

Cornwall's Industrial Heritage

A guide to the 12 tours of the Association for Industrial Archaeology's
Conference Week in Cornwall, 3-9 September 2010



organised by

The Trevithick Society

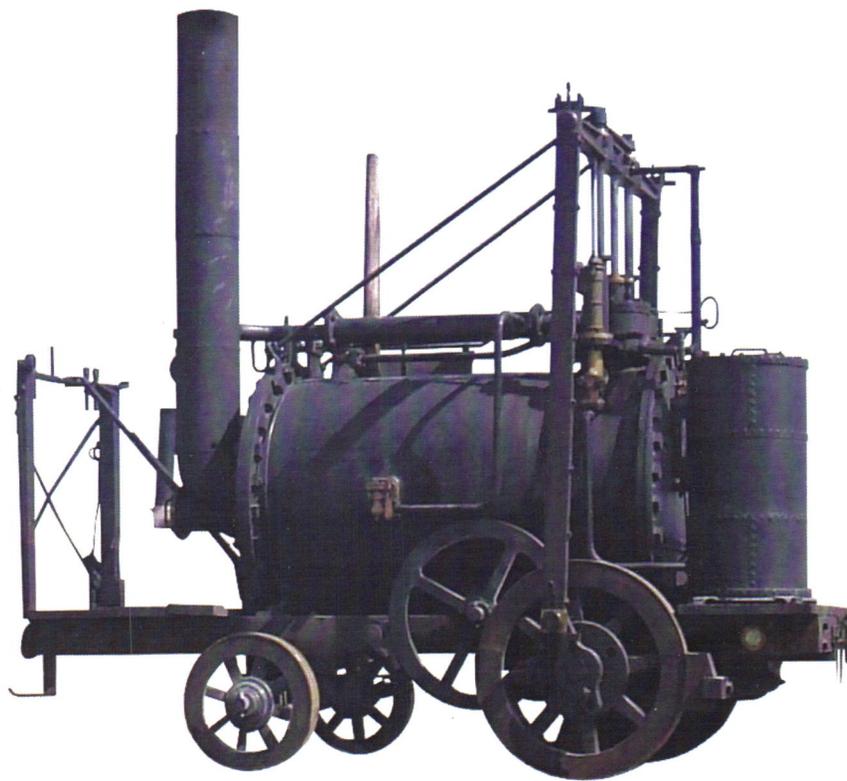
1935-2010



75 YEARS

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Full-scale working replica of Richard Trevithick's 'Roaring, Puffing, Devil',
the world's first successful self-propelled road vehicle, built by the Trevithick Society
for the bicentenary in 2001.

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The Trevithick Society

1935-2010  **75** YEARS

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Pendeen Community Heritage

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Frontispiece, 16 (top), 17, 18, 19, 21, 22, 23, 25 (bottom), 26, 29 (bottom), 31, 32, 33, 34 (top), 35, 38 (bottom), 39 (bottom), 40, 41, 42, 43, 44, 45, 46, 52 (bottom), 53, 54, 56, 57, 58, 59, 62

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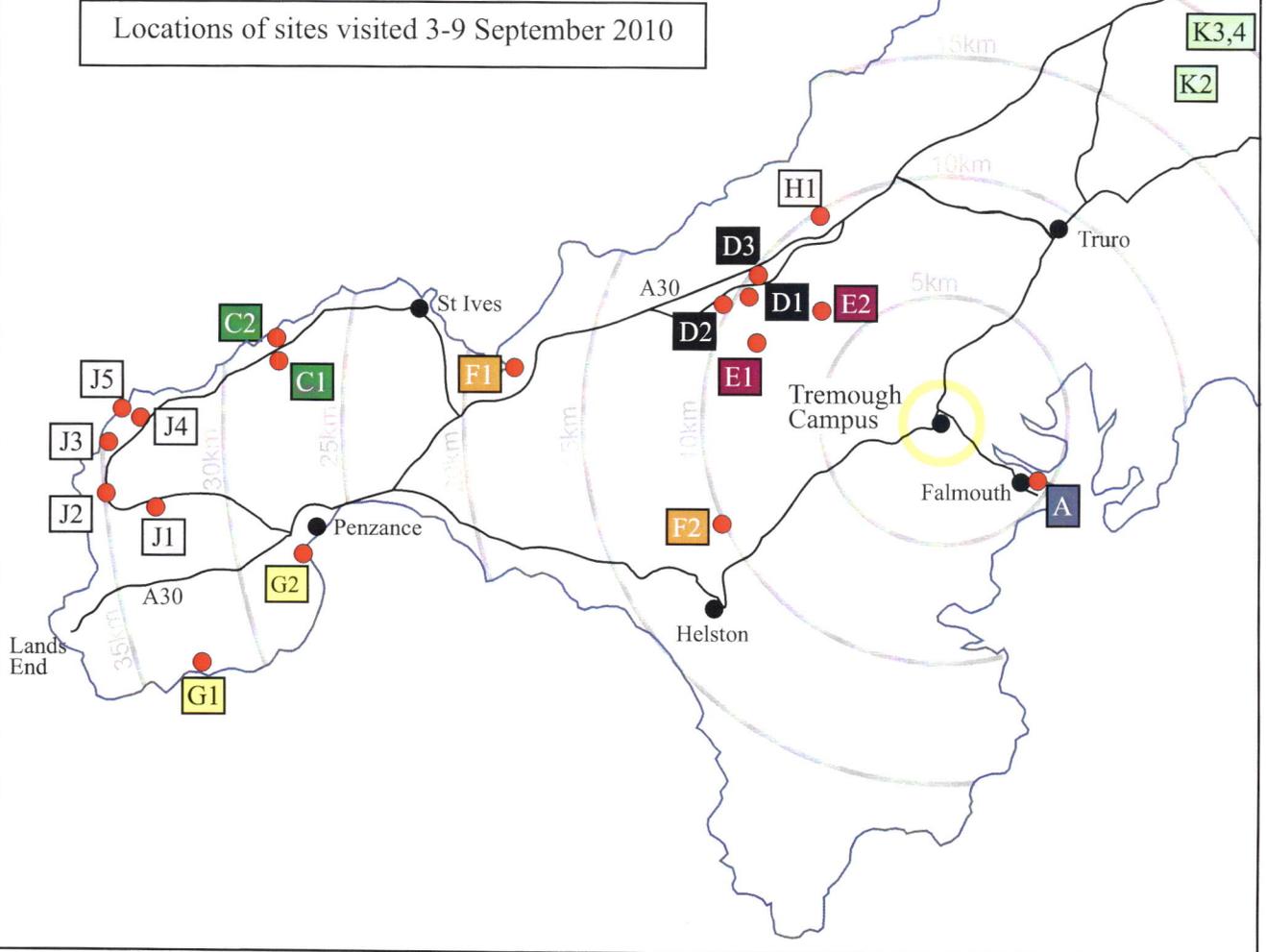
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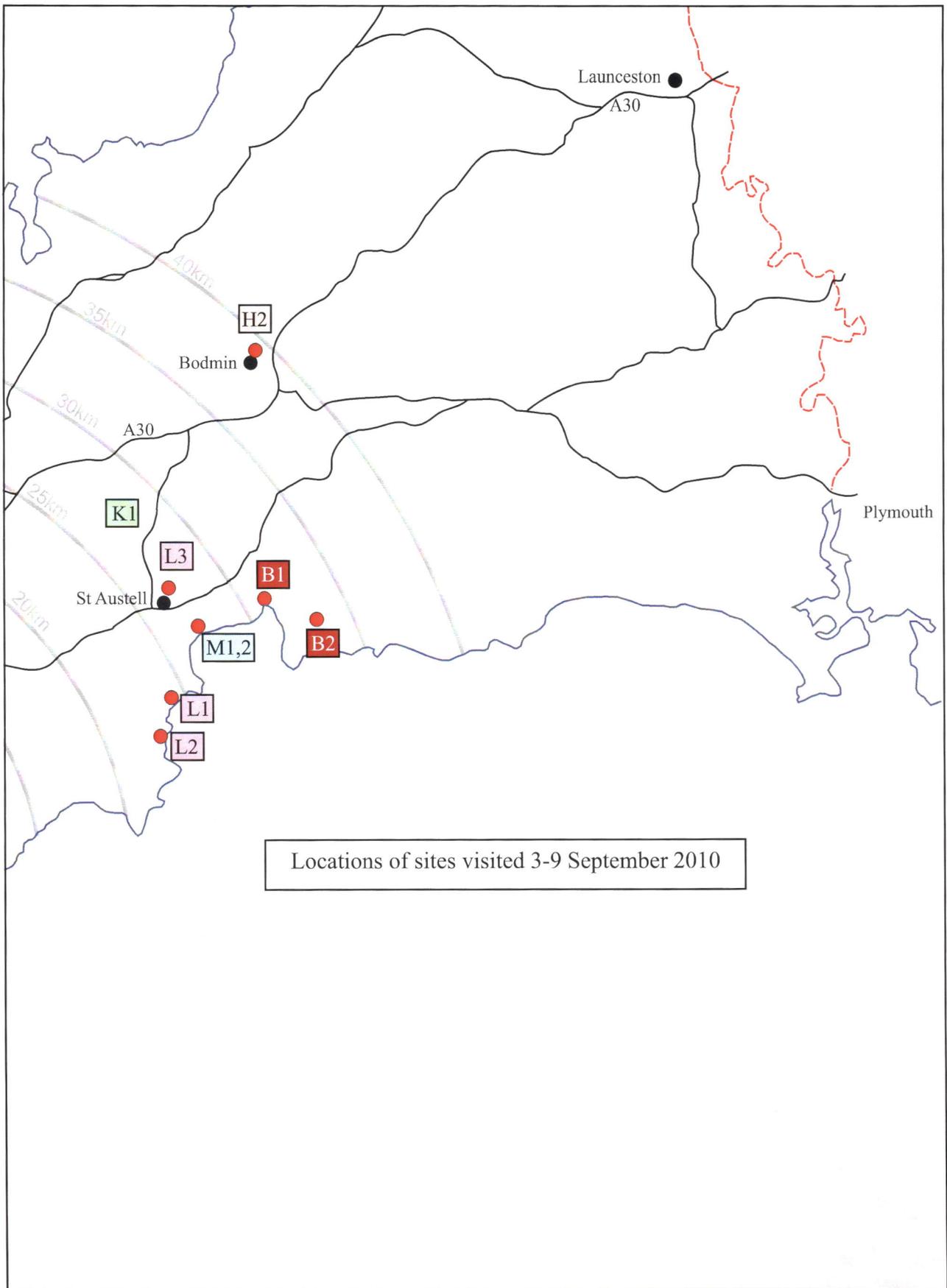
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Locations of sites visited 3-9 September 2010





Friday 3rd

TOUR A: Falmouth Docks

Carrick Roads, the estuary of the River Fal on which Falmouth stands, is one of the most extensive natural harbours in the world and one of the deepest in western Europe. The current Falmouth Docks complex dates from the mid nineteenth century and was begun under Parliamentary powers obtained in 1859. A site of 150 acres was obtained under Pendennis Head and by 1863 the Eastern and Western Breakwaters and two dry docks were in operation by the Falmouth Docks Company. In 1868 Cox & Co, a ship repairing business already operating in Falmouth moved to the Docks area.

In 1914-18 the business came under Admiralty control and work began on a third dry dock. After the war the Docks Company and the ship repair operation, by now Silley, Cox & Co came under the control of a London company R. & H. Green and Silley Weir, Ltd. They built a fourth dry dock and greatly extended the wharves and repair shops.

Falmouth was a key port during the Second World War, repairing, converting and fitting out a stream of vessels; it was also a major embarkation point for the Normandy landings. Post war the County and Duchy Wharves were completed in 1958 and the rebuilding and extension of No. 2 Dry Dock, now Queen Elizabeth Dock, followed. This dock is 850' long and 130' wide. By 1974 the docks had passed to the P. & O. Group.

The docks have never handled cargo as such, being a ship repairing and bunkering facility. The long-



Main entrance to Falmouth Docks.

term anchorage, further up the Fal at King Harry Ferry, which sees ships laid up in hard times, comes under the control of the Truro Corporation Harbourmaster.

The docks were rail connected from an early date, initially by broad gauge and from 1892 by standard gauge. Locomotive No. 3 a Hawthorn Leslie 0-4-0 ST of 1926 now runs on the Mid-Suffolk Light Railway.

Sunday 5th

TOUR B1: Par Harbour

Cornwall has a number of medieval ports left high and dry by silting (*cf.* Pentewan) but Par is a rare example of one created by the same process. Here the sea has receded by almost two miles and town and harbour are on a sandbank. In the eighteenth century ships loaded on this bank and granite for the second and third Eddystone lighthouses was shipped from here. Smeaton's successful construction of Charlestown Harbour from 1791 stimulated interest and the first plans for Par date from this time. Only when local industrialist and entrepreneur J. T. Austen (later Treffry) took a hand around 1828 did work proceed. Treffry built what is still the largest artificial harbour in Cornwall. There were no lock gates, the harbour drying out at low tide. In the early 1960s this area accommodated "two china clay drying plants, storage tanks for liquid clay and space for dried clay, a mineral grinding plant, a railway wagon repair shop, coal



Par harbour: china clay processing facilities.

umps, sidings, a gasometer and a lorry park". In earlier times there had been a lead smelting works, brick works and kiln, pilchard fishery, shipbuilding, sail lofts, a granite cutting and dressing yard and a candle factory. Par Consols Mine was linked to the harbour by inclined plane and Fowey Consols by inclined plane and a two mile canal. The smelting works had a 248' chimney, known as Par Stack; it was demolished in 1907. Latterly Par was almost exclusively a clay port but that activity began to run down from 2006 and now the

harbour is effectively closed to commercial traffic. The railway network at Par Harbour with tight curves and low bridges ensured that a wide variety of small, specialised locomotives shunted the port. Best known of these are Alfred and Judy two cut-down saddle tanks (Bill and Ben in Thomas the Tank engine) now preserved at the Bodmin & Wenford Railway.

TOUR B2: Fowey

Unlike the other china clay ports, Charlestown, Pentewan and Par, Fowey, a natural estuary harbour, has a history stretching back to the 13th century. In Tudor times it was a trading port for a great variety of cargoes, though already in decline. The modern port dates from the 1870s and was driven by the need to solve congestion problems at the other clay ports. The first jetties, upstream of the town were quickly completed; the port later passed into GWR control and major investment took place in the early years of the last century. Fowey was served by two rail lines, one from Lostwithiel, which is still open as a freight only branch serving the clay jetties, and another from St Blazey. This latter line, including Cornwall's longest rail tunnel (St Pinnock, 1173 yards, 1.07km) closed in 1968 and

was converted into a private road for china clay traffic. At the beginning of this century Fowey was handling around a million tons of china clay per annum.

Loading china clay at Fowey.

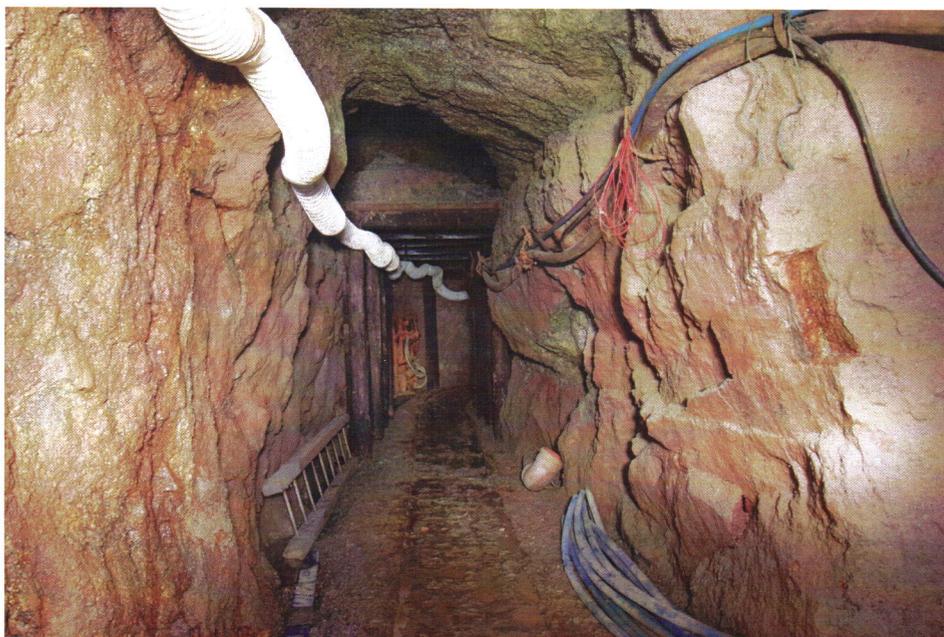


Sunday 5th

TOUR C1: Rosevale Mine

Rosevale Mine is a privately owned former tin mine situated at Zennor, near St Ives in West Cornwall. For the past 30 years the underground workings have been restored and preserved as a typical Cornish mine. The mine is owned by the Rosevale Historical Mining Society, consisting of three people who have undertaken the restoration of the underground workings as a voluntary pastime activity. Most of the work has been privately funded together with money obtained from visitor donations.

Rosevale is the only underground mine restoration project of its type in Cornwall and, as such, forms a unique and important part of the county's mining heritage. It is equipped as a working mine, but also contains a wide variety of mining machinery, tools and relics. The restoration works have been undertaken



Rosevale Mine, No.1 level.

using traditional methods and materials, whilst meeting modern Health & Safety requirements, thereby preserving the mine as an authentic and realistic example of a small nineteenth/twentieth century Cornish tin mine. The long-term objective is to maintain the mine as a heritage site and to continue to open-up some of the currently inaccessible workings.

The restoration of

Rosevale Mine began in 1974 when the lease of the mine was taken on by the West Cornwall Mining & Minerals Club with the aim of restoring the mine as a society activity. The mine had remained abandoned since the 1930s and the entrances to both levels had collapsed. Restoration started on No.1 Level, however the club folded in 1975. Two of the members of the society decided to maintain the lease on the mine and formed the



Rosevale Mine, chain ladder in stope.

Rosevale Historical Mining Society (RHMS) later that year. Since this date RHMS has consisted only of 2-3 people, each of whom has mining experience, with all work being carried out in-house as a pastime activity.

The restoration has comprised a wide variety of works, including installing new timberwork and replacing old timbering, track laying, surveying, removing collapses and blockages of waste rock, rock-bolting, and stabilisation works. Most of the equipment was obtained during the 1980s as unwanted stock and scrap from the local mines and other related organisations. As well as restoration the mine requires continual on-going maintenance, especially of timberwork and steelwork.

There is no long-term commercial objective for the mine. Most of the restoration and general maintenance work has been privately funded by members of the RHMS, however considerable assistance has also been received through donations from visitors.

The main projects for the next few years include sinking a 6-7 metre deep winze from the end of the 'new crosscut' in No. 2 Level and stabilising access into the end part of No. 2 Level where there is a connection into flooded workings at Deep Adit Level. The aim of the new winze is to intersect Deep Adit Level close to the point of its collapse, which will then enable the collapse to be cleared with a view to dewatering and gaining access into the remainder of Deep Adit Level. The hope is that this level may lead into the unrecorded and currently inaccessible workings of old Wheal Chance; the full extent of these workings is unknown.

It is anticipated that these proposed works will take many years to complete, but in the meantime maintenance of the existing workings will need to be continued.

TOUR C2: The Wayside Museum, Zennor

Zennor and the surrounding area, well known for their dramatic scenery, were heavily populated from c3000 BC and are consequently rich in archaeological sites and remains. The small fields that form a patchwork design on the landscape with their stone 'hedges' date back in many cases to the Bronze

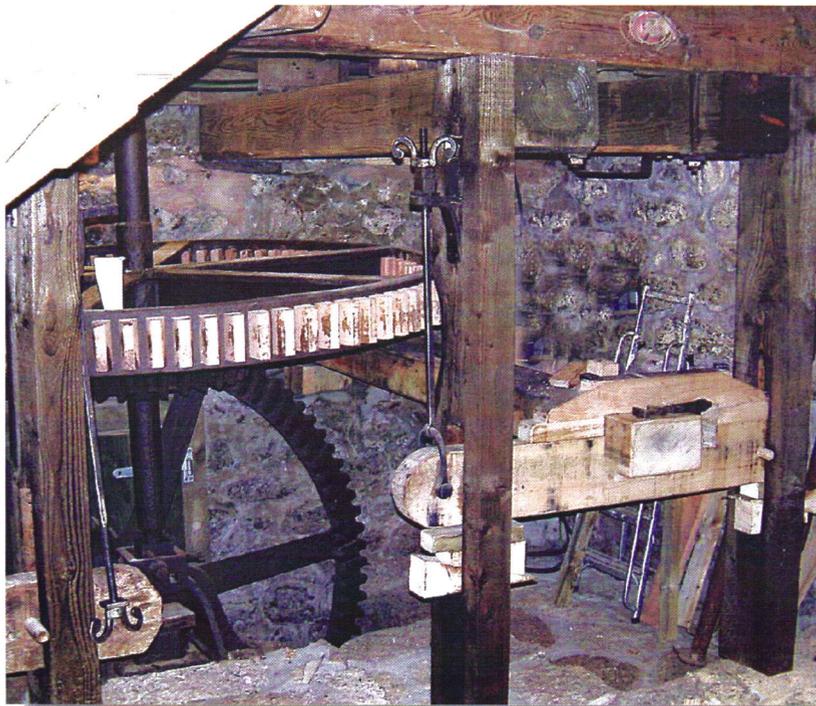
Entrance to the Wayside Museum with Zennor Church in the background.

Age and are now considered to form part of one of the oldest working landscapes in the world.

In 1935 Colonel Frederick Hirst, an amateur archaeologist, started collecting agricultural and other implements and relics peculiar to this area and displayed them 'along the wayside' adjacent to the miller's cottage at Trewey Mill. They were then moved into the grounds of the property where they have remained since, forming what is now the internationally renowned Wayside Museum and Trewey Mill. Deceptively small from the outside, the museum houses an extensive collection of over 5000 artefacts which reflect the lives of the people who have lived and worked in this ancient landscape dating from 3000 BC to the 1960s.



Housed in twelve themed undercover areas, The Wayside has a unique setting within the garden of a 16th century miller's cottage and fully working granite water mill – Trewey Mill. There is something to interest everyone: agriculture, domestic life, people of past Zennor, mining, archaeology, quarrying, blacksmiths forge, shipwrecks, schoolroom, dairy and fishing. What makes this museum so interesting and different from others are the detailed stories and descriptions enabling visitors to not only experience how items were used, but to gain a rare insight into the lives of the people who used them and unlike most museums many of the artefacts are in their natural surroundings. Few items are behind glass and there is a wealth of detailed information to absorb.



The interior of Trewey Mill.

Trewey Watermill

Trewey Watermill is situated within the grounds of the Wayside Museum and is a grist mill which has been painstakingly restored and repaired by the present owners during 2009-10.

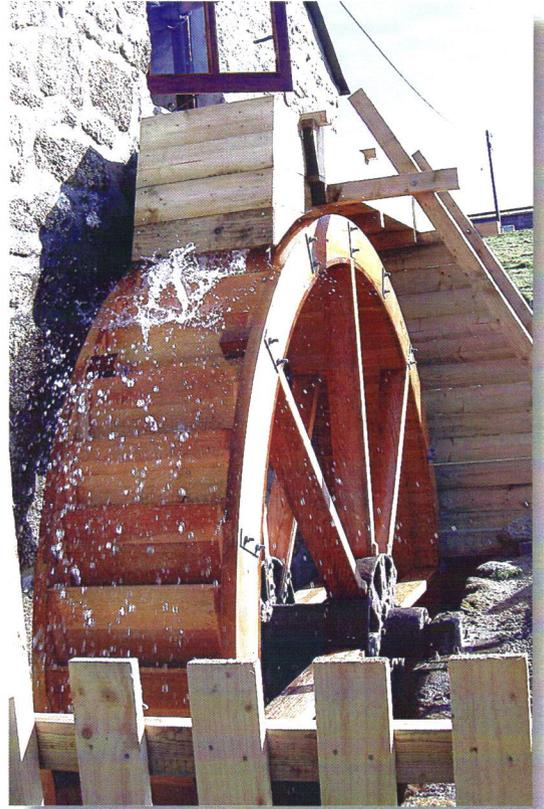
The mill has two sets of original granite millstones, rare in milling terms, as most are either made of French burstone or Derbyshire grit. Trewey Mill is one of only two fully working watermills grinding corn in Cornwall today. Research shows that a mill existed here as far back as 1513 or earlier, and although the present mill dates from the mid-1800s, there are many unusual features which are

Trewey Mill waterwheel.

characteristic and unique to Zennor.

As the only remaining mill in Zennor (there were once four on this stretch of river to the sea), Trewey Mill, last worked 150 years ago is now capable of producing a good quality stone-ground wholemeal flour. Visitors to the mill and museum can view the new 12' waterwheel and impressive restored 19th century gearing machinery made by Harvey's of Hayle and which operates daily. Milling demonstrations also take place.

Now that the mill is fully operational it forms an important feature of Cornwall's heritage as well as a practical educational resource. The mill building, also houses a collection of early wooden ploughs and agricultural implements on the upper floor.



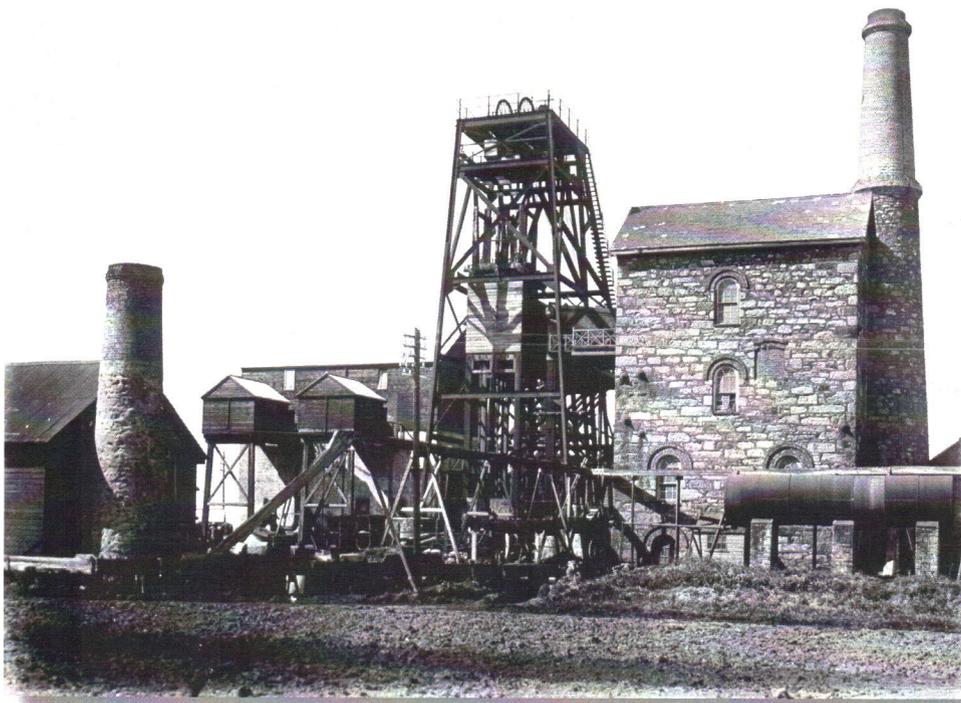
Sunday 5th

TOUR D1: Robinson's 80" Engine, South Crofty Mine, Pool

This famous old engine (10' 4" equal beam) was built in 1854 by the Copperhouse Foundry for Alfred Consols, near Hayle. Designed by Samuel Grose, she cost £2,700 plus a further £700 for two 12-ton boilers, and was started, as Davey's Engine, in June 1855 and was later said "not to be excelled in the county for duty and appearance."

In 1864 she was re-erected at Crenver & Wheal Abraham United, on Old Sump Shaft of Wheal Abraham, in company with the 90" from Great Wheal Alfred and a new 70". At Abraham, known as Pelly's Engine, the 80" was the first to start work and was worked at 11½ s.p.m. in January 1865 in the interim stages of unwatering the mines before the other engines were ready. Throughout the decade she worked here she continued to return a consistently high duty, being thrown idle after 1875 when the mines closed. After remaining unsold until August 1881 she was bought for the re-working of Owen Vean & Tregurtha Downs mines.

The bob, weighing some 40 tons, was moved whole on this occasion, with the record number of 45 horses drawing the wagon from Wheal Abraham to the new site on 11 October 1882. Hundreds of people followed its journey, through Leedstown, Townshend and Goldsithney, the proceedings enlivened by "the thought that as Relubbus Bridge is not very strong it might go down, bob and all; but all went right." At Tregurtha Downs a crowd estimated at 1,200 witnessed its arrival. Here she was re-erected by Loam & Son and provided with a new cylinder by Harvey & Co. of Hayle to replace the original which had been fractured by the breakage of a main rod immediately before Crenver had closed down.



Robinson's engine house, 1948.

Harvey & Co. also supplied a new steam capstan with two 12" cylinders to drop the 20" pitwork provided and she was christened St Aubyn's Engine at a ceremony in March 1883. The mine was bought as a going concern by Harvey & Co. in July 1885 for £1,755 (after an outlay by the original company of over £33,200) and was worked thereafter by a new company. In January 1889 the engine house was gutted by a fire that commenced at four a.m. and, despite the feeble attempts of

the Marazion and later the Penzance fire-engines, burnt most of that day. At first it was thought the engine was so badly damaged that "although the machinery is standing, most of it will have to go to the foundry to be re-cast" but when the charred wreckage had been removed and the engine examined it was found that no serious damage had been done. After renewal of the lighter and more vulnerable parts, she was back at work again within a week. For a time during 1891 (at which time the mine was briefly known as Wheal Helena) she stood idle but pumping continued thereafter until April 1895. After being re-started in August 1899 she was for sale August 1902, when working ended.

Early in 1903 she was purchased (for £375) by South Crofty for the new vertical Robinson's Shaft then being sunk. The engineer in charge of re-erection was Nicholas Trestrail, the main beam being uneventfully hauled to Pool in May 1903 by two traction engines. The new shaft (18' x 6') was intended to replace the old crooked Palmer's Shaft on which stood an aged 60". This engine was scrapped in 1908 when Robinson's



Trevithick Society group viewing Robinson's engine.



Robinson's engine house, 1996.

Shaft, then down to the 205 fathom level, came into use. At South Crofty the 80" proved an extremely successful and trouble free engine, working continuously day and night for a full fifty years, with the cylinder cover lifted only once during this long period. Latterly, however, the steam case had not been used and her piston stroke was noticeably less than the designed 10' 4" but she continued to work a full seven lifts of 15", 14" and 10" pumps to a nominal depth of 337 fathoms (2,022')

delivering 310 gallons per minute at 5 strokes per minute. In 1955 electric pumps took over the task of keeping the mine free of water and the fires in her four working boilers were drawn for the last time.

She is an historic engine, not only on account of her longevity but in being the last Cornish engine to work on a Cornish mine. Her final working stroke at five minutes past one on Sunday 1st May 1955 concluded not only an eventful career of over one hundred years but a whole chapter in Cornish engineering history going back two centuries and more. As that great authority on the Cornish engine, J. H. Trounson wrote, "On the following morning, the Sunday, several people gathered in the engine house to see the end. The talk was of old times and though we were all there to see her make her last stroke there was a strange and awesome atmosphere about it all. It was like waiting for the passing of a great monarch and we knew that it must come soon at last, at 1.05 pm, the dread signal was rung from underground to stop the engine. Several elderly men came downstairs from the middle chamber and we stood watching silently as the driver stopped her and pinned down her handles for the last time – I believe he had tears in his eyes."

TOUR D2: Western United Mines, Pool

Western United Mines operates the former New Cook's Kitchen section of South Crofty Mine at Pool. Mining is known to have been carried out in the area of South Crofty Mine since the 16th Century and it was in the 1740s that Cooks Kitchen Mine was started. During the 1850s the former large sett of East Wheal Crofty was subdivided into North Wheal Crofty and South Wheal Crofty. In 1872 the Cook's Kitchen sett on the western boundary with Dolcoath was divided into the northern New

The all-concrete engine house at New Cook's Kitchen Shaft, 1940s.



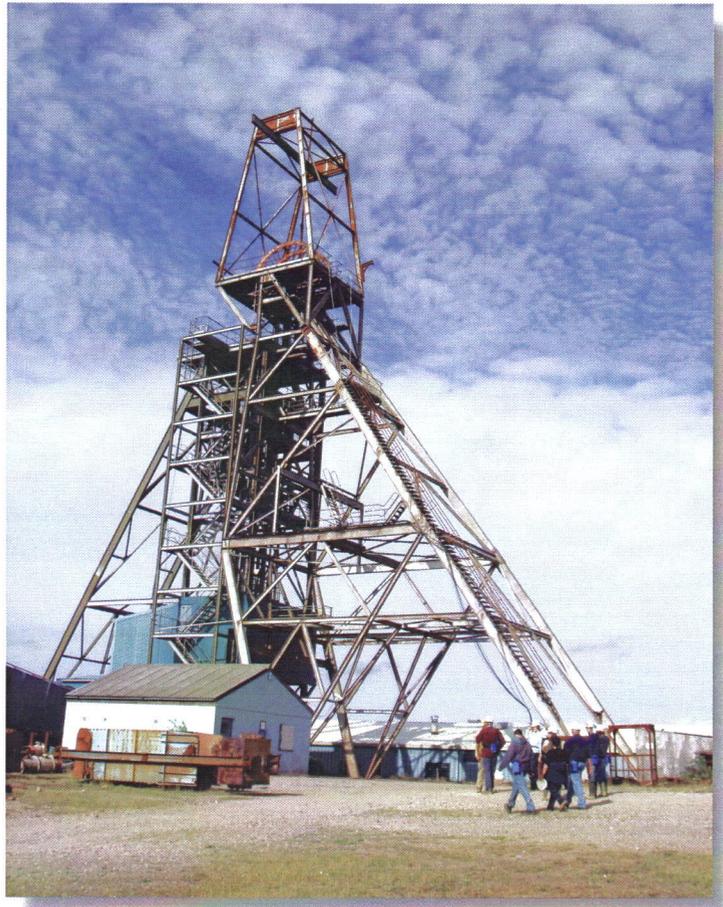
Cook's Kitchen sett with the southern half remaining as Cook's Kitchen sett, the latter being sold to Tincroft Mine with Tincroft and Carn Brea Mines amalgamating the following year.

The New Cook's Kitchen sett became part of South Crofty Mine in 1899. Work on New Cook's Kitchen Shaft commenced in 1907, with a modernisation of the stamps and mill areas the following year and in 1936 the entire Dolcoath sett to the west was purchased, considerably increasing the size of the mine.

In 1985 the price of tin crashed causing unemployment and hardship all through the Cornish mining industry. Government help was largely unforthcoming for Cornwall's metal mines and on March 6th South Crofty Mine closed, the last working tin mine in Cornwall and Europe.

Modern headframe over New Cook's Kitchen Shaft.

The New Cook's Kitchen section was reopened by Baseresult Holdings Limited (BHL) in 2001 as New Cook's Kitchen Mine and then abandoned. Although flooded to adit level (~140 feet) Baseresult intended to restart it as a working mine. A section of the workings above adit, on North Tincroft Lode, was opened in 2003 for tourist visits with access from the Tuckingmill Decline. The mine became operational once more in April 2004 with the commencement of tunnelling works in preparation for the return of mineral extraction.



Western United Mines Limited (WUM) was launched in November 2007 and is a joint venture between BHL and Cassiterite LP. The mine holds resources of tin, copper and zinc which are proposed to be extracted in the future. At the present time there are 55 people directly employed by WUM all of whom work at the South Crofty Mine site. The current phase of operations (to November 2009) sees ramp decline development being carried out in order to facilitate diamond drilling and the future trackless mine operation. Once the current diamond drill research and mine development stage is complete it is forecast that mine production will commence in 2011.

TOUR D3: Cornish Mines and Engines, Pool

The National Trust Cornish Engines facility occupies the site of East Pool Mine. East Pool, a very rich mine, can trace its history right back to the eighteenth century as a copper mine. It was restarted in 1835, again for copper, but by the 1860s tin had become the main product. In 1895 East Pool amalgamated with neighbouring Wheal Agar to become East Pool & Agar Limited. East Pool was predominantly to the south of the old A30 with Agar to the north. East Pool was a prosperous mine whereas Wheal Agar often struggled.

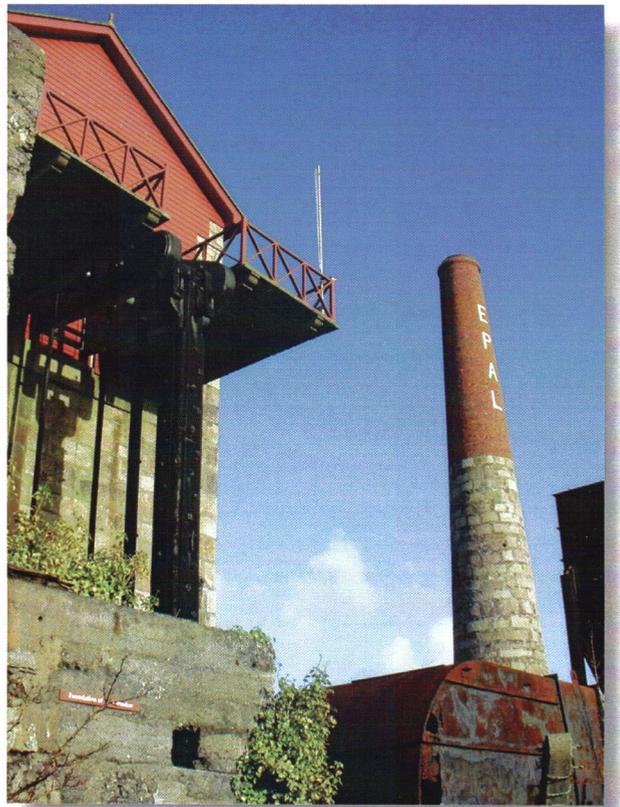


Michell's whim.

In 1921 a disastrous underground collapse at East Pool rendered much of the mine unworkable. Nothing daunted the management a new shaft, Taylor's, was sunk adjacent to the Wheal Agar part of the mine. East Pool continued to work until 1945, latterly sustained by government subsidy; when this was withdrawn the mine closed though pumping at Taylor's Shaft continued until 1954 to protect neighbouring South Crofty. East Pool is now part of the very large South Crofty operation.

Highlights of a visit to East Pool are the two preserved Cornish engines. At Michell's Shaft, East Pool is a 30" double acting beam winding engine from Holman Brothers of Camborne, a late example of the type. This was made redundant by the 1921 collapse but was preserved in its house and passed to the Cornish Engines Preservation Society and thence, via the Trevithick Society, to the National Trust. It is operated by a concealed electric motor. The adjacent boiler house is a reconstruction with a boiler similar to the original.

At Taylor's Shaft in a house dating from 1923 is a 90" beam pumping engine from Harvey & Co. of Hayle. Built in 1893 for the nearby Carn Brea Mines, the engine was stopped in 1914 and purchased ten years later by East Pool for their new shaft. She was the last big engine built by Harvey at Hayle and worked until 1954. Her preservation was due to her purchase by an American steam enthusiast, Mr Greville Bathe, and donated to the care of the Cornish Engines Preservation Society. The National Trust, and formerly the Trevithick Trust, has created a major display of Cornish mining history in the ancillary buildings around Taylor's Shaft, with most of the artefacts on display belonging to the Trevithick Society (the Trevithick Trust was created in 1993 by Cornwall County Council, the Cornish District Councils and the Trevithick Society, the latter providing specialist knowledge). These buildings contained all the other shaft equipment, a horizontal winding engine by Holman and a steam capstan by Harvey but they were wantonly scrapped in 1974. The stack at Taylor's is a notably fine one, bearing the initials of the company EPAL, also the trademark of the company's arsenic output.



Taylor's Shaft engine house and the 'EPAL' stack.

Monday 6th

TOUR E1: King Edward Mine

Near the village of Troon, south of Camborne in Cornwall, lies a museum and collection of mining machinery that deserves to be far better known. King Edward Mine, on the Great Flat Lode, owes its survival first to its previous use as an educational establishment and secondly to the dedication of a stalwart group of volunteers.



King Edward Mine from the west, left-right: mill, survey office, winding engine house (background) and calciner.

King Edward Mine was originally the eastern section of South Condurrow Mine. This dates back to the 1850s and was a notable producer of copper and tin. The mine closed in 1902 and the School of Metalliferous Mining in Camborne took over the abandoned eastern part for the practical instruction of students. The School was able to use the shallower levels of the mine down to 400ft as they drained into the then working Wheal Grenville to the south. At surface the mine, renamed King Edward VII Mine to honour the new King in 1901, was re-equipped, based on the best mining practice of the time. This included a full mill and dressing plant, survey office and lecture rooms. The original count house and miners' dry were retained. Although its main purpose was educational, the mine was run commercially with much work being undertaken by the students. The intention was that the tin produced would cover the mine's running cost. Students received practical tuition both in underground mining techniques and in ore processing.

By the end of the 19th century, the great days of Cornish tin were over. There was little investment in the new technologies and methods being developed elsewhere, due to the industry's innate conservatism and a disastrous slump in tin prices. So the new equipment installed at King Edward between 1897 and 1906 was relatively rare in Cornwall at that time. The mine came into production in 1904 and continued until the outbreak of the First World War. In 1921, the adjacent Grenville Mines closed and pumping there ceased. This caused King Edward Mine to flood, and commercial tin production ceased. From this time, underground training moved to the more shallow levels of Great Condurrow Mine, higher up the hill.

King Edward continued to be used as a field station and, over the years, the mill was stripped and turned into a pilot plant. In 1974, the School of Mines moved to larger premises outside Camborne and some of the teaching from King Edward Mine along with the pilot plant was relocated there. In 1987, with the support of the School of Mines, the KEM Preservation Group was set up with the objectives of preserving the site, restoring the mill to its condition c1910, and establishing a small museum. Since then volunteers have put in thousands of hours in pursuit of this end. In 1989, the

importance of King Edward Mine was officially recognised by the listing of all buildings on the site as Grade II*, putting them in the top 5% nationally. The site is now a major component of the recently designated Cornwall & West Devon Mining Landscape World Heritage Site.



King Edward Mine in full operation.

volunteer group formed a charitable joint company to run the museum. In 2005, the School of Mines, on relocating to the new Combined Universities in Cornwall campus at Falmouth, relinquished its lease of the mine to original landowners, the Pendarves Estate. Kerrier District Council started the process of acquiring the site and this was completed by Cornwall Council in 2009, however the site is still operated under a temporary lease. A supporters' group, The Friends of King Edward Mine, was formed in 2007.

The importance of the King Edward site is that it houses a comprehensive collection of extremely rare, and in some cases unique, equipment. Furthermore it is all in working order. We owe this firstly to those who equipped the mine at the dawn of the 20th century and secondly to the enthusiasts and volunteers, who have laboured over the last 20 years to conserve, restore and replace a collection of mineral processing machinery which has immense significance. As the mine in its present form was always something of a demonstration mine, it is entirely appropriate that it should now perform that function for visitors. Fortunately the Californian stamps were still on site when the volunteers began work in 1987 but almost all the other mill equipment had been scrapped. Undaunted, the team set to work to collect a representative set of machinery. In 1974, the Trevithick Society had dismantled and saved two Cornish round frames from a tin stream works at Tuckingmill. These made up one good frame. Shaking tables from South Crofty and Geevor mines were installed. A 14' diameter double dipper wheel came from Tolgus Tin where it was to be scrapped, while scrap merchants were about to remove a small Hardinge ball mill from Geevor when the King Edward team came to know of it. Other items were recovered wherever possible.

On the approach to King Edward Mine, a ruined engine house is seen to the left. This is not part of the museum but, built in 1869, housed the engine which drove the South Condurrow stamps. Ultimately there were 96 head of stamps and the engine worked until 1909. The buildings at King Edward fall into two categories; those, which were originally part of South Condurrow Mine and date from c. 1870 and those built by the School of Mines between 1899 and 1907. It is these latter that the museum

In 2000, the Trevithick Trust leased a major part of the site from the School of Mines. Following major building repairs, King Edward Mine first opened to the public in April 2002. In 2005, on the demise of the Trevithick Trust, the lease reverted to Kerrier District Council and, at short notice, a combination of the Trevithick and Carn Brea Mining Societies and the KEM

currently occupies.

Visitors enter the site through the calciner house, which until the 1930s contained a furnace for roasting ore to drive off unwanted impurities. It now contains an exhibition on the Mineral Tramways Project. Next comes the Museum shop and reception. This once housed a large buddle and was later a laboratory for the School of Mines. On proceeding outside, we pass the original boiler house before another engine house can be seen. This dates from 1868 and housed a beam winding engine with a 25" cylinder, which passed to the School of Mines but was replaced by a more modern winder in 1907. This wound from the Engine Shaft of South Condurrow, which can be seen a short distance to the north. Engine Shaft opened up unexpectedly in 1995 and has since been re-collared. Over the shaft is a very recent item of Cornish mining history, the very last cage brought to surface with miners when Cornwall's last working mine, South Crofty, closed in March 1998.

Before entering the museum buildings, look for of the star exhibits on site. This is the original Holman twin cylinder horizontal winding engine, which replaced the beam engine in 1907. Though it now sits on its original site, the engine has led a nomadic life. In 1942, it was removed to Castle-an-Dinas Mine on Goss Moor. This fascinating mine was then being extended in the wartime search for wolfram, the ore of tungsten. After its closure in 1957, the winder was on display at Poldark Mine. It returned to King Edward in 2001 and is now being restored; at present it will run on compressed air. Happily finances have now allowed for a replica of the engine's original wooden house, which burnt down in 1958, to be erected. Eventually there may also be a new headgear over Engine Shaft.

Now enter the 1901 museum building. This once housed a 90hp horizontal compound steam engine, again from Holman Brothers of Camborne, which drove all the plant in the mine mill via a flat belt. It was superseded by electricity in the 1930s. The museum houses a small and comprehensive collection of items concerned with Cornish mining in general and the surrounding area, the Great Flat Lode, in particular. Move through to the heart of the museum - the mill with its comprehensive collection of ore processing machinery, all of it rare and amongst the last of its kind in the world, all in working order.

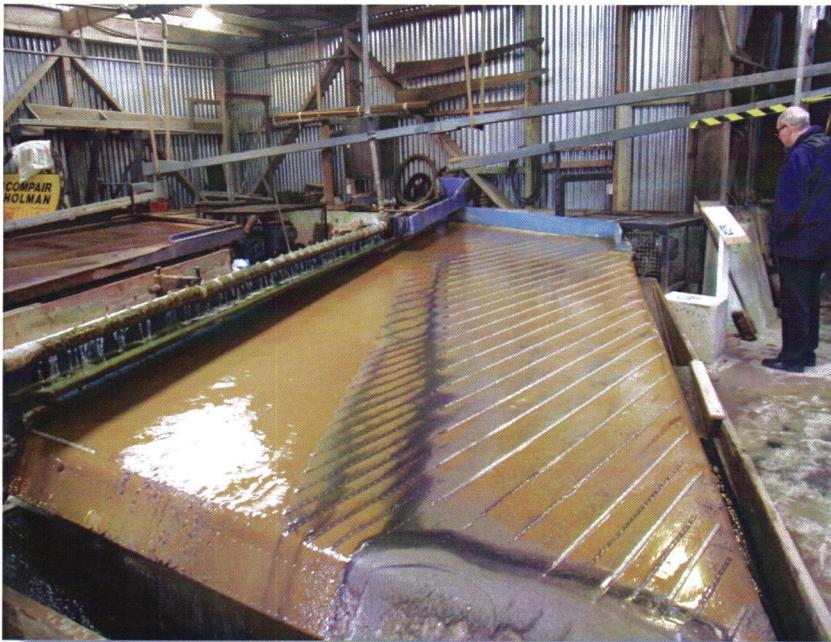


South Condurrow stamps engine house.

The purpose of the mill is to recover cassiterite, tin oxide, SnO_2 , which is 78% tin metal by weight. The ore entering the mill may only have a 1-2% tin content by weight, which means that 98-99% will effectively be a waste product. The processes within the mill are designed first to crush the ore, then to separate the heavier tin content from the waste by means of gravity and water. At the same time as separation, there are also the first stages of collection and concentration, which will continue as far as possible, eventually to obtain a saleable black tin concentrate. All the processes depend on the differential behaviour of mineral particles, the tin, in waste whilst flowing in a more or less controlled manner over moving sloping surfaces. The heavier material should stay on the surfaces whilst the lighter waste is washed away.

Visitors enter the mill at the upper level, just below where the ore was trammed in from Engine Shaft. Immediately above, and not at present open to the public, is the area where the ore was tipped out and fed through the 'grizzly', a set of iron bars that controlled the maximum size of ore to go into the stamps ore bin. Any over-size pieces would have been fed into the Fraser & Chalmers jaw crusher. This is contemporary with the Californian stamps and was bought and erected at the same time.

Descending the staircase by the side of the Californian stamps, one can appreciate the scale of this machinery. The stamps came from makers Fraser & Chalmers in 1901, after being exhibited by them at the Paris Exposition of 1900. Five individual stamp heads are each in turn lifted and partly rotated by a camshaft. Each head weighed 850lbs and has a drop of 8". The individual heads drop roughly once a second. These stamps crushed the tin ore to a pulp. It is believed that these are the only full sized working set in Europe.



Shaking table in operation in the KEM mill. The grey-black band on the left is the tin concentrate.

The pulp from the stamps is transferred via a small dipper wheel to a hydraulic classifier. Whilst the stamps were probably the third set to be erected in Cornwall, the classifier was the first such installation. This sizes the material into four products dependent on size and weight fractions. The different machinery within the mill will only operate successfully with material of a certain size range. The coarsest, heaviest pulp is fed

to the Holman-James shaking table. The material fed here can be likened to beach sand. As the pulp flows across the deck, the shaking action causes the heavy tin to go to the bottom and be trapped behind riffles, whilst the lighter waste is washed off the table. The longitudinal shaking drives the tin up and along the table to be collected at the end. None of the processing machinery in the mill is so efficient as to be able to trap all of the available tin. Middlings pulp, which still contains tin and waste, is collected separately and fed via one side of the 14' dipper wheel to the Hardinge ball mill. This grinds the middlings, releasing further fine tin and waste that is returned, via an original pattern mill pulp sampler, and the other side of the 14' dipper wheel to the classifier, where the sizing process will start again.

The second stream of pulp from the stamps is fed onto the Holman-James slime table, a similar piece of equipment to the sand table, but dealing with a much finer source material. Again tin is collected at one end, waste flows away and the middlings go back, yet again, through the ball mill regrinding process.

The third pulp stream - and by now the material has the consistency of gritty flour - is fed to the Cornish round frame. The table slowly rotates and the pulp is fed onto the deck via a fixed circular launder that goes two thirds of the way around the deck's circumference. The tin tends to stick on the deck and the waste washes away into the centre to be discarded. A second circular launder, covering the remaining



The round frame in the KEM mill.

third of the circumference, carries in clean water, which as the table rotates from the feed area, gently washes away further waste from the rich tin material still on the deck. Control of the water flow here is critical, so as not to wash any tin away with the waste. Finally a strong jet of water and a brush remove the concentrate into a separate collection launder in the centre of the table. Like the feeds to the sand and slime table, once started this is a continuous process fed from a steady flow of pulp from the stamps and the subsequent regrinding.

The hydraulic classifier separates the pulp into four streams and the last one, containing the finest tin particles, is led onto the set of three 19th century self tipping wooden automatic ‘rack’ or ‘rag’ frames. These have been reconstructed on the original design and are another very rare feature. Once, like the round tables, there were banks of these machines working downstream of the main processing mills, but being of wood construction none appear to have survived in Cornwall. The frames operate in a similar manner to the round frame, a steady stream of pulp flowing over the inclined deck. The heavy tin sticks and the waste flows away, often to another set of frames further downstream. An automatic wash of clean water is regularly flushed across the deck. The tin is then swept into a separate collecting launder, the deck resets and the process continues.

The concentrate from the various processes would contain not only cassiterite, but also other heavy minerals such as copper, iron and arsenic, as sulphides. Roasting of the concentrate would drive off the sulphur and arsenic and this was done in the calciner. The lighter oxides of copper and iron, which remained with the tin, were then re-treated on a Frue vanner. Like the rag and round frames, these were once very common but again, as far as is known, no operating example has survived. The King Edward Mine vanner is a project that has occupied the volunteers at the mine for around 12 years. Over this time original vanner pieces have been restored and others made so that, as far as is known, KEM now has the only working Frue vanner in Europe, if not much further afield.



The rag frames.

Lastly, we have the final stage of concentration. Calcined tin is fed over

a 12' diameter convex centre-head buddle, another piece of original 19th century equipment. This concentrates heavy black tin and again any middlings that might still be within the system would be taken out and sent back for regrinding. From the buddle the tin is finally concentrated in the bank of kieves. The kieves in the mill are not the originals, but the automatic stirring and packing mechanism above them is still in situ. Hopefully in the near future this, another potentially unique, piece of equipment, will be restored to full working order. The output from the kieves was the final black tin concentrate, now a saleable product to the smelter.

As well as the mill, King Edward Mine contains other machinery awaiting restoration; currently work is progressing on the erection of a vertical steam engine, which drove, via overhead shafting, machinery at the world famous Holman Brothers factory in Camborne. There is also a 1930s pattern froth flotation cell, and other potential projects.

Elsewhere on site are the parts of a rare surviving Cornish beam engine. The Rostowrack engine was designed by William West and built at his St Blazey Foundry in 1851, the only surviving engine from this maker. It was put to work at a china clay works near Bugle and then in 1861 moved to Rostowrack where it worked for 91 years. It is a rotative engine with a 22" single acting cylinder and was used for pumping via a bell crank and flat rods. The Shell Film Unit filmed it just before it ceased work. Then owners, the Goonvean & Rostowrack China Clay Co., presented it to the Cornish Engines Preservation Society and it was re-erected in the Holman Museum, Camborne in 1953, where it could be run on compressed air. Sadly, on the closure of Holman's museum in the 1970s, the engine was dismantled and has remained so ever since. Another long-term project is the erection of this engine, which will, of course, also involve the renovation of the original 1868 winder house.

In addition to the areas of King Edward Mine currently open to the public, there are other historic structures on the site. Among these are the 1860s count house or mine office, the School of Mines survey office, carpenters' and blacksmiths' shops, the original miners' 'dry' or change house and a cobbled 'spalling' floor, also dating from 1860, where copper ore was broken up for further treatment.

TOUR E2: Marriott's Shaft (Basset Mines)

Marriott's Shaft was originally part of South Frances Mine, which merged with Wheal Basset and West Wheal Basset to form Basset Mines Ltd. in 1896. The mine had a nominal capital of £100,000; the largest shareholders were Francis Oats, former St Just miner and now director of De Beers, and the Bolithos, the tin smelting and banking family of Penzance. Almost concurrently with the new company the 80" Cornish pumping engine here was destroyed by fire and the new company seized the opportunity to re-equip Marriott's completely as the main shaft from which they planned to explore the Great Flat Lode at depth.

The Great Flat Lode is a remarkable structure, trending ENE-WSW and dipping at 30° SSE; the more typical lodes in this area dip around 60-70°. While other lodes in the vicinity carry copper the Great Flat Lode almost exclusively carries tin. The lode outcrops at Wheal Uny, just west of Redruth, and can be traced through North Wheal Frances, South Carn Brea Mine, through the Basset sett and into Wheal Grenville and South Condurrow to the south of Camborne. Diamond drilling from underground at Wheal Pendarves in the 1980s failed to locate a western extension. In 1876 the various mines working the structure raised 83,452 tons of ore which produced 1846 tons of tin metal, an average of 2.5%. Large areas of the lode are thought to still be unexplored.

In 1897 alone some £18,630 was laid out. Francis Oats and W. Jelbert, the mine's engineer, visited South

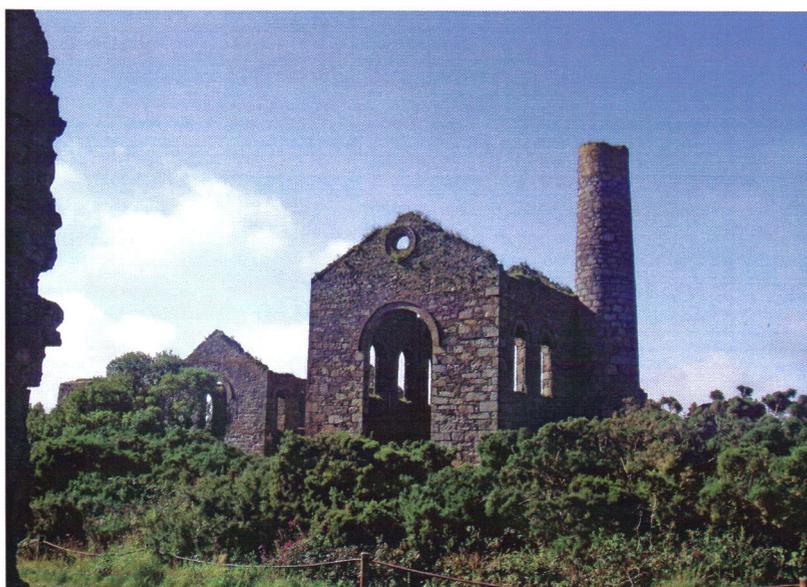


Marriott's Shaft in full operation.

great success; the original mild steel plate beam began to break up and had to be replaced in 1909 by a new one in 1½" steel plate. It was also very heavy on fuel and barely achieved half the 11 strokes per minute claimed by the designer. According to William 'Kimberley' James, manager of Basset Mines Ltd, writing in early 1900:

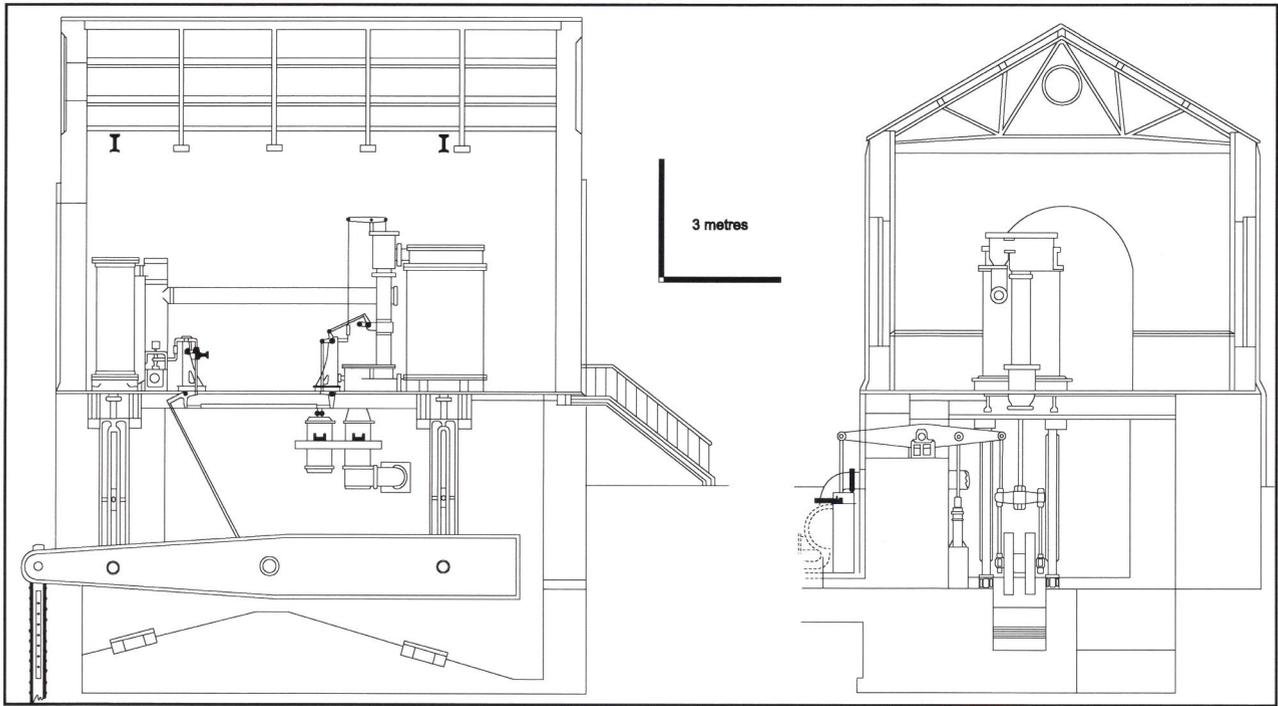
I must confess I was hoping we had more power in the Engine I don't think she is equal to a Cornish 90" Engine I should say she is only equal to a Cornish 85" but she is working very well so far.

Water was to trouble the mine almost continually, combined with breakages of pumping equipment and the amount of coal consumed in 1902 is indicative of this. The total for the year was 15,773 tons: Lyle's 80" 4,143 tons, Lyle's whim 569 tons, Marriot's 40/80" compound 4,581 tons, Basset stamps 2,680 tons, West Basset stamps 1,406 tons, Carnkie pumping engine 802 tons, Thomas's whim (primarily for raising and lowering men) 271 tons, Pascoe's compressor and whim 646 tons, calciner 387 tons, Lyle's capstan 48 tons, smiths' shop 240 tons. For the amount of tin treated that year, 49,007 tons, this equalled 1 ton of coal per 3 tons of ore raised.



In the winter of 1903-04 no tin ground was available below the 190 fathom level on the Great Flat Lode for nearly nine months, necessitating the exploration of side lodes. In May 1906 three men were killed by a fall of ground in the 200 fathom level west of Daubuz's Shaft, where they had been surveying. Despite high tin prices the mine made a loss of £2,194 in 1904 and £4,358 in 1908 while in 1909 only a meagre profit

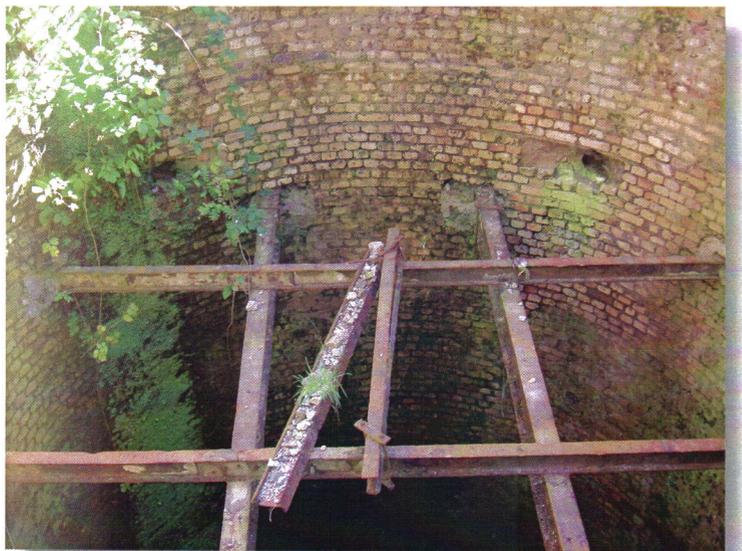
The engine house at Marriott's Shaft; the shaft is in front of the large arched opening.



Sectional drawing of Marriott's engine house showing the arrangement of the engine beam and cylinders. of £86 12s 6d was made, disappointing indeed.

During World War I only East Pool and South Crofty mines were given any protection from losing miners to the armed forces and many miners left, many to join the tunnelling companies used in mining operations on the Eastern Front. By the end of the war however Cornish mining was in a state of collapse: while tin had reached £300 per ton ancillary costs had risen dramatically and too few miners had returned to work. In 1917 the mine only treated 26,486 tons of ore, compared with 32,419 in 1916, and the accumulated loss was £23,422. The mine went into liquidation on 31 December 1918: for "want of capital, heavy pumping charges, and thirty years of adversity have combined to bring about this decision". According to the *Mining World* of 28 December 1918, "Basset possesses the finest pumping plant in the whole county, and it needs it, for it is probably the wettest mine. It consumes as much coal as the whole city of Truro".

At the time of closure pumping charges then constituted 40 per cent of Basset's total operating costs. During 1919 the tin remaining in the stopes was cleaned out, and the shafts and levels were cleared, using 200 men working three shifts a day against the rising water-level which on one occasion rose 60 feet in 36 hours. The balance bob at the 240 was the only thing that could not be raised in time and by mid-April all underground work had been completed, with surface operations and the fencing of shafts completed by Christmas 1919. The non-ferrous and iron scrap, the oak pump rods, the machinery and other materials realised £21,946.



The bricked upper section of Marriott's Shaft.

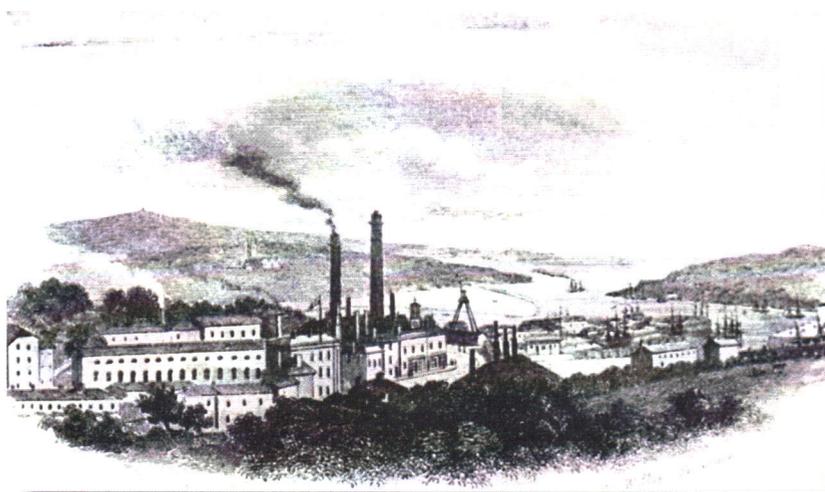
The remains here are very impressive, including a building which housed a 2 cylinder compound horizontal winding engine from Holman Brothers driving a rare (for Cornwall) conical winding drum. Other buildings include a large miners' dry, a massive boiler house which supplied steam to all the engines on site, and, next to the circular, vertical, shaft, 340 fathoms deep and 16' in diameter, the house for the pumping engine.

Other buildings beyond housed an air compressor, a steam capstan and the ore sorter at the terminus of Basset's own 18" railway, which linked to the West Basset stamps and Wheal Basset site. The Koppel locomotive was named Kimberley, presumably by, or in honour of, the manager.

Monday 6th

TOUR F1: Hayle

Hayle as a town is a child of the Industrial Revolution, the name not appearing on maps until the late eighteenth century. Hayle sits on the confluence of two short rivers and takes its name from the Cornish language word "heyl" meaning saltings. These two rivers meet at Hayle and flow as one for the last half mile to the sea where they create a shifting sand bar causing difficulties for shipping, of which more later. The town is a linear development along the southern bank of both rivers, with the western end of the town being known as Foundry and its eastern counterpart as Copperhouse. In the early 1700s the port facility and its industrial development started to take place and, although the quays along both rivers dry out at low water, there was ample depth for the ships of the day.



Hayle harbour and Harvey's foundry.

The story really begins with the decision of the Cornish Copper Company to move its smelter from Carn Entral near Camborne to Hayle in 1757. The local mines produced a considerable tonnage of copper ore and this needed smelting. Over time it was found cheaper and more convenient to send the copper for smelting in South Wales with its plentiful supply of coal so the company moved into engineering trading as Sandys, Carne & Vivian becoming renowned for their large engines

for mine pumping. The company finally ceased trading in 1869. Sadly few remains of this enterprise have survived although the canal constructed alongside the river to allow ships up to the works is still discernible with much of the masonry constructed of black scoria or smelter waste. A small town grew up around the works and became known as Copperhouse, a name still borne by that part of Hayle to this day. The company built houses for its workers, many from 'scoria' blocks cast from copper slag. In 1769 the copper company built the Copperhouse Canal still to be seen today and began the practice of flushing the harbour, a practice which continued until recent years.

In 1799 blacksmith John Harvey from nearby Gwinear set up a works at Carnsew to the west of Copperhouse in the area known to this day as Foundry. The scene was set for many years of dispute between the two companies, which was exacerbated as the Copper Company moved into foundry work

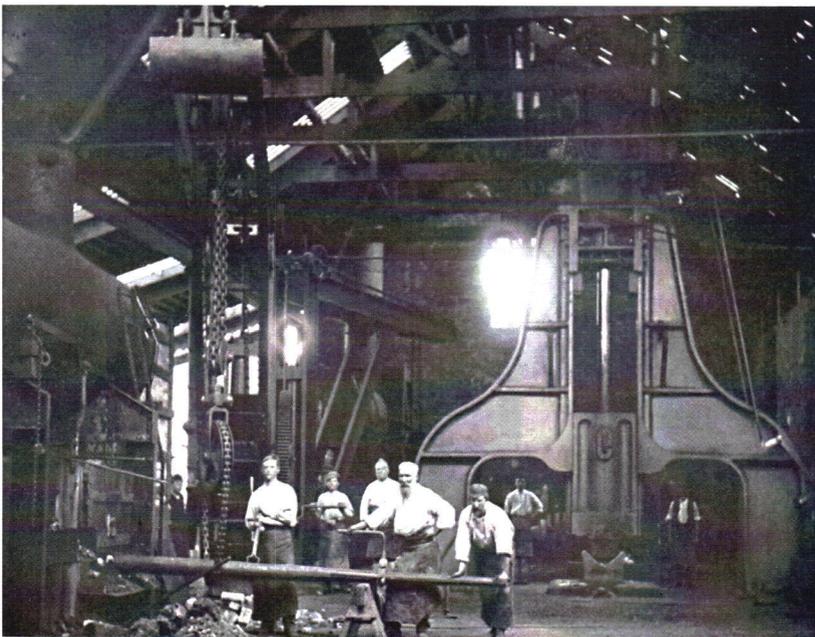


30-ton derrick crane and traction engine at work in the harbour.

from the 1820s. For the next 50 years two of the greatest makers of Cornish beam engines operated cheek by hostile jowl in this small Cornish port. In 1847 Harvey's was listed as "Millers, merchants, iron founders, iron & coal merchants, shipbuilders, ship owners, ironmongers, wholesale grocers, tea dealers, general merchants and ropemakers". The Copperhouse foundry closed in 1869 and Harvey & Co. took over most of their assets. Harvey's continued in business but in 1903 their foundry closed and they were thereafter builders' and general merchants. Although a considerable number of Harvey buildings have been demolished much of interest still remains and will be the subject of our field trip.

The Hayle Railway opened in 1837, using a combination of locomotives and inclines, ran to Camborne and Redruth with branches to Portreath and Tresavean Mine near Lanner. The Hayle terminus was beneath

the viaduct where the tour will begin. Its route ran from the quays and followed the line of the rivers eastward on the level, eventually gaining higher ground east of Hayle by an inclined plane at Angarrack, traces of which can still be seen. Passengers were carried from 1843. In 1846 the Hayle Railway became part of the West Cornwall Railway, which ran from Truro to Penzance, and Hayle then became a station on the Cornish main line. When the West Cornwall was extended in 1852 it followed the Hayle Railway route to a point just east of Hayle with deviations to avoid the incline at Angarrack and another at Penponds, west of Camborne. The line then kept to higher ground through Hayle and from the new station just east of the viaduct a steep branch descended to link with the old Hayle Railway network on the wharves. A network of lines served the harbour and foundries; many of the sidings were horse worked until closure in the 1960s.



6-ton drop hammer in Harvey's forge.

The West Cornwall main line crossed Hayle town on a timber viaduct 277 yards in length. The viaduct we see today is a replacement, dating from 1886, and is what is politely known in Cornwall as a 'lash-up'. At least one pier at the east end is significantly out of the vertical and elsewhere can be seen the results of various pieces of reconstruction work. The square brick piers at the west end still contain old cast iron columns inside them. Its odd claim to fame that it is the only viaduct in the country under which the same road passes twice.

Aerial view of Hayle harbour, 1960.

Nestled around the viaduct are the remaining buildings of Harvey & Co.'s foundry. Following some grievous losses in recent years, they are now being conserved and restored by the Harvey's Foundry Trust. Among the buildings to be seen are the 1835 granary or foundry barn, remains of the boring mill and erecting shop, a pattern shop and the timber-clad drawing office, supported at first floor level



on former mine drainage pipes. Later in the tour the remains of the 1776 hammer and boring mills can be seen and later a 500 metre ropewalk which operated from 1791 to 1916.

A substantial smelting works operated locally here at Mellanear from 1838, although there is virtually nothing to see today. It opened, like several of its kind, with the abolition of tin coinage from 1838 and was operated by Williams, Harvey. In 1908 the operation transferred to Bootle, the better to handle the preponderance of foreign ores coming into Liverpool, though the works retained the Mellanear name. The original Hayle works reopened briefly from 1915 to 1921.

The tour concludes in Foundry Square, on the north side of which White's Warehouse is the former Hosken, Trevithick & Polkinhorn (HTP) Steam Bakery, part dating from 1828. In 1852 part of the Harvey empire passed to J. H. Trevithick Holdings, later to become the great Cornish trinity, HTP. John Harvey House with distinctive clock tower was Harvey & Co.'s head office. Barclay's Bank was Harvey's Emporium, effectively the company shop, and Foundry House of 1895 is on the site of the foundry offices and shop. It was later the Cornubia Biscuit Factory of HTP. The original White Hart Hotel of 1824, now in Masonic hands, was built by Henry Harvey to provide a living for his sister Jane, whose income from her husband Richard Trevithick was, to say the least, sporadic. The current White Hart next door dates from 1838 and was used to accommodate Harvey customers visiting Hayle.

Other notable businesses that operated at one time on North Quay Hayle were a C.E.G.B. coal fired power station, an oil depot, Associated Octel which produced bromine from sea water and the Pentowan Calcining Works. Situated on the outskirts was the National Explosives Works and at Copperhouse was the works of J. & F. Pool, which specialised in the manufacture of many sizes of perforated plate. This business has now transferred to the Midlands under the Ashe & Lacy banner. Thos. Ward shipbreakers also operated for some time in the harbour.



Foundry House, the former Harvey offices and, later, the Cornubia Biscuit Factory.

TOUR F2: Poldark Mine

Poldark Mine lies within the Wendron mining district to the north of Helston. The earliest evidence of working on the site is the Poldark mortar situated in the main car park. This feature comprises hollows in the granite outcrop, used by prehistoric tanners to crush tin ore from the River Cober, one of the richest alluvial tin deposits in West Cornwall.

By the fifteenth century the tin industry had become well organised and the tin streams and small mines could take their ore to tin stamps for 'dressing': crushing and concentrating ready for sale to the smelters. The earliest known record for a tin stamps and the first documentary record of the Poldark site is a lease between the Duchy of Cornwall and John Trener.

Tin streamers working the valley had discovered the outcrop of a lode near the present day main car park entrance. The lode was followed under the Poldark site and into the hillside. The working of the tin mine, known then as Wheal Roots, had commenced. The workings were extended to the north to include at least two other tin lodes and to an unknown depth. The mine did not operate the tin stamps at Poldark but no doubt sent its ore there to be processed ready for sale to the smelters. It is known that the mine worked between 1720 and 1780.



Prehistoric mortar stones in the Poldark Mine car park.

Mining across the county was in crisis from the 1860s, first with a decline in the value of copper and from the 1870s the price of tin, both as a result of growing production from overseas mines. By 1880 many of the mines of the district had ceased working and those that continued had their own processing plants. With a ready source of power, the water wheel, the site was purchased by the newly formed Trenear Dairy Company which built the building now used as the museum; later it became an egg packing station when the museum building was further expanded.

The eastern end of the Poldark site was later acquired by Wendron Forge. In 1966 the forge was acquired at auction by Peter Young. Peter persuaded the blacksmith to continue working and gradually built up an important collection of memorabilia opening the adjoining land to the public and calling his enterprise Wendron Forge; it soon had one of the most important collections of steam and early oil engines in the country. Peter decided to drive a tunnel into the hillside to find the mine and drain the water which caused problems within the site; this was necessary as the shafts had been filled by the local farmer. When the old workings were reached they were found to be full of mud and debris with just enough room to crawl over. It was decided to clear them to enable visitor access and over the next ten years the mine was opened up to the public.

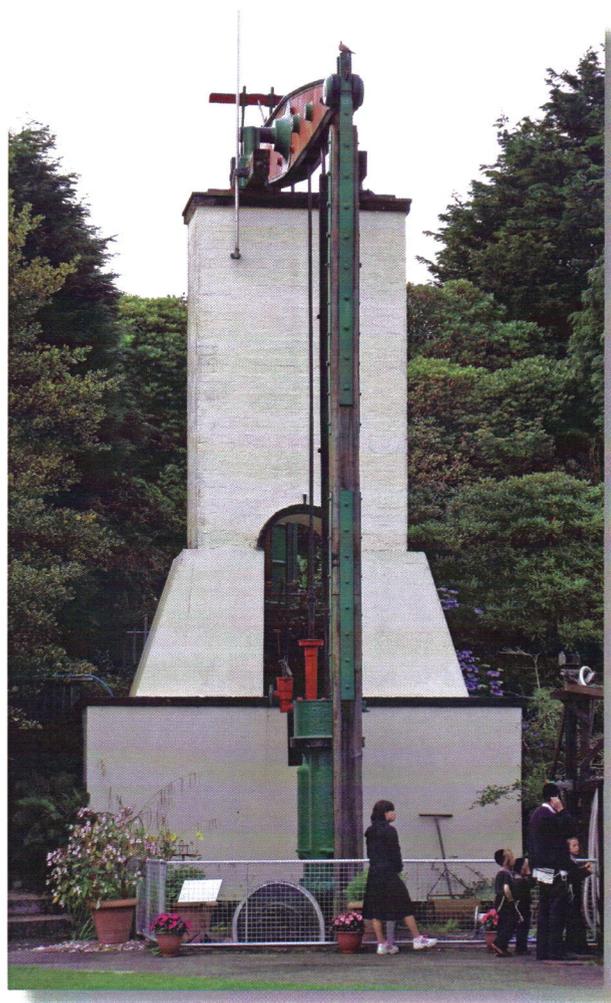
It was in about 1975 that Wendron Forge became home to the enigmatic Greensplat engine. This engine has no maker's identifying marks and its age is unknown. It had worked at Greensplat china clay pit from about 1894, having been acquired from the nearby Wheal Bunny for £60; it is possible

The Greensplat beam engine.

that it originated in the Caradon district. On arrival at Greensplat it was converted from rotative to non-rotative and worked until February 1959, the last engine to work under steam in Cornwall. In the winter of 1972/3 it was moved to Wendron where it is now worked hydraulically.

In 1988 the Wendron site was sold to a property developer who continued to operate it much along the lines that Peter had. From this time the site was not developed and stayed much as it was when Peter retired. By 1999 visitor numbers had dropped to some 30,000, far below an economic level. Receivers were appointed and Poldark closed its doors in September of that year. With interest from an American buyer it looked as though the now important collection of artefacts would be shipped overseas and the site closed permanently.

Three local enthusiasts financed a new company, Transcroft Limited. Protracted negotiations with the receivers meant that opening for the summer season was being placed at risk as the site was in an extremely bad state of repair. Finally, in June 2000 the site was purchased and the doors reopened on the 28th.



From acquisition it was decided that the interpretation and storyline at Poldark needed to be focused and themed upon aspects of Cornwall's heritage not interpreted elsewhere whilst at the same time the site needed to offer entertainment. No site explained the early history of tin, the story of tin working and mining before 1820, and nowhere was the fascinating story of the Cornish overseas explained. With its unique prehistoric remains and detailed early history, Poldark is well placed to explain the history of tin from the earliest times of the working of rich alluvial deposits to the development of underground mines and their story to the 1820s.

In July 2006 the mining districts of Cornwall and West Devon were inscribed as a World Heritage Site by UNESCO, the United Nations Educational, Scientific and Cultural Organisation. Poldark is situated within the Wendron Mining District of the World Heritage Site and is the District's interpretation centre.

Tuesday 7th

TOUR G1: Museum of Submarine Telegraphy, Porthcurno

The Telegraph Museum occupies the site of the Porthcurno Telegraph Station and the Cable & Wireless training facility. In 1870 the telegraph cable to India was brought ashore at Porthcurno instead of at Falmouth as originally planned. The absence of rocks in the sandy cove and the fact there was no local fishing activity drove the choice. The four companies, which had laid the Bombay



Display cases in the World War II tunnels

cable soon merged in 1872 to form the Eastern Telegraph Company and as this company developed its network, Porthcurno, “PK”, was to be its major station; in fact, it was the largest cable station in the world. At its zenith 14 cables came into Porthcurno from such points as Lisbon, Vigo, Gibraltar, Madeira, Newfoundland and Valentia. These cables went on to New Zealand, Australia, Malaya and Singapore.

At the beginning of the twentieth century Porthcurno sat at the heart of

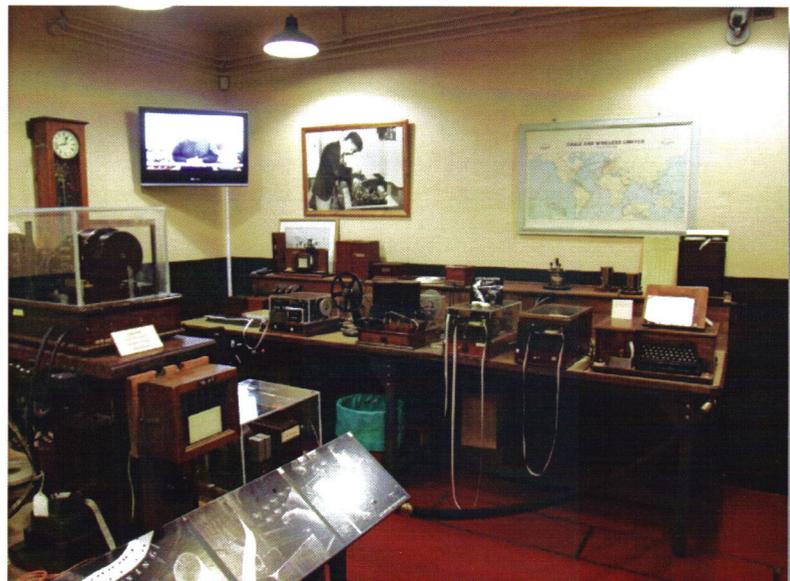
a world wide network but in 1902 Marconi sent a wireless message across the Atlantic from Poldhu on the Lizard to Newfoundland. Despite the cable companies’ protestations that they did not fear this competition, they built a mast on the cliffs near Porthcurno to eavesdrop on, and possibly interfere with, Marconi’s transmissions. Its base can still be seen.

The importance of submarine cables became apparent during World War 1, as their traffic cannot be intercepted. The Royal Navy found and cut all German cables, leaving the Germans dependent on neutral cables, which passed through the UK! By the 1920s cable traffic was falling and in 1928 the Eastern Telegraph Co. and the Marconi network merged to form Imperial and International Communications Ltd. This in turn became Cable & Wireless in 1934.

During World War II Porthcurno was regarded as a key strategic site. Underground tunnels, driven by miners loaned by Geevor Tin Mine into the cliff behind the cable station, housed all of its equipment to safeguard it from bombing. The tunnels were bomb proof and air conditioned. In addition the cove and surrounding cliffs were fortified with pillboxes and pipes were laid across the beach, which could be flooded with petrol and set alight in the event of an amphibious landing. The Defence of Britain Project lists no fewer than 13 pillboxes of various types at Porthcurno, an astonishing number for this relatively isolated cove. One pillbox, alas no longer extant, served for many years as the box office for the Minack Open Air Theatre.

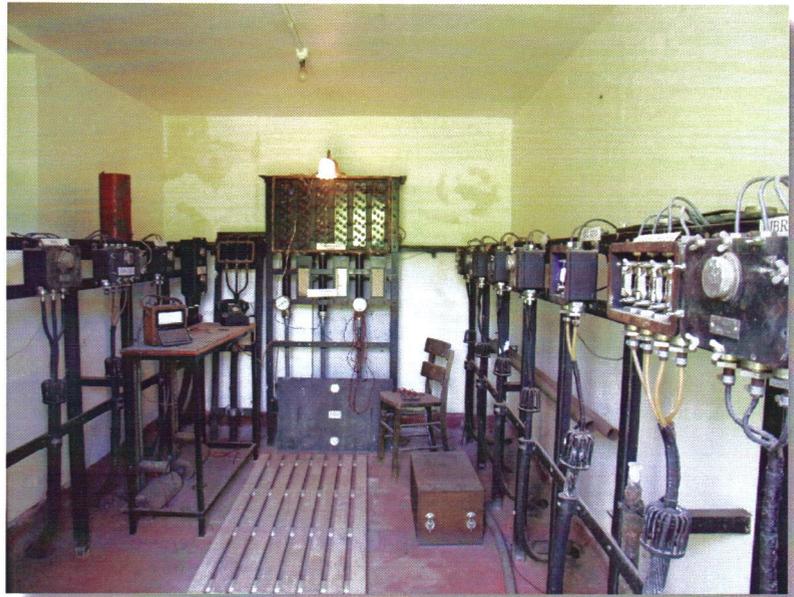
After the war Cable & Wireless was nationalised and its activities confined to overseas with the Post Office taking over all UK operations. Porthcurno was the sole exception to this, remaining with Cable & Wireless and becoming its main training facility. The last telegraph cable was brought ashore in 1952 but in 1970 the final telegraph

Exhibition of telex equipment.



The interior of the 'cable hut' on the beach at Porthcurno. This is where the submarine cables became part of the land network.

activity took place. The training college remained open until 1993 and the Museum of Submarine Telegraphy opened in 1997, largely manned by former members of staff. The main building houses displays, which tell the story of submarine telegraphy. The wartime tunnels contain the museum's collection of equipment and explain the technology, while at the top of the beach the Cable Hut contains the terminations of the network of cables.



TOUR G2: Newlyn harbour and its fishing industry

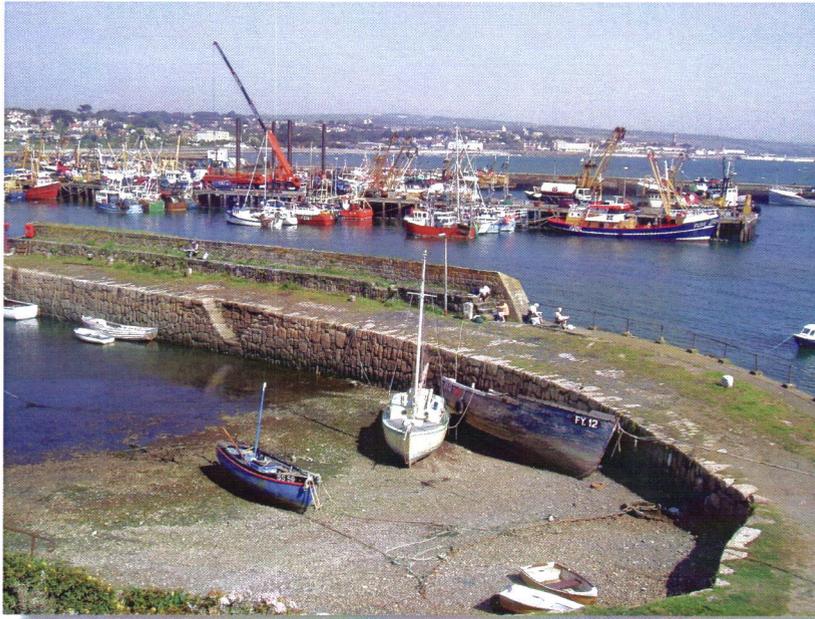
The fishing port of Newlyn lies to the west of Penzance, where the Newlyn River reaches the coast. Before the rise of Newlyn as an important settlement the landing rights and most of the property within the Newlyn area were owned by the Manor of Alverton. Newlyn's history has been strongly linked to its role as a major fishing port. The natural protection afforded by the Gwavas Lake (the area of seawater on the western side of Mounts Bay) led to many local fishermen using this area as a preferred landing site.

There are numerous narrow streets and alleys behind the main road which runs around the harbour connecting Penzance and Mousehole. Many of these streets have unusual names such as The Fradgan, Gwavas Quay and Bowjey Hill. Amongst these narrow streets are fisherman's cottages and pubs which are very much the home territory of the locals, but where visitors are always made welcome.

Newlyn harbour is first recorded in 1435 by the Bishop of Exeter; later large scale improvements to the harbour led to Newlyn becoming the predominant fishing port in Mounts Bay. In 1595 a Spanish raiding party sacked and torched Newlyn, Mousehole and Paul before marching on to Penzance. In 1620 the *Mayflower* stopped off at Newlyn old quay to take on fresh water as the water supplied in Plymouth was contaminated. Newlyn was therefore her last

Fishing boats inside Newlyn's old harbour, late 19th century.





port of call in the UK.

In 1755 the Lisbon earthquake caused a tsunami to strike the Cornish coast, over 1,000 miles away. The sea rose ten feet in ten minutes at Newlyn, and ebbed at the same rate. The 19th century French writer, Arnold Boscowitz, claimed that “great loss of life and property occurred upon the coasts of Cornwall”.

The medieval harbour wall at Newlyn; part of the fishing fleet is behind. Penzance is in the distance.

Newlyn was the home of William Lovett, a leader of the Chartist

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movement. During the 19th century Newlyn was the scene of riots following protests over the landing of fish on a Sunday by fishermen from England, mostly Lowestoft. The Cornish fishermen were members of the Methodist church and as such strong supporters of sabbatarianism.

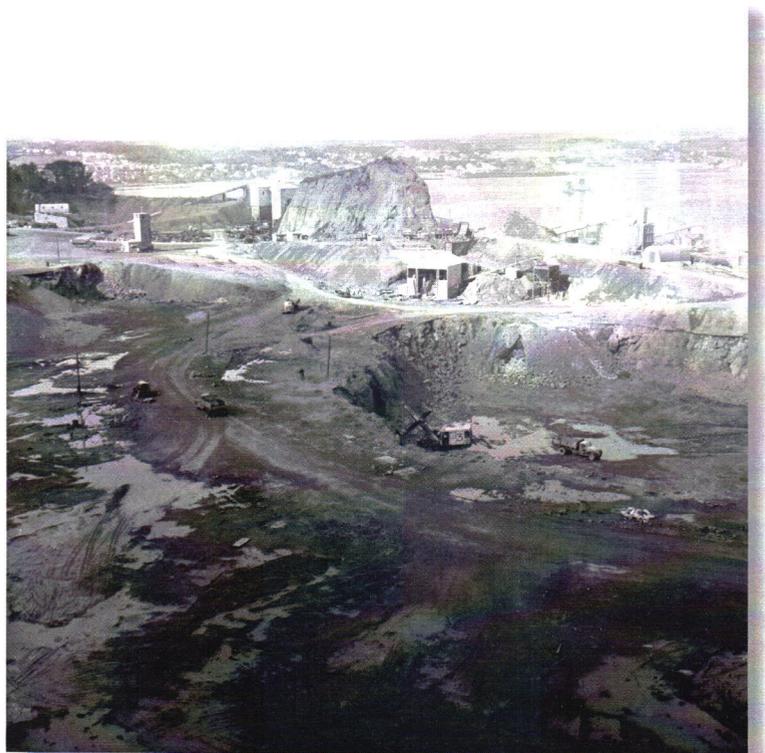
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Before the 19th century ‘Newlyn’ referred only to the area near the old quay. The part of the village which now contains the fish market was known as Street-an-nowan (New Street), which was separated at high tide from ‘Newlyn Town’, the site of the lower part of the modern harbour being reclaimed land and formerly a beach. The small park opposite the ice factory is still known as ‘The Strand’ and was formerly part of the beach.

In 1881 the Newlyn art school was set up and artists came from all over England to paint the area. Walter Langley was the first ‘major’ artist to move to the area, in 1882, followed by Stanhope Forbes two years later. It was Forbes who described Newlyn as “the artistic Klondyke”. Other artistic worthies included Percy Craft, Henry Rheam, Chevallier Taylor, Blandford Fletcher and Elizabeth Forbes, wife of Stanhope.

Penlee Quarry was established just to the south of Newlyn in about 1898, the quarry eventually having port facilities, including a small locomotive, just south of the harbour. There have been somewhat

Penlee Quarry, early 1950s. This was used as a testing facility by the Climax Rock Drill & Engineering Company of Pool, rivals of Holman Brothers.



contentious plans, now on hold for economic reasons, to flood the now-disused pit to create a marina.

In 1915 the Ordnance Survey tidal observatory was established in the harbour and for the following six years measurements of tidal height were taken every 15 minutes.

In 1937 the fishing vessel *Rosebud* sailed to London to deliver a petition to the Minister of Health on behalf of those villagers whose homes were threatened under the government's slum clearance scheme. Ironically it was the start of World War II which halted these clearances. During the war Newlyn was a base for the Air Sea Rescue craft covering the Western Approaches. The harbour was bombed during the war, hitting



Church Street, on the west side of the harbour.

the collier *Greenhithe*, which was beached in the harbour at the time and supplied coal to the east coast drifters, which travelled to Newlyn during the mackerel fishing season.

A lifeboat has been stationed in Mounts Bay since the opening of a station at Penzance in 1803. This station remained open until 1917, although it was not in operation between 1828 and 1851. In 1908 an additional lifeboat station was opened at Newlyn but this closed in 1913. At this time a new station opened at Penlee Point, remaining open until a short time after the loss of the lifeboat *Solomon Browne* during the attempted rescue of the crew of the mini bulk carrier *Union Star* on December 20th 1981. After the disaster the *Solomon Browne* was replaced temporarily by the *Guy and Clare Hunter*, replaced in turn by the new Arun class boat *Mabel Alice* in March 1993. The new boats were subsequently stationed in Newlyn Harbour.

Newlyn's economy is now largely dependent on its harbour and the associated fishing industry. Because of Newlyn's association with the creative arts there are also a number of artists and art galleries that are established in the area. As the present time, Newlyn harbour is the largest fishing port by turnover in England, over £18 million in 2004. The fishing fleet boasts a number of different catching methods: beam trawling, trawling, gill netting, potting and a large number of under 10m vessels that fish inshore. The port was a major catcher of pilchards until the 1960s. Today, a few vessels have resumed pilchard fishing and use a modern version of the ring net. The largest vessels are beam trawlers owned by W. S. Stevenson and Sons, one of Cornwall's largest fish producers: most of the other vessels are owned by their skippers.

Tuesday 7th

TOUR H1: Wheal Peevor

Wheal Peevor, along with its satellite West Wheal Peevor, lies about 1km west of Scorrier, the engine houses being prominent features on the north side of the A30. A number of mines formerly worked in this area, including North Treskerby, Wheal Rose, Great North Downs, Wheals Montague and

Harmony, Treleigh Wood and Wheal Chance. With the exception of Wheal Peevor, which only produced tin, these mines primarily or solely produced copper.

It is not known when operations at Peevor commenced, however it was described in September 1791 as “much failed. It produces about £300 of Tin monthly which will scarcely pay its cost...” At this time the mine was included in the North Downs sett.

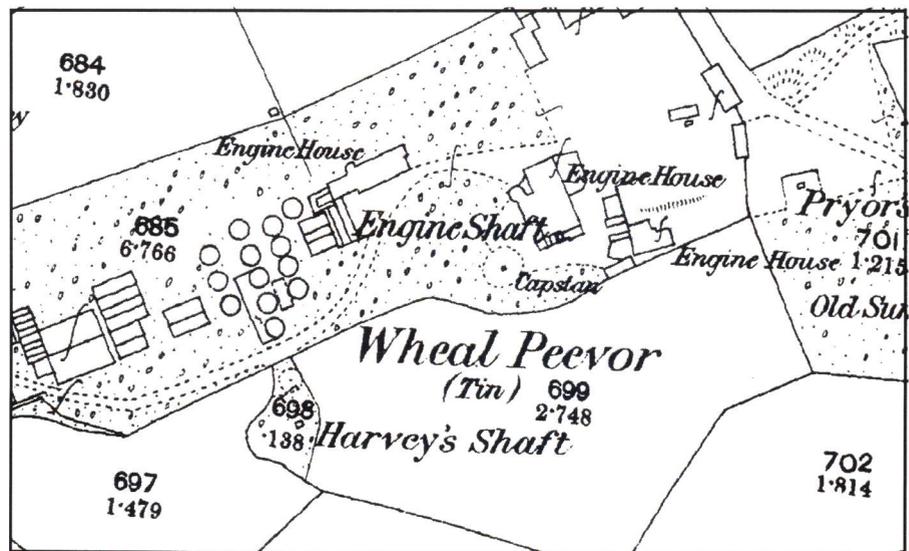


Wheal Peevor in the 1970s. From left to right: stamps engine house, pumping engine house, winding engine house.

The main period of activity commenced in 1871 when the mine was promoted, with very many other tin mines, after the price of tin increased to produce what was to become the penultimate tin boom of the 19th century. However, during the period 1872-76 the mine’s adventurers had to pay £22,650 in calls – contributions towards the mine’s running costs in proportion to the adventurers’ share holdings.

During the exceptionally wet winter of 1876-77 part of the Great County Adit, to which the mine had been connected, collapsed and there were fears that the mine would be drowned. The price of tin at this time was collapsing and few mines were even able to pay their way, let alone pay any dividends. The situation was exacerbated by the Cornish smelters, who were importing large amounts of tin from Australia and the Malayan Straits, depressing the price even further. In 1878 Wheal Peevor was one of the thirteen mines able to pay a dividend, of £2,250. The mine was able to pay another dividend the following year, higher at £5,025 because the price of tin had rallied.

That great champion of Cornish mining, the late J. H. Trounson, said of Wheal Peevor and neighbouring West Peevor that “the Peevors were small mines but of exceptional richness and between 1872-89 they produced 4,480 tons of tin oxide.” Ore from Peevor was giving 4% tin when most mines were achieving 1 to 1.5%. He says that the prevailing price of tin at this time was extremely low and as the ore grade fell, the mine was in difficulty. Remarkably, during the period 1878-82 the mine sold 2,287 tons of black tin (tin concentrate) and paid £27,716 in dividends with an average tin price of only £43 per ton. Losses commenced in 1882 and the mine (with West Peevor) was sold in 1897 having been idle for some years. The mine had a



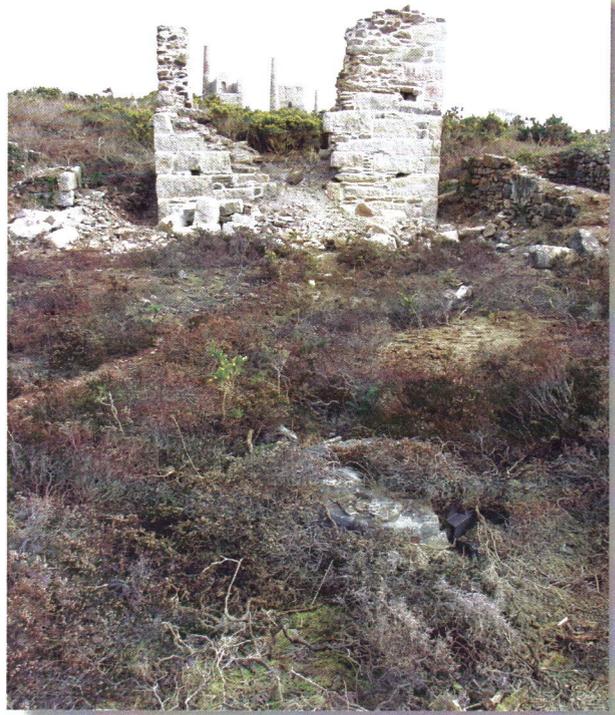
Extract from 25-inch OS sheet SW56: 15 showing the layout at Wheal Peevor.

Tinyard at Wheal Peevor showing the remains of one of the calciners with a buddle in the foreground. Stamps and pumping engine houses left and right in background.

60" pumping engine, 36" stamps engine and a 22" whim; the best price offered at auction for the lot was £433, against a reserve price of £650.

The mine was reopened between 1911 and 1913 as Peevor United Mines Ltd, which also included North Downs and Black Dog, the latter formerly a part of Wheal Busy. This operation was described by Mr Trounson as "feeble" and under capitalised, and produced virtually nothing; Wheal Peevor was always regarded by him as worthy of further investigation. A rather decrepit 70" pumping engine, brought from Wheal Johnny near Camborne, was used during this reworking.

Let Mr Trounson take up the tale. "She [the engine] had very rough handling at Wheal Peevor. One day a visitor went into the house and found an old man driving her who was obviously as deaf as the proverbial post. She started to touch her beams but the old man didn't appear to realise it and at last the blows became so violent that loose bricks on the top of the stack were hurtling through the slates on the roof. The old man suddenly asked his visitor, 'Is she touching, Mister?' Yes the poor old engine had a very rough life there."



There were attempts to explore the mine for wolfram in 1938 and diamond drilling took place at neighbouring West Peevor in the 1960s.

Wheal Peevor was never an important mine but it is worth visiting today as one of the few sites where the three main engine houses of a Cornish mine all survive and can be seen in the overall context of a mine at surface. Here we have the engine houses, dating from the 1870s, for the pumping, winding and stamp engines all remaining and conserved for the future, though the actual conservation activity has attracted some criticism. The site also includes a Brunton calciner, used for removing sulphides from the crushed ore, as well as a series of buddles, used to separate tin ore from waste and produce a concentrate. Unfortunately no conservation work has been carried out in this section of the mine.

TOUR H2: The Bodmin & Wenford Railway

Bodmin and its vicinity has quite a complex railway history. The Bodmin & Wadebridge Railway opened in 1834 using steam power from the outset. It ran from Wadebridge to Wenford Bridge with branches to Bodmin and Ruthern. The B. & W. in its early days relied to an extent on canal practice. Thus its intermediate goods sidings were referred to as 'wharves' each with a wharfinger in charge. In 1845 the line was acquired, quite illegally, by the London and South Western Railway but remained an isolated outpost of that company's system until the North Cornwall line reached Wadebridge in 1895. Meanwhile the Cornwall Railway main line had avoided Bodmin by opening a station at Bodmin Road, some 3½ miles distant in 1859. It was 1887 before a steeply graded branch was opened from Bodmin Road to the town. The branch had its own terminus in Bodmin, known latterly as Bodmin

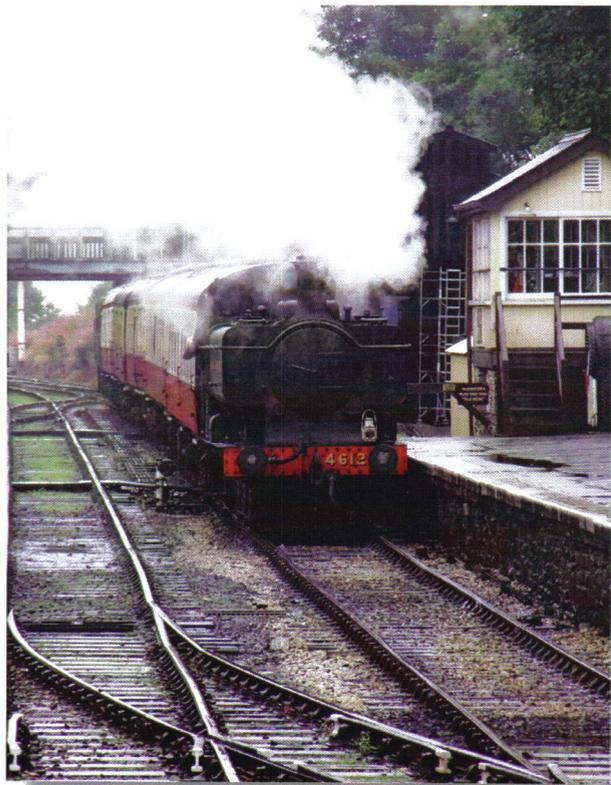
3452 at Bodmin. This is a British Rail Class 10 0-6-0 diesel-electric (DE) shunting locomotive. After being withdrawn by British Rail in July 1968 it was sold to English China Clays Ltd for further service. It spent much of its subsequent life at Fowey shunting china clay trains. It was bought for preservation in March 1989 and was put to work at Bodmin.



General. The following year a line to Boscarne Junction linked the branch to the former Bodmin & Wadebridge system. That had its own station in Bodmin, Bodmin North, now demolished for road improvements. All passenger traffic ceased in 1967 and freight in 1983 with china clay traffic

from the dries at Wenford being the final workings. The Wenford Branch achieved legendary status among railway enthusiasts due to the survival there of three 1874 L&SWR 2-4-0 Beattie well tanks until the 1960s. Their short wheelbase and low axle loadings made them ideal for this early mineral line. Two of the three are preserved.

In 1984 the Bodmin Railway Preservation Society was formed, and they held their first open day at Bodmin general two years later. 1987 saw the Cornish Steam Locomotive Society move their equipment from Bugle to Bodmin. A Light Railway Order was granted in 1989 and the following year passenger services recommenced between Bodmin General and Bodmin Road, although by now that station had been renamed 'Bodmin Parkway'. A new intermediate station known as Colesloggett Halt was brought into use. In 1996 the former junction line was also reopened, with another new station provided as Boscarne Junction.



The stations served are all in or near Bodmin. They are Bodmin Parkway, Colesloggett Halt, Bodmin General and Boscarne Junction.

The Bodmin & Wenford Railway is now established at Bodmin General and runs trains approximately three miles to Bodmin Parkway (formerly Bodmin Road) in one direction and three miles to Boscarne Junction in the other.

The Cornish Steam Locomotive Preservation Society was formed in 1974 to preserve mainly industrial locos. The society is based at Bodmin General station on the Bodmin & Wenford Railway

4612 leaving Bodmin. This is a GWR 5700 Class 0-6-0 PT pannier tank locomotive that operated out of St Blazey engine shed for use on the china clay branch lines.

'Alfred', one of the two ex-Port of Par Bagnall 0-4-0 STs, at the Royal Albert Bridge for the 150th anniversary celebrations.

and has a number of locomotives in its care. An open day was held at Par within months of the organisation being formed. In 1977 the CSLPS moved to Bugle and started the Bugle Steam Railway. In the early 1980s the British Rail branch from Bodmin Parkway to Bodmin General was finally closed and a group of interested people started the Bodmin & Wenford Railway. The CSLPS moved to Bodmin General in 1986 and provided the locomotives for the infant railway.



As well as the steam locomotives the Society also has the care of a number of wagons including a Mink, a mineral wagon and a fruit van.

Wednesday 8th

TOUR J: The St Just Heritage Coast

This section of coast extends from the sandy north end of Whitesand Bay (Gwynver Beach) to the steep cliffs north of Pendeen, covering the entire coast of the parish of St Just in Penwith. The coast includes many notable mines, such as Cape Cornwall, Wheal Owles, Botallack, Levant and Wheal Hermon, the latter the first Cornish mine to appear on a map. This is the area where cliff mining was best developed in Cornwall, the spread of lode directions (from N-S to E-W) making this possible. The lode orientation also led to the development of so-called 'submarine mines', notably Levant, Botallack and Cape Cornwall where workings extended up to 1.5km from the shore and to 600m below the sea bed.



While there are no major rivers and only four streams within the parish it is recorded that in the 1840s there were around forty waterwheels in use, including one of 65 feet diameter. Steam power arrived comparatively late, compared with the history of tin and copper extraction, and it was not until the early 19th century that

The southern part of the St Just coast, from just south of Cape Cornwall to Whitesand Bay. In the middle ground is Wheal Hermon, the first Cornish mine to appear on a map.

The central part of the St Just coast, just north of Cape Cornwall. Wheal Edward stamps in the foreground with the Crowns in left background and Allen's Shaft headframe and stack to the right.



Many industrial remains can be seen inland. This is an arsenic works and four associated tin stamps in the Kenidjack Valley. The Wheal Drea engine house is on the horizon.



beam engines came into general use in the area.

The mines are set within a prehistoric landscape, the boundaries of which have changed little since the fields were formed. Mineralisation does not extend far inland in the St Just area although there are isolated exceptions such as Balleswidden and East Botallack Mines to the east of St Just.

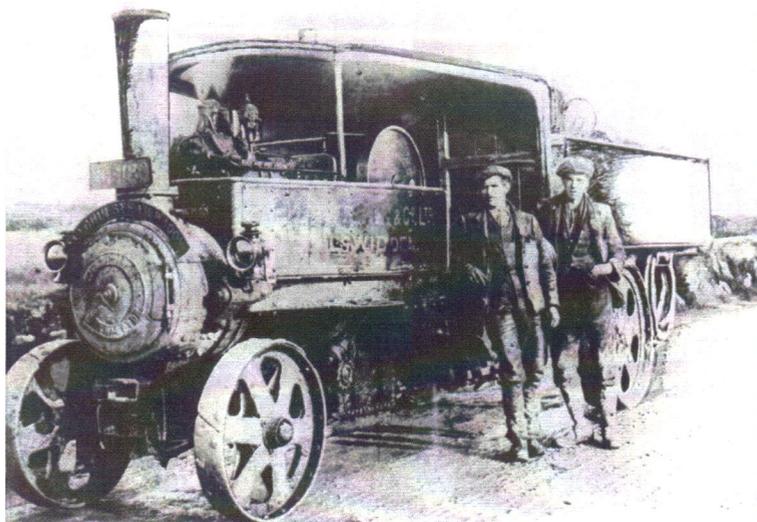
TOUR J1: Leswidden China Clay Works

The tract of kaolinised granite to the east of St Just has been worked in three pits, Balleswidden (pronounced bal-swidden), Leswidden and South Bostraze. The first china clay extraction took place at Balleswidden in 1873, shortly after the closure of Balleswidden Mine. The clay was taken from the waste tip around Holman's Shaft by Frederick Olve, who operated the works until about 1910. The shaft was 60 fathoms deep and the clay extended all the way to the bottom.

In 1888 there is mention in the local press of a new pumping engine being erected and it appears that one of the mine's engine houses was demolished to make way for the new pump. Ten years later, when a light railway to St Just was again being proposed, it was

“stated by experts that the Leswidden estate, which is situated on the direct route of the proposed railway, has an inexhaustible supply of

Traction engine at Leswidden China Clay Works, 1930s.



Balleswidden clay pit (the Blue Pool) with clay processing plant and pan kiln in the background.

this valuable product. Already two limited companies have been formed, each having a capital of £20,000 and another is in course of formation with a capital of £25,000 for the development of this industry. Directors of the first two named companies are joining the board of the railway syndicate, and are introducing contracts for the conveyance of the whole of the output of china clay”.



Balleswidden clay works was being worked in 1913 by H. D. Pochin & Co. and considerably expanded during the 1920s, the new coal-fired dry being used from 1926. The Leswidden pit was also in operation by 1914, worked by English China Clays, and both pits were able to take on men discharged from Botallack Mine that year.



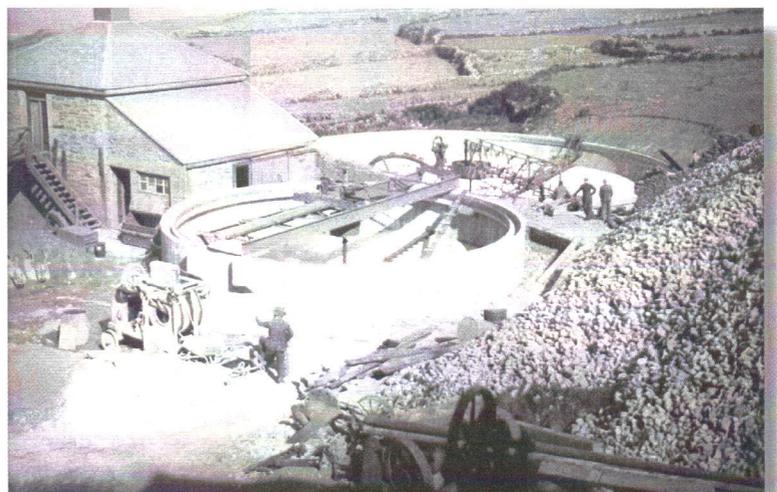
Leswidden clay pit.

Clay from the pits was taken to Penzance harbour by traction engine and stored next to the harbour (the building is now the Meadery) prior to shipment. In August 1920 Pochin’s installed mechanised scoop conveyors at Penzance for loading the clay and the first vessel with a cargo for America left shortly after. English China Clays and

Pochin had an agreement that Balleswidden clay could be stored at the Leswidden dry and vice versa, being an informal agreement for the amalgamation of the two works. In March 1927 an arrangement was made by Pochin’s to purchase the lease of Balleswidden Mine with the kiln, etc. Eventually both companies became part of ECLP (English Clays, Lovering, Pochin) but the two pits were closed shortly after during a rationalisation of the industry.

South Bostraze China Clay Works, early 1970s.

The South Bostraze clay pit, hidden behind an earth embankment on the north side of the road, was started in the 1960s. In 1972 the pit was producing 80-100 tonnes per week, mainly for fire bricks for the steel industry and a



general purpose filler clay.

The mass concrete settling tanks, mica drags, sand drags, pan kilns and linhays are unique to this area, looking more like sprawling military establishments than clay processing plants; those in other clay districts were made from more conventional masonry. The works on the north side of the St Just-Penzance road are those of the Balleswidden works although the pit on the south side of the road (the 'Blue Pool') provided the clay. The works on the south side of the road was built for Leswidden, with the pit, shallower and smaller than Balleswidden, to the south.

The Leswidden pan kiln was rebuilt at some point as its orientation is opposite that shown on the 2nd series 25" OS map. To the west lies a concrete block works, near which lie some older mica drags and settling pits. Further south lies a small clay processing works, formerly part of the Balleswidden operation. The pan kiln at South Bostraze, while conventionally built, is oil-fired. The houses to the east of the Balleswidden works are called McLaren Villas, named for the Honourable H. D. McLaren, the then chairman of ECC. To the west of the Blue Pool lie the scant remains of the Balleswidden Mine dressing floors, where a few buddles can be seen.

TOUR J2: St Just

Looming out of the fog of the West Penwith moors, St Just is Cornwall's most westerly town. Although not particularly pretty (it was described by John Betjeman as 'a sad, dismal place, situated in a most inhospitable and cheerless corner of the country'), the town is ruggedly handsome, blending into a background of tiny prehistoric granite-walled field systems. St Just lies seven miles west of Penzance, set in a parish of about 7,820 acres and measuring about two miles in width and eight in length. The parish is separated from its neighbours Morvah, St Buryan and Sancreed by granite hills, while to the west lies the Atlantic Ocean with its border of granite and greenstone cliffs.

The town is named for one of two characters. The first is St Justus, a 6th century Christian missionary. He is thought to have been sent to England with Augustine in about AD 596 to convert the Saxons. He died in AD 627, by which time he had become Archbishop of Canterbury. The alternative is the son of King Gerent (who gave his name to the parish of Gerrans, near St Just in Roseland, to the east of Falmouth). One of the monuments in the church (the Selus Stone) may be dedicated to his brother, supporting his case. A large number of Christian missionaries came to the



Market Square, St Just.

south-west from Ireland to convert the inhabitants to Christianity. Unfortunately the Celtic brand of Christianity was not acceptable to the Church of Rome, and it was thought necessary by King Athelstan in the tenth century AD that they be put to the sword to more properly convert them. The church of St Beriana (St Buryan) was built to commemorate his victory.

St Just was still relatively undeveloped by the 16th century and was described by John Leland:

From Lanant by the North Se (Sea) to St Just, alias Justini, beyng the very West Poynt of al Cornewayle, where ys no thing but a Paroch Chyrch and divers sparkeled (scattered) Howses.

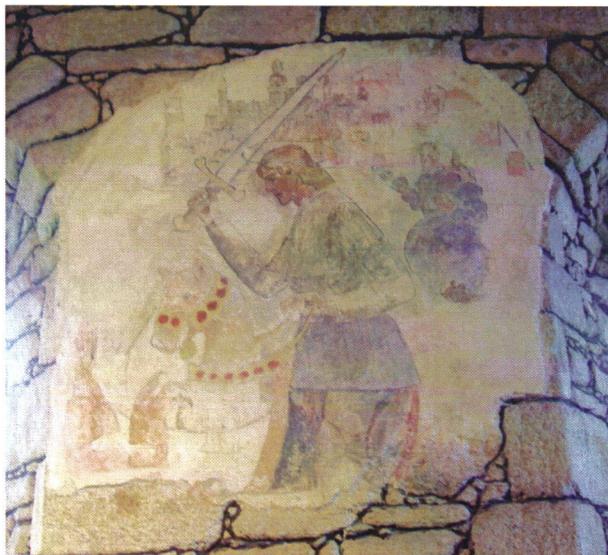


The plen-an-gwarry with the war memorial memorial clock in the background.

The scattered houses still remain, as does St Just. The town's fortunes have been fairly mixed over the last couple of centuries. St Just grew to its maximum population in the mid-late 1800s, and the number of houses doubled between about 1840 and 1870. However, by about 1880 much of the Cornish mining industry was in decline. This decade was the final boom of the 19th century, however by this time Cornwall had lost its premier mining position for both tin and copper. The ebbing and final collapse of the mining industry in the last quarter of the 19th century saw waves of emigration to countries such as North America, Canada, South Africa and Australia.

St Just again attracted attention during the brief renaissance of Cornish mining in the early 20th century. However the town fell into another decline after this, and by 1971 the population had fallen to only 3,576. Although the population has now risen to 4,475, it still has fewer inhabitants than lived in the town in 1831. The only recent developments of any size have been the housing estates and the secondary school.

Most of this development (including the library, health centre and fire station) has been in the Lafrowda area, to the west of the town centre, with scattered housing developments elsewhere. Despite these new developments, few of which can be seen from the town centre, the town has managed to retain its distinctive Cornish character and rugged charm.



Medieval wall paintings in St Just Church.

Religion has been important both to the town and district since earliest times, and in and around St Just can be seen some of the earliest evidence for Christianity in south-west England. Chi-rho monograms (representing the first part of 'Christos', for Christ) have been found on 5th and 6th century stones, while part of a late 9th century cross was found in the church during rebuilding works in the 1860s.

In the middle 1700s both John and Charles Wesley preached regularly in the town, either in the Plen an Gwary, a medieval amphitheatre, or at the cross which formerly stood outside it. Although comparatively small now, it should be realised that at that time St Just was similar in size and population to Manchester. Other branches of Christianity which are or have been represented in the town include teetotal Methodists (Methodist Free Church), Bible Christian, Anglican and Roman Catholic; very nearly every hamlet has its own chapel, though most are disused. In more recent times there has been an increasing interest in the Celtic and Christian-Celtic sites (holy wells, standing stones, stone circles, etc.) and many pagans now visit or live in the area.

The heart of the town, now, owing to mid-19th century developments on the east side, consists of Market and Church Squares. Church Square contains the mainly 15th century church and some 15th century houses. Two of the town's pubs, the King's Arms and the Star Inn, are shown on a map of 1778 but may be 17th century. Market Square joins Church Square to the west. Actually a triangle, the Square contains one pub, two hotels and several shops. Just to the north, the Plen an Gwary lies on the south-west corner of Bank Square.

TOUR J3: Botallack Mine

The Botallack Mine sett (lease area) is a very old one, granted from the Boscawen family in 1721, while Botallack village was mentioned by John Norden about 120 years earlier as:

...a little hamlet on the coaste of the Irishe Sea, much visited with tinnners, where they lodge and feede, being nere theyre mynes.

In 1778 it was reported that the mine was worked for 80 fathoms beyond the high water mark and that the workings reached to three feet from the sea bed. The first pumping engine was erected on the Crowns rocks not later than 1819. This was an incredible feat of engineering, particularly as the site of the house meant that no foundations could be dug for it, and it was necessary for the granite blocks to be bolted and mortared directly to the



Mid-19th century engraving of Botallack. At the top of the cliff is the Carne whim; below it is the old count house. The pumping engine house can be seen on the Crowns rock and just above it the Wheal Button Shaft engine house is just visible. A timber headframe can be seen on Wheal Hazard Shaft to the right of the count house.

bare rocks.

By the late 1820s the mine was considered to be largely exhausted above adit. New discoveries inland had made the adventurers concentrate their efforts in that direction, rather than under the sea, and when these had failed they had looked towards the boundaries of the sett. In 1835 the sett was relinquished and offered for sale. Stephen Harvey James took up the lease and became purser the following year, a position he was to hold until his death in 1870.



A Cornish Tin Mine.

Postcard showing the Crowns section after abandonment; this card was sent to Russia.

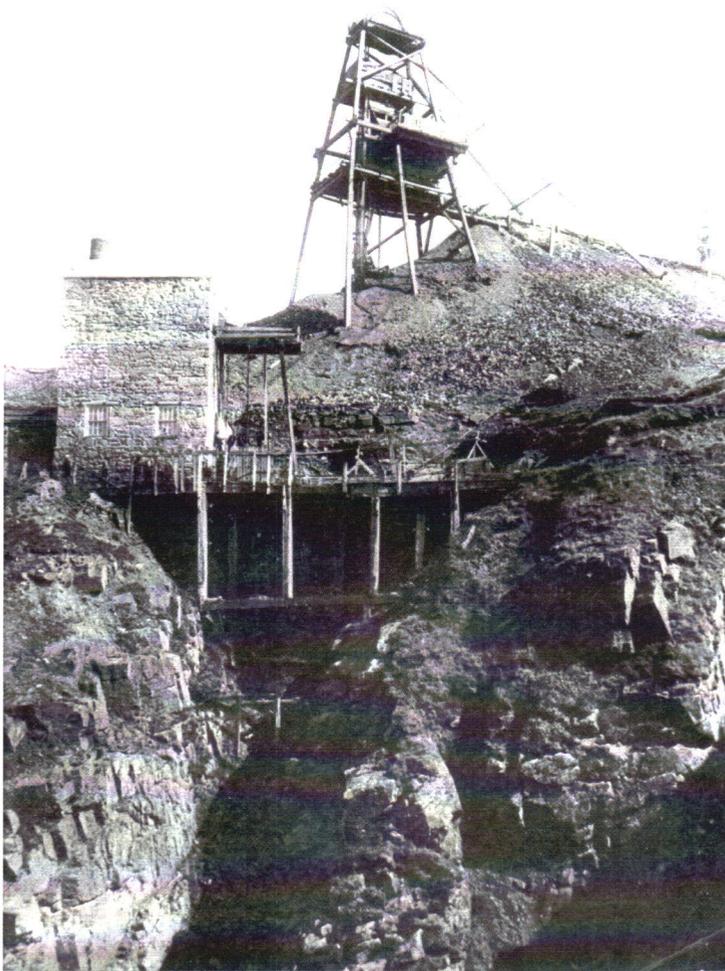
The financial situation of Botallack for the first few years was precarious. Between 1814 and 1835 the mine had produced tin and copper ores worth £53,230, while between 1837 and 1841 it only sold copper ore to the value of £2,055. In November 1841 the agent declared that he “knew not where to find two penny weight of ore in all the mine”.

The decision to continue the mine for the time being was in any event a good one as two months later a copper lode was cut which yielded £24,000 profit to the mine over the next year and assured its prosperity for several more. It was the beginning of the mine’s reputation for high returns on shares, and was to pay out £42,500 between 1842 and 1846.

In 1838 the mine was 100 fathoms deep below adit and employed 172 people. Three years later the first steam winding engine (the Carne whim) was built on the cliff top above the Crowns. In 1843 hundreds of spectators watched an eight ton boiler being lowered down to the new steam winder on Wheal Button Shaft, just to the north of the Crowns engine and not much higher above the sea. Another steam engine was erected at the top of the cliff to wind from Wheal Hazard Shaft, just south of the Crowns.

Wheal Cock was added to the sett in about 1851 at which time Botallack was 180 fathoms deep. Botallack was 200 fathoms deep in 1855 by which time some levels had been driven 200 fathoms beyond the cliffs. Exploratory work in the Crowns section throughout the 1850s prompted the commencement of the famous Boscawen Diagonal Shaft in 1858, completed in 1862. The shaft was sunk at an angle of $32\frac{1}{2}^{\circ}$, and extended out to sea for about half a mile, reaching a total vertical depth of 250 fathoms below the adit. To wind from the shaft a new engine, Pearce’s Whim, was erected on the cliff just above the Crowns pumping engine. Men were carried up and down the shaft by a gig, a wheeled box purpose-built by Holman’s foundry to hold eight men on an incline. On April 18th 1863 the chain which pulled the gig suddenly broke, precipitating eight men and a boy to their deaths further down the shaft.

By that time the mine had reached 220 fathoms depth and employed 299 men, 116 females and 115 boys. The mine also had three pumping engines, one stamping engine and seven winding engines.



Wheal Cock: Engine Shaft and Skip Shaft. The gully in the centre of the photograph is the weathered course of the lode. In the 18th century this area was a tin processing area and some features remain from that period.

Carnyorth Mine was added to the sett in 1866, after which both mines were worked briefly as Botallack and Carnyorth United. The latter sett was about 120 fathoms deep in 1865 and employed 111 people in its own right.

The 1860s were the zenith of tin production at Botallack, with the dressing floors being greatly expanded during the early part of the decade to deal with the large quantities of lower grade ore which were being produced. This included the erection of a new stamping engine at Narrow Shaft, driving 64 heads of Cornish stamps. The engine also pumped water from Narrow Shaft for use on the dressing floors. Increased production meant more workers, and in 1870 the mine employed 530 persons although the use of buddles meant that 112 fewer girls were now employed at the mine. The year 1875 saw the commencement of arsenic production at the mine, with the erection of a shaft

calciner near the track down to the Crowns. This was supplemented in 1889 by a Brunton calciner, built nearly opposite the count house.

The mine however was in severe financial difficulties before this, with the accounts recording a loss on three months trading in 1883 of £1,740 19s 7d. In October it was resolved to try to sell the mine as a going concern, but no buyer could be found. The mine had turned around somewhat by 1886, with the debit reduced to £526, an amazing reduction from the £3,427 it had owed in the previous month. In the early 1890s the Wheal Cock section was equipped with new pumping and winding engines, the aim being

The unique double-banked calciner labyrinth. In the distance are the engine houses of West Wheal Owles (left) and Wheal Edward (right).



to operate this as the main producing part of the mine. During most of the year, however, much of the mine was idle, the reduced grades and low metal prices making much of the ore not worth mining.

At the end of 1894 the surface labourers were working only part time owing to flooding by the very bad storm (on November 12th) which had also destroyed many of the mine's stamping mills in Botallack Bottoms. Flooding also occurred at Levant. The mine closed at the end of January 1895, the last men discharged on February 15th 1896.

In 1906 Botallack was reopened by Cornish Consolidated Tin Mines Ltd and it is from this period that the most prominent of the current remains date. A new vertical shaft, Allen's, was sunk to a total depth of 1,477 feet from surface. Mining activities were not carried out to any coherent plan, work starting with the Crowns (coastal) section but moving inland on the discovery of flooded workings. More old workings were discovered in sinking Allen's Shaft and in 1911 the old company, Botallack Mines Ltd, was liquidated and a new one, Botallack Ltd, took over. However, on reaching the bottoms of the old workings it was discovered that the lodes had narrowed to "knife edges"; during the operations most of the tin recovered was taken from the then extensive dumps rather than underground. Botallack Mine closed in February 1914 and was explored by Geevor in the 1980s but plans for working there were abandoned following the tin crisis of 1985.

Apart from the early 20th century mill and late 20th century headframe there are still extensive tracts of mid- to late-19th century dressing floors and even cobbled copper dressing floors, burning house and tin stamps from the early to late 18th century. Botallack Mine also contains at least seven engine houses in various states of preservation.

TOUR J4: Geevor Tin Mine Heritage Centre

Geevor Mine was one of Cornwall's great survivors and was working up to 1990. It is a unique example of a 20th century tin mine and one of the largest preserved mining sites in Britain. The word Geevor comes from the Cornish for goat - 'gever', and the Geevor Goat is still a symbol of the mine. Mining in this area can be traced back centuries. Wheal Givar was reported in 1716 and a Geevor Mine in 1768. Other workings in the vicinity were Wheal Stennack and Wheal Mexico - the old



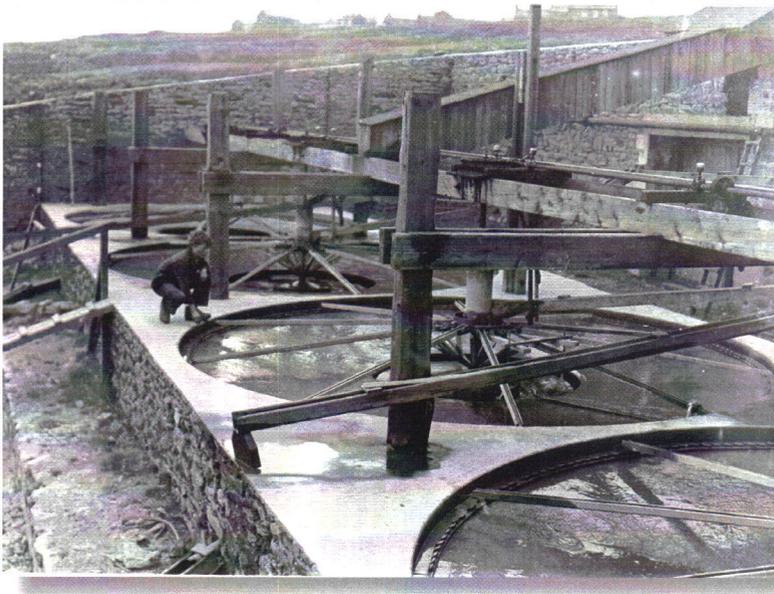
Victory Shaft and winder house, 1930s.

shallow workings of the latter are today part of the Geevor visitor tour. By the mid-19th century, most of what is now Geevor was described as North Levant in tribute to the rich and legendary Levant Mine, just to the west.

Early in the 20th century, St Just miners, returning from South Africa due to the Boer War, formed a succession of companies to prospect in the Geevor area. In 1911, these became Geevor Tin Mines Ltd with a capital of £50,000 and an area approximating to the Geevor of today. The mine used the latest plant and methods and took power from the Cornwall Electric Power Company at Hayle. No traditional Cornish beam engines were

used at Geevor.

Work began around this time on Wethered Shaft, which is at the entrance to the site, while Victory Shaft, further west, was sunk in 1919. The mine worked steadily through the first half of the century, though with periods of closure in 1921 and 1931. Nevertheless, the mine survived the Second World War and into the post-war period. By the 1960s, the company was actively seeking new reserves of tin beyond its own sett. These years saw an epic project to pump out the old Levant Mine, regarded then as a good prospect at depth. This entailed sealing a breach in the seabed where the Levant undersea workings at the 40 fathom level had fatally weakened the roof, allowing the Atlantic to break in following closure in 1930. The breach was successfully closed in 1968 but sadly the promised riches in Levant did not materialise. In 1975, a new sub-incline shaft was begun to go below the old Levant workings and out to sea; HM The Queen opened this in 1980. Work also began to the north east at Boscawell Downs and the prospect of reopening the famous Botallack Mine was reviewed. The modern steel headgear at Allen's Shaft, Botallack dates from this time.



Buddle yard at the bottom of the mill, 1930s. The boy tending them was later killed at the stamps.

All this activity came to naught in 1985 when the international tin price collapsed. The International Tin Council's role was to buy tin when prices were low and sell when they improved, thus stabilising the market. In 1985, the ITC ran out of money, ceased operations and released its tin stockpile onto the market. There was a huge surplus and the price dropped like a stone from £10,000 a ton to £3,400. No Cornish producer could survive without help. The DTI decided

to assist the other Cornish mines and gave £25 million to South Crofty and Wheal Jane. Geevor got nothing and in April 1986 it closed. There was a period of activity removing already broken ore and in 1988, with the tin price picking up, mining recommenced in a small way. However, in early 1990 the mine finally closed; pumping continued for a few months in case of a rescue bid but later that year the pumps ceased and the mine flooded. Scrap merchants began to remove equipment from Geevor.

Fortunately there was recognition, locally and across Cornwall, that a unique part of the county's heritage was in danger of disappearing forever. As a result, Cornwall County Council purchased the site in 1992 and it opened as a tourist amenity the following year, offering access to the ore processing mill and other surface buildings. By 1996, underground visits to the shallow early workings of Wheal Mexico were on offer and Geevor has continued to develop year by year, first under the management of the Trevithick Trust from 1996, and since autumn 2001 run by locally based Pendeen Community Heritage (PCH). Over this period visitor numbers have steadily risen to around 40,000 per annum and new parts of the site have been opened up, such as the miners' dry in 2001 and an exhibition devoted to St Just engineers and founders Nicholas Holman in 2005. An HLF lottery bid, agreed in 2006, with contributions from Cornwall County and Penwith District Councils, funded a £3.8m project, which included repairs to 21 buildings at Geevor – the entire site is now scheduled – and a new museum, Hard Rock, which opened in 2009. A project is in hand to increase the length of the current

Frue vanners in the mill.

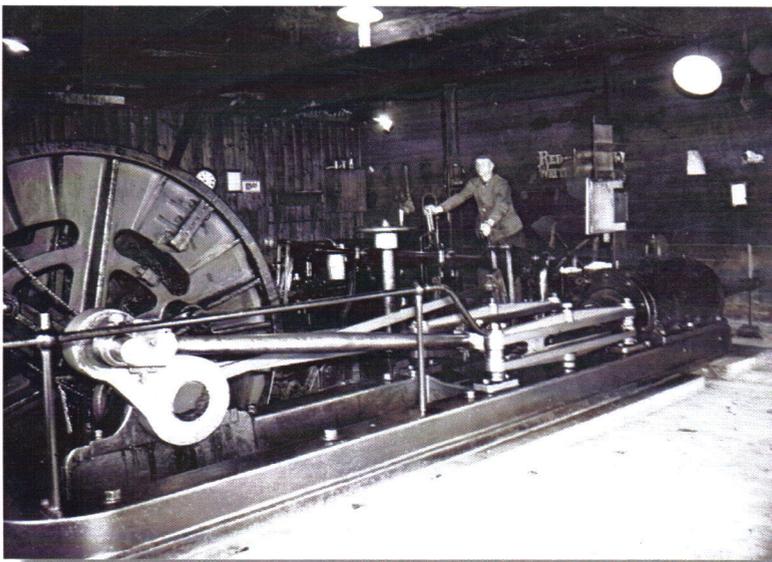
underground tour in Wheal Mexico. Geevor has also been designated a 'gateway site' to the western part of the Cornwall & West Devon Mining World Heritage Site.

The visitor arriving at Geevor by road first sees Wethered Shaft and the buildings around it. Not currently open to visitors, they are of considerable interest. The wooden headgear, a rare survival, dates from 2001 and is a replica of the original which collapsed a year or two earlier. This was the main shaft when Geevor Tin Mines took over in 1911 and remained so for the next decade. Its use declined with the sinking of Victory Shaft and it was effectively out of use by the 1950s. Wethered Shaft is still open and some 400ft deep. The wooden engine house, one of only two surviving in Cornwall, still contains the original winding engine. It also at one time housed compressors. Adjacent buildings include the former power house, the mine social club and old stables. From 1983 to 2005, a set of water-driven stamps stood here. The Locke Stamps were brought from Nancledra and re-erected as an example of this early technology. After some years of neglect, they have been re-erected elsewhere on site.



Leaving the car park, on the left are steps leading down to a small underground chamber. This seems originally to have been part of a small shaft and prospecting tunnel later converted to a miners' store and shelter; it is one of the oldest features on the site. Site reception is in the former mine offices. A magnificent three dimensional model of the mine, showing all the shafts and the miles of levels excavated in the search for tin can be seen here before going out onto the site. After the compressor house, which provided all the air for the drills and machinery, we come to the main winder house for Victory Shaft. This contains the electric winder from British Thomson-Houston, which came into service in 1954.

Though only fifty years old, the electric winder is now a piece of history in its own right; its installation was part of a major rearrangement at Victory Shaft. The current steel headgear, replacing a wooden structure, also dates from this time.



When the electric winder was installed, its steam predecessor was retained and is in the adjacent concrete building. It dates from 1906 and came to Geevor from Wheal Vor, near Helston, in 1923. It has been altered to run on compressed air and saw occasional use when winding ropes were changed right up to the mine's closure.

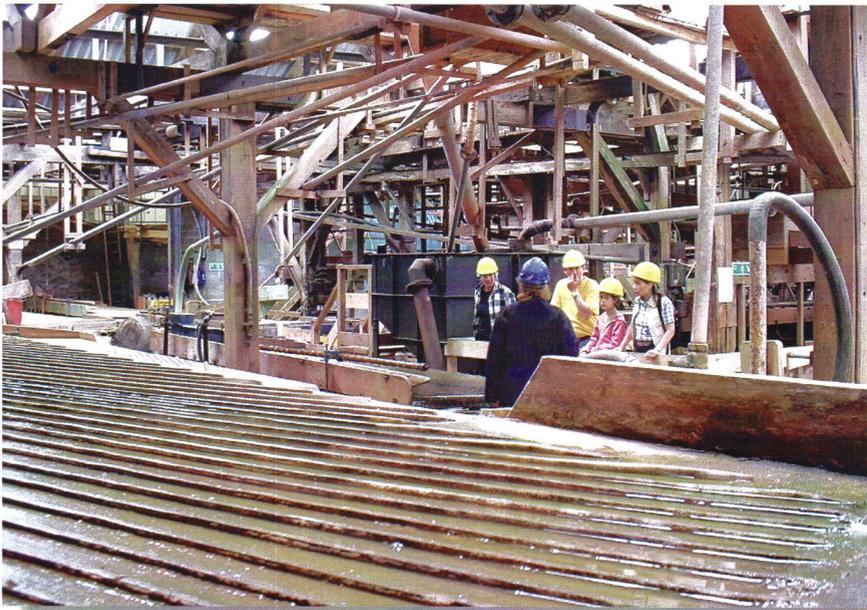
Behind the winder house stands a large building, formerly an engineering

The steam winder in use.

fitting shop. This now houses the UK's newest mining museum, 'Hard Rock', the centrepiece of the £3.8m restoration of the site where striking modern displays tell the story of Geevor and local mining. A purpose-built cinema shows a new version of the Geevor film and upstairs a set of beautifully engineered, interactive exhibits shows how tin was processed from the ore. A gallery houses temporary exhibitions; the first was of the mining paintings of Kurt Jackson, a local artist with an international reputation.

We then reach the miner's dry, where men changed before and after their shift, by a covered tunnel from Victory Shaft. This is the most atmospheric part of the site and remains essentially as it was on the day the mine finally closed. Clothes, hard hats and boots remain by lockers and graffiti, much mercifully obscure, is on walls. Allowing public access to this building was a brave decision and has been done with considerable sensitivity - to stand here when the Atlantic wind whistles and the air is damp and cold is to understand in a small way just what is meant in human terms by "the price of tin". A total of £350,000 was spent here to make the building look exactly the same.

We now make our way via the drill shop and mine rescue station to the mill. The mill treated all the broken rock hoisted from the mine, 98% of which was totally valueless. The mill is a large building and its processes are complex so a very brief description must suffice here. It has seen many changes and it suffered from the depredations of the scrap merchants immediately after the mine closed. Fortunately most damage was in the newest part of the mill dating from 1980. Enough survives to enable us to follow the treatment process. In fact only at Geevor can one get a real sense of the processes involved in a 20th century Cornish tin mine.



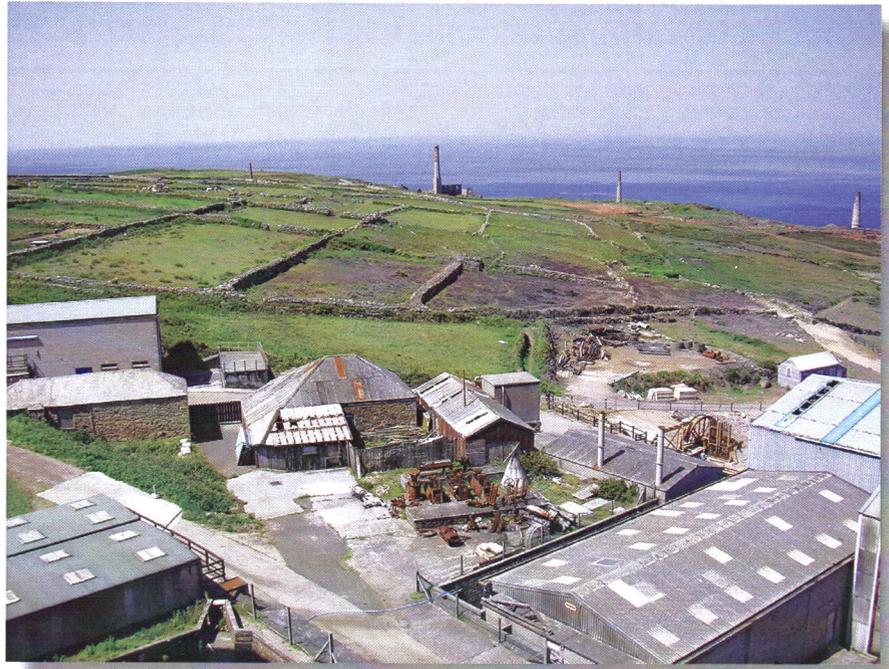
View of the mill, shaking table in foreground.

Ore entered the top of the mill having been crushed to a two inch size. It was washed and further crushing then took place. Examples of a jaw and a cone crusher can be seen awaiting restoration. The ore then travelled along the picking belt, where rubbish was removed by hand and any iron waste by electromagnet. Women worked this belt during World War II and some have recorded their experiences on a fascinating CD as part of Geevor's Oral History Project.

At the next stage, known as Heavy Media Separation, less dense rock particles were floated off. The ore now went to a fine ore bin, which was the supply for the mill. A further crushing to fine sand then took place using steel balls in a ball mill - a 1937 example is still in situ. The fine ground ore was then graded by size and passed to shaking tables. Here the water and the motion of the tables separate the product into 'heads' (high grade tin), 'middlings' (waste rock with some tin attached) and 'slimes' (containing only very small amounts of tin). The names refer to where they come off the tables.

The 'heads' went to a flotation process to remove arsenic and sulphides. This process was previously

undertaken by roasting in a calciner. A Brunton calciner, last used in the 1930s and the most complete surviving example in Cornwall, has been restored and will in the future be open to visitors. 'Middlings' went to regrind ball mills and then returned to tables; 'slimes' went to a separate plant, which will also soon be open to the public. Unlike other Cornish mines, such as South Crofty, Geevor never produced arsenic for sale commercially.



The view from the headframe of Victory Shaft over part of the mill. The stacks in the background on Levant Mine are, left-right: man-engine, compressor house, stamps and calciner.

This whole process produced three grades of tin, the tin being in the form of cassiterite - tin oxide - also known as black tin. High grade tin was bagged

for sale to the smelter; medium and low grades were stockpiled and sold in bulk. The sulphides were eventually sold for their small copper content but the presence of arsenic depressed the value - interestingly they did include some gold, but only a few parts per million.

At the bottom end of the mill we arrive at the most popular part of the site - the chance to go underground. At the bottom end of the mill, tours leave to go into the old workings of Wheal Mexico. Knowledgeable guides, many former miners, take parties into the hillside through these old tunnels. This has proved so popular that work is in hand to extend the tour and increase its capacity. Despite the disappointment that the Heritage Lottery Fund felt unable to support a case for opening up the modern 20th century underground workings, this remains an aspiration for PCH. In future it could be possible to go 100 metres below ground at Deep Adit level into some quite spectacular stopes. This would provide an underground tour comparable with any in the UK. It will be a major task but this is what visitors want to see and is part of the objective to create at Geevor the national museum of hard rock mining.

Our progress around the site has so far been mostly downhill. Many processes in the mill relied on gravity to move the ore and slimes around. In the old days, the final waste went over the cliff and Geevor could be recognised from a red stain on the sea. Coming back uphill on the left are the Locke stamps from Nancledra, mentioned previously. These were refurbished and re-erected in 2006 as a memorial to Clive Carter, author, historian, painter and model maker, who oversaw their original move to Geevor in 1983. He was a great friend to Geevor and was involved in the creation of the Holman Exhibition near the stamps. Nicholas Holman & Co., run by a branch of the great Camborne family, Holman Brothers, were based at St Just and Penzance and served the mining industry of West Cornwall as engineers and foundry men.

There should be time to visit Geevor's excellent cafe, renowned for its pasties, and deservedly popular with walkers on the South West Coast Path, which skirts the site to the west, and next door the equally well stocked shop with a range of books and souvenirs.

TOUR J5: Levant Mine

Levant is one of Cornwall's most famous mines and like many others in the county very little is recorded of its early history. In 1820 Richard Boyns, a local mining man and entrepreneur, formed a new company to work the mine, almost immediately they struck a rich vein of copper ore which eventually led to large dividends being paid to the share holders. This company operated Levant until getting into difficulties in 1871 when a new company was formed to take over the mine, its purser being Richard White, who was to run Levant for the next 30 years or so. It has been said both unjustly and inaccurately that Purser White never worked underground however it is a matter of record that in June 1840 the young Richard White was buried underground by five fathoms of 'rubbish' and only removed after several hours work by many men.



Levant Mine, late 19th century.

Over the years the mine continued to get deeper and to go further under the Atlantic Ocean, reaching its deepest point, the 350 fathom level, by 1904. Access to the lower levels was achieved by sinking two shafts out under the sea, Old Submarine shaft connecting the 210 to the 302 fathom level and, New Submarine Shaft connecting the 260 to the 350 fathom level.

To get to and from their place of work the miners had to climb many hundreds of feet on the ladders. In 1857 a man engine was installed on the mine, and eventually this saved the men enormous toil by enabling them to descend to and ascend from the 266 fathom level (approximately 1800 feet from surface) with very little effort. On October 20th 1919 however the main rod of the man engine broke killing 31 miners and injuring many more.

In 1920 the old cost book company was dissolved to be replaced by a new limited company, Levant Tin Mines Limited, under a new manager, Colonel F. F. Oats, son of the great Francis Oats. Amazingly, only working from surface down to the 210 fathom level the mine survived for ten years on ground supposedly worked

Whim engine house with timber headframe over Skip Shaft at rear. Engine Shaft is in front of the pumping engine house. In the background is the calciner stack and, on the horizon, Pendeen Watch lighthouse.



out many years before. It did however finally close in October 1930.

In the late 1950s the neighboring mine Geevor began to investigate the possibility of reopening Levant to enable them to work the seaward extension of their own lodes. Initial investigations in Skip Shaft revealed that the sea had broken in to the old workings. This hole through to the ocean was eventually traced to a notorious weak spot in Levant on the 40 fathom level, the "40 backs". It took two attempts to seal this breach but by the end of the 1960s this had been successfully achieved. Skip Shaft was refurbished to the 190 fathom level with a four man cage being installed in place of the original two ore skips. Geevor and Levant sadly succumbed to the collapse in the price of tin in 1985 and closed in 1991; both mines are now flooded to sea level.

In 1935 concerns were raised regarding the future of the beam winding engine on the mine and in August that year a group of the great and good of Cornish mining and engineering got together to preserve it. This group called itself the Cornish Engines Preservation Committee; in 1948 it became a registered charity and changed its name to the Cornish Engines Preservation Society.



The winding engine stands in the same house where it worked for 90 years, perched on the edge of the cliff, making it the most westerly steam engine in the country. It is also Cornwall's oldest. Built in

'Higher Bal' on Levant Road, formerly part of Spearne Consols Mine and later acquired by Levant. It was worked to over 280 fathoms below adit, here about 50 fathoms. This rotative engine was used for winding and stamping, the shaft being behind the wall alongside the road.

1840 by the West Country's foremost engine builder, Harvey and Co. of Hayle, it is said to have been designed by Francis Michell, a member of a distinguished Cornish engineering family. The engine also has a national claim to fame. It was Britain's first beam engine preserved on its working site by private individuals. Today the engine is owned by the National Trust having been handed over by the CEPS in 1967 along with other engines: Taylor's 90" and Robinson's 80" pumps and Mitchell's 30" whim. Taylor's and Mitchell's are both on display at Pool; there is only limited access to Robinson's.

The engine house was restored by the National Trust, whilst the engine itself was put back into running order by a group of Trevithick Society members (known as the Greasy Gang) over the years 1984 to 1992. In 1990 the National Trust and the Trevithick Society jointly launched the Levant Beam Engine Appeal to raise a sum of £128,000 required to complete the restoration and to provide a means of steaming. Using the funds obtained the National Trust rebuilt the ruined boiler house and installed an electricity generator and an oil-fired boiler. An old Cornish boiler was obtained and installed in a non-working manner to show how steam was raised before. The engine first ran again in steam in 1992, and since then it has been steamed for several months each year for visitors to see how the engine once looked and operated.

Wednesday 8th

TOUR K: The St Austell area

China clay was first recognised in Cornwall by William Cookworthy in 1746 at Tregonning Hill, north-west of Helston. Some years later huge deposits of very high quality clay were discovered in the Hensbarrow granite of the St Austell district. By 1768 Cookworthy had patented a way to use the clay and developed a his own Plymouth Porcelain Factory. English pottery had previously been of coarse earthenware and stoneware, but now white porcelain was possible.



Meledor china clay pit.

Other potteries started to use china clay from Cornwall, and by the early nineteenth century the kaolin industry had become a big business. Many of the pottery factories owned rights to mine the material themselves. In addition to pottery, kaolin was starting to be used as a whitener by the paper industry. Early in the twentieth century there were around seventy producers. The competition was cut-throat. Corners were cut, with little capital investment or product development; wages were low and working conditions were poor. However, these various works helped the Cornish engineering companies which supplied the pits with many beam engines for pumping slurry.

By 1910 production was nearly one million tons a year and paper was using more than ceramics. 75% of output was exported, mainly to North America and Europe. Cornwall held a virtual monopoly on world supply. English China Clays was formed in 1919 by the merger of the West of England China Clay Co., Martyn Brothers and North Cornwall China Clays, who together accounted for around half the output at the time. ECC became the leading clay producing company for the rest of the century.

This merger was followed in 1932 by the merger of ECC with two of its main rivals, John Lovering and H. D. Pochin. This formed the new company English Clays, Lovering, Pochin, & Co. (ECLP); in 1956 the Lovering and Pochin families were bought out and the company became known as ECC International Ltd. English China Clays was acquired by Imetal of France for £756m in 1999 and continued to be run as ECC. Imetal subsequently changed its name to Imerys.

Today around 80% of the china clay produced is used in paper. Of the rest, 12% is used by the ceramics industry and the balance in products such as paint, rubber, plastics, cosmetics, pharmaceuticals, cork and agricultural products. Even waste products are saleable, from granite blocks for coastal armouring

to sand for aggregates: annually the industry sells 1.6 million tons of rock and 500,000 tons of sand.

120 million tons of china clay have been extracted, but reserves in the ground will last at least another hundred years.

TOUR K1: Littlejohns China Clay Pit

Littlejohns was worked in conjunction with Virginia, Hallow and Trethosa pits from at least the 1840s to the present day; formerly it had been partly owned by Spode. In 1843 it was acquired by the Cornwall China Stone and Clay Company at a rent of £1,300 pa for first 7 years, £1,600 the second and £1,800 the third, with dues of 6s/ton on china clay and 3s/ton on china stone. Two days after the commencement of lease, the contiguous Littlejohns pit in Roche parish was sold and may have been acquired by the company. During first six years the lessors had not made enough money to cover minimum rent and the tenancy ended on 31st December 1849 with 4,000 tons of china clay and 6,000 tons of china stone unsold on site.

In 1849 a scheme was put forward to regulate china clay and stone prices and the remaining Littlejohns clay was released onto the market in 1850. New sheds, pits and pans built at Littlejohns in 1850 by the West of England China Clay Co. Because of construction and renewals at and around the pits the company did not reach full production till 1851, and only 1,117 tons of clay and 3,710 tons of stone were produced during the first year of the term. Demand for clay rose from this point with corresponding expansion of industry.

By the 1870s the West of England Company, by far biggest and most successful concern, paid £6,000 annual rent between 1876 and 1883 and was committed to £7,000 per annum thereafter. In June 1877 it sent away 5000 tons less clay than previous June. Since 1873 all companies had been selling clay at below cost price, partly as a result of competition, and several companies went into liquidation; some directors had even fled the country to escape creditors.

Following strikes in 1912, the West of England Company was one of the few companies to respond favourably, it then employing about a quarter of the industry's labour force. The raise offered to the men was followed by offers from a few other companies. The men not receiving offers moved to other pits to make the men stop working and another general strike ensued, though men at Little Johns (and others) stayed at work. The strike lasted over ten weeks but came to nothing. The pit became part of ECC then ECLP, and still produces high quality clays.

TOUR K2: China clay dry quarrying and processing plant, Meledor

The dry mining operation was commissioned in 2007 at a cost of £8 million pounds. The plant is designed to process all mined china clay matrix, including the considerable quantities of non-clay bearing rock. Essentially, the plant differs from the traditional hydraulic mining methods in as much that excavated material is carried by dump truck to the water and processing rather than the wet mining method where water is carried to the quarry face for discharging through water cannons and subsequent pumping stations, for sand removal. In this method the non-clay bearing rock has to be removed by a dedicated earth moving team and may or may not be further processed to produce aggregate.

The dry mining plant eliminates the need for multiple pumping stations and reduces the water consumption by two thirds. The resulting reduction in energy consumption is significant. The

Crushed clay-rich granite being broken up by high-pressure water jets.

plant incorporates a 1200 by 800 millimetre jaw crusher which is fed by all material over 80mm. The minus 80mm material, a mix of clay, sand and mica go first to a washing barrel, where the minerals are slurried. This then allows for the standard classification using bucket wheel sand classifiers, followed by hydrocyclones, which produce a product below 53 micrometres, 90% china clay and 10% mica. The



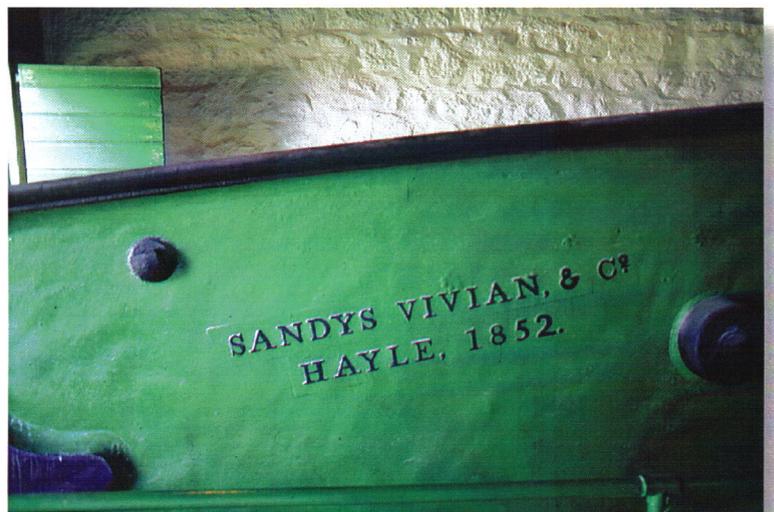
plant operates 24 hours a day with a throughput of 900 tons per hour.

Bucket wheel separators at the dry quarrying site.

TOUR K3: Parkandillack beam engine

The Parkandillack Cornish cycle pumping engine was originally built for Old Sump Shaft at Wheal Kitty, St. Agnes, in 1852 by Sandys, Vivian & Co., Copperhouse Foundry, Hayle. This 50" engine was then moved in 1912 to its present location, fitted with a new cylinder by Bartles of Carn Brea, and pumped china clay slurry from the clay pit until it was retired in 1953. Like many of these engines it is "levered" or has uneven strokes, the outdoor stroke being 9' and the indoor 10'. A feature of Copperhouse design is the valve

The dog footprints on the side of the Parkandillack beam, just above the name.



arrangement of the top nozzle chest whereby the equilibrium valve is situated centrally between the governor and the steam valves. Other companies located the equilibrium at the side. Another feature of the Parkandillick engine is the St. Austell governor. In the clay district the pumping engines had a winding engine situated next door to wind skips full of waste to the top of the sky tips and the two engines were fed from a single boiler. The St Austell governor sensed the steam requirements when both engines were working and favoured the pump to keep clay production continuous. Yet another odd feature of the engine is the “dog’s paw” mark. When the beam was being cast a dog was in the foundry and ran over the sand mould leaving its paw prints. These prints can be seen on the beam and we even know the dog was a spaniel! Today the engine is still operational, and with no pumps attached, is in balance and works perfectly well on 5psi. air pressure.

TOUR K4: Parkandillack tube presses

The tube press, developed by English China Clays/Imerys, is the most efficient method of filtration for the production of medium to coarse size china clay products. The plant, commissioned in 2008, at a cost of £20 million, incorporates 120 tube press units which produce at a rate of up to 90 tons per hour. Formerly the hydraulically operated presses were made from cast-iron but are now polypropylene. The product from the tube press is further reduced in moisture by a fluidised bed dryer. The energy reduction obtained compared with more conventional filtration plants is up to 80%. The 15,000 tons of weekly production is moved, mostly by rail, at 1,140 tonnes at a time to the port of Fowey for export by ship. The tube press plant produces almost all its output for paper manufacturing and at the present time output from Cornwall is 1.2 million tonnes per year, of which 50% goes into paper, 30% into a wide variety of ceramics and the remaining 20% into products such as paint, rubber, plastics and pharmaceuticals.



Tube presses at Parkandillack; water from the presses runs from nozzles into the troughs.

Thursday 9th

TOUR L1: Pentewan

This village was a very early Celtic settlement, then later was mentioned in the Domesday Book. Its name comes from the Cornish “pen” meaning headland and “tewyn” meaning dunes. The village is clustered around the harbour which was first established in 1744 by the Hawkins family of Trewithen at the seaward end of the White River Valley. The harbour we see today was opened in 1829 as a

private venture by the Hawkins Estate, with the entrance closed by double locks twenty six feet wide. The dock and sluicing pond were fed from a small stream, the sluice pond having to be provided as the harbour entrance was constantly affected by accumulating sand. Much of the outgoing trade for the harbour came from the china clay industry just a few miles north around St Austell and from the local stone quarries. Incoming trade was largely coal and lime. The sand problem was then exacerbated as the china clay industry discharged waste sand into the white river thus augmenting the silting.

In 1900 this surfeit of sand gave rise to the Pentewan Block & Development Co. which manufactured concrete products. The large holiday park built along the back of the beach is built on dumped sand. With trade increasing transport was becoming a problem and so a horse tramway of c. 4' 6" gauge was built from St Austell down the valley to Pentewan in 1829. The site of the St Austell terminus today is a Co-op supermarket. In 1874 this was reconstructed to 2' 6" gauge for steam locomotives. A motley assortment of locos, some built to the theories of Victorian inventor J. B. Fell, worked the line.

With increasing traffic the line became steam hauled in 1873, finally closing in 1918. There was never an advertised passenger service, and no passenger vehicles existed, save the Hawkins family private carriage, however, early accounts quote the fare as 3d. so it is to be assumed ones "carriage" was a clay wagon! Photographs also exist showing almost all available goods stock pressed into service for "tea treat Sunday School special services" from St. Austell to Pentewan; one such is described in *A Cornish Childhood* by A. L. Rowse.

However, the clay trade, which gave Pentewan birth, also caused its demise. From its inception Pentewan Harbour was plagued by silting, both from the river and from storms moving beach sand. This material, which was largely waste from the china clay workings, was brought down by the White River and discharged into St Austell Bay adjacent to the Pentewan harbour entrance. Efforts to resolve this can be seen today where an ever growing series of flushing reservoirs are to be found above the harbour. The port closed for clay traffic c1918 and the railway closed too. There was some subsequent activity in sand traffic and a concrete block works operated for a while with a narrow gauge rail system. Today the dock with Hawkins' foundation stone remains intact and still holds water. Lock gates and winches can be seen but to seaward the channel, jetty and breakwater are almost completely submerged by sand. Several charming terraces in a Georgian style complete the picture at Pentewan.

TOUR L2: Mevagissey Harbour



Mevagissey is a working harbour situated some 7.5km south of St Austell. A fishing hamlet is first recorded at Porthilly in 1313, although there is evidence of settlement dating back to the Bronze Age. Towards the end of the 17th century, Porthilly merged with the hamlet of Lamoreck to make the new village. It was named after two Irish saints, St Meva and St Issey (the 'g' comes from 'hag', the Cornish word for 'and').

A small quay was built by a member of the
The busy inner harbour, looking west.

Trewolla family in about 1550 on the north side of the inlet as a shelter for fishing boats. Fishing, particularly net-seining, was an important trade for the town and transport links were forged with London, the chief market for fish. Of the ten inns in the village at that time, two (The Fountain and The Ship) still remain.

In 1774-76 the quay was enlarged and another built on the west side of the harbour, under the Mevagissey Harbour Act, for £4,300. Thus, Mevagissey Harbour was set up as a Trust Harbour. The inner harbour, comprising the current East and West Quays, was constructed from this time.

Jetties and wharves were added during the next decade. Over the years subsequent Harbour Acts were passed in 1865, 1888, and 1892.

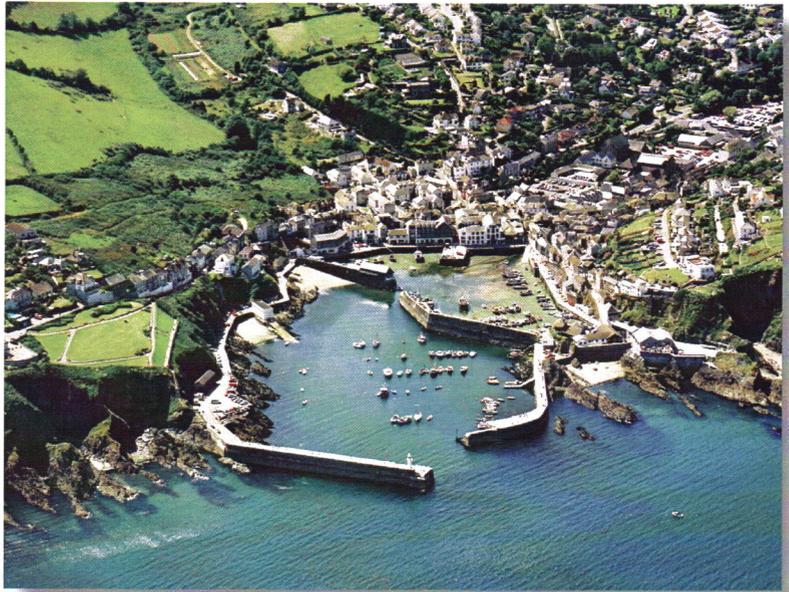
Andrew Pears, the founder of Pears' Soap was born in the village in 1768 and set up a barber shop here until he moved to London in 1789.

The outer harbour dates from 1888. The outer harbour walls were washed away in the storms of the great blizzard of March 1891 and were rebuilt and completed in 1897. The eastern section of East Wharf dates from about this time as does the northern section of Middle Wharf, where the area between two slipways was filled. Mevagissey had a power station built in 1895, powered by pilchard oil, which provided electricity for the lighthouse and surrounding streets. Local sources claim that it was the first town in the country to have electric street lighting.

In 1988 Mevagissey Harbour was given charity status, and along with Looe it is one of the only two Trust Harbours that are registered charities. The charity status means a great deal to the harbour, and the financial benefits are very important. Much expensive work has been carried out over the years to maintain the structures, culminating in £1.25 million spent in 1998 to strengthen the outer pier. The buildings surrounding the harbour largely date from the mid-18th century although some are older.

At present there are 63 registered fishing vessels in the harbour which employs approximately 57 full-time fishermen and 12 part-time fishermen. Most of the boats are under 10 metres in length, the different types of fishing carried out being trawling, wreck netting, sole netting, ray netting, shellfish with pots, long lining, and hand lining for mackerel. In the summer months several of the boats offer angling trips and sight seeing trips around the bay. The harbour also offers tourist fishing trips and there is a regular summer passenger ferry to Fowey.

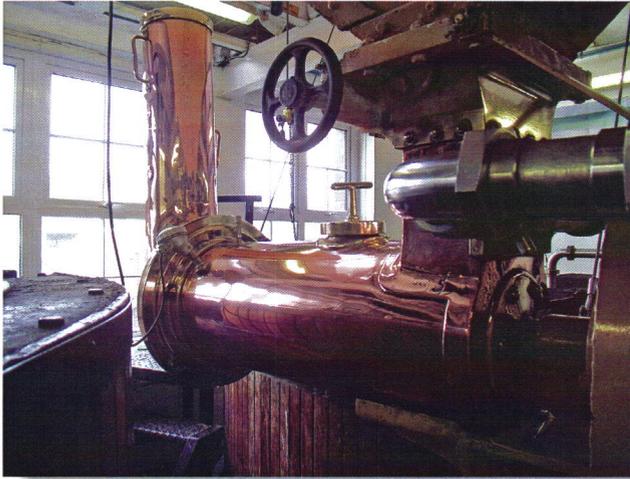
A small park in Mevagissey is popularly known as "Hitler's Walk". It was named for a district councillor in the 1930s who was nicknamed after the Nazi leader for his officious habit of walking up and down checking on the boats moored in the harbour.



Mevagissey harbours.

TOUR L3: St Austell Brewery

The St Austell Brewery was founded by Walter Hicks in 1851; he was a maltster who moved into brewing and had mortgaged his farm for £1,500 to provide the start-up costs. His first steam brewery in Market Square began operation in 1869 and the old brewery building survives as offices. The first pub, the Seven Stars Inn, was acquired ten years earlier with the London Inn and brewhouse added in 1867. In 1893 the brewery moved to its present premises in Trevarthian Road by which time the business was being run by Walter Hicks junior. The name St Austell Brewery Co. dates from 1934 when the Christopher Ellis Steam Brewery of Hayle was acquired.



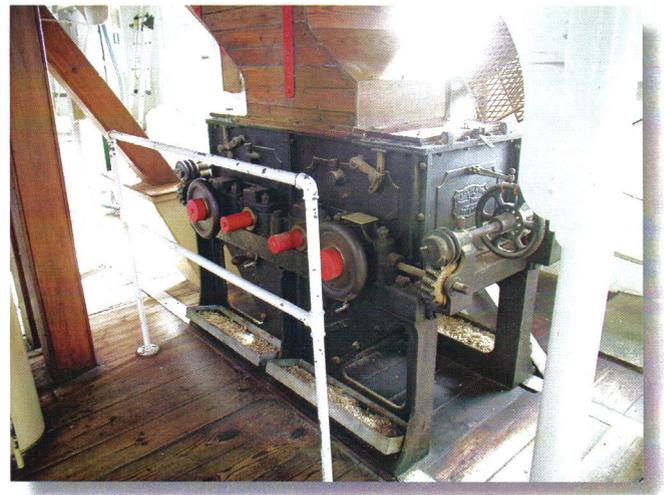
Steele's masher. The copper pipe can swing to fill a mash tun on either side with a "porridge" of cracked malt and hot liquor.

The 1893 brewery is a classic 'tower' brewery of the period designed by Inskipp & Mackenzie, specialist London brewery architects, whose other work includes the great Anchor Brewery near Tower Bridge. Equipment dating from the opening of the brewery remains in use today.

In 1893 the brewery had 19 pubs and hotels but by 1910 this had risen to 54. In that year it became Walter Hicks & Co. Ltd. The first mechanical transport was a Foden steam wagon acquired in 1906. The brewery remains a family company with the line of descent coming from Walter Hicks' eldest daughter. In 1943 part of the estate of the Treluswell Brewery near Penryn was added to that of St Austell and after the war a major upgrade of the whole tied estate took place.

Traditional 4-roll grist mill (Bristol manufacture) which cracks malt.

The company remains renowned both for its quality beers and its well maintained pubs. *Tribute*, originally brewed as *Daylight Robbery* for the 1999 total eclipse, is now a popular guest beer in public houses throughout the country, while HSD (Hicks Special Draught) is a strong bitter of great character. The brewery opened a visitor centre in 1992 and also arranges tours. At the present time the brewery owns over 160 pubs and hotels in Cornwall and Devon and sells over 40,000 barrels of beer annually.



Thursday 9th

TOUR M1: Charlestown

This little port is a totally artificial settlement, occupying what was once the rocky cove of West Polmear. Here trading vessels would beach for one tide to load and unload. The dock and piers,

unchanged in essentials since they were built in 1791-1801, are the work of the great John Smeaton for local squire and adventurer Charles Rashleigh, from whom the settlement takes its name. Lock gates permitted vessels to remain afloat for loading and unloading at all states of the tide.

Charlestown harbour.

As elsewhere in the St Austell area, the original export cargo was copper ore, with coal and timber coming in, but china clay eventually became the principal purpose of the port. On the east side of the dock can be seen where

clay was tipped by chutes directly into waiting vessels. The west quay handled imports of coal and timber. Some of the clay came to the basin direct by a tramway system in a tunnel from the Carclaze clay dry. Charlestown was for many years a thriving port, with a shipyard, ropewalk and limekiln, but its small size restricted the vessels which could use it. In 1971 the entrance was widened and a folding gate replaced the original wooden lock gates, permitting entry to vessels of 600 tons but the trend was for even larger boats. This, and its difficult entrance, led to the cessation of commercial traffic and the harbour now houses a collection of traditional sailing vessels. These and the port area itself are often in demand for filming.



Charlestown dock gates.

Although there has been some development in recent years, most of the village retains its all of a piece eighteenth century flavour. This was due to its remaining in single ownership until sold in 1986. After this china clay traffic ceased and the village came increasingly to rely on tourism. It was, however, a significant port in its day. In 1876 Charlestown exported some 34,000 tons of clay; the figures in the same year for Par were 50,000 tons and Fowey 75,000 tons.

Above the harbour was the Charlestown Foundry, opened in 1827. It passed through various hands and produced Cornish beam engines up to 50" cylinder and at least two of 70". Latterly it specialised in boiler making, bridgework and structural ironwork. The very last pumping engine for use in Cornwall, a 36", came from Charlestown in 1914 and its beam, used as a balance bob, may be seen at Taylor's Shaft, East Pool. English China Clays acquired the foundry in 1935 and it worked latterly as an engineering centre for the company. Although much of the site has been cleared for housing the cast-iron waterwheel has been kept as a centrepiece.

TOUR M2: Shipwreck & Heritage Centre

The Charlestown Shipwreck & Heritage Centre opened in 1976 in the lower part of the former Lovering clay dry to display the collection of shipwreck artefacts and relics amassed by founders Richard and Bridget Larn. Doubled in size some five years later it has the largest collection of such material in the UK and enjoys an international reputation for the quality of its exhibits. The shipwreck and historical artefacts on display in the centre are the largest private collection of this type on public display in Europe. Brought together over the last 45 to 50 years, it forms the basis of one of the most unusual and interesting collections open to the public.



Display cases containing sextants and ship models.

The Centre tells the history of diving, salvage and shipwrecks from the earliest times to the present day, with historic diving equipment, including a replica of John Lethbridge's 1740 wooden diving barrel, observation chambers and one atmosphere armoured diving suits. The exhibition includes one of the largest underwater diving equipment collections in the country. Other exhibitions reflect village life in Charlestown, its history and the once thriving china clay industry. There is also a display containing a large collection of geological specimens and early mining equipment.

Current displays include:

200 Year Anniversary of the Battle of Trafalgar

This new collection of Nelson memorabilia is a fascinating insight into the man and his predominantly victorious career. A range of artefacts include many medals and an 1805 *Times* newspaper with interesting information regarding dispatches delivered to the Admiralty in November 1805. There is also a letter by Nelson dated 1804 and much more not to be missed.

Roland Morris Collection

This impressive collection has recently been added, includes artefacts and lost equipment from the British fleet of 1707, commanded by Admiral Sir Cloudesley Shovell, including his own ship, *H.M.S Association*. This extremely rare collection containing exhibits nearly 300 years old from the sea bed.



China recovered from a ship wreck of 1754.

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The Trevithick Society

The end of the 19th century saw the end of widespread mining in Cornwall and the use of steam engines in mining, although the last pumping engine remained in use for another half-century. In the early 20th century the last of these mammoth relics of Cornwall's engineering achievements in the Victorian age were finally being replaced and scrapped. It was the closure of Levant Mine in 1935 and the removal of its engines that prompted a small group of individuals to form the Cornish Engines Preservation Committee to acquire the 100-year-old 24" winding engine. In other parts of the country the preservation of such monuments had, generally, to wait another quarter of a century or so.

The far-sighted efforts of this group must now be seen as a pioneering landmark in industrial archaeology. In 1947 the Committee became a registered charity and changed its name to the Cornish Engines Preservation Society. In the ensuing years the CEPS acquired Taylor's 90" and Robinson's 80" pumping engines, Michell's 30" winding engine and an engine house near Tavistock. In 1967 ownership of the beam engines was transferred to the National Trust, along with a dowry for their upkeep. The cottage formerly belonging to Richard Trevithick was also included.

In 1971 the Society combined with the Cornish Waterwheel Preservation Society (formed in 1970) and the name The Trevithick Society was chosen in honour of Cornwall's greatest engineer, Richard Trevithick, a key figure in the development of high pressure steam and its application in engines for mining and transport use.

As an educational charity the Society aims to encourage an interest in Industrial Archaeology through lectures, outings and other meetings and by publishing the results of individual research through its Journal and other publications. We encourage the preservation of engine houses and other industrial buildings of worth as a significant part of Cornwall's heritage. The Society encourages the sympathetic re-use of redundant industrial buildings along with the statutory protection and preservation of prime examples of all types.

The interests of the Society have broadened over the years to include the wider range of Cornish industries and we now actively work to record and research industrial sites which are not covered by any statutory protection and are considered at risk. In recent years this has included a long-term project based on the Redruth Brewery, to record the site and save many artefacts and documents, and part of an engineering works at Camborne. At the present time Society personnel are involved in recording three mines, a china clay works and a recently discovered, possibly unique, tin smelting works in Cornwall, explosives factories in the Isle of Man and Lancashire, and a mine on Sark. For the bicentenary of the successful run of Trevithick's Puffing Devil in 1801, the Society built a full-scale working replica, a £70,000 project supported by many industries in Cornwall.

The Society maintains close links with numerous public and private bodies having common interests, both at a local and national level, and is affiliated to the Association for Industrial Archaeology and the National Association of Mining History Organisations. Our contact with the National Trust has been particularly close since they took over the care of four Cornish engines and Trevithick's cottage in 1967. The Society has been responsible for the restoration of the Levant beam engine to steam working and has loaned artefacts to numerous industrial sites both inside and outside Cornwall. A long term objective has been the establishment of a museum to house our collections, most of which are on show or in store at King Edward Mine near Camborne. Members of the Society were involved in the successful application for World Heritage Site Status for Cornwall and others site on various advisory bodies.