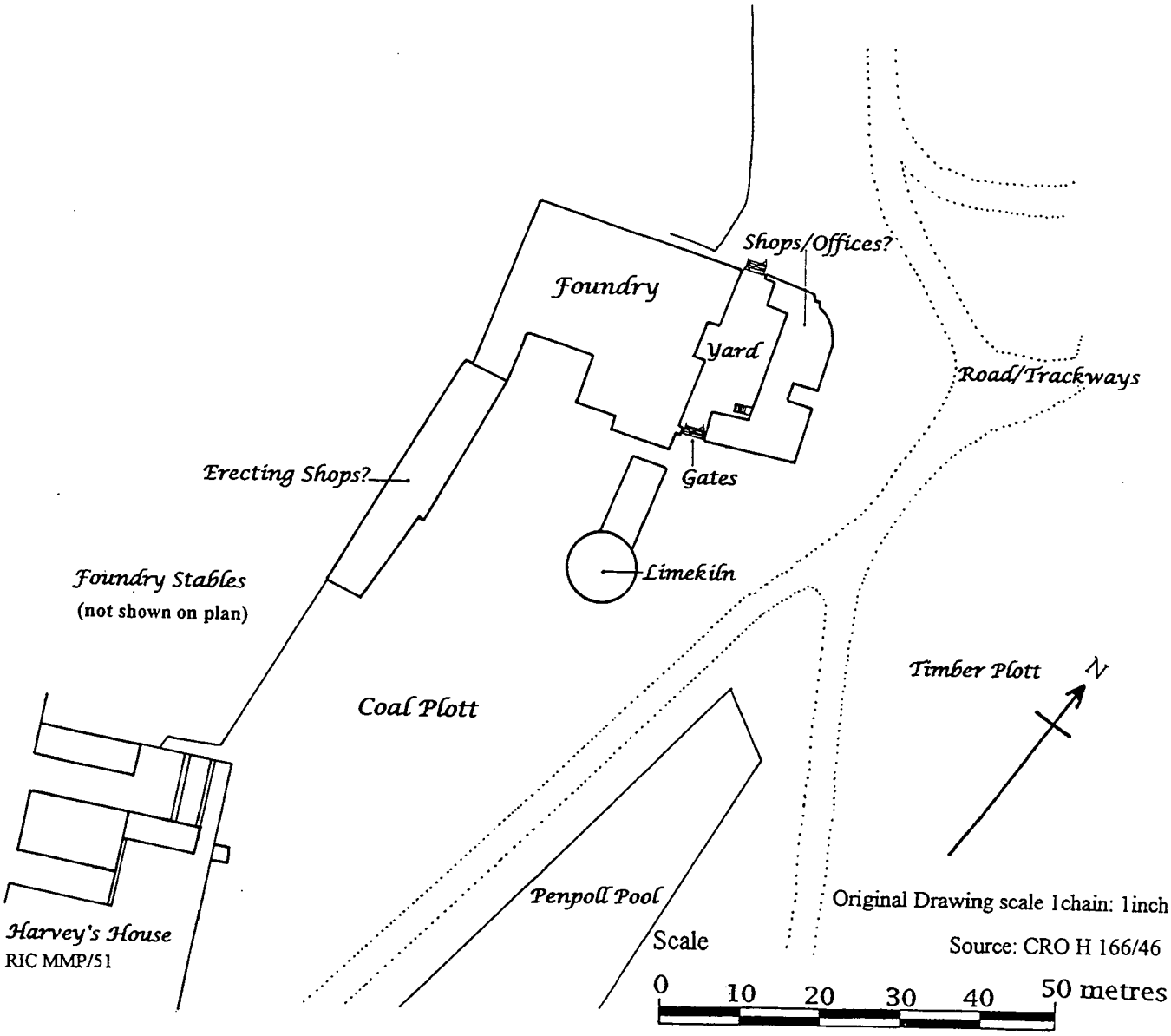



*Figure 1: The Foundry in 1815*

### 3.2 Phase 2

**1816-1835** The Foundry Under Arthur Woolf

By 1835 the foundry site had undergone considerable expansion, under the leadership of Henry Harvey and Arthur Woolf. In 1816 the casting floors and foundry were enlarged; cupola furnaces were in use by the 1820s in addition to the reverberatory furnaces. The building later known as Trevithick's Stores had been added to the north of the old foundry, and to the south, a new pattern shop and wood store replaced the limekiln. Offices were built over the original northern gateway. At the end of the erecting and machine shops, the building now known as the Foundry Barn was in place by ca 1825. The farm at the rear and stable blocks had been added by 1828, and there was a small shed to house a fire-engine which served the foundry site. Along the frontage facing the Helston road on the east a wall now enclosed the yard, with a pattern store and smiths shop built against it.

This second phase of construction is particularly crucial to the history of the foundry, as it represents the point at which Harveys became a manufactory and engineering works rather than a small ironfounders. By 1835 the works was producing 80 inch pumping engines on a regular basis, and was employing 232.

Survival

The most significant structure to survive from this period is the Foundry Barn. The Farm and the Stable Blocks also belong to this phase, as does the small building later identified as the Fire Engine House. The building next to the viaduct known as Trevithicks Stores would appear to be a late 19th century rebuild of a structure dating from the ca 1830 period.

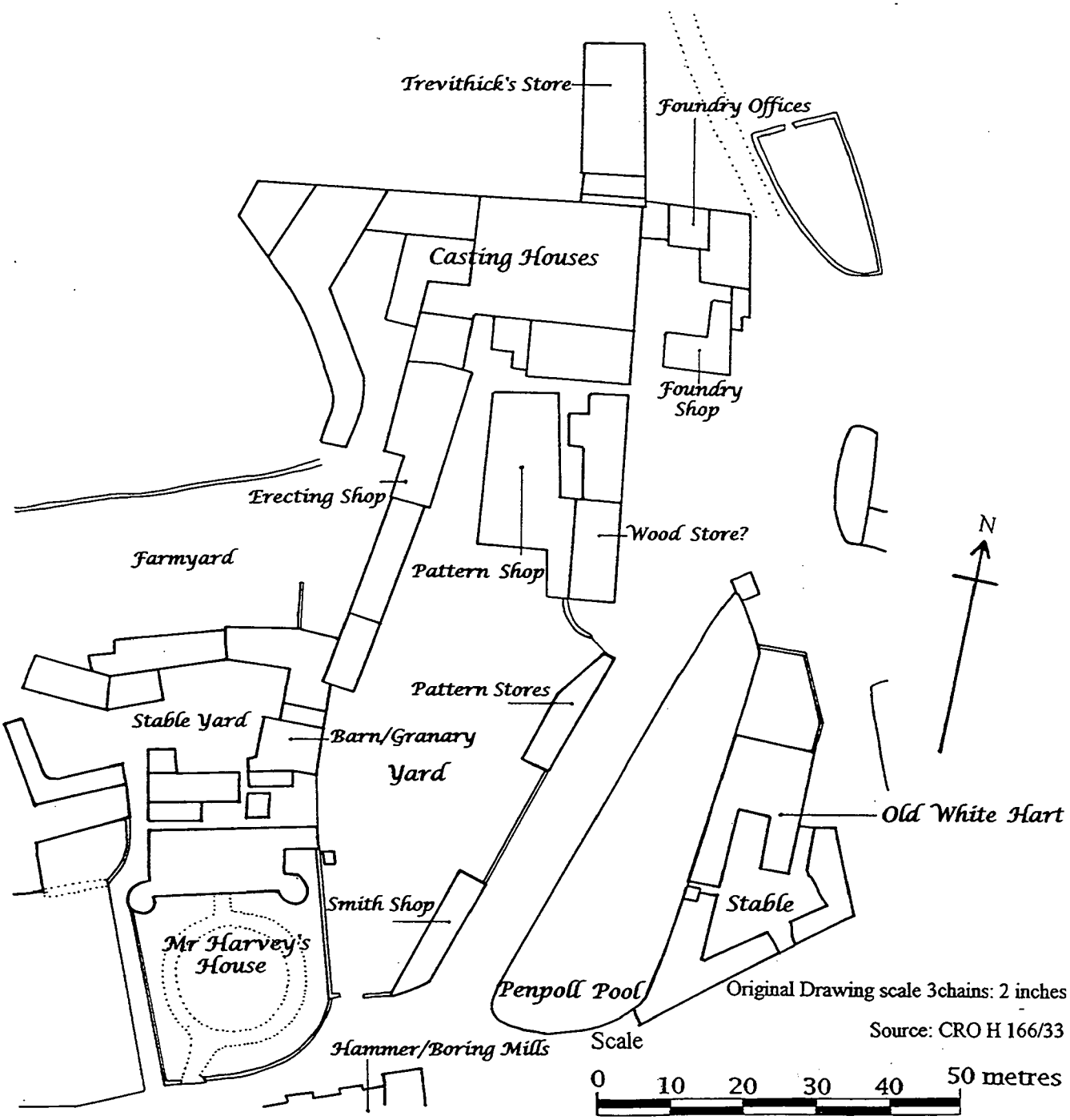



*Figure 2: The Foundry in 1835*

### 3.3 Phase 3

**1836-1853** The Foundry at its Peak

Between the 1830s and 1850s the foundry once again underwent great changes and rebuilding, as the demand for large pumping engines increased with the expansion of mining in depth in Cornwall and overseas, and also for many waterworks projects in Britain and Holland. Foremost was the building of an entirely new steam-powered Boring Mill from 1839 to 1842, capable of handling 150 inch cylinders, together with an Engine House and 24 inch engine and its associated Boiler House and Stack. This complex was erected as a northward extension to the Foundry Barn. The iron foundry and casting floors were also expanded, and the buildings fronting Foundry Square were redeveloped as a range of new Offices and Shops, with a new Ironmongers Shop built as an extension to the south. Along the Helston Road, a completely new and massive Fitting Shop (the "Coliseum") replaced the earlier buildings, with its own engine house and stack. A major change in 1852 was the building of the West Cornwall Railway viaduct across Foundry Square; possibly linked with this event was the extension of the railway line from the quays into the foundry itself, through the entrance arch which had once been the gate into John Harvey's little yard of the 1780s.

Henry Harvey's death in 1850 marks the end of an era; the foundry subsequently altered to suit changing circumstance, but never again displayed the focused development which was evident under the direction of the "old" family.

Survival

As might be expected, the impact of this period on Foundry Square was far-reaching and much has survived to the present day. The complex now consisting of *Excaliburs*, Barclays Bank, and Foundry House are all survivors from this phase, though in some cases altered. The "Coliseum" (Fitting Shop) was demolished in 1984; two of the granite cornices for the stack survive, and the footings for the rear wall were recorded in trenches 6 and 7. The Boiler House, Engine House and coalstore for the new Boring Mill are intact at the north end of the Foundry Barn, together with the truncated stack at the rear. Of the Boring Mill itself, only the end wall with one buttress remains. A fragment of the ca 1852 tramway into the site was encountered in trench 1.

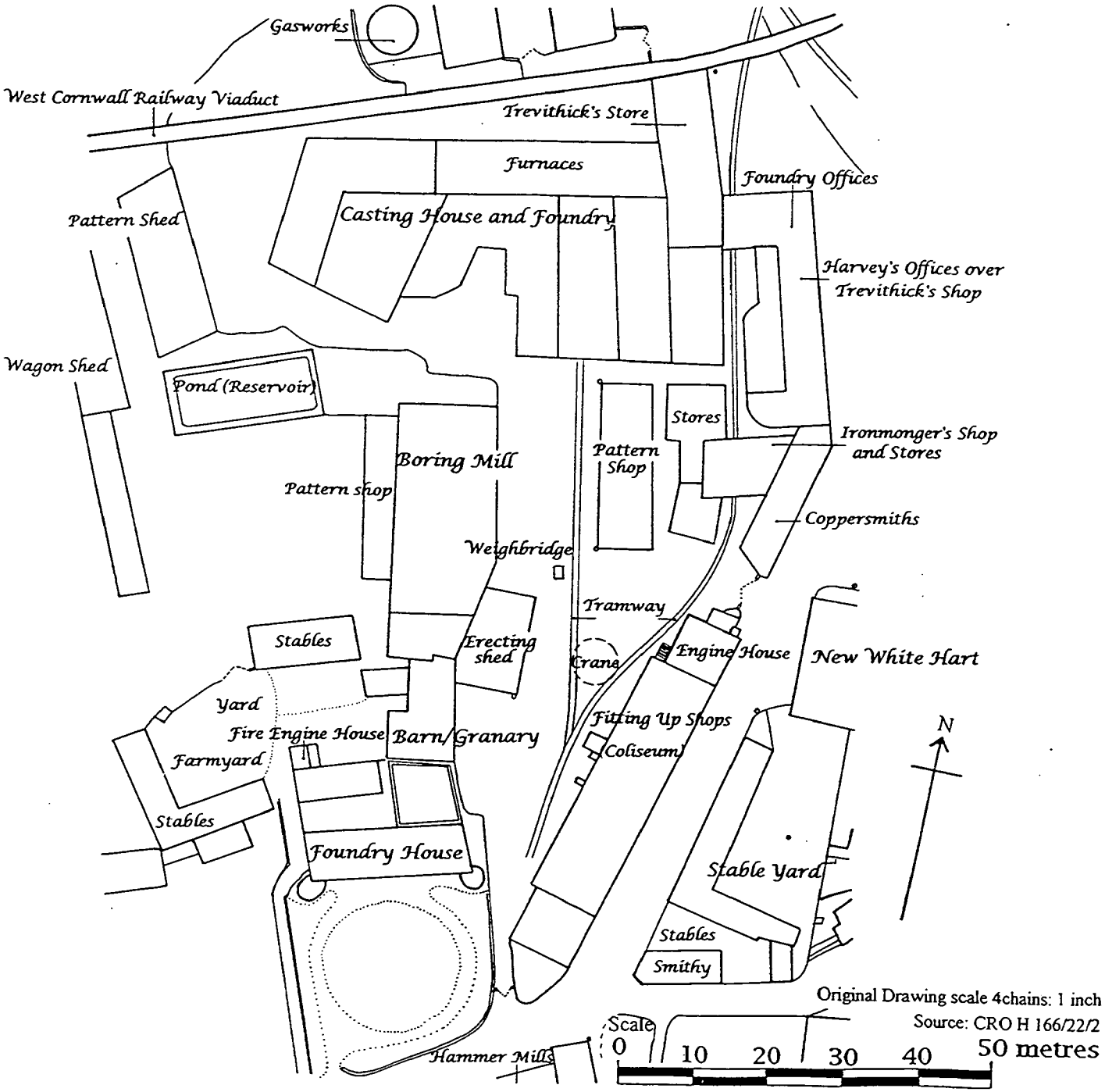



*Figure 3: The Foundry in 1853*

### 3.4 Phase 4

**1854-1879** Tightening the Belt

Although the foundry was very busy during the 1850s, Cornish mining was generally in decline from 1860 onwards (with the exception of deep tin producers), and all the Cornish foundries suffered from a contracting demand for their products. Harvey's was fortunate that their reputation for metropolitan waterworks engines ensured continuing contracts from elsewhere in Britain. Consequently, it is no surprise to find little alteration in the ground plan of the foundry site in Phase 4. The main changes were confined to infilling the centre of the site, between the Fitting Shop and the Foundry Barn. This area was newly occupied by the Central Erecting Shop, and a new overhead Travelling Crane was set up ca 1880 between this building and the casting floors to the north. By 1880 the other two major foundries in the county had closed (Copperhouse and Perran), leaving Harvey's such trade as remained.

Survival

The additions made during this period have all been demolished, leaving only the bases of the granite piers which supported the travelling cranes.

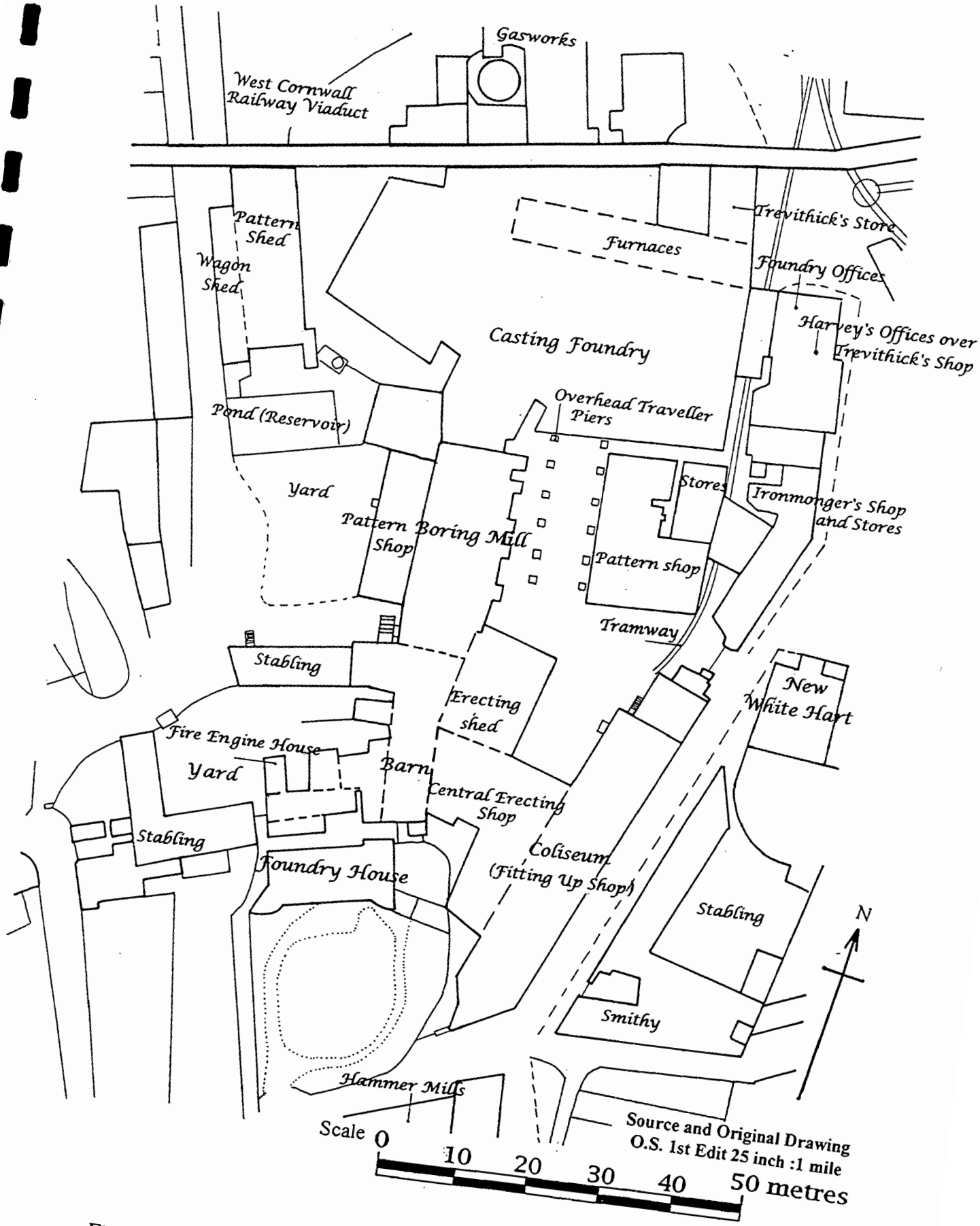



*Figure 4: The Foundry in 1879*

### 3.5 Phase 5

**1880-1903** Decline and Closure

During its declining years the foundry made a gallant attempt to diversify into large-scale shipbuilding, and although there was as a result a great deal of new build, it was not on the part of the site which is the subject of this study.

The infilling of the central yard continued, with additional buildings erected abutting the south end of the Foundry barn; the southern end of the Travelling Crane in the yard was now covered by a roof. Henry Harvey's house was demolished ca 1885 and the site incorporated into the "New Yard". Otherwise the foundry at closure in 1903 was much as it had been in 1880.

Survival

The additional buildings belonging to this phase have all been demolished, leaving only the wall bases and floors to be recorded on the Site Survey.

### 3.6 Conclusion

From the phase maps it is clear that the major period of growth occurs between 1815 and 1860, some 45 years which quite neatly coincide with the Cornish copper boom. It is also clear that the works as it existed in 1853 was the equal of anything in the country, and in this respect the stature of Harveys as engineers was remarkable considering the broad extent of the company's other interests in general merchandise, rope-making, lime-burning, shipbuilding, milling, baking, and retailing. In one sense this diversification was the company's salvation, as it enabled them to survive beyond the closure of the engineering works in 1903; in other ways it was the downfall of Hayle, which depended so utterly on the health of one major employer and landowner.

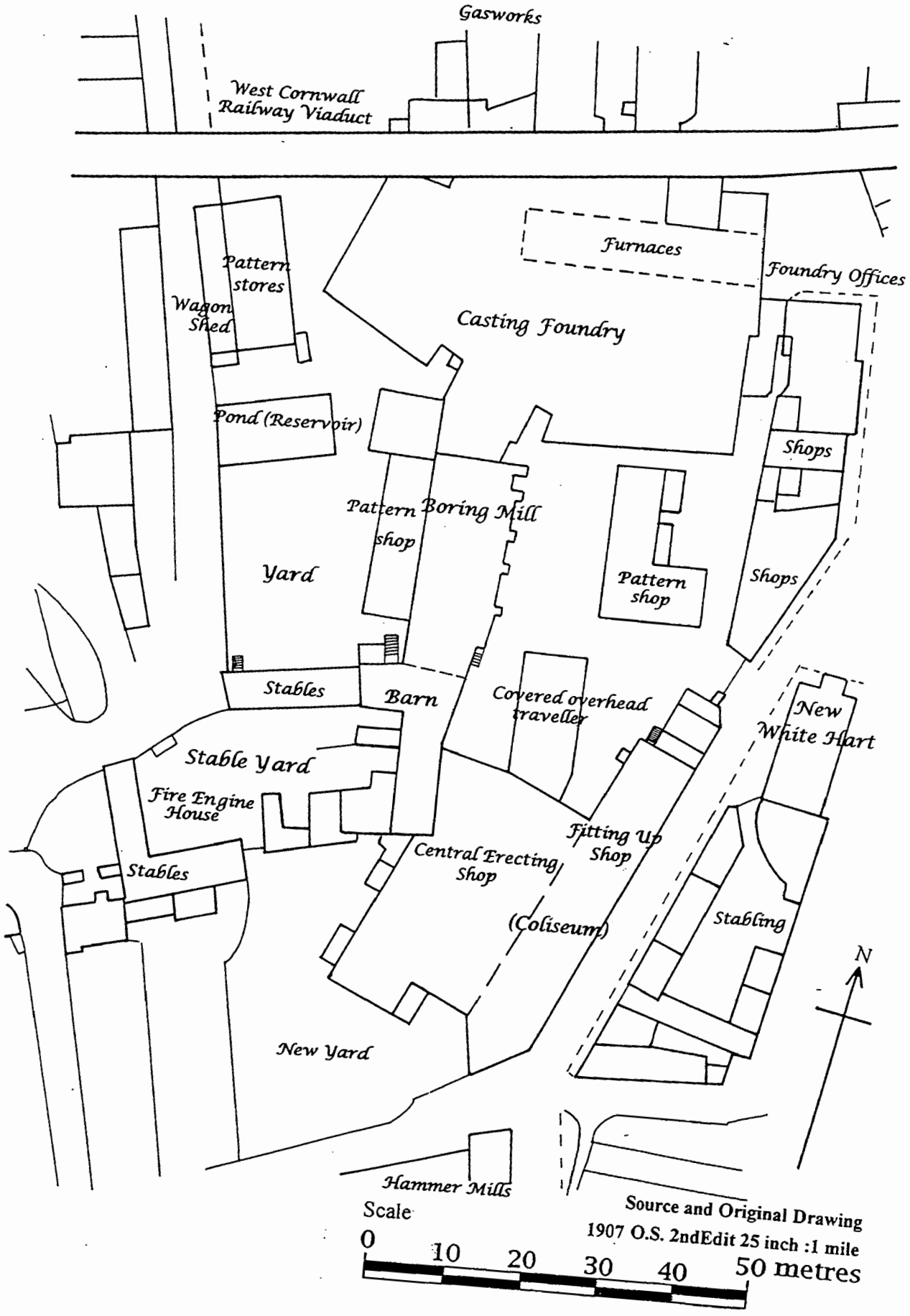



*Figure 5: The Foundry in 1903*

# 4. THE FOUNDRY SITE TODAY

The study area adopted for this report is defined by the dotted line in figure 6 (on the facing page). It was used to encompass the proposed development, which affects a smaller area of the site in the Outline Proposal, and also includes other buildings which give a context for the Evaluation study. This represents only a small part of the works of Harvey & Co, which covered several acres at this end of Hayle. Within the study area, surprisingly little survives of the Foundry as it was circa 1880. The structures which do exist are all the more precious as they represent a direct link to the time of Henry Harvey and Richard Trevithick.

The **Farm** and its associated buildings are essentially intact, though they are abandoned and in poor repair: this group includes the L-shaped **Stable Block**, the **Early Stables** with arched doors, the **Fire Engine House**, and access to the Granary on the top floors of the **Foundry Barn**, all grouped around a cobbled **Yard**. This section is a purpose-built industrial complex, designed to house the teams of draught horses which each day would have made deliveries through West Cornwall. The Yard is now partly obscured by rubble and debris.

The **Foundry Barn** is complete, though in poor repair with collapsed roof and floor timbers choking the interior and rendering access difficult and dangerous. This structure has had a long history since the 1820s and is not yet fully researched or understood, but it clearly exhibits several phases of build and reuse. At the northern end the **Engine House** and **Boiler House** survive against the stub walls of the Boring Mill; at the rear of the Boiler House is the truncated **Chimney Stack**. Part of the walls and buttresses of the 1840s **Boring Mill** survive and form the perimeter of a tarmac car-parking area.

The **Casting Shops** and **Furnaces** were demolished shortly after closure and are all now overbuilt with recent industrial development.

Immediately to the south of the railway viaduct, the **Pattern Shed** with **Cart Shed** at the rear is roofed and in good condition; on the opposite side of the lane is another building identified as **Trevithick's Stores**, in good condition and occupied for industrial use. At the front of the site, bordering the Helston Road, the main **Fitting and Machine Shops** were demolished in the 1980s and the site is now cleared space. The **Offices**, **Retail Shops** and **Stores** fronting onto Foundry Square survive in good condition and are all at present occupied.

The proposed **housing scheme** would occupy the cleared area to the front of the Foundry Barn, including the site used by Philps Bakery as a car park. It would also involve the demolition of the existing Farm buildings and Stables to the rear of the Barn, and the building of new housing units on this site. The Boring Mill walls would be retained, but the place of the Foundry Barn within the scheme is uncertain; the initial proposals were for demolition of this structure.

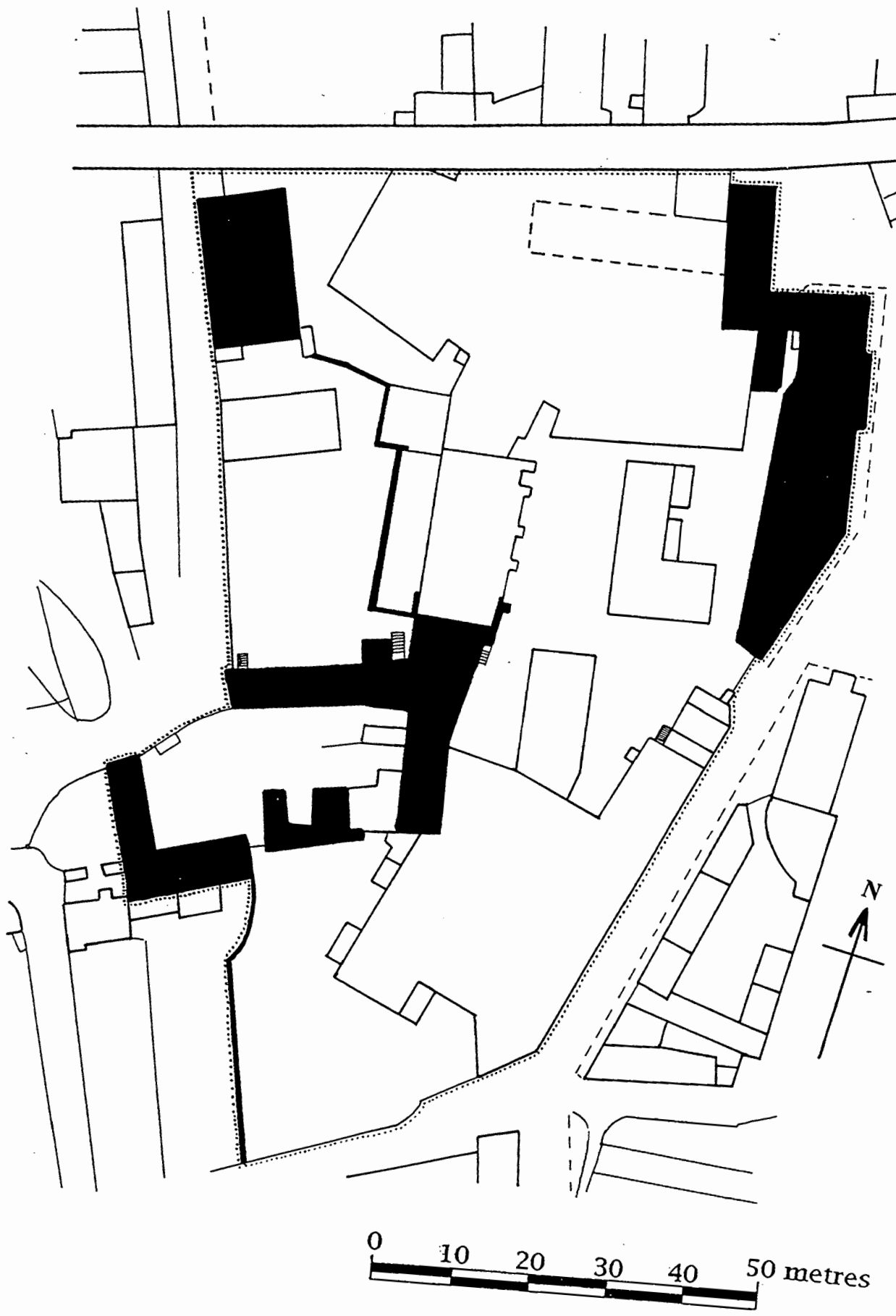



*Figure 6: Evaluation Study Area and Surviving Buildings within it*

# 5. SITE INVESTIGATION

The purpose of the Site Investigation was to establish the character and extent of any below-ground archaeological deposits in advance of the Detailed Application for the site, and to determine whether these might form an archaeological constraint which should be taken into account by the Applicant and Local Authority. The Foundry site in its entirety has a long history of development and redevelopment over a period of 124 years (see 2.2; 3), but the area affected by the development proposals at the front of the site was until the 1830s an open space occupied by a coal yard, and is thus relatively recent in terms of the foundry's growth. The Foundry Barn and Stables at the rear have a slightly longer history. Within the area of the site accessible to the archaeological investigation, structures known to have existed at various periods (not necessarily contemporaneously) included the following:

- The Boring Mill, Engine House and Boiler House (1839).
- The Foundry Barn (ca 1825).
- The Farm and Stables (ca 1820).
- Smiths Shops and Pattern Stores (1828 and 1835).
- Boiler Makers Shop (1864).
- Fitting Shops (the "Coliseum") (1847).
- Central Erecting Shop (1864).
- Travelling Crane (ca 1880).
- Henry Harvey's House (ca 1790).

The site investigation trenches were confined to those areas of the site which were likely to be directly affected by the proposed development, and which were accessible to the CAU team; excluded were the interior of the Foundry Barn (on safety reasons), and the Farm and Stable Yard (as these were deemed to have little below-ground potential).

### 5.1 Trench Location

The Site Investigation trenches were intended to be opened initially by mechanical excavator, and were laid out at a standard size of 5 by 2 metres (except Trench 6, 10 by 2 metres). 6 trenches were initially laid out under the supervision of the Excavation Director.

Trench 1 was intended to intercept any remains of the engine house at the north end of the Fitting Shop (the "Coliseum"). The engine here would have provided power to all the machines in the Fitting Shop via line-shafting.

Trench 2 was located inside the 1840 Boring Mill, close to the Engine House Wall. The intention was to look for any remains of the foundations for the boring bar and cylinder mounts. The Boring Mill was used to finish the inside of large steam cylinders (up to 150 ins diameter), using a rotating boring bar fed through the cylinder.

# Site Plan and Survey of Foundry Square Study Area
(Trench Evaluation excavation)

| CORNWALL ARCHAEOLOGICAL UNIT | | |
|---|---|---|
| | Drawing No. | GRH 207 GRE 195 |
| | Project/ Site Name | Harvey's Foundry Evaluation Excavation |
| | Details | Plane Table Survey |
| Planning Department<br>Cornwall County Council<br>Old County Hall<br>Station Road<br>Truro<br>Cornwall TR1 3AY<br><br>Tel (01872) 323603 | Project No. / PRN | 1993053<br>31891 |
| | Scale | 1:200 (Original Drawing) |
| | Survey Date | 29/3/95 |
| | Surveyor | Colin Buck Anna Jones |
| | DrawingDate | 6/4/95 |
| | Drawn by | Colin Buck |

**Key**

- Granite Block Piers
- Concrete Floors
- Brick Floors
- Pipes (Cast iron)
- PTSP Plane Table Station Point
- *LSP* Level Station Point
- *4.74* Levels

N

**Scale**

0 4 8 12 16 20 metres

• 4.654
*TBM (located on gas inlet pipe adjacent to White Hart outbuilding)*

Highway
Tarmac Pavement
Soil and Rubble Deposits
Exploratory machine trench to ascertain depth of natural silts
Trench 1
Trench 6
Trench 7
Trench 4
Trench 3
Trench 2
Trench 5
Gas pipe
*4.66 (Tramway Rail)*
*4.54 (Stone Sett)*
*4.58 (Tramway Rail)*
Concrete gutter
Foundry Drain cover
Rubble Dump
Iron Girders
Granite Walling 0.8m ht
2.0m ht
0.7m ht
Ground Level
Inspection Pit?
1.1m ht
Hydraulic Vehicle Lift ?
0.3m ht
0.1m ht
0.7m ht
0.15m ht
Fitting shop (Colisseum West wall)
0.2m ht
0.3m ht
0.14m ht Granite Wall ?
Wall Foundation
Soil and Rubble Deposits
Brick Platform
Blocked Window
1.8m ht
1.3m ht
0.6m ht Granite Brick rubble wall
*4.37 (Earliest Coal floor level)*
PTSP 1
PTSP 2
LSP 1
LSP 2
Gas pipe
*4.75 (Earliest Coal floor level)*
Barn opening
Foundry Barn/Granary
Steps to First Floor
Coal store
Engine house
Boiler house
Shed
Boring Mill East Wall
Tarmac
Boring Mill Shaft opening
Boring Mill West wall
Concrete Gutter
Retaining wall
Workshop
Gravel
Shed
Stables
Lean-to-Shed
Foundry Stables
Cobbles
Tarmac
Drain?
0.4m ht Red Brick wall base
Granite and Scoria Block wall
Granite Floor stone
1.48m ht
1.9m ht
1.45m ht
Building
Fire Engine House
*4.89*
*6.99 (Top of Bank)*
Foundry Farm House Wall
Electric Sub Station
Philp's Bakery Car Park
Foundry Farmhouse and garden
Foundry Lane
Tarmac
*4.2*
*4.84*
*4.99*
*5.1*
*4.17*
*5.65*
*5.20*
*5.06*
*5.22*
Ground Level

Trench 3 was located to intersect the wall of the Boiler Makers Shop which at one time abutted the Barn, and was designed to examine the relationship between the inside and outside of the Boring Mill Engine House.

Trench 4 was located to intersect the wall of the Central Erecting Shop, immediately in front of the Barn. The Erecting Shops were used to assemble large engines and other machines for fitting and finishing prior to despatch.

Trench 5 was intended to test for any survival of Henry Harvey's House (demolished circa 1880). The house was built ca 1790 to house the Harvey Family.

Trench 6 was located at the front of the site, and was (at 10 metres) twice the standard length. It was designed to locate the floor level of the Fitting Shop, and to further investigate the stratigraphy in depth at the front of the site.

Trench 7 was an additional trench, inserted in an area which should have only one phase of development other than the early Coal Yard. It was designed to establish the level of the natural ground surface in this part of the site.

**5.2 Excavation Techniques and Site Recording**

The trenches were laid out using hand tapes and offset measurements, and were in each case opened by mechanical excavator under the supervision of the Site Archaeologist. Cleaning up of the sections and the trench base was done by hand. Sections were drawn for each trench at a scale of 1:20, with one at 1:10, and a photographic record was made using monochrome and colour transparency film stock.

Although initially the trenches were to be 5.0m long by 2.0m wide, if features were encountered within them that were important in terms of site stratigraphy or foundry development, then trench sections were expanded in the appropriate direction. For example, Trench 1 was extended to the west to follow the mid 19th century tramroad rail that was found *in situ,* and Trench 5 was doubled in size to investigate any possible remains of Henry Harvey's house when none was visible in the initial trench. Trenches 6 and 7 were both extended to include remains of the Coliseum (fitting shop) west wall.

Levelling throughout the site was done using a standard dumpy level and sopwith staff. An OS bench mark was located on the north face of the Lloyds Bank building fronting Foundry Square. This level was traversed back to the site via a temporary bench mark (TBM) (see Site Survey, facing page 22). Levels were taken across the site to indicate topographical changes, section levels, and heights of archaeological features found in the trenches. All of these figures are reproduced on the site survey in *italic* form (as metres above mean sea level).

The photographic site record included colour slides and black white negatives of all sections and trenches, together with coverage of the whole site and its surviving structures.

**5.3 Results**

**Trench 1**

Trench 1, sited at the northern end of the "Coliseum" Erecting Shop, proved to be particularly difficult, as the ground consisted of compacted and very hard fill which

limited the depth of the trench to less than 0.5 metres. Consequently it was not possible to establish a complete stratigraphy to the underlying natural, and it is a matter for conjecture whether more survives than has been recorded. Machine excavation of the eastern part of the trench at a depth of 0.1m uncovered a brick floor area which was left to be recorded in plan. This appears to be all that remains of the small engine house which provided power for the machinery in the Fitting Shop. After much machine scraping in very hard compact grit and iron slag nodules, a tramrail was uncovered in the western end of the trench, located 0.18m

## Plan of Trench 1

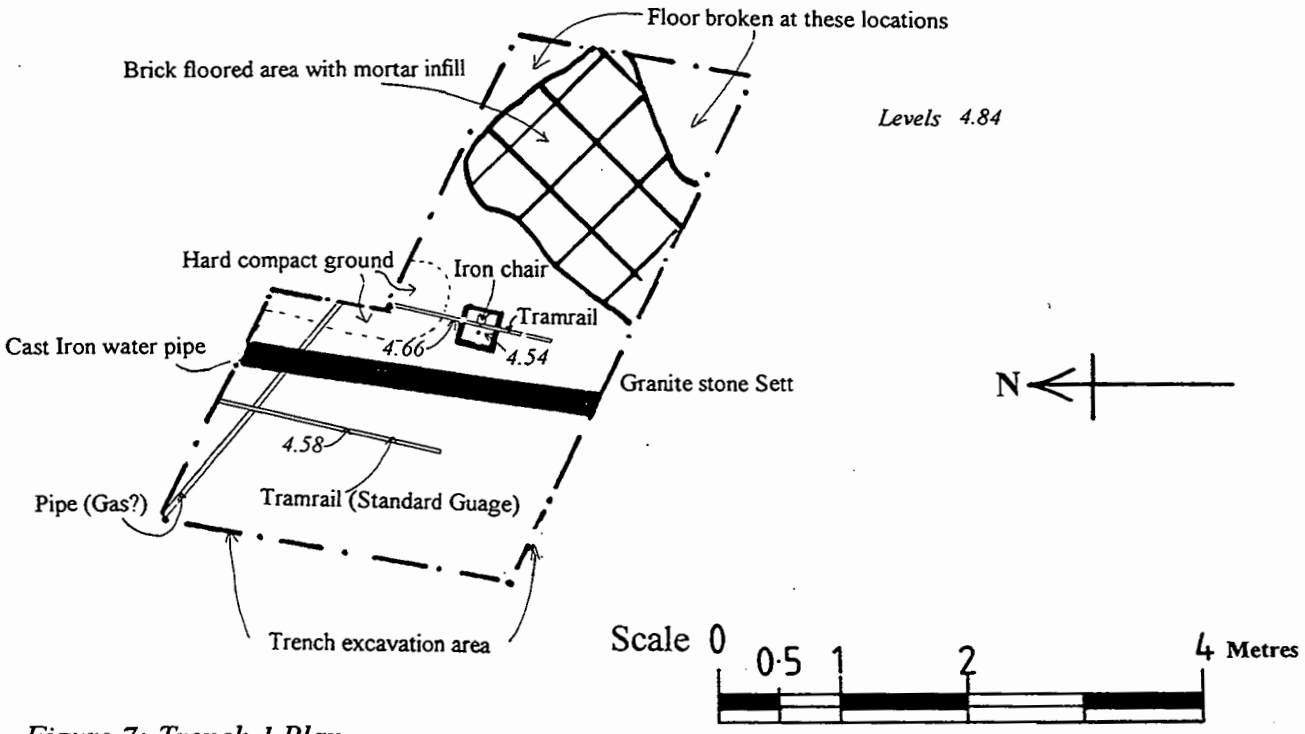


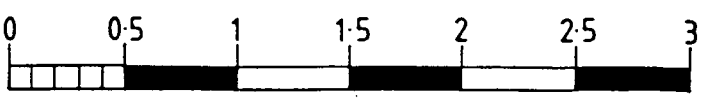

*Figure 7: Trench 1 Plan*

below ground level, with an extant locating chair on its eastern side seated on the original granite stone sett which measured 0.3 x 0.3m. A corresponding tramrail was found 4ft 8in to the west, making this a "standard" gauge line. Further excavation between the rails revealed a cast iron pipe, (one of many uncovered during excavation) of 0.17m diameter, and also uncovered a small diameter iron pipe (located beneath the tramrail) of 0.04m diameter which has been interpreted as one of the foundry's gas pipes. Unfortunately further excavation to the north beneath the tarmac access road was not possible, and to the south the tramrail continuation lay under compacted ground with overlying later brick floor levels.

The 1853 plan of Harvey's Foundry shows the tramway route into this part of the site from the West Cornwall Railway lines on the quays. The function of the tramway may have been to bring in pig iron for re-melting in the foundry's reverberatory and cupola furnaces. The tramway ran into the centre of the site (between Harvey's drawing offices and Trevithick's stores) where the tramline changed direction via a weighbridge. The rails themselves are of an early design, measuring 0.07m depth and 0.025 width, with no `T' headed finish to the top of

the rail. It was surprising to find the rails lying in situ as they are usually taken for scrap metal, but later infill and brick floors appear to have preserved them. The latest map which shows the tramway still in use is the 1879 OS 1st edition 25". The small gas pipe lies beneath the tramway and therefore pre-dates it, which fits well with the documentary evidence relating to Harvey's gas works of 1843. The relationship between the larger cast iron waste pipe and the tramway could not be satisfactorily determined, but the pipe appears to pre-date the tramway. This pipe may be the same as the 0.17m one found in Trench 7 running parallel to the Coliseum foundations from the direction of the Hammer Mill. A late phase of the of the Coliseum at its northern end overbuilt the tramway, as did the covered travelling crane.

## Trench 2




**Trench 2 Section A-A**

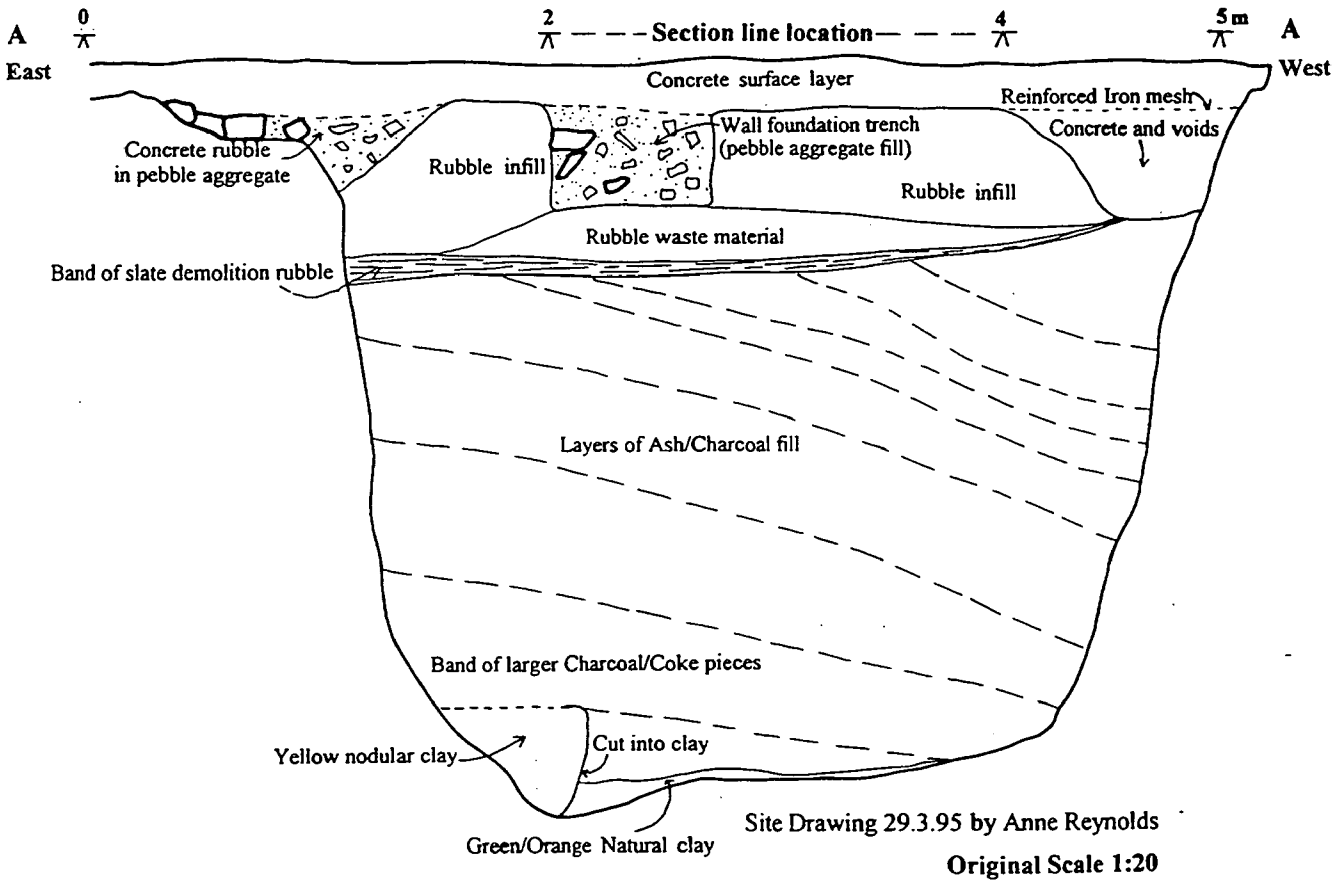



*Figure 8: Trench 2 Section A-A*

This trench was located under a concrete floor within the walls of the Boring Mill. The concrete floor, which was initially broken by machine, proved to be on average c0.4m thick but was deeper in places, especially where large granite stones had been used to fill voids. Two wall foundation trenches were located under the concrete (which was reinforced with steel mesh), with some of its loose pebble and granite aggregate fill in situ, measuring 0.7m wide and 0.5m high. These features

seem to be post-foundry and related to buildings that were in use after 1903 when the foundry was closed down. Below this was a band of rubble infill, sealing a thin layer of broken slate. Between this and the natural clays were layers of clinker and ash infill, extending to a total depth of ca 3m from present ground level. These layers were banded in a way which probably reflects episodes of tipping and infill from the eastern side of the excavation.

The rubble layer and band of slate demolition debris both seem to be remains of the demolished boring mill roof, presumably post-1903. But the layers of ash/charcoal down to a depth of 2.25m below this appear to represent a deliberate attempt to fill in a pit (the function of which is unknown) with the most ubiquitous waste fill at hand: boiler house and foundry furnace ash and clinker. However, this fill may suggest that the boiler house or foundry furnaces were still working at the time, possibly prior to the foundry's demise in 1903. An alternative explanation is that a large pile of this furnace waste existed which was used to fill up the deep boring mill when it stopped operating. Although it is difficult to determine the precise date of the infill, certainly the pit was filled in prior to demolition of the building containing it. The Boring Mill seems to have had full employment up to at least 1893 producing engines for the shipyard, after mining in Cornwall had entered a steep decline. The pit in the Boring Mill may have been filled in after this date, with the end of the requirement for boring very large cylinders. The small cut in natural clay at the bottom of section A-A may be the remains of one side of a masonry foundation, which was removed prior to the ash and clinker infilling. Unfortunately the trench could not be extended in any direction (as the concrete breaking machine was not available). No other evidence of the function of the boring mill apparatus or foundations could be found.

## Trench 3

This trench did not achieve its original design aim of establishing the relationship between the Boiler Maker's shop and the Engine and Boiler House of the Boring

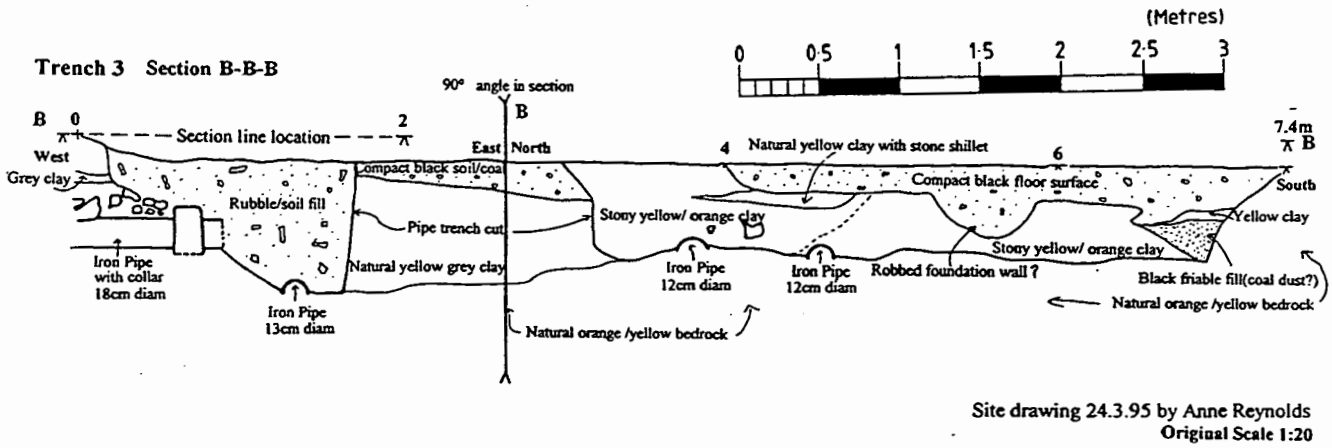



*Figure 9: Trench 3 Section B-B-B*

Mill. Instead four cast-iron pipes were found which seem to have destroyed the earlier boiler maker's shop foundation walls. However, the section does contain the cut of a robbed out foundation wall, which may be that belonging to the boiler

maker's building. Trench cuts for the cast-iron pipes are also visible in the section, which with the site plan create an interesting mosaic of pipes coming from different directions. Pipes run from the engine house (18cm diam) and boiler house (12cm diam), both possibly carrying excess condensed and waste water into the main water drainage system; two other pipes may run from either from the barn and stable or possibly from Henry Harvey's house located in the southern part of the study area. The section illustrates this confluence of pipes and the various backfill layers, also the black coal floor surface just outside the boiler house area which one would expect when the boiler is regularly being filled with coal.

This was the first trench to be excavated, and provided an insight into the natural ground levels and layout of the site. Natural rock was found within 0.08m of the existing ground level. This fact in itself indicates the extent to which the site has been subject to the "cut and fill" technique of making a flat building site from a sloping one; especially as the lower part would have been very wet, and adjacent to Penpol Pool. Thus the top level of the site under and adjacent to the Foundry Barn appears to have been removed to provide a flat area for building, and the excavated material used to build up or fill in other areas of the site to the east.

## Trench 4

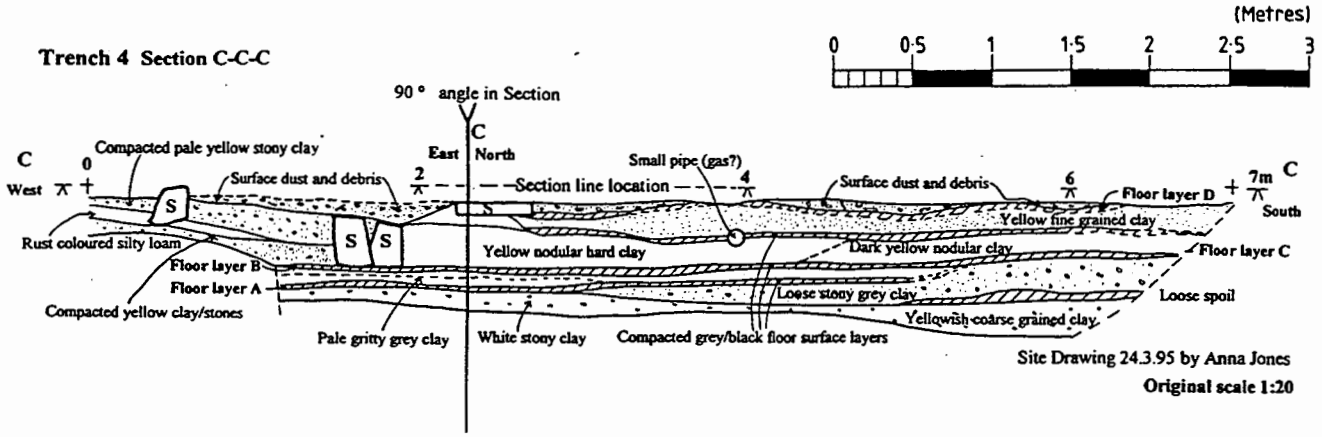



*Figure 10: Trench 4 Section C-C-C*

Photographs of the Central Erecting Shop (built ca 1860) give the impression of a substantial building. However this trench and the results of the site survey both suggest that these "sheds" or "shops" as they were known seem to have been constructed of large granite block piers (measuring approximately 2.0 x 1.6m), interspersed with cast-iron vertical supports and wooden infill with windows. This design resulted in the maximum flexibility of internal use, as well as allowing for the possibility of future extensions and additions. Apart from the extant foundry barn/engine/boiler house the Coliseum (fitting shop) was the most substantial building on the site, with continuous granite stone walls.

Smaller foundation walls were built between the granite piers, and it is the northern foundation wall of the central erecting shop that seems to have been uncovered in this trench, in the western end of section C-C-C.

The trench 4 section provided the first opportunity to observe floor layers and specific horizons that had been in use for a period of time. Generally these early floor levels consisted of hard compacted granite chips with a covering of coal or ash deposits. This observation ties in very well with the documentation and map information, and confirms the fact that most of the site within the study area (except for the barn and stable) consisted of a "coal plott" by 1815. Levels were taken on this earliest coal floor surface both in this trench and Trench 7; the two locations are some 40 metres apart but a height variation of only 0.38m was found. This floor level A (identified in section C-C-C), the lowest and therefore earliest floor level, represents the "coal plott", and perhaps indicates the first levelling of the site. Floor level B seems to be another, later hardcore base; it is of similar texture, colour and appearance to that of A and may correspond to the "coal yard" as labelled on the map of 1835. As can be seen from the section this floor level (B) underlies a possible wall foundation (S), and floor level C. Layers C and D may be associated with the Boiler Makers shop. This Shop was in place by 1841. Layer D may be the floor level of the final phase of expansion, where a newer higher floor was added.

As in Trench 3, natural rock was located only 0.7m below the existing ground level, which again demonstrates the amount of ground that has been taken away from higher part of the site to make the ground more level and even throughout. The site's second example of a small 0.04m iron pipe with screwed joints can be seen recorded in section C-C-C. Probably a gas pipe, it appears to travel towards the "Coliseum".

**Trench 5**

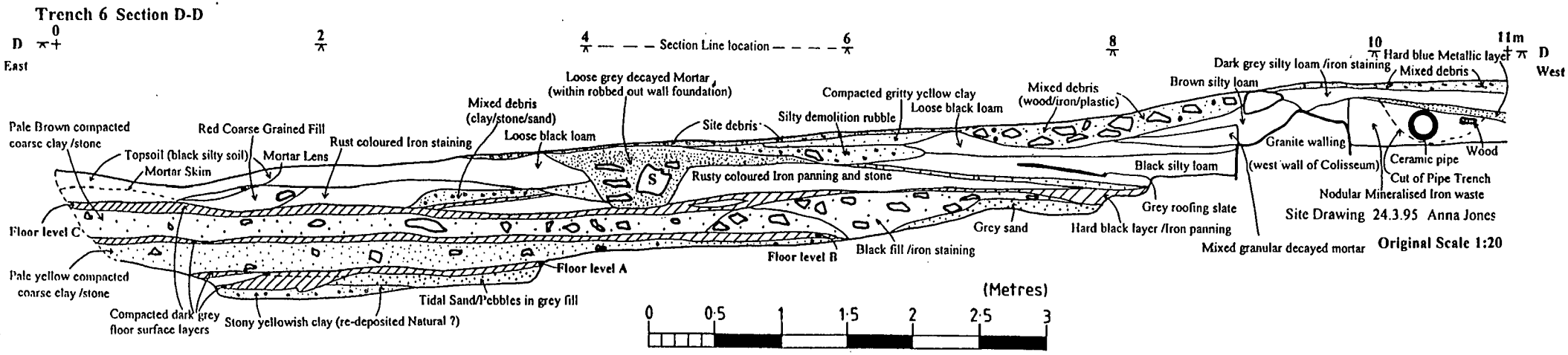
Henry Harvey's house seems to have been extant from ca 1790 until ca 1887. Its outline in plan changed little over its 80 years of existence, but it must have been a grand house (with fine architectural details and turreted stairtowers at either end of the front elevation) intended to at least match the Riviere Mansion house of 1791, owned by the Copperhouse directors.

Trench 5 was located to intercept the foundations of the western staircase turret or corner of the house. Unfortunately, although the trench was expanded to a 4 x 5m excavation no evidence of any building was found, and the mechanical excavator dug through 0.3m of subsoil directly onto natural clay and shillet. Consequently no plans or sections were made.

A close observation of the ground levels in this area of the site provides an explanation for the total disappearance of Henry Harvey's house. Levels taken indicate that over 2.0m of the original ground surface seems to have been removed at this end of the study area, which obviously included the house foundations. Reasons for this demolition may be twofold; firstly an expansion during the late 19th century into this end of the foundry complex, and secondly that occupation of the building was no longer tolerable with the foundry and hammer mills working 16 hours a day by 1871 (6 am to 10 pm).

**Trench 6**

This trench was designed to fulfil three requirements; firstly to investigate the floor levels of the "Coliseum" and remains of any earlier structures; secondly to




## Trench 6 Section E-E

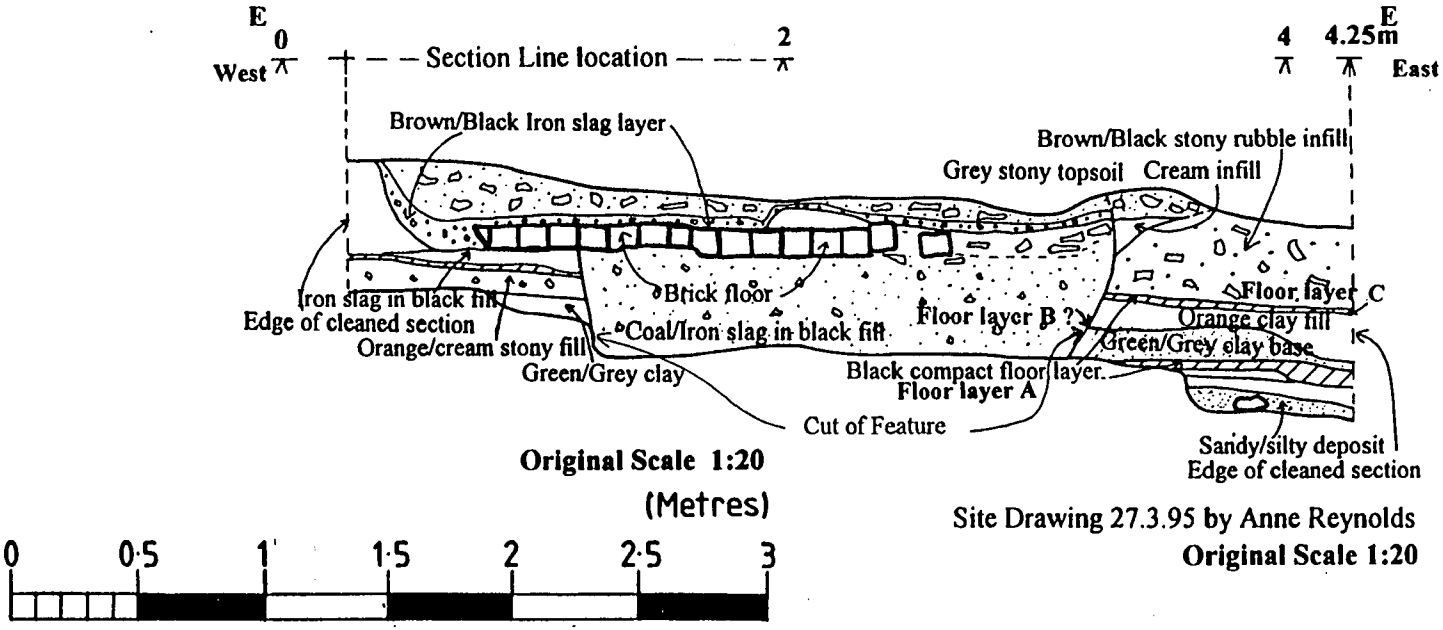



*Figure 11: Trench 6 Sections D-D and E-E*

investigate by machine the depth of the natural silts and to establish the present-day water table; and thirdly to locate the foundations of the "Coliseum" (fitting shop) west wall.

Three floor levels are recorded in Section D-D, labelled A, B and C; cutting the horizons above C is a feature located ca 4.5m along the section line which appears to be a trench, containing loose decayed mortar with some stony fill. The west wall of the Fitting Shop consisted of granite blocks, located at 9.0m along the section line D-D. The ceramic pipe located in the trench to the west of this wall has been laid within a very hard nodular iron waste which appears to have been banked up against the outside wall of the "Coliseum". The pipe's shallow depth, only 0.3m below ground level, perhaps indicates the extent to which ground level may have been reduced during demolition and site clearance. Part of the opposite (northern) side of the trench was recorded as Section E-E. Within this are floor levels A and C, a large cut infilled with cinders and iron slag, and a brick floor overlying the cut. Floor levels A and C are similar nature to the corresponding floors in section D-D on the opposite side of the trench. The cuts in opposite sides of the trench are quite different in character, suggesting that Trench 6 has intersected the junction between these two features.

Floors A, B and C appear to be spread and compacted yard surfaces constructed during the 1780 to ca 1840 period. They are likely to correspond directly to the floors found in trenches 4 and 7. A conjectural interpretation would involve successive levelling and raising of the site during this period, perhaps in response to flooding. The central cut in Section D-D may represent a robbed foundation trench for the western wall of the early Pattern Store, which pre-dated the "Coliseum" on this part of the site in 1828. The ca 1845 "Coliseum" replaced this Pattern Shop but was much wider. There seem to be no floor levels contemporary with the "Coliseum" in section D-D, although the brick floor in section E-E may represent a late phase of operation. The large cut in Section E-E may be the backfilled foundation trench for a large machine, which was supported on (removed) wood or masonry blocks; the brick floor was then inserted, presumably to level this section of floor.

The trench was deepened at the eastern end with a *sondage* until water was encountered at a depth of ca 3.0 metres. This water was contained within layers of gravel sandwiched between brown clay. Above the clay was a layer of dark grey alluvium ca 0.3m thick at a level of ca 2.5 metres, which was assumed to represent the original tidal mud of the upper part of Penpol Creek. Above this again was a layer of soft slate, presumably redeposited material from the western part of the site. This deep section was recorded photographically only.

**Trench 7**

This trench was sited in an area of the site which should have seen few phases of development, in order to establish a control for trenches 1-6. Section F-F shows the result. In the western half of the trench, three floor layers A, B and C were recorded. These were interrupted by the cut for a large (28cm dia) iron pipe. The eastern half of the trench was more confused, perhaps reflecting later disturbance, with a smaller iron pipe of 17cm diameter encountered at a depth of ca 0.6m. The section was terminated by the stub remains of the western wall of the "Coliseum".

Layer A was identical in character to the layer A recorded in trenches 4 and 6, and again probably represents the "Coal Plott" of ca 1780. The large iron pipe may

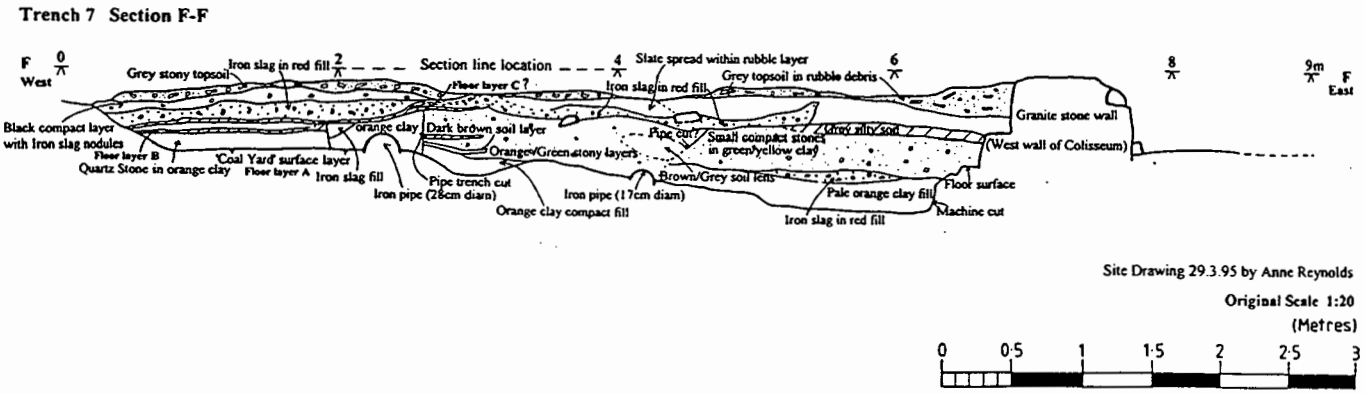



*Figure 12: Trench 7 Section F-F*

have carried some overflow water from the Hammer Mills off the site, and post-dates layers A and B, but not C. The foundation wall of the "Coliseum" extended 0.75m below the present ground surface.

### 5.4 Summary of Results

- **Trench 1**: The original aims for Trench 1 had to be modified as the ground was too hard even for the mechanical excavator to deal with. It also quickly became apparent that there was little remaining of the Coliseum engine room other than remnants of a brick floor. A small bore pipe underlying the tramroad at very shallow depth may be a gas pipe from the original foundry gasworks. The discovery of tramway rails *in situ* was a welcome surprise, with one rail still supported on its granite sett. The line is in the precise location shown on the site plan of 1853. Use of a simple bar rail section within the works indicates that the line was intended only for light, horse-drawn traffic, as would be expected.

- **Trench 2:** The Boring Mill group, with its associated Engine House and Boiler House, is one of the most significant and interesting parts of the Foundry site. Almost certainly built in a direct response to the orders for the Dutch Haarlem Mere pumping engines, this facility when complete was the largest in Cornwall and the South West, capable of boring a 150 inch cylinder 15 feet in length. This represents a notable technological landmark in the evolution of British heavy industry and the history of machine tools. The results of Trench 2 were unexpected and difficult to resolve. One would assume the original floor level in the Boring Mill to have been somewhat lower than the present-day concrete, in order to provide clearance between the centre of the boring bar and the outside case of a 150 inch cylinder. However, 3 metres is a massive difference in levels and represents a large-scale excavation within the Boring Mill, the purpose of which is unknown. The interior of this building would appear to offer excellent potential for further archaeological investigation, as the entire floor is likely to

be sealed by backfill and demolition debris; it should be completely excavated and recorded if it is to be affected by development.

- **Trench 3:** The natural slate was encountered at a depth of no more than 0.75 metres throughout Trench 3, and the section indicates that the ground has been levelled here by removal of the topsoil and subsoil at a relatively early period in the foundry's history. The large number of cast-iron pipes within the trench is very hard to explain in terms of possible function; the large (18cm) pipe in the north-west corner is most likely associated with the 24 inch engine in the Engine House.

- **Trench 4:** Once again, the natural slate was encountered at a shallow depth of no more than 0.70 metres. The three floor levels recorded are diagnostic of episodes of use which so far cannot be positively linked to datable horizons, but on the basis of available evidence would all appear to pre-date 1840.

- **Trench 5:** Once the trench was opened it was very soon evident that Henry Harvey's house had not only been demolished, but the ground on which it stood had also been removed, as the natural soft slate was immediately encountered. Confirmation of this was obtained by quickly examining the outbuildings to the rear of the house; their foundation level is almost 2 metres above the present ground level at Trench 5. As there was no archaeological material within the trench in the form of wall foundations, floors, or other features the trench was backfilled and not recorded.

- **Trench 6:** The *sondage* at the eastern end of Trench 6 appears to have established the original alluvials of Penpol Creek at a depth of ca 2.5 metres (1.7 metres OD). As expected, the front of the site bordering the Helston Road is therefore all made-up ground, raised and levelled by tipping material excavated from the higher (western) part of the site. The relative lack of structural remains and coherent upper floors in the section is a little surprising, but is probably simply an indicator that the floors of the "Coliseum" and that of the building which predated it in the main consisted of beaten earth.

- **Trench 7:** this confirmed the complex and confused history of various episodes of spread material and floors evident on the rest of the site. The large iron pipe (28cm) encountered at very shallow depth is a puzzling feature; the numerous pipe runs encountered throughout the site will require careful investigation to determine whether they still perform a storm water or other drainage function.

## Conclusions

Although relatively few structures were revealed by the trenches, the Site Investigation proved to be of great value in confirming the history of this part of the foundry site. The map and documentary evidence collected prior to the excavation was shown to be correct in its essential detail, and there are no "hidden" phases or structures beneath the known and documented buildings. As a result, it is

now possible to make informed recommendations to the Applicant and Local Authority.

The discovery of the tramway in trench 1 was an exciting and unexpected find; it is one of the very few examples of an early (1850s) railway still *in situ* with its original rail. That the original coal yard surface of the early 1800s should also survive intact in many places was also a welcome corroboration of the map evidence. The most puzzling aspect of the investigation was the large backfilled void in trench 2 (the Boring Mill). This feature will certainly provoke a re-examination of our (admittedly conjectural) interpretation of this area.

### 5.5 Site Survey

**Methodology**

As part of the Evaluation process, the site was surveyed on a base plan provided by the Applicant using a plane table and microptic alidade to a scale of 1:200. The survey included the evaluation trenches and all surviving features of the foundry which were visible at ground level. The site was also levelled using a dumpy level and sopwith staff from a Temporary Bench Mark (TBM) referenced to OS datum as detailed in Section 5.2.

**Results**

Prior to the Site Investigation, the site was cleared of rubble and debris by the Applicant. Although the contractors had not gone below the floor level of the buildings from the final phase of the site, they had nonetheless been thorough and there was little remaining infill or debris. The primary function of the survey was to accurately locate the position of the archaeological trenches relative to other features and the existing buildings; secondly, to make a full archaeological record of all surviving features within the study area.

As expected, there were relatively few features to record, demolition of all standing structures having taken place in the 1980s. Granite pillars survive to a maximum height of 1.1 metres in the northern part of the site, which are the stub remains of the supports for the travelling crane. Within these pillars, a concrete floor and pits for a vehicle hoist and inspection pit indicate a late reuse of this area for vehicle servicing. Elsewhere, similar granite supports for the travelling crane in the Central Erecting Shop survive only at ground level.

At the front of the site, there are the scant remains of the rear wall of the Fitting Shop (the "Coliseum") and fragments of brick flooring. The front wall footings now lie beneath the modern pavement, the road having been widened after the Fitting Shop was demolished. Particularly surprising is the slight impact such a large structure has had on the archaeology of the site, even below ground in trenches (6) and (7).

At the north end of the site, the survey identified and recorded the remains of structures which abutted the Barn on this side. These remains consisted of wall foundations, concrete floors, and a standing wall to a height of 1.8 metres.

In conclusion, it can be seen from the survey that the demolition carried out during the 1980s was particularly complete and thorough, leaving little trace at surface of

the complex and massive set of erecting and fitting shops which are evident in the contemporary photographic archives.

## 6. RECOMMENDATIONS

As a result of the documentary, cartographic, and exploratory trench Archaeological Site Investigation, this report makes the following recommendations to the Applicant and the Local Authority:

1. There may be important sub-surface archaeological remains within the footprint of the 1839-1842 Boring Mill, and preservation of the floor area of this structure is likely to be good. There are many unanswered technical questions relating to this important mill which can only be resolved by close examination of the remains. If development will affect this area, it should be a condition of consent that the Boring Mill is fully excavated and recorded in advance of any such development.

2. The northern continuation of the 1850s tramway may survive intact beneath the present tarmac access road into the site. If the road is to be relocated or affected by the development, the Applicant should make provision for a Watching Brief (by a qualified archaeological consultant) to record any surviving remains of the tramway.

3. The granite pillars which are the truncated remains of the travelling crane supports in front of the Foundry Barn date from the 1860s and have historic value. It would be beneficial to the future interpretation of the foundry if the Applicant could incorporate those which do survive into the development.

4. As far as can be determined by the Site Investigation, there are no other significant archaeological constraints to development on the remainder of the now unoccupied area of the site. The Applicant should make provision for a Watching Brief (by a qualified archaeological consultant) during the digging of foundation trenches, removal of ground, or laying of main services, to record any features of archaeological significance which may be exposed as a result of such work.

5. The Foundry Barn, Boiler House, Engine House, and Boring Mill complex has assumed even greater importance as a result of the documentary research undertaken for this study. The Foundry Barn incorporates part of a pre-1815 structure, and the granary portion is now dated to ca 1825. The additions which form the Boring Mill complex are datable to 1839-1842, and can be demonstrated to have a direct relationship to one of the most famous episodes in Harvey's history, the building of the Haarlem Mere engines. The cylinder of the great 144 inch engine which is now preserved in its house in Holland was bored within the walls of what is now Bookers car park. The Foundry Barn was later incorporated into the new Central Erecting Shop, and the large arch in the front wall of the Barn which survives today is clearly visible in a series of historic interior photographs of the foundry, one of which is the earliest photograph known of a Cornish foundry.

6. The Foundry Barn and Boring Mill complex should be the subject of either (i) adaptive re-use which retains the external appearance of the structure, or (ii) active conservation as a stabilised ruin. There should be no question of demolition. Before any works are undertaken which will affect the buildings, an archaeological Buildings Record should be made by a qualified archaeological consultant, as specified in *Foundry Square, Hayle, Archaeological Assessment,* CAU, 1993.

7. The Stables, Fire Engine House, and Stable Yard Walls form a cohesive and historically significant group together with the Foundry Barn. The Stable with the arched doors pre-dates 1828; the L-shaped block and Fire Engine House were in place by 1835. Both the early Stable and the Fire Engine House are of exceptional historic interest by having essentially intact period interiors; the Stable has the original doors, partitions, fitted cupboards and even sliding ventilator, while the Fire Engine House has its boarded ceiling. Such things are increasingly rare within the larger context of farm buildings and country house estates. That they should have survived from the earliest period of Harvey's Foundry when all the great fitting shops and casting floors have been lost is extraordinary, and it is therefore more regrettable that their significance has not previously been appreciated.

8. The Early Stable Block, Fire Engine House, Cobbled Yard, and Stable Yard Walls should be the subject of either (i) active conservation and restoration as part of a Foundry Museum and Heritage Centre scheme, or (ii) adaptive re-use which retains the external appearance of the structures. An attempt should be made to preserve original interior fittings where possible. The L-Shaped Stable Block should be the subject of adaptive re-use which retains the external appearance of the structures. The Link Building between the Early Stable Block and the Foundry Barn is of poor quality and could be removed or reconstructed to suit a new function. Before any works are undertaken which will affect the buildings, an archaeological Buildings Record should be made by a qualified archaeological consultant, as specified in *Foundry Square, Hayle, Archaeological Assessment,* CAU, 1993.

9. The Local Authority may wish to take into account the effect of the new housing and its detailed design on the Hammer Mills, the Foundry Barn, and Boring Mill. If these historic structures are to be retained and have an essential future as part of Hayle's heritage, their benefit to the (international) tourist trade as a potential economic force in the town should not be compromised by inappropriate design and massing of the new housing scheme.

John R Smith

Colin Buck

CAU, April 1995

## APPENDIX

**Timeline**

| | |
|---|---|
| **PHASE 1** | **1779-1815 The Early Years** |
| 1779/80 | John Harvey moves to Hayle (Carnsew) and builds his small iron foundry. |
| 1780 (Sept) | Lease from Henry Lord Arundell to J N. Harvey *"to build canal for new foundry on Penpoll wastrell and to use riverlet"*. (Previously ships min 40/50 tons discharged goods on beach - so deepened to c.30/40 ft wide for c.200 yards of Penpoll River). |
| 1780-1789 | Carnsew channel deepened. (Quay built up by G. Blewett 1758-1780 to include stone quay, counting house, storage sheds and timber pound). |
| 1781 | Letter stated *"as Harvey takes a most unreasonable time to his jobs and charges high"*. |
| 1783 | Tehidy Estate of Lord de Dunstanville: *"To John Harvey for cast iron stoves for Tehidy kitchen, £1.9.2"*. |
| 1786/88/89 | References to Harvey's miscellaneous iron castings to mines. |
| 1789 | Carnsew Quay transferred to Cornish Copper Company (include above plus channel, cellars). |
| 1791 | (Prior to this date) - a boring mill had been erected (condensers, air pumps and nozzles were being made) for Ding Dong mine. |
| 1791 | H. Harvey imports skilled labour, from Bristol etc. |
| 1792 | H. Harvey wrote *"Another fire engine to be built in the foundry immediately"* (possibly Newcomen design). |
| 1792 (Dec) | H. Harvey writing to Mr J. Hornblower (engineer for Wh.Unity, Poldice and Tincroft) stated on the making of brass *"You cannot mix the metals so well in pots as we can in the air furnace"* (i.e. foundry at this time possessed a reverberatory or air furnace). |
| 1793 (Mar) | H. Harvey employed c.20 men making mine castings and an order for 10x9cwt press plates. |
| 1793 (July) | Letter from H. Harvey stated *"the greatest thing that oppresses us is the slackness of water to execute the work. Rev. Mr Robinson has just dropped us an order for castings for his refining furnace"*. |
| 1793 (July) | Lease stating *"Lessee has lately spent considerable sum of money in building an iron foundry with warehouses, cellars and courts"*. (lease for 1/3 part of newly erected iron foundry). |
| 1793 (July) | Lease stating *"Lessee has lately spent considerable sum of money in building a boring mill and 3 messuages"* (use of watercourse for working boring mill ). |

1795 Pooling up of river around boring mill.

1801 Castings for R. Trevithick's first locomotive made.

1803 Castings for William West locomotive made.

1803 John Harvey died (October). Henry Harvey took over ownership (born 1775).

1806 Small high pressure engines manufactured by 1806 (ie 1 x 12" cylinder for Crinner; 1 x 14" cyl. for Perran Sands).

1807 Evidence from a lease indicates that H. Harvey's house and Mr West's existed as well as two houses by the millpond (built by H.H.).

1809-12 Particulars of a law suit indicated Harveys property as being a *"messuage called Mellanhire, with walls of old stamping mill adjoining, a boring mill, 2 mess. lately built by Henry Harvey adjoining the mill, over 20 acres land and newly erected iron foundry with several warehouses and cellars and the canal from Hayle River to the Foundry"*.

1810 Alterations to Harveys premises.

1810 Advert for a foreman for the foundry in the Bristol and West of England papers *"a sober man used to both loam and dry sand moulding - castings chiefly steam engine work - no kettles or store work. We cast about once a week on average through the year"*. (salary £80 pa + house provided).

1812 Inventory of stock (Sept)

Sundry flasks - (engine beam flask, sheave flask, segment flask) = £400.

Wrought iron beams and core bars (ie wrought iron spindles for striking loamwork, cast iron plates for striking cores).

2 cranes (1 large and one small foundry crane).

1 new cast iron stove carriage with wheels and axles.

Patterns (some specified *"pewter pattern for whim sheave - 70 lbs"*) = £150.

No mention of furnaces (perhaps included in £150 fixtures?).

No mention of engine parts but heavy stock of pumps from 4" to 16" (9 ft long)

1813 An engine for rock boring constructed to R.Trevithick's design (for use on Plymouth breakwater). First power driven rock drill in the world?

1815 H. Harvey could not make the cylinders and cases of engines - but can make every other part.

1815 R. Trevithick's pole steam engines made at Harveys.

**PHASE 2** **1816-1835 The Foundry Under Arthur Woolf**

1816 A. Woolf became superintendent of the foundry and promoted the development of the foundry into an engine manufactory. He was the first to make a wrought iron boiler tight for high pressure steam in Cornwall and stamping of ores by steampower (ie made ore stamper for Wh.Fanny (Carn Brea) in 1813/14, pumping engines for Wh.Abraham 1814; and Wh.Vor 1815). He developed 70" and 40" engines for Wh.Alfred in 1824.

1816 Stock Book (Sept) 4 engines in hand (for: J.Richards, Wh.Virgin, Mill Engine, and Mr.Frazer.)

1816 H. Harvey erected furnaces for tin smelting (through his interest at Wh.Vor):

Output = c.150 blocks per quarter (3 blocks coined at Penzance, and 32 blocks at Helston ).

1816 Cash Book entries for 14 Nov (new foundry built capable of dealing with the larger castings required).

Building the walls of a new foundry.

363 perches (1 ft = 4/6d) (1 perch = c.16½ ft or c.5.0 metres)
£59.3.6

149 perches (1 ft = 3/6d)
£26.1.6

Helling roof 68½ sq ft (1 sq ft = 10/6d)
£35.19.3

Plastering against Pins = 624 yards (4d per yard)
£10.8.0

Cleaning and cutting - 1480 ft moorstone at 6d
£37.0.0

2 moorstones 23 ft (at 4d)
£0.7.8

42 stones under pillars (at 8d)
£1.8.0

Providing stone for foundry crane
£0.9.0

Labour for providing stone
£3.1.7½

| | |
|---|---|
| 1817 | Letter from H. Harvey stated *"we can bore a 63" cylinder"* (if it doesn't exceed 10 ft 9" length). |
| 1818 | Copper house quay built. |
| 1818 | Harvey's wharf constructed (£9000). |
| 1819 | Delivered in 3 weeks: a cast iron engine beam to weigh 20 tons for United Mines (£320). |
| 1819 | Completed body of holing machine (used for making rivet holes in boiler plates). |
| 1820 | Stock £1000 for new machinery in the mill (most machines made at Hayle). |
| 1820(Sept) | *"Licence for Geo.Grenfell to import coal and culm for carrying to a tin smelting house which it is intended to erect on said plot, for use of the smelting house".* |
| 1821(March) | Letter stated *"we have no tin to dispose of, having some time since given up smelting".* (new tin smelting furnaces on Wh.Vor worked from 1823-1844). |
| 1821 | So much work carried out at the foundry new orders were turned away. |
| 1821 | Stock £1200 for new machinery in the mill. |
| 1822 | Stock £2000 for new machinery in the mill. |
| 1822 | Evidence of a later 1836 lease suggests the Granary and Grist mill were built between 1822-1829. |
| 1823 | Whereas the original melting furnace of John Harvey was undoubtedly a reverberatory/air furnace, during the 1820's (before 1823) cupolas were in use. The blowing engine was a puffer single engine of 5" cylinder with an 18" stroke with wrought iron boiler weighing 24 cwt. The cupolas melted about 10 cwts to a charge. |
| 1823 | Coke for the cupola was made at the works. In this year the amount of coal coked was 120 .weys, of 72 bushels each annually. Method of production - *"we charge into our oven 32 bushels of coal which make 80-90 cubic feet, or 15 cwt of coke and cost us about 19/-".* (The foundry also ground its own coal dust in the Blacking mill). |
| 1824 | H. Harvey answered an enquiry in May for a 60" pumping engine (out of county) - stating they had made them for: Wh.Busy, E.Crinnis, Wh.Charlotte, Wh.Vor, Wh.Alfred and Polgooth. |
| 1824 | So much work that men were working day and night (for example; a quote stated that 3 engines and pitwork would be ready in 6 weeks). |

1824 Trip by H.Harvey and A.Woolf to Birmingham (Eagle foundry) and Wales (Neath Abbey iron works) to view recent developments/technology?

1824 White Hart (now Masonic Hall) built for Jane Trevithick ( retired in March 1837).

1825 (Oct) c.232 employees.

1826 Hammer Mill:

Screwing m/c ,Drilling m/c,Screwing m/c(flat thread), Grind Stone m/c, 8" cyl steam engine with 30" Air Cylinder
£100.00

16" double cylinder steam engine with boiler, stand, sweep etc
£240.00

18" double cylinder steam engine with boiler, stand, sweep etc
£295.00

Large Hammer
£279.7.3

Stamping Mill complete, Buddle Stroke (incl. launders and frame), Small Hammer
£177.19.3

Blacking Mill

Hatches and Barrels, Large Blacking Mill

Boring Mill

Boring and Turning apparatus in the Boring Mill (with water wheel)
£729.18.7

Sundry Oak Cells and other timbers in foundation of Boring Mill
£24.0.0

Cast Iron Blowing Cylinder
£30.1.0

4x11" (9 ft stroke) Pumps under floor
£14.0.0

Cast Iron Water Pipes
£40.0.0

Two Cranes and Winches in Boring Mill
£10.0.0

Flood Hatch and Frame

Large Lathes - 4 in Under Fitting up Shop with 5 Upstairs (from £7-£47 each)

Drilling m/c in Fitting Up Shop
£48.8.3

| | |
|---|---|
| 1826(march) | Stock Book : 6 engines then in hand and 1 recently completed: |
| | (28" for Mr Woolf, 15" for Great Work Whim, 27" for stock, 36" for Wh.Bounty, 40" for Wh.Prosper). |
| | 3 Boilers in hand (for Great Work, Perran Foundry, Holdsworth/Phillips) |
| 1826(April) | c.150 employees. |
| 1826 | Grist Mill - a pair of 4 ft diam Caen stones procured for milling. |
| 1827 | Machinery installed in Grist Mill. (3 millwrights paid but no mention of Mill in Stock Book until 1829). |
| 1827 | H.Harvey leased Carnsew Quay after C.C.C. lease expired. |
| 1829(March) | Stock Book: 3 mills mentioned under headline -Grist Mill: (pony power used?) |
| | Front and South Mill had 2 Caen stones each; North Mill had 2 Granite stones. |
| 1829 | After C.C.C. lost the lawsuit (over boundaries/quays dispute) , they closed their floodgates-resulting in Harvey's harbour silting up. Harvey responded by building his own reservoir for sluicing his part of the harbour. A tram railroad was constructed to bring quarried stone from Carnsew Cliff to build up the Weir and Basin (completed Dec 1834). |
| 1830 | *"The longest Bob we ever made was for a 90" engine"* (10ft str 29'4" long). |
| 1830's | Agricultural machinery made for foundry farm and some for general sale (ie ploughs, thrashing m/c, chaff m/c, potato steamers, manure carts). |
| 1830 | Value of stock at grist mill = £382.13.2½. *"We have several teams of horses who eat c.20 to 30 bushels per day each".* |
| 1830 | H. Harvey's gasworks plans drawn - gasometer 27 ft diameter and 14 ft depth designed to power 75 lights for the foundry (not erected until 1843). |
| 1830's | Nicholas Harvey - due to general depression of mining in the 1830's (copper/tin price fluctuations) sought out new orders for the family business (60" engine to Holland; 90" to Belgium from 1834). |
| 1832(July) | Steam engine erected at grist mill (later replaced in 1836 by a larger one). |
| 1832 | Penpol terrace built and iron swingbridge (replacing a wooden one). |
| 1833 | A. Woolf retired (failing health). |
| 1833 | Upon N. Harvey's return a re-organisation of workshops took place and more new tools installed (some foundry made, some purchased). |

1833 Coinage hall on quay in existence by 1833 (used until 1839 when it was used as a warehouse).

**PHASE 3 1836-1853 The Foundry at its Peak**

1836 Inventory of stock

Machinery in fitting up shop:

Little lathe (from Derbyshire) with machinery (8 foot Jobbing lathe) £52.00

Planing machine (cuts forwards and backwards) (from Derbyshire) £235.00

6 lathes complete (Nos. 1,2,3,4,8,11) at £60 each £360.00

3 old lathes (nos 6,7,9) and 2 chuck lathes (nos 5,10) £117.00

Steam engine with boiler complete £160.00

Drilling machine £30.00

Machinery in boring mill:

Large and small cylinder boring apparatus complete

Apparatus for turning plunger poles and large and small chuck lathe complete

Pump boring apparatus

Small cylinder Boring apparatus

2 Cranes with blocks

Water wheel, cistern and pipe for supplying same with gear wheels for working lathes £70

Oak cells in boring mill £70

Hammer mill:

Engine with boiler complete £200.0.0

Hammer and frame with shaft, flywheel, stands etc. £140.0.0

Charcoal mill £8.0.0

Blast engine complete £150.0.0

| | | |
|---|---|---|
| | Drilling machine | £5.0.0 |
| | Machinery for stamps incl. waterwheel | £10.0.0 |
| | Hydraulic press for proving chain | £30.0.0 |
| | Weighbridge complete | £45.0.0 |
| | Blocks, chains, winches and shears in yard complete | £50.0.0 |
| | Engine and boiler complete with shafts, pinching press etc. | £200.00 |
| | Extinguishing engine complete with 120 ft of leather hose | £100.00 |

1836 c.305 men employed.

1836(Feb) *"Weighbridge made (or 2) for our own use to weigh about 8 tons".*

1836 Stock books:

13 engines in hand (80" for Wh. Bucket; 4 x 60" for De Dunstanville, Perran Consols, Hayle Consols; 50" for S.Wh.Leisure and Pollvean; 45" for Trewavas; 36" for Tregarova; 24" for Wh. Spiers; 20" for Tamar mines; 16" pressure engine for Cpt. Clemence).

3 boilers in hand (for Perran Consols, Wh. Darlington and Hayle Consols).

1836 Lease - Harvey's owned 18 acres of land, 26 dwelling houses, Mr Harvey's dwelling house, part of stables, boring mill, grist mill, granary, ropewalk, water stamps, part of foundry yard and White Hart.

1836 Large steam engine added to grist mill.

1837(Oct) Lease - *"of boring mill, also dwelling houses, steam grist mill, and White Hart lately erected by Henry Harvey, with use of watercourse for boring mill except tin smelting house and buildings erected by Geo. Grenfell".*

1837 Mellanear smelting works operating (by Mr Michael Williams).

1837 Mining depression again affecting home domestic orders.

1838/9 New White Hart built. Leased by Wm. Crotch who set up a regulator coach and omnibus for Penzance and Truro which ran daily. Also convenient stop for passengers using "Herald" steamer which sailed from Hayle foundry to Ilfracombe and Bristol every Tuesday - returning the following Saturday.

1838 Stock list for grist mill:

20" double engine complete with flywheel, shaft etc. Mill machinery : pit wheel, crown wheel and pinion for 4 pair stones - other items include - corn elevator belt (86 tin cups on belt); wood pipes to convey corn in mill and granary. Hoist in mill and another in granary. New flour machine and (Smut?) machine complete. Thus new mill used not only for fodder but for grinding flour for company shop - also bake house existed by 1838 for ship bread, loaf bread etc.

1838 Stock books: includes item 242 pieces of pumps for Mexican 60" engine.

1838 Again due to lack of orders N. Harvey made extensive tours of Wales and London looking for new orders:

1. In Wales exchanged coal for Hayle engines.

2. Gained new orders for blast furnace engines for smelting works. H. Harvey wrote *"at present we have in hand 2 x 60" and 2 x 90" blowing cylinders for blast furnaces".*

3. Orders gained for engines to work rolling mills and boilers.

1839 In 1839 a new boring mill capable of boring cylinders of 150" diameter was being built. This mill was to be independent of water and steam driven by a new 24" engine under construction in September.

1840's Expansion of the works in the 1840's due to water board contracts in UK cities and low countries.

1840 Cash book

| | |
|---|---|
| Building walls of boring mill (1598 perches at 2/-) | £159.16.0 |
| Laying roof (78ft sq at 9/-) | £35.18.0 |
| Plastering against pins (877 yds at 2d) | £7.6.2 |

1841 Royal Commission enquiry (into conditions of work for children?). Evidence given by N. Harvey. Hours of work :

| | | |
|---|---|---|
| 6 am to 6 pm (1 March to 1 Nov) | 8-8.30 breakfast | 12-1 dinner |
| 7 am to 7 pm (2 Nov to 29 Feb) | 8.30-9.0 breakfast | 1-2 dinner |

1841 464 employees (344 over 18 yrs; 75 between 13-18 yrs; 45 under 13 yrs).

1842 H. Harvey wrote *"we have just finished a strong boring frame, Bar 34 inches diameter and calculated for boring cylinders 150" diameter and 15 ft long".*

1843 Another larger grist mill erected.

1845 Foundry chapel built c1845.

1847 Properties at rear of White Hart Inn built soon after 1847 (2 dwelling houses).

1847 Stock book:

Fitting up shop:

4 x planing machines (beds from 6 ft to 20 ft and width 1 ft 8" to 4ft)

17 x turning lathes (various sizes).

3 x chuck lathes with 5/6000 various files for finishing

Radial drilling machine and shaping machine

Old boring mill:

Large and small boring frame for cylinders.

Large and small chuck lathe.

New boring mill:

Steam engine and 2 boilers complete and large boring frame complete.

Vertical boring apparatus, frame etc. (bought from Liverpool 1843);

chuck lathe complete (16ft).

Hammer mill:

20" engine complete; 14" blast engine; 2 x hammers

Flywheel framing and screwing machine.

4 x furnaces for faggoting and a Nasymyth's patent steam hammer.

Boat yard:

New eccentric punching machine, new shears to lift in the boilers of steam tugs.

Boiler Yard:

14" engine and machine for bending boiler plates.

1847 Hen. Harvey had an *"attack of paralysis"* Xmas 1847. He then took life easier and had other outdoor employments (Carnsew hill fort/park) which included planting trees - but he could not walk unaided.

(Up to) 1847 When the inventories of stock for 1816, 1826, 1836 and 1847 are compared; the increase in the number of tools that will be noticed during these 10 yearly periods indicates the growth of the works from a foundry chiefly engaged in casting pumps with a few auxiliary tools to enable an occasional cylinder to be bored, to a well equipped factory turning out engines second to none in the world.

Early 1850's London office of Harvey's opened.

Early 1850's So many orders that Perran or Copperhouse foundries took the overflow (12 month waiting list at Harvey's). Large numbers of pumping engines built for metropolitan water boards and mortars for Crimean war.

1850 Henry Harvey died in May - a quote of his *"I have always made it a rule, whenever I find myself deficient in ability, to endeavour to make it up by industry and perseverance"*.

1852 Under a partnership agreement made some time before his death H. Harvey's estate was divided up. Foundry, rope walk, lime, coal, timber and iron trades, wharves and shipping retained by Harvey and West families. Payment of £17,777 plus Grist mill, grocery and draper business taken by Trevithicks as their share of their uncle's estate.

**PHASE 4 1854-1877 Tightening the Belt**

1864 Mellanear mine and Wh.Alfred Consols were wound up.

1864 Harvey's rate valuation lists indicated following properties - Carnsew, Mellanear, Trelissick, old smelting yard, stable and oats stores, reading room + school room foundry hill, coal yard, improved land at Carnsew, stores and dwelling house, C. Olivers quay, shipwright's yard and premises, boiler and iron shipyard, batten yard, steam sawmill, lime kilns, timber plots, wheelwright's and carpenters shop, stores sheds and weighbridge, offices, foundry, ironmongers shop, gas works, gasometer, higher hammermill, ropewalk, wharf leased to West Cornwall railway, harbour dues, copper ore plots, wharfage dues.

1866 633 employees at Harveys.

1869 Public hall built c.1869.

1870's Reduction of making Cornish pumping engines as depression in mines forced many to sell, leaving idle their steam engines - some brought back to Harvey's and reconditioned. Some sold to other counties ie Cumberland purchased a 100" from Wh. Rose and 90" from Wh.Trelawney.

1870's Further extensions to Foundry:

Fitting shop: (on 2 floors) *"Here the forgings were finished and not many years ago nearly all the work in the fitting shop was done by hand. Now the shop is full of ponderous machines".*

Vice shop : small parts that could not be dealt with by machinery were finished here and at the end of the fitting shop was a department making *"Mr Husband's Pneumatic Stamps".*

Erecting shop : (adjoining the fitting shop) - various engine parts assembled - pumping engines supplied to Metropolitan water works incl: Newcastle on Tyne collieries, Newcastle and Gateshead water works, London, Liverpool and Manchester Metropolitan Water Boards.

Casting foundry: making beams, cylinders, pumps et al - *"Cupola furnaces constantly charged, molten iron carried in single or double handled ladles and huge iron kettles fitted with gear to shift them."* (Common size of cylinders are 90" - frequently large).

Boring shop: *"one may see a row of immense iron rings 7 or 8 ft wide and 10 or 12 feet deep, each with temporary axles and turning round while a planing tool working in circles makes the interior surface true and bright".*

1871 Harveys working 8-10 pm every night.

1873(Oct) 9 hour day introduced (6 am-5 pm).

1875 The swing bridge constructed in 1832 was replaced.

1876 Weighbridge on wharves purchased (platform 20 ft long; weigh capacity 20 tons, capable of taking 40 ton broad gauge loco). This existed until 1952.

**PHASE 5 1878-1903 Decline and Closure**

1879(early) Foundry workers on 10% reduction pay and mechanics on part time.

1879(Oct) Harveys men mostly on full time (as Perran Foundry had closed).

1880's Metropolitan Water Board contracts kept Harveys' business ticking over.

1885 Harry Harvey took charge of engineering works (overall a spurt in business during the next five years, then gradual decline until closure in 1903).

1887 Listing of proposed new gas circuit included item `new erecting shop and yard' - as separate from erecting shop (and two hammer mills).

1888 New gas works built by Willey & Co (Exeter) for town and foundry.

1888 c.1200 employed (shipbuilding took many).

1888 Further expansion in forge, machine, shipbuilding and boiler dpts (the latter dpts meant steamships of carrying capacity of 4000 tons could be built). During this period exports of steam winding engines and air compressors to South Africa, stamps to Transvaal. Harry Harvey introduced the use of cast steel ingots in the smithy for the making of large forgings in place of the faggot iron previously used, and a 'steel mix iron' for pumps to South Africa.

1889 Night shifts established in the new machine shop and hammer mill.

1890 Harveys employed c.8-900 men.

1890 Fire at old pattern shop (20 ft away from the new pattern shop).

350 shipbuilders on strike over the 52 hours per week imposition.

1890 Following account written 18/4/1890 in the *Engineer* magazine describing Harveys foundry:

Forge and smithery dpt:- was a large rectangular building containing 4 steam hammers (largest 6 tons) which together with 2 powerful cranes had recently been added to the plant. Hammers worked day and night turning out the forgings. Variety of large and small forges places throughout the shop. Labourer's work was specialised to his trade.

Machine fitting and erecting shop: (close to the forge) Main machine shop c.250 ft length and one storey high. It is entered through the new machine shop, a fine building (120 ft long by 45 ft wide. Lofty and well ventilated windows in the roof and sides. Floor cemented throughout - railway runs through the centre of the shop, communicating with the forge. All the motive power for machines is placed on either side, leaving space for the overhead traveller which runs the entire length of the shop and commands every machine there.

Boring mill :(few steps from the m/c fitting shop) older than above and erected nearly c.75 years ago. Altogether nearly 100 machines in both shops. (Fitting and erecting shops adjoin the machine shops - the latter has 40/50 apprentices working them).

Two Erecting shops: one for heavy, one for light work. Both have travellers traversing the entire length and width - the main one can lift 25 tons.

Pattern shops: long rows of buildings - where all the patterns are prepared for the foundry, and numerous pattern lofts (stored for all classes of engines).

Foundry: casting work carried out in a 24,000 sq foot building. At the top end are placed 5 cupolas. In addition are two large air furnaces - linked to a 120 ft stack. All around the building are the ovens in which the various moulds and cores are dried. All interior area used by revolving cranes or travellers. Castings up to 25 tons in cwt are made. A new shop is being added here for casting light pump work for the Transvaal.

Boiler yard: (many changes prior to 1890). New building laid down - covers an area of 26,000 sq ft. Main shop is 260 ft long by 48 ft wide. A 45 ton traveller running its entire length, every motion of which is controlled by steam power. There are two other travellers of 25 and 10 tons. The rivetters, flanges, and manhole punch are all on the hydraulic system. Vertical rolls are of massive construction (it can roll plate 1½" thick and 11`6" length). A machine is being erected for boring holes in boiler plates.

| | |
|---|---|
| 1892 | Harry Harvey died in December. He was the last of the 'engineer' based directors - all others were merchants. |
| 1894(June) | Directors' decision to wind up the foundry and concentrate on the mercantile side of the business. |
| 1895 | Period of making men redundant - pay reduced for remainder. |
| 1903 | Decision taken by directors to close down the foundry in June. |
| 1903(Nov) | £9900 accepted for fixed and loose plant and tools in the Foundry (except for those in the small workshop). T W Ward dismantled and scrapped the foundry. |

## SHIPBUILDING

Major phases:

| | | | |
|---|---|---|---|
| 1. | 1834-1862 | Wooden sailing vessels | Produced 20 ships |
| 2. | 1862-1887 | Iron vessels | Produced 47 ships |
| 3. | 1887-1893 | Large steel vessels | Produced 12 ships |

**79** ships total

Harveys had wharfs at London, Marazion, Truro and Porthlevan.

## BIBLIOGRAPHY


Anthony G H, 1968, *The Hayle, West Cornwall and Helston Railways*, Oakwood Press

Barton, DB, 1969, *The Cornish Beam Engine*, 149 *et seq*

Bliss V, 1978, *The History of Hayle*, Penwith DC

Butts, V, 1978, *The History of Hayle*, unpub. manuscript

Ferguson J, 1993, *Hayle Historical Record*, unpub. manuscript

Harris TR, 1937, *Copperhouse Foundry*

Harveys of Hayle Catalogue, 1844, at RIC Truro

Lake, 1872, *Parish Histories of St Erth and Phillack* (vols I and IV)

Minchinton W and Perkins J, 1971, *Tide Mills of Devon and Cornwall*, 14

Noall C, 1984, *The Book of Hayle*, Barracuda Books

Pascoe W H, 1981, *The History of the Cornish Copper Company*, Dyllansow Truran

Penwith District Council, 1991, Planning Application 1/91/H/0054/F

Penzance Teacher's Centre, 1978, *Tayle of Hayle*, Cornwall Education Committee

Rolt, LTC, 1965, *Tools For The Job*, 56, 77, *et seq*

Smith, JR, 1993, *Foundry Square, Hayle, Archaeological Assessment*, Cornwall Archaeological Unit

Smith, JR, 1990, *Perran Foundry*, Cornwall Archaeological Unit

Vale E, 1966, *The Harveys of Hayle*, Bradford Barton

CRO H 162/1 Article on early history of the Foundry

CRO H 165/5 Valuation 1841

CRO H 165/6-16 Valuations 1864-1897

CRO H 165/33 Chronology of events 1864-1883

CRO H 215 Photographic Album 1897

CRO WH 2815-2819 Hayle Foundry 1793-1853

CRO H 217 Draft history of Hayle, T R Harris, ca 1950

CRO TM59/TMA 59 Tithe Map St Erth 1842

RIC MMP/51 Map ca 1790

CRO H 166/46 Map of 1815

CRO H 166/20 Map of 1828

CRO H 166/33 Map of 1835

CRO H 166/11 Map of 1841

CRO H 166/22/2 Map of 1853

CRO H 214/3/2 Map of 1864

CRO H 166/21 Map of 1887

CRO H 166/48 Map of 1890

OS First Edition 1:2500, 1877

OS Second Edition 1:2500, 1907

## CAU ARCHIVE

The Archive produced during this project has been incorporated into the Cornwall and Isles of Scilly Sites and Monuments Record (SMR) housed at the Cornwall Archaeological Unit, Old County Hall, Station Road, Truro, Cornwall. It consists of the following:

| | | |
|---|---|---|
| * | Field sheets and survey drawings | GRE 195, 195/1, 195/2, 195/3 |
| * | Finished drawings | GRH 207, 207/1, 207/2 |
| * | Photographs | GCS 16250-16292 |
| | | GBP 496 (1-36); 554 (6-16) |
| * | CAU SMR | PRN 31891 |