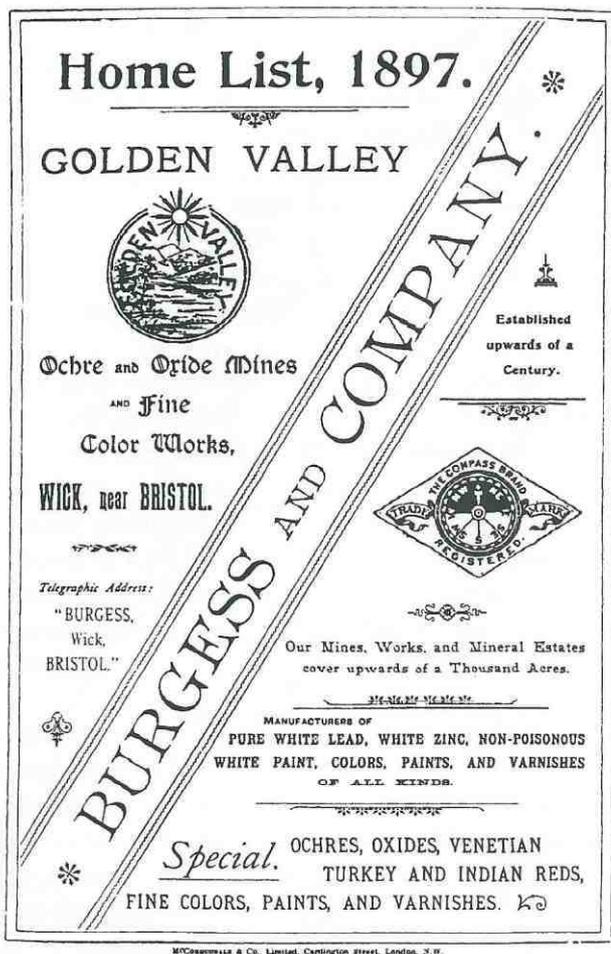


## The Ochre Mines and Works at Wick, South Gloucestershire

R.B.J. Smith & M.J. Breakspear

BIAS Brunel Prize Essay



Front cover of Burgess & Co Home List of Products, 1897

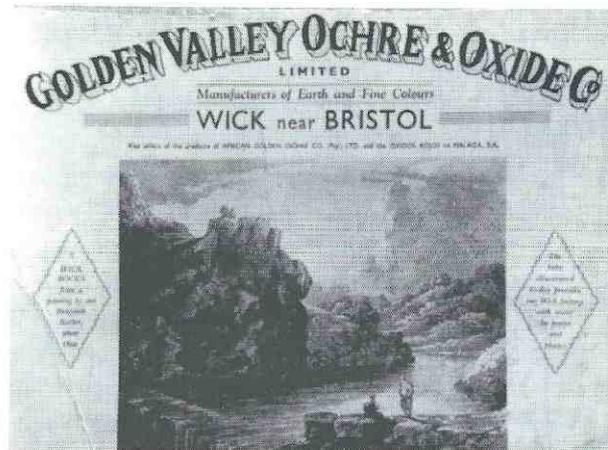
Ochre is a naturally occurring material and is essentially a mixture of clay and iron oxides. When the predominant iron oxide is the anhydrous form (haematite) its colour is red, when hydrous forms predominate its colour is yellow and varying proportions of these produce a range of colours. A material containing a high proportion of the red haematite is called 'oxide' and, in some parts of the country, 'Redding'.

Ochre has been used from the earliest times as a pigment and continued to be used until the production of synthetic materials. These had a wider range of colours, greater consistency and cheapness. It has been exploited in most areas of England and Wales. In the area surrounding Bristol major sites where ochre exploitation has been carried out are Winford in Somerset, a number of sites in the Forest of Dean and at Wick in South Gloucestershire.

Wick is a village situated some eight miles east of Bristol on the A420 road. The River Boyd, that rises on the edge of the Cotswolds, flows in a southerly direction through the village continuing south to join the River Avon at Bitton. The valley of the Boyd is known as the Golden Valley. Just north of the village the Boyd has cut a deep gorge through the limestone and sandstone rocks. The Ochre Works was situated in this gorge (ST706732). The access to the site of the Works was by a road (now a track) running north from the A420 and following the River Boyd. There is a bridge over the river at the entrance to the site.

### History

There had been an iron-founding industry at Wick from the mid-eighteenth century based on the water power provided by the River Boyd. Izzard and Hall state that there was an iron works and paper mill on what was to be the Ochre Works site in 1761, and a weir across the river and a site access road were constructed by Henry Hillman and Richard Haynes in 1778.<sup>1</sup>

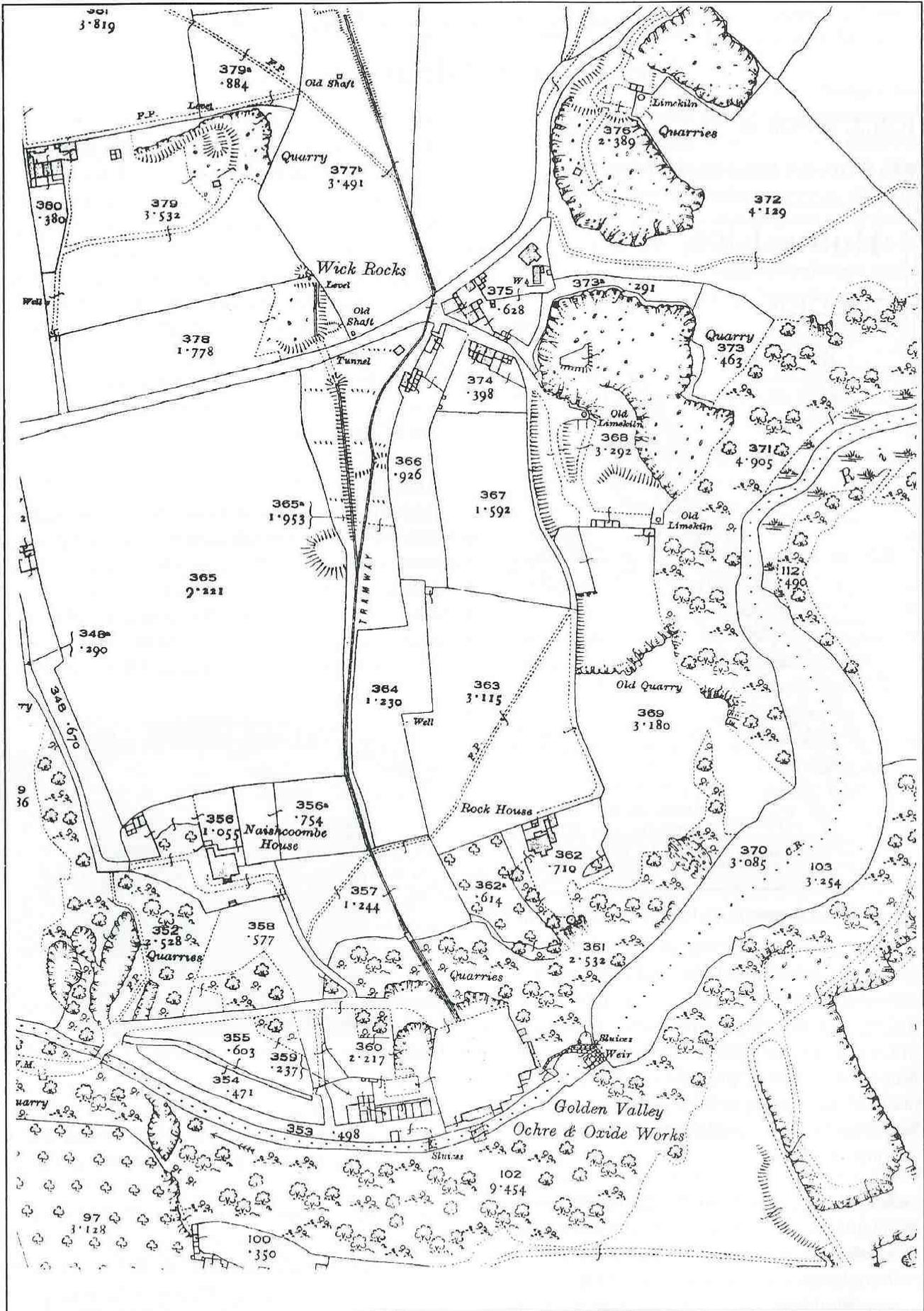


Golden Valley Ochre & Oxide Co publicity material c1930

A painting said to be by Benjamin Barker around 1800 was used in some Golden Valley Ochre and Oxide Co publicity material (circa 1930) and depicts a dam across the River Boyd and an upstream pond.

The Ordnance Survey (OS) plan of 1882 shows a rolling mill and dam across the Boyd at what was to be the Ochre Works site and the *Kelly's Directory* for that date gives George Phipps as the manager of the iron rolling mill and forge at Wick. A geologist visiting the site in 1890 notes that:

*'pits are being sunk in the Trias for ochre which is being ground by Mr Phipps at the Wick rolling mill'*<sup>2</sup>



The Works, from the 25 in Ordnance Survey plan of 1921

By 1895 Messrs Burgess and Co were processing ochre mined on the plateau above the works. An article entitled 'New Ochre Works at Wick near Bristol', dated 1895, gives a very comprehensive description of the works and the processes used and it is clear that by that date the processing of ochre on the site was well established.<sup>3</sup>

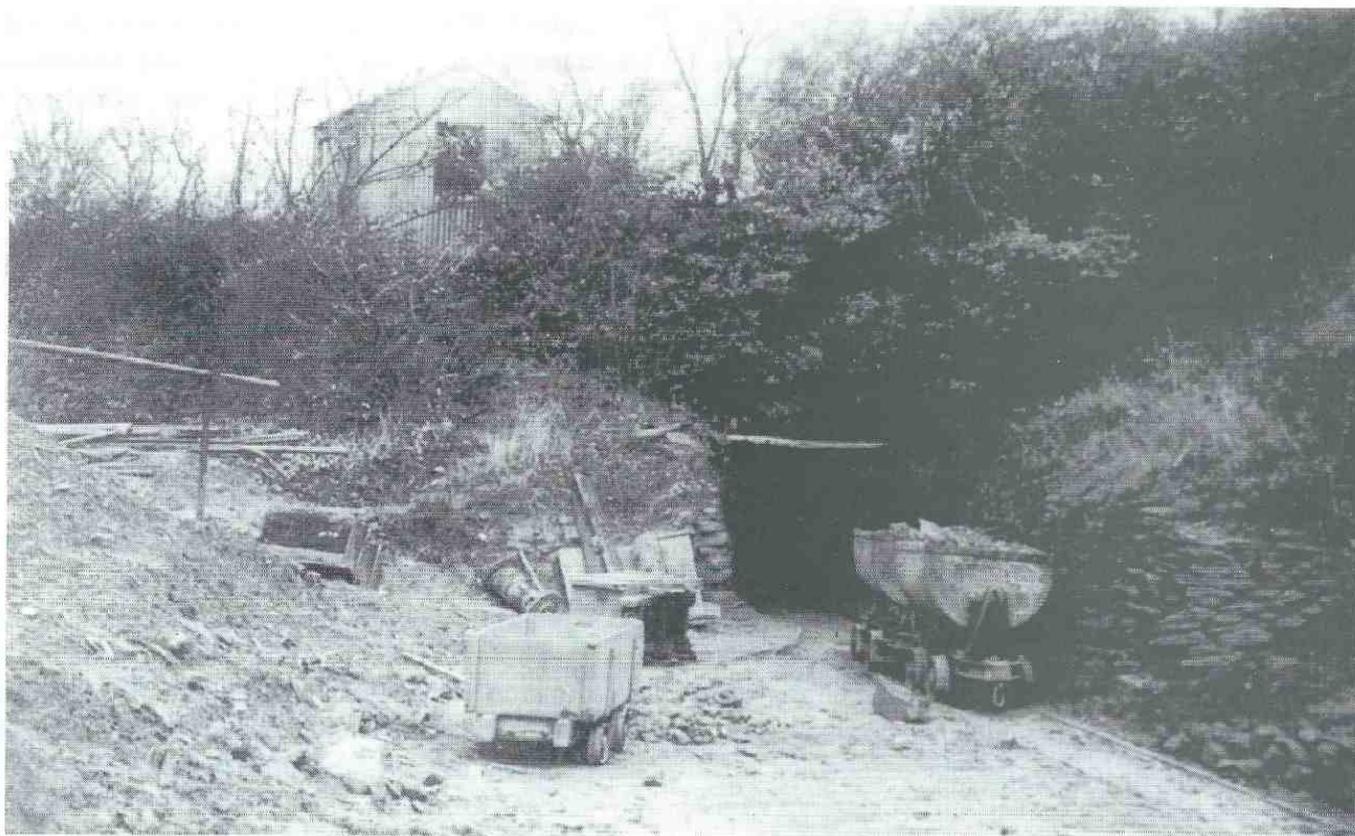
The Burgess and Co Home List of Products for 1897 contained some 1000 items marketed under the 'Compass Brand' trade mark. The front cover of the list of products refers to 'Golden Valley Ochre and Oxide Mines and Fine Ochre Works', fine colours being materials whose manufacture involves some chemical treatment or process as distinct from natural colours whose preparation involved no chemical treatment or process. By 1900 messrs Burgess & Co had become The Golden Valley Ochre and Oxide Co and in 1904 this became a limited liability company 'The Golden Valley Ochre & Oxide Co Ltd'.<sup>4</sup> Charles Beavis, who had previously been employed as chemist and later manager, became managing director of the company. He was joined shortly afterwards, as joint managing director, by his brother Rowland Beavis who had trained as an engineer. The Beavis family remained associated with the Golden Valley Ochre and Oxide Co for most of the rest of its existence and under their direction it expanded considerably so that, at its peak, some 200 people were employed.

In 1968 The Golden Valley Colours Ltd, of which The Golden Valley Ochre & Oxide Co (Wick) had become a part, was taken over by English China Clay. Two years later, in 1970, the works was closed down and soon afterwards the works machinery was removed and the buildings on the site demolished. The site, though now very much overgrown, remains much as it was after the demolition of the works, no development having taken place and can be visited and explored with care. Details of the artefacts remaining on the site are given below.

#### Ochre Mines

The earliest reference to ochre mining at Wick that has been located is contained in a paper by C. Lloyd Morgan. A map is given showing the location at Wick Rocks of sites at which ochre was worked and he notes that at one site a bed of brown ochreous rock four feet thick was (i.e. on 21 June 1890) being worked. It was eight feet from the surface and overlain by red (and green) marls being underlain again by red marl.<sup>5</sup>

An account dated 1895 describes the ochre deposits, in somewhat glowing and, to be shown by experience, to be optimistic terms, as covering about 25 acres and containing that which experts have pronounced to be the largest deposit of red and yellow ochre in this country, and probably the world:



Ochre workings, Wick, before 1935

Geology Department, City of Bristol Museum and Art Gallery

*'The earthy minerals, which crop up to within 18ins from the surface, range in colour from a pale chrome to a rich, red and purple. Of this raw material there are hundreds of thousands of tons - a practically inexhaustible supply - easily accessible and of the finest quality'.<sup>6</sup>*

One of the valuable features of these deposits, noted in several early accounts, was that they had been formed in roughly stratified bands and lenses, and this made exploitation easier than those deposits that occur in 'pockets'. At this time (1895) the ochre was still being extracted from trenches, some only a few feet deep. A rail track had been laid to the main sites (probably two) where ochre was being dug and was conveyed in trucks down to the works. The slope from the plateau on which the ochre pits were located was very steep and a balanced incline or self acting system in which loaded trucks pulled up empty ones was installed. The building at the top of the system containing the cable drum still exists being known as the 'Drum House' and enjoys some listed protection. A detailed description is given later in the section describing the site as it is today.

By 1902 ochre was being extracted from shallow mines and photographs of these show narrow passages with timbers supporting the roof and traversed by a rail track.<sup>7</sup> Following loosening and breaking by blasting, picks and shovels were used to extract the ochre and load it into trucks which were man-handled to the slope out of the mine and pulled up the slope to the mine exit using a hand operated winch. From the mine exit trucks were drawn by horses along the tramway to the Drum House. The tramway from the mines had two branches, one making a level crossing of the road (Rock Road) and one going underneath in a tunnel, both branches joining south of the road before reaching the Drum House. When a sewer was being laid in the road (*circa* 1980) the sewer trench broke into the tunnel that had carried the tramway under the road.

A photograph held in the records of the Geology Department of the Bristol City Museum is described as 'Wick Ochre Mines before 1935'. It probably shows not the entrance to a mine but the southern end of the tunnel under the road and is particularly interesting as it shows two different types of trucks, one being rectangular and a somewhat larger metal tipping truck of the type which has been and still is widely used. It is possible that the rectangular truck being more manageable was used in the mines whilst the larger one was used for transport of the ochre to the works. but this would have involved double

handling of the ochre. It seems more likely that the metal tipping trucks, which are seen in very old photographs, were being replaced by the rectangular ones. This is supported by the fact that when the site was visited in 1967, by which time the mines had closed, the only trucks found were the rectangular type constructed of wood with iron bottoms. These measured 3ft by 1ft 6 in by 1ft and had a door at one end for emptying. The track gauge of these was 2ft.<sup>8</sup>

In his account of the geology of the Bristol District, published in 1921, Reynolds refers to a site, approximately a quarter of a mile from those previously described, being situated at a cross roads (ST 710740) where ochre was obtained by tunnelling.<sup>9</sup> The area in which this site is situated is known as Gatheram. There is an earlier report of mines at Gatheram. In 1910, the members of the Cotteswold Field Club visited the mines by permission of Mr W. Machell the Managing Director of the West of England Ochre and Oxide Co Ltd of Swinford (a village south of Wick), a company having an association with the Golden Valley Company.<sup>10</sup> The ochre is described as being worked in adits driven along the dip of the beds. The site is marked on the 1921 OS plan as a quarry and there is no indication of a tramway to the site. It is possible that the Gatheram mines were joined underground to those at Wick Rocks.

Documents relating to the operation of the mines have been found. 'Workers Time' books cover the periods December 1921 to November 1922 and November 1932 to March 1933<sup>11</sup> and 13 May 1939 to 15 February 1941.<sup>12</sup> These documents, all of which are fragile and some in poor condition, have enabled factual information relating to the mines to be obtained. The records were kept in books having pages with printed headings but the information recorded under the various headings was in some cases not as indicated. Examples of these are the '*Hours Worked*' were the trucks filled and the '*Amount Earned*' was the corresponding weight of ochre.

There is one feature of these records that cannot be explained with complete satisfaction. The 1921/22 records have two separate pages with identical headings for each week, most of the same names appearing on both pages. This suggests that the men working in the mines were also carrying out some other work. and some blank pages marked '*no deliveries*' suggests that the other work was connected with deliveries of some type. The post-1921/22 records are for alternate weeks and

presumably the men worked in the mines every other week and carried out other work recorded elsewhere when not at the mines. This would mean that the requirements for ochre produced from the mines was well below the potential mines output. In the period covered by the mine records the number of men employed at the mines varied from five to 12 and the ochre produced varied considerably in the range ten to 40 tons a working week. The post-1921/22 records give separate ochre production figures for 'Mines' and 'Gatheram', details of each being recorded in the same way. The records have entries showing the activities other than mining that the miners carried out such as 'Exploration', 'Making new Road', 'Timbering' and 'Pumping Water'. For two weeks in 1940 ochre production in the mines virtually ceased because of water.

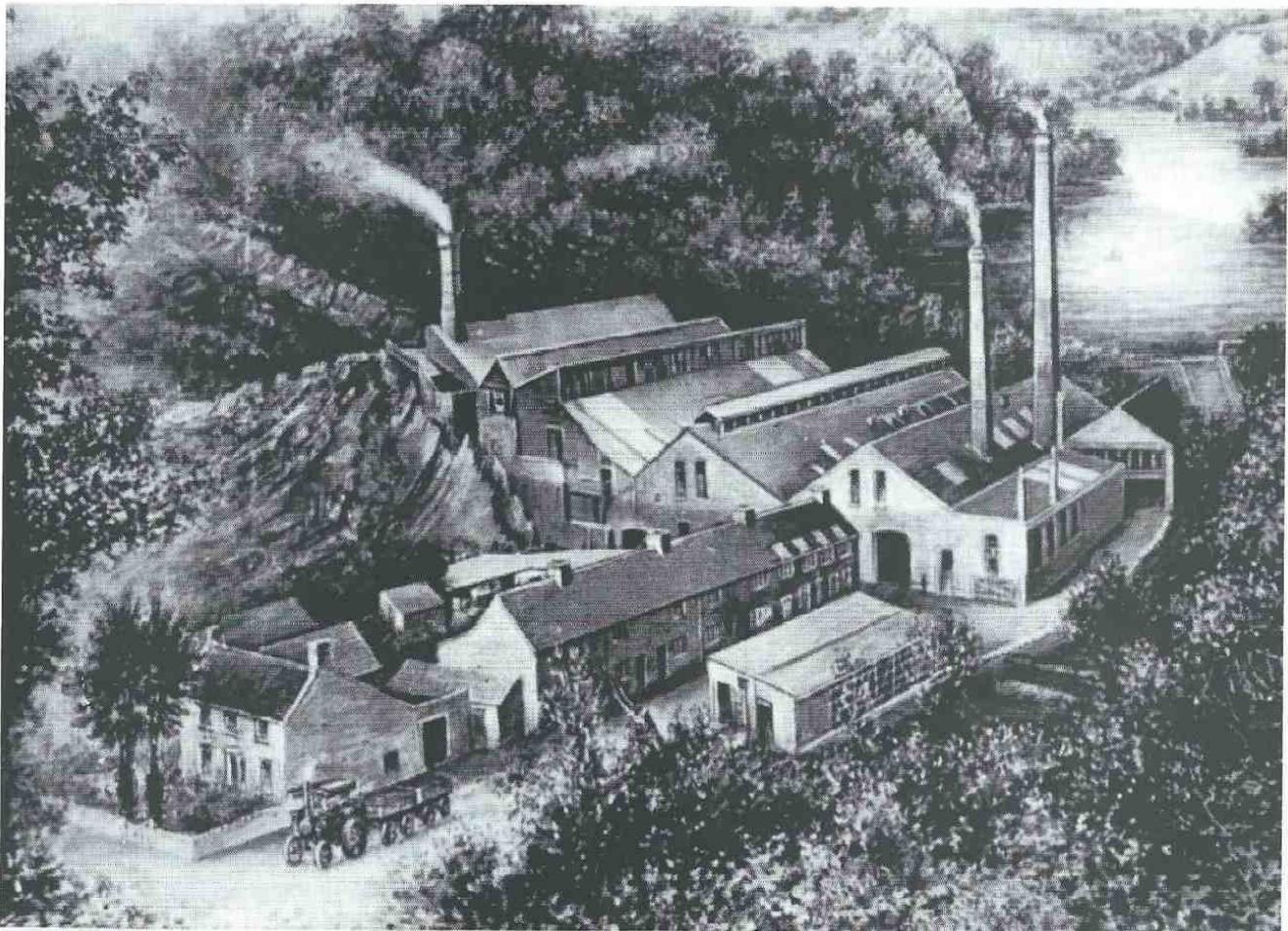
The mining records indicate that on rather rare occasions Fullers Earth as well as ochre was mined and there is an official reference to this in 1929.<sup>13</sup> In the Burgess & Co Home List of Products, referred to previously, there is a mention of Fullers Earth and at a much later date R.H.S. Robertson notes that: '*about 1950 Mr Charles H. Hewitt of Henbury, Bristol was drying and milling for decolourising vegetable oils a non-smectite clay at Wick*' and in a brochure this was described as 'Hewitts Henbury Decolourising Earth'.<sup>14</sup>

There are numerous references to 'Red Clay' in the mine records and, in 1940, 22 tons were produced. The only known use for this clay is given by I. Brown who states that it was puddled, tiles dipped into it and burnt to give a pleasant colour.<sup>15</sup>

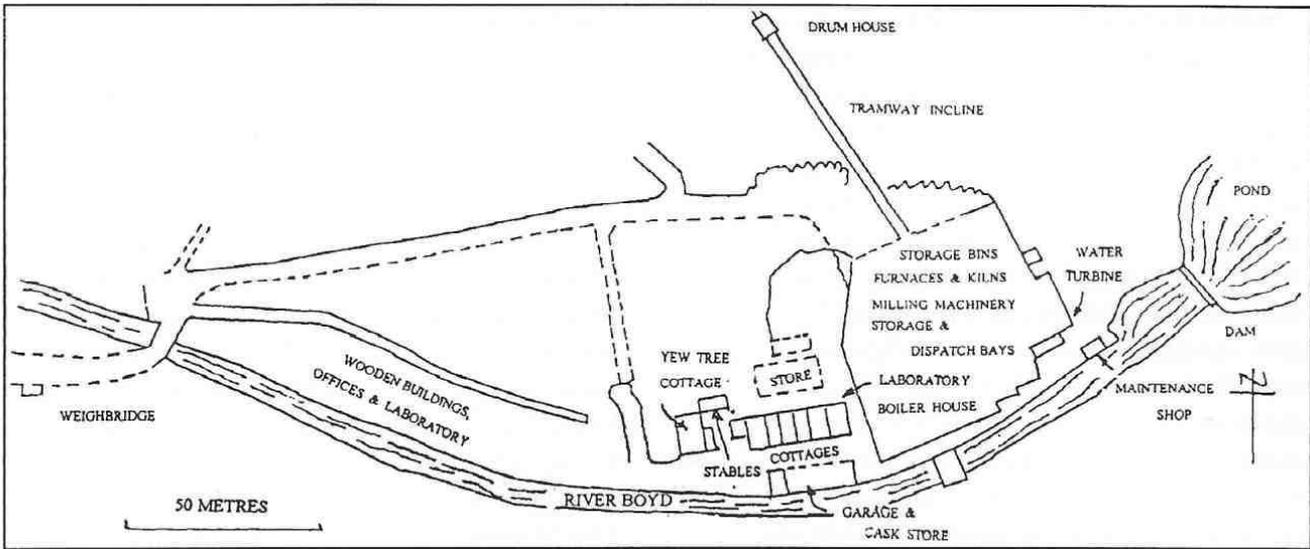
After a period of low activity all mining ceased in 1961 and when visited by I. Brown in 1967 the above-ground buildings and equipment at the Wick rocks mine site remained in good condition but the levels had deteriorated and contained a good deal of water.<sup>16</sup> At the Gatheram site there was no evidence of past mining activity.

### The Works

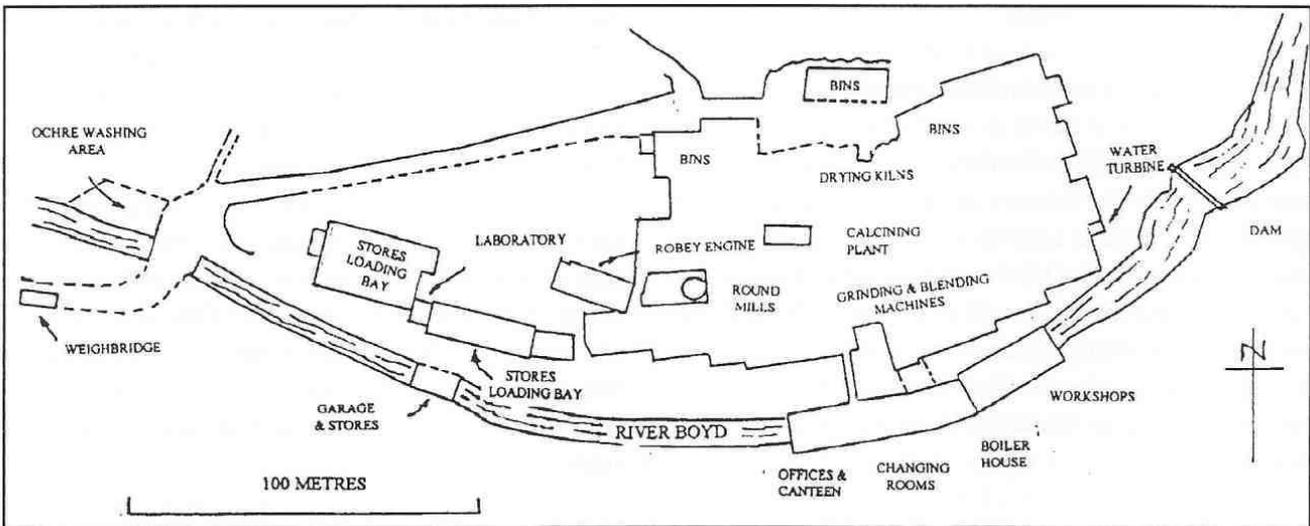
Pictures of the works in the early 1900s show the dam across the River Boyd with a large pond of water upstream and a series of adjacent large buildings starting part way up the gorge slope and at successively lower levels down to the floor of the gorge. The buildings provided four levels at which the processing was carried out, the initial processing being at the top level where the crude ochre was stored in bins with successive processing at lower levels. This reduced the amount of handling required and made for efficient working. The processing of different coloured materials was carried out at vertically distinct sections to avoid one material contaminating another.



View of the works around 1900 from a postcard date stamped 1904



Site layout 1920, based on 25 in OS plan of 1921 and verbal information



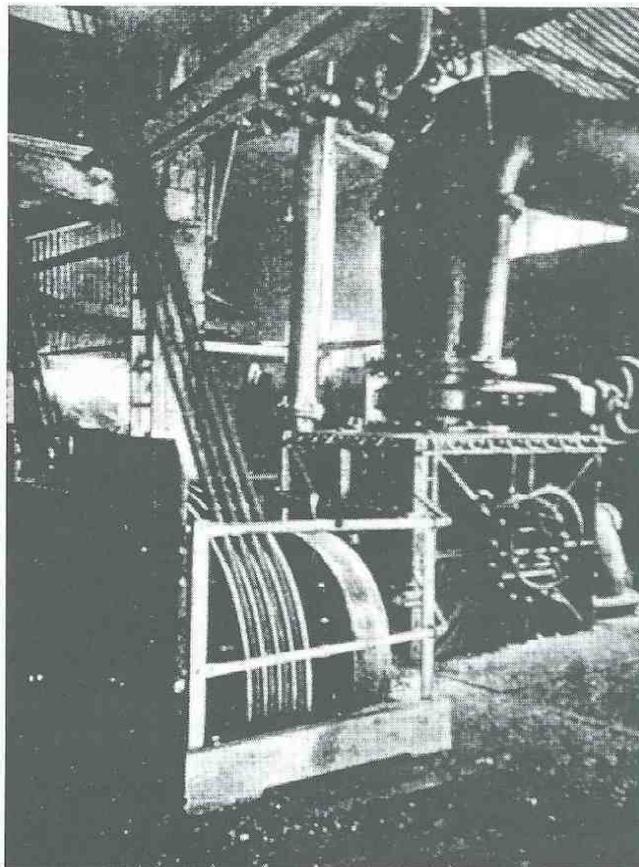
Site layout 1970, based on 25 in OS plan of 1971 and verbal information

Other buildings on the site were a row of cottages, three being occupied by people working on the site and two used as laboratories. At right angles to these was another larger cottage 'Yew Tree Cottage' probably the works' manager's house at first but latterly occupied by the works' caretaker whose duties included operating the tramway incline down to the works and controlling the sluices on the dam. At the back of this cottage were stables to house the horses that were used in the mines and initially for drawing waggons used to transport ochre to and from the works. A building alongside the river was a garage and a wooden cask store and repair shop. A long row of buildings, ex-army wooden huts, were used as offices and laboratories.

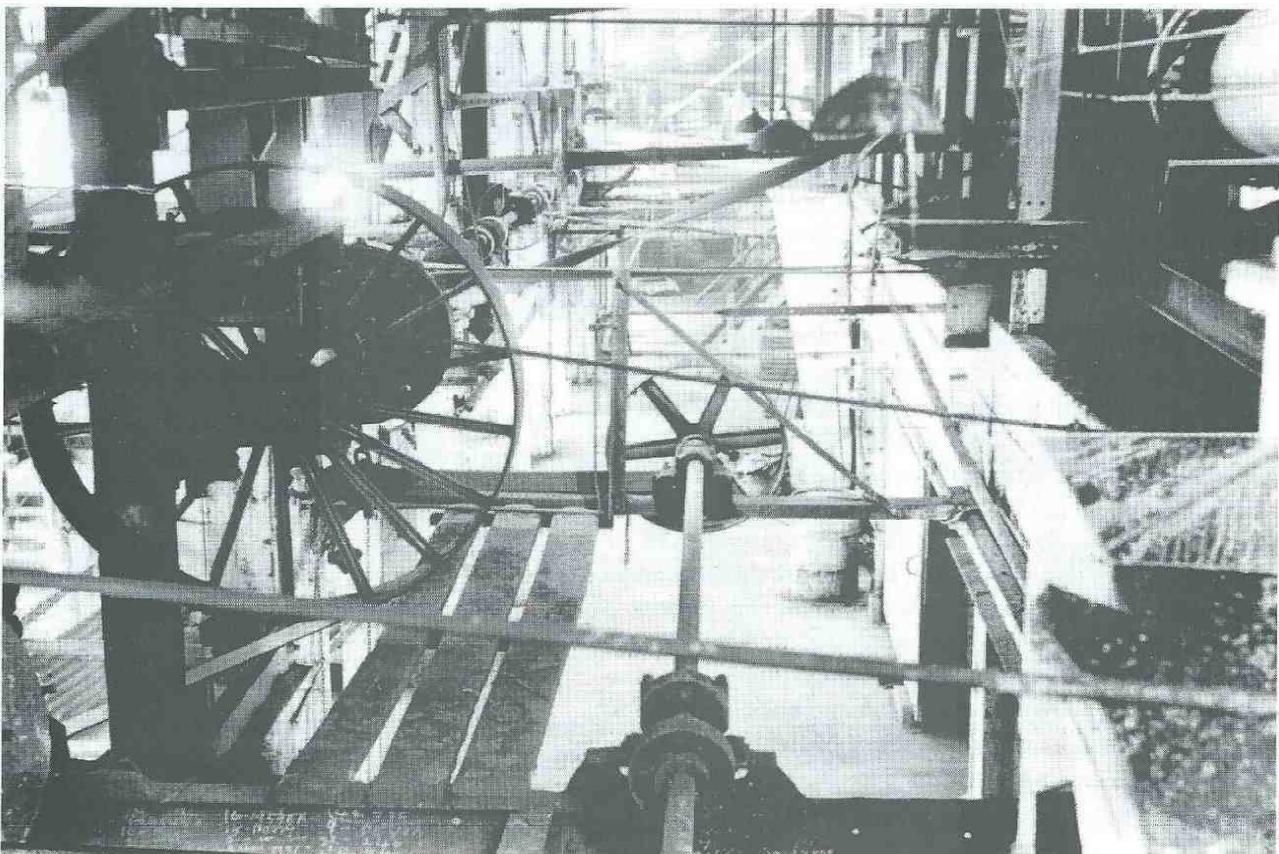
Originally the only source of power at the works was a water turbine, this was later supplemented by a condensing steam engine having an output of 150 HP and the associated boiler plant, fired initially by coal, later by coke and finally by oil. A further addition was a Robey diesel engine installed as a separate unit from the main works power system to drive two grinding mills.

A shaft consisting of several sections, between which were couplings, ran through the works providing the power to the various machinery, via wheels and belts. The drives from both the steam engine and turbine were connected to this shaft. By using the couplings to disconnect the shaft-sections from one another, the proportion of power provided by the steam engine and the turbine could be varied thus enabling the turbine to be run at 'full', 'half-load' or 'shut down', whilst still maintaining the machinery in operation. In a particularly dry summer the turbine was shut down completely, the pond being kept full as a standby power source.

In 1911 the turbine was replaced and an article dated 1912, the author of which used the pseudonym 'Ochre' and is thought to be Rowland Beavis of the Golden Valley Ochre Company, provides a detailed account of the turbine installation and operation. The following is based on this article. The turbine was manufactured by Messrs King and Co of Nailsworth, Gloucester. Water was taken from the dam at a point 15ft below the water level in the pond and passed to the turbine via a 30ins boiler tube, passing down



The water turbine built by Messrs King and Co of Nailsworth, Gloucester



Line shafting and belt drives to machinery

through the turbine to the outlet pipe that discharged 11ft below the turbine, and was then ducted under the site to the river. The turbine was governed to run at 330rpm and connected to the works shaft that ran at 100rpm by a reduction gear and rope drive.<sup>17</sup> When the works was closed the turbine was removed by Mr John Huish of Weston-Super-Mare and formed part of his collection of stationary engines. When Mr Huish died his entire collection apart from the turbine was sold and, as no place for it in a museum could be found, it was cut up for scrap.

The dam was one of the major engineering constructions on the site and remains today much as it was. It is described in detail later. As well as maintaining the water level for operating the works turbine it also controlled the flow of water to the numerous mills lower down the Boyd and the balancing of these two aspects was sometimes difficult. An uncontrolled release of water at times of high water flow could cause flooding and at times of low water, restriction of water could affect the working of downstream mills. After the severe storms of 1968 concern was expressed for the safety of the dam and it was decided to reduce its height, the height of the weir being reduced by about one metre. This was interpreted by many of the work force as foretelling the end of operations on the site.

During much of the period over which the works was operating concern for environment protection and prevention of pollution did not receive the attention it does today. At times the river Boyd became heavily polluted with ochre and, on occasions, literally 'ran red', the pollution arising not only from rain water from the works but also from dumps of ochre alongside the Boyd.

As the demand for the company's products increased, the works was expanded to meet these needs so that by the late 1960s buildings covered most of the area between the dam and the bridge over the Boyd at the works entrance. The main processing buildings had been greatly enlarged, there now being 21 machines installed there. The cottages had been removed to make room for this expansion, though are thought to have been occupied up to 1960. Buildings had been constructed over the river to accommodate the boiler plant (moved there from the main building in 1952 after a serious fire) workshops, canteen, changing room and offices. Large stores buildings were constructed near to the entrance to the site and close by offices and a garage spanned the river.

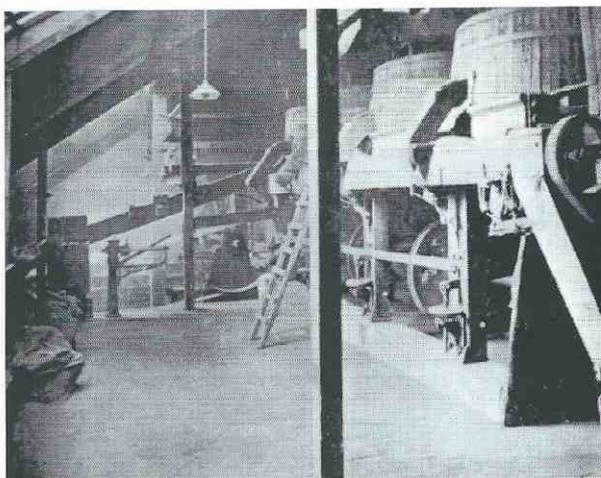
Although the remains of the works buildings are only

fragmentary it is still possible to identify where some of the buildings stood on the site. This will be discussed in the final part of this paper.

### Processing

Initially the works processed only material from the adjacent mines but as the demand for and the range of the company's products increased the need for raw material, both in terms of variety and quantity, could not be met by the mines alone. Raw materials were brought into the works from a wide range of sources, which included Winford (Somerset), Malaga (Spain), South Africa, the Persian Gulf and Cyprus.

The materials from overseas were imported into Avonmouth. From here they were collected or sent to Warmley station, a few miles west of Wick. Initially transport was by horse drawn waggons, but horses were later replaced by a steam tractor, then by steam driven lorries and, finally, by petrol-engined vehicles. Some of the material was spilt both at Warmley station and along the Wick road and the coloured roads are remembered by many of the older people in the area.

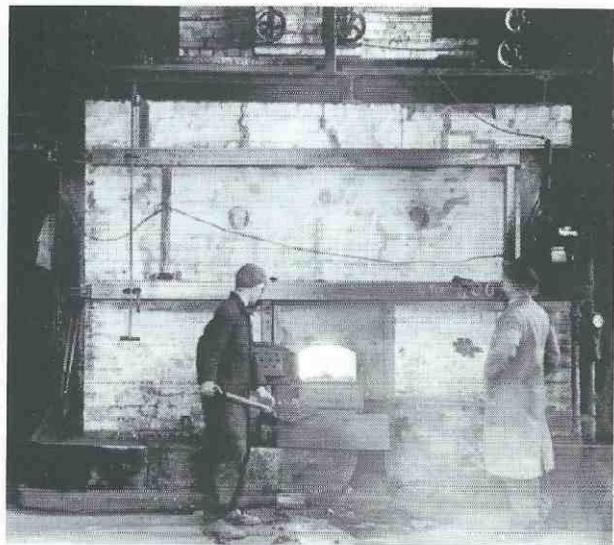


Milling and levigation plant

*The Great Northern Magazine, 1905*

An early account gives the following description of the method of ochre processing then in use. The raw material was drawn from the storage bins, which were at the highest level in the works, and subjected to an initial crushing to reduce the size of the lumps to 2-3cm. This was followed by a process known as 'levigation' that was well established for the size-separation of materials. The ochre was crushed in mills fitted with heavy (4 ton) steel rollers entirely submerged in water. There was a continuous flow of water into the bottom of the mill and this, carrying the finely-ground material in suspension, passed from an overflow at the top of the mill to a series of settling vessels. When sufficient material had collected at the bottom of the vessels, hatches were opened and the

settled material, in the form of a pulp, discharged onto the drying floors below which were heated by coal or coke-fired furnaces. When the levigated material was dry it was removed in the form of irregular shapes and then passed to the final grinding process. This grinding was by horizontal mill stones.<sup>18</sup>



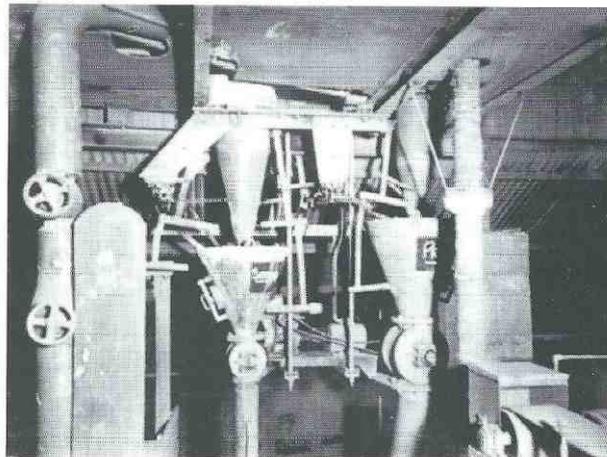
**Kiln furnace**

Changes in the method of processing were made as the raw material, and type of final product required, changed. To produce a red ochre or oxide from the yellow ochre mined, the latter was heated to convert the hydrous to the anhydrous form of the iron oxide. This process was known as 'calcining' and though it produced an oxide it did not have the technical qualities of some naturally-occurring materials. For some purposes the ochre from the mines was dried and then ground without previous levigation.

One of the major changes to the processing over the life of the works was the introduction of various types of grinding mills for improving the final product and the grinding efficiency. The edge and horizontal stone mills were supplemented by, but not entirely replaced by, 'Ball' mills (in which grinding was carried out by balls in a rotating drum) and by 'Round' mills (comprising a chamber in which vertical grinding elements rotated) and 'KEK' mills (consisting of two rotating spiked plates). There was a total of 21 machines on the factory levels that were connected with processing.

An important later addition to the grinding plant was the 'Microniser', a plant devised by an American, N.H. Andrews. Development work on the plant was carried out at Wick and the inventor paid a number of visits to the works. The plant used superheated steam to spin and grind the ochre and was capable of producing a very fine product, said to be of 'face-powder consistency'. The gaseous effluent from the

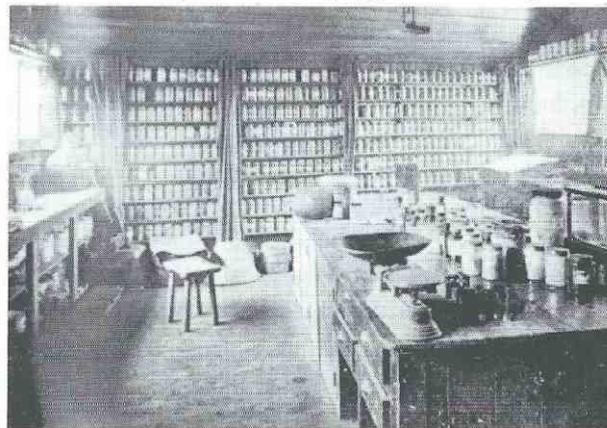
plant was carefully filtered to remove dust, but on occasions when the filtering system failed much of Wick was covered in a fine dust. The introduction of this plant played an important part in prolonging operations at Wick and the headed paper of Golden Valley Colours Ltd noted that it sold the products of Microniser Pigments Ltd. Operation of the processing plant was continuous for 24 hours a day.



**The outlet from the microniser**

The working conditions at the plant were for many years rather primitive and facilities for washing very basic. Many workers returned home in their ochre-coloured clothes and were unpopular passengers on buses.

A very important part of the ochre processing was the need for strict quality control of the product to ensure that the size, grading and colour (tint) met the customers requirements. At the peak of the works production a quality control staff of six were employed working in a well equipped laboratory.



**The laboratory. Note the large number of bottles containing samples of material supplied previously to customers.**

*The Great Northern Magazine, 1905*

The ochre produced was used for a wide variety of purposes, one of the earliest was in the manufacture of coloured paper. Other important uses included the manufacture of paints and distempers and the colouring of stone work and asphalt. The asphalt used

for surfacing the Mall in London was coloured with ochre from Wick.

During World War Two the workforce was augmented by English China Clay employees and prisoners of war. Home products assumed a great importance when imports were restricted.

Some processing of 'fine colours' -that is pigments in the production of which some chemical processing takes place- is known to have taken place at Wick, but detailed information is lacking here.

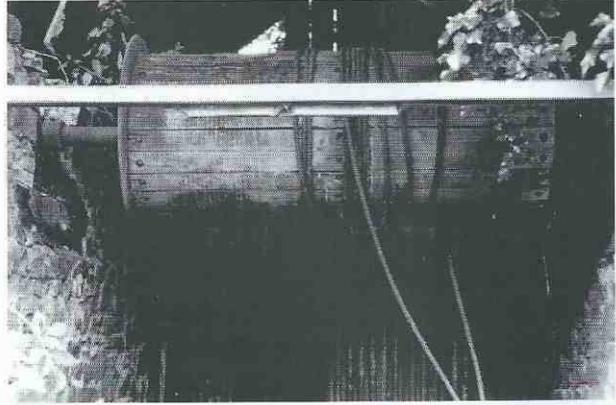
### The Site Today

There is now no evidence of the ochre mines in the fields north of Rock Road, though a local farmer does attribute some depressed areas in the fields to subsidence into workings. Similarly, at Gatheram evidence of mining is absent. It is possible, with the eye of faith, to trace from the ground configuration in the fields south of Rock Road, where the tramway routes were to the drum house. There are pieces of tramway rail in some of the hedges.

The drum house is the only building that remains on the site. It is sturdily built of random local stone with a wooden framework supporting a corrugated iron sheet roof. Some of the sheets are missing, others are damaged. The entrance to the house from the incline side has been filled in with wooden doors, clearly not in their original position. It is possible that these doors were once fitted at the other end of the house. The wooden drum, with steel cable wound round it and supported on bearings at either end, is still in its original position. At one end of the drum axle is the brake drum around which a steel band connected to a 3.5m long brake lever. Pulling this tightened the steel band and braked the drum. The incline to the works is 60m long and slopes at a gradient of 1 in 3.5. No remains of the double tramway that ran down the incline or the rollers on which the steel cable would have run have been found. The building is described by interested local residents as 'listed' though this has not been checked. There is considerable vegetation and large trees surround the building but at present this does not represent a serious danger to the building. Nearby the building is the remains of a steel tipping truck of the type once used on the incline.

The dam remains much as it must have been when working on the site ceased, although parts are becoming overgrown. The stepped path to the top of the dam has deteriorated but access to the fenced platform at the top of the dam and sluice gate control

is still possible (the weir is 3m below this platform). There is no evidence of the 30 in pipe that fed the water from the dam to the turbine. In the bank near the top of the dam it is possible to locate the site where the Works fire pumps were located.



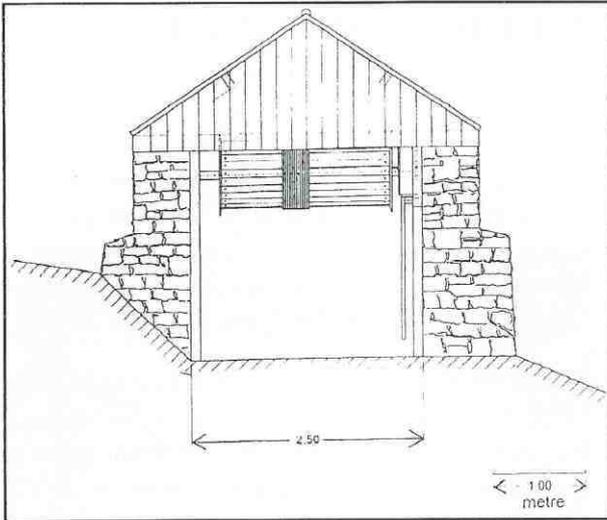
**Drum House winding drum**

Apart from the drum house and dam the remains of the works are fragmentary. In the flat area at the base of the dam a circular steel plate, resembling a tumbler and set in concrete, can be seen. This was the site of an early blacksmith's shop and the turntable was used for supporting banded millstones when they were being repaired. Close by in the river the concrete supports for the buildings that spanned the river still exist.

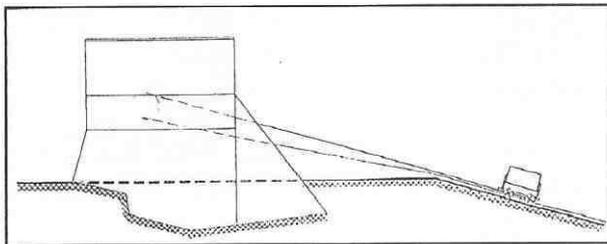
Near the top of the slope on which the works was built are the remains of a substantial structure of heavy girders that supported extensions made over an old quarry. This structure, as are most of the building remains on the site, is a deep red colour acquired by contact with ochre. Nearby on the ground is an iron-banded millstone. Just below the structure referred to above is one of circular construction, possibly the remains of the calcining furnace. Between this and the site entrance for some 50m are the remains of buildings at two distinct levels, again very reddened, illustrating the way the works was constructed on the slope. Between these building remains and the site entrance are large areas of concrete. These are the floors of large buildings used for storage and also containing loading bays.

The bridge over the river at the site entrance still remains as a substantial structure. It can be seen that an original bridge was widened at some time, probably when the road up to the ochre bins at the top of the works was widened.

A short way down the site entrance road, the site of the works weighbridge, now little more than an area cut into the roadside hill slope, and fragments of brick foundations can be seen. Further down the entrance



The Drum House



Drum House and incline

road the remains of old ochre drums and other materials, indicate where the works waste dump was.

There are no known plans for the development of the site at present which, despite the ever present noise from the adjacent active quarry, is a popular walking area for Wick residents.

**Acknowledgements**

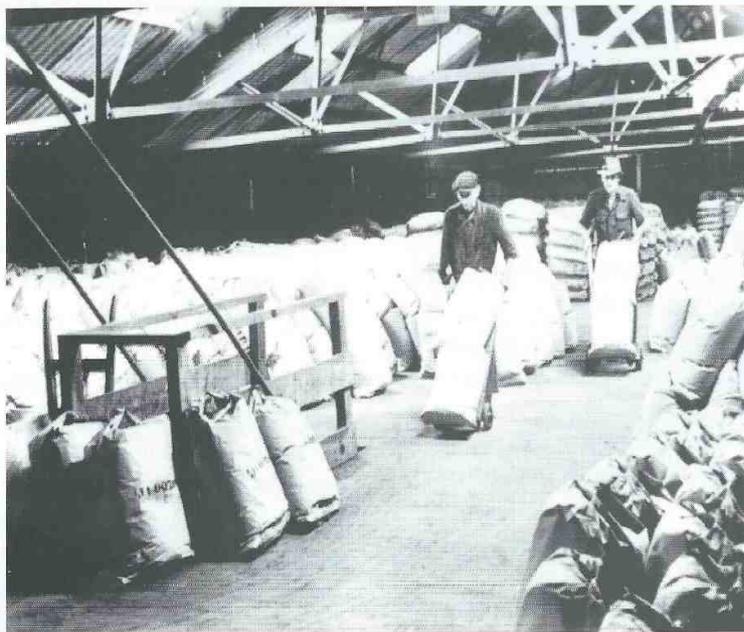
Documentary information relating to the ochre operations at Wick is sparse and the value of oral and other information supplied by people who had been associated with the operations is acknowl-

edged. Information supplied by Gordon Fitz and Idris Davies, who were employed at the works, and Frances Read who, for much of her early life, lived at Yew Tree Cottage on the works, has been particularly valuable.

Our thanks are due to members of the Wick and Abson Local History Group who made available much useful information, to Barbara Kent for access to her late husband's collection of photographs and to David Bick and Ivor Brown for information made available relating to the mines.

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17. 'Ochre' (pseudn.) 'Water Power as an Auxiliary' *The Power User* (October 1912) 270-2
18. Anon., 'The Ochre Beds of the Bristol District'. *The Quarry* (1902) 155-6



Processed ochre store