

Southeast Wales Industrial Ironworks Landscapes

Year 3: water management features

March 2007

A report for Cadw
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GGAT report no. 2007/023
Project no. GGAT 80



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1 Introduction and Acknowledgements

1.1 Introduction

The landscapes of the iron making industry of South East Wales represent an increasingly rare and important historic landscape and archaeological resource, which remains under considerable threat from a variety of developments from reclamation and landscape renewal to residential and industrial development. For this reason the current project has been instigated, to assess the current state of survival/preservation of the ironworks landscapes of the northern coalfield rim, and inform conservation, protection and management requirements through providing recommendations for the proactive and long-term management the ironwork areas.

In essence the work will help to ensure that any necessary change to industrial ironworks landscape is accommodated without sacrificing the essential integrity and coherence of the historic environment.

The latter half of the twentieth century saw the wholesale clearance, reclamation and development of many industrial sites in the South East Wales region. Ironworks, in particular have been vulnerable to landscape reclamation and renewal schemes, to such an extent that the vast majority of ironworks have at least in part been affected, and the process is ongoing. Therefore, it is both opportune and welcome that this project has been instigated, commissioned and funded by Cadw as part of an on-going initiative. It is hoped that this report will provide the catalyst for the urgent consideration of the future conservation of ironworks and their associated landscapes.

The current report sets out the results of the project, with a section defining the aims, and methodology. It also summarises the known and potential threats and provides general recommendations and establishes management/conservation priorities.

The main body of the report, Section 6, identifies and describes the water management systems. These are mapped, in the current landscape using a MapInfo Geographical Information System, and figures have been produced to illustrate the various interests. The water management systems and features mapped are based on the first edition 1:2500 OS map, Landmark mapping, kindly provided by Cadw under licence agreement.

1.2 Acknowledgements

The project was commissioned by Cadw and undertaken by the Glamorgan-Gwent Archaeological Trust (GGAT) in their remit as the regional archaeological body responsible for the understanding and preservation of the archaeological resource in southeast Wales.

The Trust would like to thank the staff of the Glamorgan Record Offices, Cardiff and Swansea, Gwent Record Office and the National Library of Wales for their assistance, The National Assembly for Wales for their helpful assistance and the staff at the National Monuments Record (NMR), RCAHMW, Aberystwyth, in particular Medwyn Parry. The Trust would also like to thank Judith Alfrey of Cadw for providing comments and advice during the project. Thanks are also due to Jessica Mills and Philip Hobson, Archaeological Records Officers, at Cadw.

For advice in obtaining information on opencast and reclaimed land, the Trust would like to thank the staff of Unitary Authorities, especially Dave Whetter of Caerphilly CBC's Planning Department. The Trust would also like to thank Anthea Brown of the British Geological Survey, and David Clarke, Joe Dearden, Graham Martin and Mike Sheldon of the Coal Authority for their assistance. Digital mining information – past opencast site data was kindly provided by the Coal Authority (ref: CA29/03/02).

The report has been prepared by Richard Roberts and Charina Jones, with the assistance of other staff of the Glamorgan-Gwent Archaeological Trust, notably Gail Higginbottom at the Sites and Monuments Record (SMR). The digital mapping has been prepared by Charina Jones, Ellie Graham, Richard Roberts and Paul Jones of the GGAT Illustration Department.

1.3 Copyright Notice

The copyright of this report is held by Cadw: Welsh Historic Monuments and the Glamorgan-Gwent Archaeological Trust Ltd. The maps are based on Ordnance Survey mapping provided by the National Assembly for Wales with the permission of the Controller of Her Majesty's Stationary Office, Crown Copyright. All rights reserved. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence No: 100017916 (2007).

2 The Study Area

The overall project entailed work on the ironworks and related features within the northern coal rim area. These are located within the respective Unitary Authorities: Blaenau-Gwent, Caerphilly, Merthyr Tydfil, Monmouthshire, Neath Port-Talbot, Rhondda Cynon Taff, and Torfaen.

The study was initially limited to the northern coalfield rim, specifically those sites described in L Ince 1993 *The South Wales Iron Industry 1750-1885*, Merton Press. The northern coalfield rim of South East Wales supplied over 30 major blast furnace iron-producing sites. However, this years project was limited to the Heads of the Valleys Region, specifically to the area designated by the Heads of the Valleys Initiative Strategy.

Between the 1790s and 1840s the Heads of the Valleys in particular was the largest producer of iron in Britain, if not the world. Whilst the key areas of Blaenavon and Merthyr Tydfil have undergone intensive study much of the rest of the northern coalfield rim remains have been afforded little in the way of recording. The RCAHMW through their upland survey and aerial mapping have studied this area as a priority and a lot of data is and will become available from them. There are many other local historians/archaeologists who have published work on different parts of the area and the first edition OS map contains an extraordinary picture of this landscape at the end of its productive life. Due to the large amount of work already completed in the areas of Merthyr Tydfil and Blaenavon, these areas were omitted from this study but known results have been mapped.

The first two years of this project studied the core Ironworks areas themselves and their associated transport links (restricted to limestone railways and tramroads) through out the northern coal rim area. Also associated with the ironworks are large complex water management systems and extractive landscapes. As a whole all these components contribute to a complex, integrated landscape within and extending between each valley region. For years three and four modifications were made to the remit, scale and with these the extent of the study area to allow the project to tie into the requirements of programmes, such as the Heads of the Valleys Initiative, and to provide results on a landscape scale through increasing available baseline data in a rapid way.

The study area was revised to cover the area of the Heads of the Valleys initiative, thereby excluding ironworks sites, to the west of Hirwaun and beyond the eastern boundary of the Initiative area, excluding the Clydach Valley. Because of this, the need to cover a larger geographic area in the third year than originally proposed, combined with the complexity and large scale of the water management systems, and the need to rapidly provide baseline data, it was decided to restrict the third years' project almost exclusively to a mapping exercise.

3 Purpose of the Report – aims and applications.

A number of Industrial Ironworking landscapes are well known and well protected. Notably the World Heritage Designation at Blaenavon, but some protection is also afforded through inclusion on the Historic Landscape Register at for example Merthyr Tydfil and Cwm Clydach. In other areas only those elements that are Scheduled or Listed are protected and consequently other elements of the landscape relating to the monument are more exposed to removal or impairment through re-development. Industrial landscape reclamation and opencast are considered to be the main threats to these endangered and rapidly disappearing landscapes and their component elements whilst other developments could also have impacts.

It was proposed that the study be initially limited to the northern coalfield rim, specifically those sites described in L Ince 1993 *The South Wales Iron Industry 1750-1885*, Merton Press. The northern coalfield rim supplied 30 major blast furnace iron-producing sites. A simple but valuable exercise comprised comparing evidence from depictions of the core ironwork areas on the first edition OS map with modern maps and aerial photographic material, with the intention of identifying what survives and is visible, what survives and is buried, and what has been destroyed. The boundaries of the initial study were taken as the limits of the core ironworks areas and did not extend to wider transport links, waterworks and associated extraction sites, which were to be covered in the future. Validation was through site visits, consultation with local land reclamation departments and talking to local experts. Each ironworks core area was categorised as archaeologically sensitive areas, areas of archaeological potential or sterile areas. As a separate document a review of the scheduling of these sites could then be undertaken.

Large-scale regeneration proposals, such as the Heads of the Valleys Initiative, represent as much an opportunity as a threat to this existing and as yet largely unquantified heritage resource. Whilst environmental enhancement work is potentially damaging to the archaeological resource, the Heads of the Valleys programme proposes five key strategic goals, the leader of which is ‘an attractive and well-used natural, historic and built environment’, and it is envisaged that this will be achieved through strategic landscape-scale environmental enhancements. A further goal refers to ‘an appealing and coherent tourism and leisure experience’, which would include for large regional-scale projects. There is considerable opportunity for integrated heritage management, and for this reason it has been attempted to tailor the ironworks landscape project to fit the landscape-scale focus of the Heads of the Valleys programme.

Local conservation initiatives, which could allow the industrial monuments to be tied in with ecological protection in amenity developments, offer further example of the potential of proactive management.

Whilst there is this wealth of information Cadw are endeavouring to improve the protection and management of what is perhaps one of the most important aspects of Wales’ history. Cadw would like to see this project attempt at building a consensus and partnership over how to tackle the protection and management issues and assimilate the information gathered into these processes. This may in effect act as a scoping for a larger project to be taken forward in future years.

The study should ultimately provide the information necessary to:

- assess the current state of survival/preservation, conservation and the recording requirements (of the ironworks landscapes of the northern coal rim)
- inform future protection and management issues, including future scheduling proposals (regarding the ironworks landscapes of the northern coal rim)
- inform the relevant Unitary Authorities on industrial ironworks landscape issues in the planning process, including forward planning
- assist in assessing the wider impact of future proposed development on industrial ironworks landscapes
- assist in the evaluation of the aesthetic or amenity value of the industrial ironworks landscape
- assist in measuring the effect of individual development proposals on the overall historic integrity and coherence of industrial ironworks landscapes, with particular reference to the issues of outright removal, severance, fragmentation or dislocation of the historic elements.
- assess the cumulative effects of secondary or piecemeal changes over time.

An important component of this project has and will continue to be the engagement of those who have a direct interest in the industrial ironworks landscape study and the applications that will be derived from it. It is hoped that this should enable decisions on the protection of the historic environment to be made in a more informed way. It is intended therefore to keep interested parties such as Cadw, RCAHMS, CCW, DEIN, the Local Unitary Authorities, and the Brecon Beacons National Park informed on the progress and findings of the studies.

Several of these objectives are directly applicable to the Heads of the Valleys programme, notably informing authorities on landscape issues, and assisting in the enhancement of the amenity value of sites. In essence the work will help to ensure that any necessary change to industrial ironworks landscape is accommodated without sacrificing the essential integrity and coherence of the historic environment.

The Ironworks were the key stimulant for the development of the surviving communities; as such these are iconic markers in the Welsh industrial landscape. This project aims to provide a deeper understanding and appreciation of these remains leading not just to a better and wider appreciation of their importance as continuing focal points in the South Wales landscape but with the intention that raised awareness and protection can be used as an impetus for sensitive regeneration and community focus.

The results of this project would seek to link into and inform existing strategies such as the 'Wales Spatial Plan' (Welsh Assembly Government 2004) and the related 'Heads of Valleys Strategy' (Welsh Assembly Government 2005), informing the process of promoting and enhancing local heritage sites within a framework of sustainable development. The latter, detailed in the document '*Heads – We Win...*' A Strategic Framework for the Heads of the Valleys', (Welsh Assembly Government's vision for the Heads of the Valleys within the context of the Wales Spatial Plan), includes the overarching aim that by '*the year 2020, the [Heads of the Valleys] area will be: a culturally rich, dynamic network of vibrant and safe communities a place where people want to live, work and play with a sustainable, high quality of life and a thriving population helping to drive the success of South East Wales as an internationally recognised Capital Region.*'

Among the key themes of the Heads of the Valleys Programme are the following: ‘An attractive and well-used natural, historic and built environment’, which would provide an ‘appealing and coherent tourism and leisure experience’. The Heads of the Valleys Initiative’s strategic goals and programmes, produced through stakeholder consultation and analysis of the available research and evidence, has been developed around five priority themes, each underpinned by a number of key Strategic Programmes (SPs):

An attractive and well-used natural, historic and built environment

- SP1: A sub-regional approach to the regeneration of settlements
- SP2: A perception-changing landscape
- SP3: Well-used and easily accessed amenities

A vibrant economic landscape offering new opportunities

- SP4: Directly linking people with work
- SP5: Joined-up solutions for business
- SP6: Linked opportunities for businesses and individuals

A well-educated, skilled and healthier population

- SP7: Improving health through prevention
- SP8: Integrated lifelong learning

An appealing and coherent tourism and leisure experience

- SP9: Linked local and regional attractions and facilities
- SP10: An integrated ‘offer’

Public confidence in a shared bright future

- SP11: Visualising the Strategy
- SP12: Pro-active communications and engagement

The following identified strategic programmes SP1, SP2, SP3, and SP9 all have implications for the heritage resource across the Heads of the Valleys region; these should, however, be viewed as opportunities to allow the quantification, assessment, and sensitive management and promotion of the Heritage resource of the Heads of the Valleys area.

The DEIN strategy ‘Working Together For Wales’ is viewed as having the potential to tie in with the broad tourism and regeneration, in addition to ‘urban and rural renewal activities, land reclamation and environmental improvements to sites and property’.

A raft of numerous supporting plans, policies, strategies and guidance exists to underpin the Heads of the Valleys Initiative and are relevant to the future preservation and management of the heritage resource in the Heads of the Valleys area; these have been summarised in ‘Annex A: Review of Relevant Plans, Policies and Strategies’, and include the following: *Environment Strategy for Wales; Learning to Work Differently – Sustainable Development – WDA; Planning Policy Wales (March 2002); Circular 60/96; Circular 61/96; Enter the Dragon Economy – SE Wales Development Strategy (Capital Wales); Wales: A Better Country – The Strategic Agenda of the Welsh Assembly Government.*

4 Methodology

4.1 General Methodology

The project involved a rapid interrogation of the computerised Regional Sites and Monuments Record, supplemented by other readily available primary and secondary data, such as a search of NMR data available through ENDEX, and online through the Coflein website. More general works and articles and other sources were also consulted where readily available, though few secondary sources were found to be directly relevant to the study of water management features; where consulted these sources are provided in the bibliography along with other general sources.

The report has been presented in such a way that upgrading of information can be considered through the medium of a GIS system. This allows data storage, manipulation, analysis, interrogation, presentation and future revision of information. Information Technology has therefore been a major component of this project and the current years work contributes to the production of a dynamic and multi-layered digital model for the study area(s).

4.2 Year Three Methodology

During year three the main element of the project was a Heads of the Valleys area-wide mapping exercise based on the first edition 25-inch OS map (LANDMARK Historic Mapping). This allowed specific ironwork water-related resources to be identified and quantified at a landscape scale. It was decided to base the mapping exercise on the first edition OS map (c. 1875-1880) as this period represented a hiatus in iron production across the Heads of the Valleys area, with the systems largely at their maximum extent. Later OS editions detail the water management systems as they were modified for steel production and public health water supply. The mapping exercise was undertaken using a GIS mapping package (MapInfo 7). The digital mapping information in MapInfo and Pdf format will be made available on completion of year four of the project.

Information on statutory protection (both for Scheduled Ancient Monuments and Listed Buildings) relevant to ironworks related water management and extraction sites in the Heads of the Valleys area was obtained from Cadw to assess current levels of protection.

Digital point data was produced to locate individual localised features based on the first edition maps, with polygonal and line data being produced to map reservoirs and linear features (eg leats, culverts and feeders). Valley system areas and areas of complex or ambiguous associations were conceived and mapped in polygonal form.

The survival of the resource was assessed through comparison of information obtained from historic maps and modern mapping (OS Landline) supplemented by information obtained from digitally available aerial photographs (Get Mapping). In addition readily available map information on areas of opencast was also sourced and used to aid this process; this primarily comprised digital mining information (past opencast site data) kindly provided by the Coal Authority under licence (ref: CA29/03/02). Additional information on land reclamation was requested from the individual UAs within the study area. It was found that this information was either not available, or could not be provided in a readably accessible format compatible with the scope of the current project.

Copies of available current Unitary Authority development plans were obtained and examined for their bearing on the heritage resource, and the way in which they could potentially effect that resource positively or adversely. In addition available information on DEIN and Environment Agency programmes, and ‘The Heads of the Valleys Strategy’ and Wales Spatial plan were obtained, and examined for ways in which the current project could specifically inform or assist in the overall aims of the programmes/plans.

During the current year the results of previous years work (years one-two) were incorporated to allow the identification and mapping of areas of special industrial ironworks landscape significance. This will be revised in year four to incorporate and take into account extraction areas.

4.3 Task Breakdown

1. Review and compile baseline documentation

- Compilation of necessary documentation/SMR/NMR data, Cadw Information
- Review first edition 1:2500 OS maps for Heads of the Valleys area
- Compile source list and bibliography for project

2. Review current state of protection and threats for newly identified sites/areas

- Establish current extent of scheduling / listing
- Establish extent of opencast and reclaimed areas
- Investigate details, where available, of current UA plans/DEIN and Environment Agency programmes and other management strategies, eg. ‘The Heads of the Valleys Strategy’

3. Undertake historical mapping and production of constraint maps

- Undertake rapid mapping (digital MapInfo point and polygon data)
- Ascertain extent of surviving remains (against modern map, aerial photographic data, etc)
- Revise existing GGAT lists and produce distribution/area maps

4. Review the assembled data

- Consider proposals for protection (where identifiable at this stage)
- Prepare integrated summary/constraints map including information from earlier years.
- Discuss conclusions with Cadw

5. Compile and disseminate reports

- Compile text
 - Briefly review background history of the ironworks of the northern coal rim, historiography, recent research, and significance and importance of individual ironwork landscapes
 - Review relative historical significance and importance of individual ironworks landscapes based on year 1 and year 2 findings
 - Provide summary description of surviving water management remains and review significance
 - Review current levels of statutory protection relating to water management features
 - Review threats and current management proposals/priorities relating to water management features
 - Make recommendations for detailed follow on study to be carried out during years four and five (as required)
- Make any additional recommendations, eg proposals for protection (years 5 and 6 unless immediately required)
- Prepare illustrations for report
- Produce reports using DTP facilities

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- Submit reports to Cadw
- Provide copies to interested parties (SMR and NMR, RCAHMW, UDP planning departments, etc)

5 Industrial Ironworks Landscapes

5.1 Review of Project: Year 1

During year one of the Southeast Wales Industrial Ironworks Landscapes project a number of wider ironwork areas, based on the information contained in Ince 1993 and a rapid mapping exercise, including limited map regression, were identified, and defined; these were further revised and core ironwork areas defined, primarily using cartographic and aerial photographic information, more detailed map regression, tied into baseline SMR and NMR information. The result was the identification of some 35 core ironworks areas; these are given in table 1, below.

Table 1. Identified core ironworks areas

Ironworks Number ¹	Ironworks Name	Grid Reference
001	Pontypool (Upper Race, Blaendare)	ST 272 997
002	Varteg	SO 265 055
003	Golynos	SO 260 047
004	Abersychan (British)	SO 258 035
005	Pentwyn	SO 265 033
006	Clydach	SO 227 128
007	Blaina (inc. Cwmcelyn)	SO 199 081
008	Coalbrookvale (inc. Trostre)	SO 194 095
009	Nant-y-glo	SO 192 105
010	Ebbw Vale	SO 174 097
011	Victoria	SO 172 076
012	Beaufort	SO 170 115
013	Tredegar	SO 144 091
014	Sirhowy	SO 144 102
015	Rhymney	SO 113 069
016	Dyffryn	SO 071 032
017	Pentrebach	SO 065 035
018	Plymouth	SO 057 048
019	Ynys Fach	SO 046 060
020	Cyfarthfa	SO 037 068
021	Penydarren	SO 058 072
022	Dowlais	SO 065 074
023	Ivor Works	SO 068 080
024	Hirwaun	SN 993 045
025	Llwydcoed	SN 993 045
026	Gadlys	SO 001 031

¹ Numbers prefixed by IW in main text

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027	Abernant	SO 006 035
028	Aberaman	SO 015 003
029	Ystalyfera	SN 764 084
030	Ynyscedwyn	SN 785 092
031	Onllwyn	SN 839 103
032	Banwen	SN 868 104
033	Melincwrt	SN 824 019
034	Venallt	SN 863 049
035	Abernant	SN 882 063

It was found that historically, many of the ironworks areas had expanded to take in significant areas of valley landscape; this was particularly the case with the larger ironworks conglomerations within the upper valleys of the Blaenau, such as at Nant-y-glo, Ebbw Vale, Rhymney, Blaina, and Coalbrookvale. Conversely, in the case of some of the less significant ironworks, such as the once jointly operated Varteg and Golynos, in the area north of Pontypool between the British Ironworks and Blaenavon, it was found that the constituent parts of the core area were often spread over some distance, with core activities being shared between different sites.

Whilst 35 Ironworks Areas were identified for the purpose of the year one report, the actual number of ironworks was 38, as several ironworks had been combined, because of proximity and development such as IW007 Blaina, which included the Cwmcelyn Ironworks and IW008 Coalbrookvale, which included Trostre Ironworks. It should also be noted that several of the more extensive ironwork areas identified, were out of necessity effectively split up into separate sub-areas. These include Ebbw Vale, which can be sub-divided naturally into three areas, along the lines of the core furnace area, the Lower Mill site, and the Bessemer Steel works, and Rhymney, which comprises the Old Furnace, the main Rhymney Ironworks site itself and the adjacent Bute Works.

The year one project entailed a review of existing protection and identification of potential threats to the resource. In terms of protection fifteen of the core ironwork areas examined were found to have some degree of current statutory protection (ie Scheduled Ancient Monuments or Listed buildings); that is between 40% and 43% of the original resource within the study area limits. The analysis indicated that of the core ironworks areas with visible standing remains, 75% are currently protected to some degree through statutory protection, while just 50% of ironwork areas with buried potential are similarly protected.

The level of statutory protection was further broken down to allow an analysis of the protected resource against surviving monument class (ie furnaces, charging ramps/platforms, calcining ovens/coking oven, casting houses/foundries, rolling mills, engine houses, waterwheels/pits, offices and other buildings), where surviving as visible standing, or positively identified buried remains. This has been specifically undertaken to identify classes of monument that are underrepresented within the current protection regime, but also identify core ironwork areas, which might benefit from the extension of existing protection.

The main features of the ironworks sites are considered to be their furnaces and charging ramps/platforms; sixteen core ironworks areas out of 35 within the study area were found to retain visible standing, or positively identified buried remains of furnaces/furnace banks

(including a count of two for Abersychan – with the scheduled air furnace). The nationally important furnaces (and engine house) at Banwen (SAM Gm420), despite protection through scheduling are in urgent need of conservation. Twelve of the 17 furnaces/furnace banks identified are currently protected by statutory protection: notably the furnace bank at IW010 Ebbw Vale (Listed Building Grade II*, Cadw ref: 22,531) is not scheduled. The furnaces at IW004 Abersychan, IW029 Ystalyfera, IW022 Dowlais (buried) and IW018 Plymouth (buried) are also of particular significance and are currently unprotected through legislation. The number of charging ramps/platforms similarly protected mirrors the figures identified for furnaces with 11 protected out of 18 identified, with that at IW010 Ebbw Vale listed (LBII*, Cadw ref: 22,531) but not scheduled. Significant unprotected charging ramps/platforms survive at IW029 Ystalyfera, IW004 Abersychan, IW021 Penydarren, and possibly also at IW009a Nant-y-glo, Other unprotected remains of charging ramps/platforms might also survive at IW012 Beaufort, IW013 Tredegar and IW025 Llwydcoed.

The survival and protection of ancillary features displayed a slightly different pattern to the main ironworks features; in general survival of ancillary features within the study area such as calcining ovens/coking ovens, casting houses and foundries, was found to be relatively low and where these features did survive they were, with a few exceptions, invariably protected. Remains of calcining ovens/coking ovens survive at five ironworks, though generally in a fragmentary or buried condition. Of the calcining ovens/coking ovens identified four are protected through legislation; that at IW026 Gadlys, which had recently been conserved, was listed (LBII, Cadw ref: 10,846), but not scheduled. The latter in terms of condition was the best surviving example of those within the study area; most remain as 'sites of', or buried. Of the five ranks of ovens originally located at IW004 Abersychan, one recorded in 1994 (Ironbridge Institute and RCAHMW 1994) survives apparently in poor condition (Riden 1994); the site is currently unprotected.

Casting houses/foundries were identified within five ironwork core areas; all are currently protected through legislation. The only unscheduled example is the foundry at IW004 Abersychan, which is a grade II* listed building (Cadw ref: 14,870). Mills and forges are similarly well-protected: these include both the forge/workshop (occupied) at IW015 Rhymney a grade II listed building (Cadw ref: 16,882), and the remains of two possible mills within the scheduled area (SAM BR157) at IW024 Hirwaun. Unusually the well-conserved brick-built mill/engine house and adjacent chimney (NPRN 34,037) at IW030 Ynyscedwyn is as yet unprotected through statutory legislation.

The level of protection afforded to surviving ironworks related engine houses is generally high with eight of the ten identified examples adequately protected through listing and scheduling. Those Engine houses, which are listed rather than scheduled (eg Grade II* Listed engine house at IW019 Ynys Fach, and the Grade II Listed examples at IW022 Dowlais and IW026 Gadlys) are occupied and have been found alternative uses. As yet unprotected, in addition to the aforementioned example at Ynyscedwyn, are the buried remains of two identified engine houses at IW010 Ebbw Vale; these located to either end of the grade II* listed furnace. Only three waterwheels/wheel pits have been identified within the study area; these are all protected through scheduling; one at IW014 Sirhowy also being grade II* listed (Cadw ref: 22,496). It should be noted that due to the nature of these features a strong likelihood exists that buried remains might survive elsewhere, as yet unknown.

Of the twenty or so miscellaneous features such as offices and other buildings identified five are currently unprotected by legislation. The more significant are the tramroad tunnel beneath the furnace bank at IW018 Plymouth, the weighbridge and weighbridge house, and the smithy and carpenter's shop at IW032 Banwen, the Company shop/office at IW009 Nant-y-glo (within 009a), the office at IW027 Abernant, and the Company shop and offices at IW034 Venallt; the latter three sites are all now occupied domestic properties. The unprotected features at Banwen have considerable group value with the nationally important features within scheduled area to the north (SAM Gm420), and it was noted that protection should be considered.

A review of identified threats undertaken during year one using Unitary Authority development plans as a basis. Other potential threats, mainly from dereliction were identified in particular from the site visits.

The year one project included rapid site validation visits; in fact a cross-section of ironworks (nineteen of the thirty-five) within the study area were visited, with the exception of the Merthyr Tydfil area (previously covered by Historic Landscape Characterisation work). The site visits in conjunction with documentary and cartographic sources were undertaken to validate the ironwork boundaries in their current state and to establish the current condition/survival, potential for survival of the archaeological resource within the identified ironwork areas.

The archaeological resource for each ironwork core area was assessed in relation to the level of current statutory protection as well as condition, archaeological value, presence of visible remains and buried potential. It was found that of the 35 core ironwork areas (ie or a maximum 38 ironworks) 21 retained visible remains, while 30 were considered to have some level of buried potential. The results are summarised in Table 2, below.

Table 2. The core ironworks areas: condition and archaeological value

Ironworks Number	Ironworks Name	General Condition of Site ²	Archaeological Value (Grading on figures)
001	Pontypool (Upper Race, Blaendare)	Reclaimed and landscaped	C
002	Varteg	Cleared and landscaped	C
003	Golynos	Reclaimed and partly redeveloped	C
004	Abersychan (British)	Intact (SAMs/LBs) /partly buried	A
005	Pentwyn	Reclaimed and landscaped	C
006	Clydach	Intact (SAM/LBs)/cleared and partly redeveloped	A
007	Blaina (inc. Cwmcelyn)	Reclaimed and redeveloped	C
008	Coalbrookvale (inc. Trostre)	Reclaimed and redeveloped	C
009	Nant-y-glo	Intact (009b: LB)/ cleared and redeveloped	A-B
010	Ebbw Vale	Intact (LB)/ partly cleared and redeveloped	A-C
011	Victoria	Reclaimed and partly redeveloped	C
012	Beaufort	Cleared and redeveloped	C
013	Tredeggar	Cleared and partly redeveloped	C
014	Sirhowy	Intact (SAM/LB)/partly buried	A

² Based on cartographic, documentary and aerial photographic evidence alone, where not visited.

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015	Rhymney	Intact (015a: SAM/LBs)/reclaimed and redeveloped	A-C
016	Dyffryn	Reclaimed and redeveloped	C
017	Pentrebach	Reclaimed and redeveloped	D
018	Plymouth	Tunnel intact/rest reclaimed and partly redeveloped	A
019	Ynys Fach	Intact (SAM)/ partly cleared and redeveloped	A
020	Cyfarthfa	Intact (SAMs/LBs)/ partly cleared	A
021	Penydarren	Cleared and redeveloped	B
022	Dowlais	Intact (LB)/ partly reclaimed and redeveloped	A
023	Ivor Works	Intact (LB)/ cleared site redeveloped	A
024	Hirwaun	Intact (SAMs/LBs)/ partly cleared	A
025	Llwydcoed	Intact? / partly cleared	A
026	Gadlys	Intact (SAMs/LBs)/ partly cleared and redeveloped	A
027	Abernant	Cleared and partly reclaimed	C
028	Aberaman	Cleared and reclaimed	D
029	Ystalyfera	Partly cleared and redeveloped	A/B
030	Ynyscedwyn	Partly cleared and redeveloped	A/B
031	Onllwyn	Opencasted and reclaimed	D
032	Banwen	Intact (SAM) / derelict state	A
033	Melincwrt	Intact (SAM) / derelict state	A
034	Venallt	Intact (SAM) / conserved	A
035	Abernant	Reclaimed/ partly redeveloped	D

The analysis of cartographic, documentary and aerial photographic material not only allowed the boundaries of the core ironworks areas to be identified, but also allowed a general overview of site condition to be established. In this way the archaeological significance or potential of the resource could be estimated and broken down into the following:

- archaeologically sensitive areas - Grade A
- areas of archaeological potential (moderate-high) - Grade B
- areas of archaeological potential (low-moderate) - Grade C
- sterile areas/low potential - Grade D

The value of the remains in the individual ironworks (IW) areas was considered in terms of certain remains, or where not visible, potential.

Of the 35 core ironworks areas examined during year one some 14 (40% of the total areas) were considered to be straight archaeologically sensitive areas, with an additional 5 (14.3% of the total) archaeologically sensitive in combination (Category A taking president), a single area of moderate-high archaeological potential (2.9% of the total), and 11 areas (31.4% of the total) of low-moderate archaeological potential, whilst the remainder were areas of low or sterile archaeological potential. Of these core areas, only those considered to be archaeologically sensitive or of moderate to high potential have been viewed as considerations, when identifying historic ironworks landscape areas (see section 7.3, below).

5.2 *Review of Project: Year 2*

Between the 1790s and 1840s the Heads of the Valleys in particular was the largest producer of iron in Britain, if not the world. A major system of tramroads and railroads was developed to furnish the ironworks with raw materials; this system, with the possible exception of the North Eastern Coalfield of England, was 'by far the most extensive in Britain and therefore the World' (van Laun 2001). The transport networks of South Wales were notable for a number of important technological advancements, such as the first use of the all-iron edge rail, and here the tramroad was developed to its highest form, with implications for the later development of public railways.

Three major components of the ironworks related transport system were identified:

- the supply lines which extended from the limestone quarries of the northern outcrop to the furnaces (c.100km overall length)
- the supply lines which conveyed coal from the coal and iron ore mines, which generally lay closer to the ironworks than the quarries (comprising a vast network of underground track)
- the exit lines from the ironworks to the ports and canals and nearby markets (originally c. 190km)

The best surviving of these routes were the feeder routes from the limestone quarries, these were considered by van Laun (2001b) to be the most productive for further archaeological research; the routes to the coal and iron ore mines being largely underground or inaccessible, having been tipped over by continued workings or removed by land reclamation and urban development, whilst the exit routes have by and large been obscured by later railways, and road development with the notable exception of the Merthyr Tramroad, which has been excluded from the current study. It was considered that any meaningful examination of the routes to the coal and iron ore extraction sites would have required a substantial amount of desk-top study and original research, which whilst being beyond the scope of the project would have been largely unproductive, and as a result year two Southeast Wales Industrial Ironworks Landscapes project concentrated on identifying and investigating the best surviving element of the ironworks' related transport networks, the supply lines from the limestone quarries.

The year two study was necessarily fieldwork orientated to allow the presence/absence of surviving remains along the various transport routes (i.e. of the main routes and branches) to be recorded with each surviving transport route subdivided according to condition; condition ratings were devised and used in relation to the overall condition of each section, as was the overall archaeological significance or potential of the resource on a network-by-network basis and allocated one of the following values:

- High
- Medium
- Low
- Unknown

Of the forty-three transport networks and branches ten, that is only 4.3%, were found to have routes surviving to 50% or more of their original length. In terms of overall archaeological significance twelve networks and branches were considered to be of high overall archaeological significance, six of high-medium significance, whilst the remainder were considered to be of medium, medium-low, low, or unknown significance. Those transport networks and branches

with a high or high-medium overall significance rating were further assessed for possible consideration for future protection (i.e. scheduling).

Table 3. Ironworks transport networks giving condition and archaeological value/significance and associated ironwork core areas

Ironworks Transport Number ³	Transport Network Name	Condition Rating	% Overall Survival	Overall Archaeological value	Associated Ironworks: Number(s)/Name(s)
IWT001	Abersychan Limestone Railway	IWT001(i): D IWT001(ii): A	55%	High	IW004 Abersychan (British)
IWT002	Llam-march Railroad	IWT002(i): B IWT002(ii): D	11%	High-Medium	IW006 Clydach
IWT002a	Llam-march Railroad (Waunllapria)	IWT002a(i): B	4%	Medium-Low	IW006 Clydach
IWT003	Llam-march Tramroad	IWT003(i): B IWT003(ii): D IWT003(iii): A IWT003(iv): B IWT003(v): A	35%	High	IW006 Clydach
IWT003a	Llam-march Tramroad Pen-Ffyddlwn	IWT003a: D	0%	Low	IW006 Clydach
IWT004	Clydach Railroad	IWT004(i): B IWT004(ii): C IWT004(iii): B IWT004(iv): E IWT004(v): E IWT004(vi): C	20%	High-Medium (includes: listed tramroad bridge 23837)	IW006 Clydach, IW012 Beaufort
IWT005	Bailey's Llangattock Tramroad	IWT005: D	<1%	Low	IW009 Nant-y-glo, IW012 Beaufort: 2nd Llangattock Tramroad
IWT006	Disgwylfa Main Tramroad	IWT006(i): D IWT006(ii): B IWT006(iii): D IWT006(iv): B IWT006(v): C IWT006(vi): B IWT006(vii): C IWT006(viii): B IWT006(ix): A IWT006(x): B	100%	High	IW009 Nant-y-glo, IW007 Blaina

³ Numbers prefixed by IWT in main text.

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Ironworks Transport Number ⁴	Transport Network Name	Condition Rating	% Overall Survival	Overall Archaeological value	Associated Ironworks: Number(s)/Name(s)
IWT006a	Disgwylfa Pant Draenog	IWT006a(i): B	100%	High	IW009 Nant-y-glo, IW007 Blaina
IWT006b	Disgwylfa East	IWT006b(i): B	100%	High.	IW009 Nant-y-glo, IW007 Blaina
IWT006c	Disgwylfa West	IWT006c(i): B IWT006c(ii): A IWT006c(iii): A IWT006c(iv): A	94%	High	IW009 Nant-y-glo, IW007 Blaina
IWT006d	Disgwylfa Main (conjectured)	IWT006d: D	0%	Low	IW009 Nant-y-glo, IW007 Blaina
IWT006e	Disgwylfa Main (south)	IWT006e(i): A IWT006e(ii): B IWT006e(iii):B	9%	High-Medium	IW009 Nant-y-glo, IW007 Blaina
IWT007	Trevil Railroad Main Line	IWT007(i): A IWT007(ii): E IWT007(iii): A IWT007(iv): E IWT007(v): B IWT007(vi): B	61%	High	IW014 Sirhowy, IW012 Beaufort, IW010 Ebbw Vale with Victoria Ironworks: Rassau Railroad
IWT007a	Trevil Railroad Beaufort Line	IWT007a: D	<1%	Low	IW012 Beaufort: Rassau Railroad
IWT007b	Trevil Railroad Ebbw Vale Line	IWT007b: D	<1%?	Low	IW012 Beaufort, IW010 Ebbw Vale: Rassau Railroad
IWT007c	Trevil Railroad Sirhowy Line	IWT007c: D	0%	Low	IW014 Sirhowy: Rassau Railroad
IWT007d	Trevil line to Victoria	IWT007d: D	0%	Low	IW010 Ebbw Vale, IW011Victoria: Beaufort Tramroad
IWT008	Rassau Railroad	IWT008(i): E IWT008(ii): E	14%	Low-Medium	IW012 Beaufort, IW014 Sirhowy, IW010 Ebbw Vale
IWT009	Hall's Trevil Tramroad	IWT009(i): B IWT009(ii): C	7%	Medium-Low	IW015a Rhymney Upper Furnace: Rhymney Branch Tramroad; Bryn Oer Tramroad
IWT010	Rhymney Tramroad Branch	IWT010(i): U	3%	Unknown	IW015a Rhymney Upper Furnace
IWT011	Morlais East Tramroad and Railway	IWT011(i): B IWT011(ii): D IWT011(iii): E	39%	High-Medium	IW023 Ivor works and IW022 Dowlais Ironworks.

⁴ Numbers prefixed by IWT in main text.

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Ironworks Transport Number ⁵	Transport Network Name	Condition Rating	% Overall Survival	Overall Archaeological value	Associated Ironworks: Number(s)/Name(s)
IWT012	Morlais West Tramroad	IWT012(i): C IWT012(ii): A IWT012(iii): E	34%	High	IW021 Penydarren Ironworks and tramroad, IW018 Plymouth Ironworks
IWT013	Tappendens' Tramroad	IWT013(i): A IWT013(ii): B IWT013(iii): B IWT013(iv): C IWT013(v): U IWT013(vi): E IWT013(vii): E IWT013(viii): C IWT013(ix): A	29%	High	IW024 Hirwaun, IW025 Llwydcoed, IW027 Abernant, IW026 Gadlys
IWT013a	Tappendens' Tramroad West	IWT013a(i): C IWT013a(ii): C IWT013a(iii): C IWT013a(iv): U IWT013a(v): B	16%	Medium	IW024 Hirwaun, IW025 Llwydcoed, IW027 Abernant, IW026 Gadlys
IWT014	Mr Glover's Railroad	IWT014(i): A IWT014(ii): E IWT014(iii): B	65%	High	IW024 Hirwaun (later connection to IW025 Llwydcoed, IW027 Abernant, IW026 Gadlys Ironworks via Tappendens' Tramroad)
IWT014a	Mr Glovers Railroad Bryngwyn Extension	IWT014a(i): B	6%	Medium-Low	IW024 Hirwaun (later connection to IW025 Llwydcoed, IW027 Abernant, IW026 Gadlys Ironworks via Tappendens' Tramroad)
IWT015	Twynau Gwynion Tramroad Line 1	IWT015(i): C IWT015(ii): B	25%	High-Medium	IW022 Dowlais
IWT015a	Twynau Gwynion Tramroad line 2	IWT015a(i): D IWT015a(ii): C IWT015a(iii): C IWT015a(iv): D IWT015a(v): C IWT015a(vi): C IWT015a(vii): B	50%	High-Medium	IW015a Rhymney Upper Furnace

⁵ Numbers prefixed by IWT in main text.

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Ironworks Transport Number ⁶	Transport Network Name	Condition Rating	% Overall Survival	Overall Archaeological value	Associated Ironworks: Number(s)/Name(s)
IWT015b	Twynau Gwynion Tramroad line 3	IWT015b(i): C	87%	Medium	IW022 Dowlais (partly under later Rhymney Limestone Railway)
IWT015c	Twynau Gwynion Tramroad Line 4	IWT015c(i): B IWT015c(ii): U	19%	Medium	IW022 Dowlais (partly under route of Rhymney Limestone Railway)
IWT016	Rhymney Limestone Railway	IWT016(i): E IWT016(ii): B	29%	Medium	IW015 Rhymney Lower Furnace
IWT017	Bryn Oer Tramroad	IWT017: D	0% (within Glamorgan – Gwent)	Low	IW015/015a Rhymney (via Hall's Trevil Tramroad)
IWT018	Tredegar Tramroad	IWT018(i): B	4%	Low	IW013 Tredegar Ironworks
IWT019	Ebbw Vale Private Line	IWT019(i): B	2%	High (includes listed causeway and tunnels 22532).	IW010 Ebbw Vale and IW014 Sirhowy Ironworks
IWT019a	Ebbw Vale Private line addition	IWT019a: D Only a tunnel (IWT019a/001) under Beaufort road survives.	<1%	Low	IW010 Ebbw Vale and IW014 Sirhowy Ironworks (via Harford's Tunnel)
IWT020	Bute Tramroad	IWT020: D	0%	Low	IW015 Rhymney Lower Furnace (via Dowlais' Twynau Gwynion line 4)
IWT021	Beaufort Tramroad	IWT021: D	0%	Low	IW012 Beaufort and IW010 Ebbw Vale
IWT022	Protheroe's Tramroad	IWT022(i): B IWT022(ii): U	26%?	High (IWT022(i) is protected within Scheduled Ironworks Area GM423).	IW034 Venallt
IWT022a	Venallt Tramroad	IWT022a: D	0%	Low	IW034 Venallt
IWT023	Banwen Quarries Tramroad	IWT023(i): U IWT023(ii): D	33%	Unknown (On private land)	IW032 Banwen
IWT023a	Banwen Coelbren Junction	IWT023a(i): B IWT023a(ii): B	87%	High-Medium	IW032 Banwen

⁶ Numbers prefixed by IWT in main text.

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Ironworks Transport Number ⁷	Transport Network Name	Condition Rating	% Overall Survival	Overall Archaeological value	Associated Ironworks: Number(s)/Name(s)
IWT024	Ystalyfera	IWT024: D	0%	Low	IW029Ystalyfera
IWT025	Nant-y-glo - Beaufort	IWT025: D	0%	Low	IW012 Beaufort (also IW009 Nant-y-glo via Bailey's Llangattock Tramroad)

The results of year two of the project allowed the archaeological resource (based on condition, archaeological value, presence of visible remains and buried potential) to be assessed in relation to the level of current statutory protection (i.e. Scheduled Ancient Monuments and Listed Buildings) for each ironwork transport network. It was found that of the 25 ironworks associated transport networks (or a maximum 44 branches) examined during the course of fieldwork, 20 networks (or 33 branches) retained visible remains, of these, 14 (18 branches) were considered to contain sections of high or high-medium archaeological significance.

Nine Scheduled Ancient Monument areas were found to be directly relevant to the study, while a further 12 listed interests, two of which were Grade II* listed, were also visited during the course of the fieldwork. The overriding majority of features currently scheduled or listed along the length of the transport networks surveyed were found with few exceptions to be tramroad bridges or features in association with bridges.

Seven of the transport networks surveyed (10 sections by condition) were found to have some degree of current statutory protection (i.e. Scheduled Ancient Monuments or Listed buildings). The extent of the scheduled resource was considered to be clearly under representative in terms of quantity and variety of transport monument type. Previous scheduling had concentrated on individual features, rather than viewing the networks as a series of interconnected features, and the protected resource had been largely restricted to one particular type of monument (ie. tramroad bridges) almost to the complete omission of others (e.g. tramroad cuttings, revetment, groups of blocks, etc).

The overall archaeological significance of the surviving resource was used to identify the transport networks and branches, which might benefit from further protection. It was found that the linear nature of the resource, and inherently lower value of individual elements, required a different approach to the traditional 'site' based approach when identifying elements of the resource for the purpose of protection. It was felt that a broader landscape approach was necessary to prevent further under representation of some of the less impressive site types, emphasizing the connectivity of the resource through group value, coherence and integrity in particular. The surviving resource had been previously subdivided into sections based on general condition, and group value, among others; these sections were used as the basis for recommending consideration for protection, rather than individual elements.

Ten ironworks transport networks and their branches, some 16 sections, were identified as satisfying the criteria sufficiently to be considered for future protection.

⁷ Numbers prefixed by IWT in main text.

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The year two works extended to a review of threats largely identified on the basis of available Unitary Authority development plans. Other potential threats, such as dereliction were identified from the site visits. As a result general conservation management recommendations were made for the surviving networks. This identified a need for future detailed survey for many of the networks, or parts thereof; 17 sites were sufficiently well preserved, or complex, to warrant recommendations for further detailed survey (possibly to include trial excavation).

6 Water Management Landscapes

6.1 Introduction

The study area of the current year's project has been revised to reflect that of the Heads of the Valleys Initiative, whilst excluding areas considered to be well-covered by previous studies. Excluded therefore are the areas of the Blaenavon World Heritage site, and Merthyr Tydfil UA, both previously the subject of historic landscape characterisation. The area of Cwm Clydach, also the subject of historic landscape characterisation and which lies largely outside the boundaries of the Heads of the Valleys Initiative has also been largely excluded from this year's project, though a draft ironworks area of significance has been provided based on the results of years 1 and 2 of this project, and the historic landscape characterisation undertaken there.

Little previous archaeological work has been carried out on the water management component of industrial ironworks landscapes within the Heads of the Valleys Initiative area with a few notable exceptions on the systems within Merthyr Tydfil and Ebbw Vale.

The Dowlais Free Drainage System deemed to be of National and Regional significance and which crosses the Unitary Authority (UA) boundary between Merthyr Tydfil and Caerphilly has been mapped (based largely on previous work carried out by GGAT and RCAHMW). As the system lies largely within Merthyr Tydfil UA and has been well covered elsewhere, it has not been considered in detail for the purposes of the present project, and has been included for comparison and reference only. In March 1993 the RCAHMW/Cadw carried out surveys of the Ffos-y-fran area of Merthyr Tydfil (Malaws and Wakelin 1993). This survey provided further information about the extent and condition of surviving above-ground archaeological interests, including the leats and reservoirs of what John Owen has termed the Dowlais Free Drainage System, a gravity-fed drainage' system, which supplied water to the ironworks of the Dowlais area including the Ivor (Ifor), "Old" and Penyardren Works (Owen 1977).

The Glamorgan-Gwent archaeological Trust has also worked extensively in the Ffos-y-fran area carrying out a number of assessments and surveys recording the Dowlais Free Drainage system between 1993 and 2003 (the latest reports include Roberts 2001 and 2002, Roberts and Lawler 2003). The eastern extent of the Dowlais Free Drainage system within Caerphilly UA has been in part covered by an assessment of the Nant Llesg area (Roberts 1997b). Further work has been published on the water supply system for the iron and steel works of Merthyr Tydfil (Gross 2001) and undertaken by the RCAHMW on the nationally important Dowlais Free Drainage System, parts of which have been scheduled as an Ancient Monument (Percival 2004).

Elsewhere in Merthyr Tydfil (outside the boundaries of the current study) assessment work has been carried out on the water system associated with Cyfarthfa and its mineral field on the western side of Merthyr Tydfil (see Roberts 1997; Williams 1997; Frost & Scott Jones 2000; and Oakey and van Laun 2004). This assessment work would benefit from integration in the future with the current project through mapping.

Of particular relevance to the study area of the present report is the archaeological assessment report produced by Archaeological Investigations Ltd on behalf of Corus in 2005 on the drainage system of Ebbw Vale/Glyn Ebwy in Blaenau Gwent (Oakey 2005). Based on detailed cartographic searches and map regression, historical and archaeological research and site visits, this study also mapped the system, with particular emphasis on four reservoir sites: Long Feeder

Pond, Guide Mill Pond, and Rhyd-y-blew Reservoir in Ebbw Vale, and Farmers Pond in Bryn Mawr, it also provided a developmental history and discussed significance of the remains. The conclusions of this report are summarised later in this report.

The changes to the project methodology and the boundaries of the study area for this and following year's project, effectively revised and tailored to inform the Heads of the Valley strategy, involved the undertaking of rapid constraint mapping of the extent of the pre-existing and surviving heritage resource (ironworks related water management in the current year). As a result a reduced amount of core ironwork areas were taken forward during the current year; the core ironwork areas within the revised study area are given in Table 4, below.

Table 4. List of ironworks in revised study area based on the Heads of the Valleys Initiative area excluding Merthyr UA and Blaenavon World Heritage site

IW number	Potential Association
IW002	Varteg
IW003	Golynos
IW004	British
IW005	Pentwyn
IW007	Blaina
IW008	Coalbrookvale
IW009	Nant-y-glo
IW010	Ebbw Vale
IW011	Victoria
IW012	Beaufort
IW013	Tredegar
IW014	Sirhowy
IW015	Rhymney
IW022	Dowlais
IW024	Hirwaun
IW025	Llwydcoed
IW026	Gadlys
IW027	Abernant
IW028	Aberaman

6.2 The Results

Initial searches of the SMR and NMR identified 101 water management related features within the revised study area; not all of the features are necessarily related to ironworks; further information on these are presented in the gazetteers within the Appendices. The incidence of this data, together with the point data generated by the current project, is illustrated in Figures 2-5.

Of the SMR and NMR water management sites only a small fraction could be confirmed as relating, either directly, or indirectly to ironworks, thus proving the paucity of the existing record and apparent lack of useful constraint data within the study area. The following tables (Tables 5 and 6) summarise SMR and NMR registers by type:

Table 5. Existing water management related features from SMR data by Type

SMR Feature by TYPE	Number of features by TYPE	Numbers of ironworks related features
Culvert	1	-
Dewpond	1	-
Drain	1	1
Leat	28	24-25
Pond	6	4
Reservoir	36	29-32
Scouring Basin	1	1
Sluice House	1	1
Spring	1	
Turbine House	1	
Well	4	
Total	81	60-64

Table 6. Existing water management related features from NMR data by Type

NMR Feature by TYPE	Number of features by TYPE	Numbers of ironworks related features
Drainage Channel	1	-
Filter House	1	-
Leat	1	-
Reservoir	12	2
Water Wheel	2	1
Well	3	-
Total	20	3

Of the above existing water management features, 64 of the 81 SMR sites were found to relate directly or indirectly to ironworks (with an additional four possibly related), whilst only three of the 20 NMR registers were found to be ironworks related (two of which were part of the Dowlais Free Drainage System). To address this lack of constraint data the project utilised rapid mapping of water management features identified from the first edition OS map to effectively increase the level of available baseline data. In this way it was found that the available data was increased over eightfold; the total number of water related features/sites identified for the purpose of this project was 601. Of these the study identified a total of 563 previously unidentified sites, with an additional 38 sites, though issued with IWW numbers, cross-referenced to sites having existing PRN identifiers.

It is evident that the number of individual features could be considerably increased through further intensive documentary work and field survey. Recommendations for further intensive archaeological documentary and fieldwork are presented later in this report.

The water management features identified from the first edition OS maps during the course of this year's project are summarised below by type (see Table 7). The actual number of sites could be further increased if features such as reservoirs were reduced to constituent parts (ie dams and sluices); such constituent parts have only been referred to separately where they are identified and named on the first edition OS maps.

Table 7. Number of new sites by type thought to relate to one or more ironworks complex⁸

New sites by Type	Number of features by Type
Aqueduct	6
Boat House	2
Canal (Aberdare Canal)	1
Dam	2
Feeder	5
Holding Tank	2
Leat	207
Pond	27
Pump House	4
Pumping Engine	1
Reservoir	174
River (man enhanced)	8
Sluice	45
Spring	9
Stream (man enhanced)	24
Tank	4
Water Balance Pit	1
Water Channel	9
Water Pipe	3
Water Tank	11
Weir	10
Well	8
Total	563

It is not possible to determine a definite physical connection to a particular ironworks for all water management features, or indeed systems, from map work alone; whilst in most cases the most likely associations can be identified, it should be noted here that given the methodological scope of the project, not all these associations are certain. It is also likely that some of the water management features identified also served more than one ironworks, for example where a valley system has been developed or where a system has developed to serve several ironworks under common ownership. It should also be noted that the latter association is likely to have been subject to change and variation throughout the operational and developmental period of any one system. The total number of reservoirs, leats and other site types identified and attributed to each ironworks, and grouped into potentially related valley systems, is presented below as an estimate only. For this reason there may be duplications in the count.

The larger water management features (reservoirs and leats), which could be used as an indicator against which the survival and hence potential archaeological significance of each system are to be measured, are given within Table 8, below. The totals shown are as a maximum for each ironworks so that the score for each system has an inter-relational bias with emphasis given to

⁸ A number of areas of water management features indicated on the 1st edition OS maps need more detailed investigation beyond the current scope of the current study. The level of information available to the study in these cases was either insufficient to establish an association with a particular ironworks (ie features are likely to relate to other water management needs, such as providing field drainage), or were of too complex a nature to allow detailed mapping, for example as in Rhymney area; the latter areas would benefit from further detailed study.

the systems relating to more than one ironworks, and therefore gives a higher rating for those systems which served or potentially served more than one ironworks.

Table 8. Potential association of ironworks systems showing number of reservoirs and leats estimated for associated water management systems from first edition OS maps

Water Management Valley System	Ironworks Number	Ironworks Name	Total Reservoirs	Total Leats	Total Other
Eastern Valley (Cwm Sychan and Cwm Ffrwd)	IW002	Varteg	5	7	5
	IW003	Golynos	3	3	4
	IW004	British	6	4	7
	IW005	Pentwyn	1	1	0
	Valley System Total Score⁹			15	15
Nant-y-glo and Ebbw fach	IW007	Blaina	12	7	5
	IW008	Coalbrookvale	4	5	6
	IW009	Nant-y-glo	34	38	12
	Valley System Total Score			50	50
Beaufort and Ebbw Vale	IW010	Ebbw Vale	25	24	5
	IW011	Victoria	9	11	12
	IW012	Beaufort	10	9	2
	Valley System Total Score			44	44
Sirhowy and Tredegar	IW013	Tredegar	27	21	5
	IW014	Sirhowy	25	14	5
	Valley System Total Score			52	35
Rhymney	IW015	Rhymney ¹⁰	21 ¹¹	39	25
	Valley System Total Score			21	39
Cynon with the Dare and Aman	IW024	Hirwaun	9	12	19
	IW025	Llwydcoed	3	6	11
	IW026	Gadlys	0	2	1
	IW027	Abernant	6	6	10
	IW028	Aberaman	4	2	4
Valley System Total Score			22	28	45
Unassigned	-	Unassigned ¹²	35	28	12

6.3 Potential Survival and Archaeological Value

Archaeological survival values for water management features identified from the first edition OS maps were given as follows:

⁹ The Valley System Total score is purposefully biased to reflect potential interrelationships of the system to more than one core ironworks area, and is not necessarily the actual number of features within the system.

¹⁰ This system includes elements of the Dowlais free drainage system. Detailed mapping of the Dowlais free drainage system was not undertaken as part of this study, however, the main links were digitised to reflect connections with the system, which also supplied Rhymney. Mapping from previous studies of the Dowlais free drainage system has been included for illustrative purposes only. The Dowlais free drainage system has been dealt with extensively elsewhere (Malaws and Wakelin 1993, Percival 2004, Roberts 2001 and 2002, Roberts and Lawler 2003).

¹¹ Bute Town Reservoir served both Dowlais and Rhymney Ironworks

¹² The exact ironworks relationship (if any) is unestablished. These may not be related to ironworks but rather relate to collieries or other uses, however, this is impossible to tell from a rapid examination of limited map sources alone.

- A: Intact (original condition) - High Value
- B: Surviving (condition unestablished) - Moderate-High Value
- U: Potentially Surviving (ie buried or drained state) - Unknown Value
- D: Destroyed - Low Value

Given that the scope of the project did not allow for a visit to each individual site to establish the exact current condition of it was considered that category A could not be assigned. For this reason also it was only possible to assess the large features (ie reservoirs, ponds, feeders and leats) in any meaningful way, as these are visible on aerial photographs and modern mapping.

The analysis of cartographic, documentary and aerial photographic material in conjunction with a comparison of data on opencast land-take from the coal authority allowed a general overview of potential for site survival to be established. Of the 601 water management features identified from first edition OS maps, potential related to ironworks and assessed in terms of potential survival, 161 features were found to survive in a condition, as yet to be established, with approximately 176 additional water management features having the potential to survive in a buried or drained state, whilst 223 were found to have been lost to development such as opencast and urban/infrastructure development. This would indicate that approximately between 27% and 56% of the overall resource has the potential to survive.

The results of this desktop process are summarised within Table 9, below, with the surviving and potentially surviving features illustrated in figures 11-15.

Table 9. Incidence of archaeological survival Value

Archaeological survival value	Number of water management features
B	161
U	176
D	223
N/A	41

The larger water management features, primarily reservoirs and leats have been used as primary indicators of the survival and condition of particular water management systems. The results of this have been summarized in relation to each core ironwork area grouped into potentially related valley systems. Whilst the extent of opencast operations and reclamation/landscaping activities appear to have had a major impact on the survival of water management features in localized areas, as for example within the Rhymney and Sirhowy Valley systems, by far the largest impact on the resource throughout the Heads of the Valleys area would appear to be that caused by urban expansion, infrastructure and industrial land renewal undertaken during the 20th century. Urban expansion in particular appears to have typically lead to the removal of many of the lower-lying reservoirs and leats within the Rhymney, Tredegar and Ebbw Valleys.

The numbers of surviving and potentially surviving larger visible water management features (reservoirs and leats) are given within Table 10, below, again as a maximum for each ironworks so that the score for each system has a inter-relational bias with emphasis given to the systems which serve more than one ironworks.

Table 10. Incidence of surviving and potentially surviving water management features (reservoirs and leats) categorised by archaeological significance

Water Management Valley System	Ironworks Number	Ironworks Name	Reservoir Value B	Reservoir Value U	Leat Value B	Leat Value U
Cwm Sychan and Cwm Ffrwd	IW002	Varteg	1	4	0	3
	IW003	Golynos	0	1	1	0
	IW004	British	1	5	1	2
	IW005	Pentwyn	0	1	0	1
	Valley System Surviving: Score			2	11	2
Nant-y-glo and Ebbw fach	IW007	Blaina	4	0	1	1
	IW008	Coalbrookvale	3	0	4	0
	IW009	Nant-y-glo	10	9	20	4
	Valley System Surviving: Score			17	9	25
Beaufort and Ebbw Vale	IW010	Ebbw Vale	5	0	4	9
	IW011	Victoria	3	3	2	3
	IW012	Beaufort	2	2	4	1
	Valley System Surviving: Score			10	5	10
Sirhowy and Tredegar	IW013	Tredegar	9	4	18	1
	IW014	Sirhowy	4	4	4	0
	Valley System Surviving: Score			13	8	22
Rhymney	IW015	Rhymney	7	4	21	6
	Valley System Surviving: Score			7	4	21
Cynon with the Dare and Aman	IW024	Hirwaun	4	3	6	1
	IW025	Llwydcoed	1	1	6	0
	IW026	Gadlys	0	0	2	0
	IW027	Abernant	0	3	3	2
	IW028	Aberaman	0	0	0	<1
	Valley System Surviving: Score			5	7	17
Unassigned	N/A	Unassigned	4	6	6	1

It is evident from the data that no water management systems within the study area now survive in their entirety, and that five out of the six systems identified for the purpose of the project potentially survive to around 50% (within a range of 34.1% - 54.6% based on potential surviving reservoirs) of their original extent, with the notable exception of the smaller and rather limited system of Cwm Sychan and Cwm Ffrwd which had a maximum potential surviving score of 86.6% based on its reservoirs, many of which could equally relate to, or could have originated for the supply of, the area's collieries.

The results, summarised in Tables 10 and 11, indicate that sufficient potentially survives of the resource to allow an understanding of the ironworks' related water management systems, a formerly important characteristic of the industrial ironworks landscapes, and that further detailed field based work is required to confirm the levels of survival and value of the surviving resource.

It is intended that field verification of the identified potential resource is undertaken at a later stage; this verification work should be targeted in the first instance on those industrial ironworks' landscape areas selected during year four for detailed study during years five and six of the project as proposed.

Table 11. Assessment of water management systems using reservoirs and leats as indicators of survival

Water Management Valley System	Totals	Reservoir		Leat	Leat Value U
		Value B	Value U	Value B	
Eastern Valley (Cwm Sychan and Cwm Ffrwd)	Valley System Total: Score	15		15	
	Valley System Surviving: Score	2	11	2	6
	Valley System Percentage Surviving	13.3%	73.3%	13.3%	40%
	Maximum Potential Surviving Value	86.6%		53.3%	
Nant-y-glo and Ebbw fach	Valley System Total: Score	50		50	
	Valley System Surviving: Score	17	9	25	5
	Valley System Percentage Surviving	34%	18%	50%	10%
	Maximum Potential Surviving Value	52%		60%	
Beaufort and Ebbw Vale	Valley System Total: Score	44		44	
	Valley System Surviving: Score	10	5	10	13
	Valley System Percentage Surviving	22.7%	11.4%	22.7%	29.5%
	Maximum Potential Surviving Value	34.1%		52.3%	
Sirhowy and Tredegar	Valley System Total: Score	52		35	
	Valley System Surviving: Score	13	8	22	1
	Valley System Percentage Surviving	25%	15.4%	62.9%	2.9%
	Maximum Potential Surviving Value	40.4%		65.7%	
Rhymney	Valley System Total: Score	21		39	
	Valley System Surviving: Score	7	4	21	6
	Valley System Percentage Surviving	33.3%	19.1%	53.9%	15.4%
	Maximum Potential Surviving Value	52.4%		69.2%	
Cynon with the Dare and Aman	Valley System Total: Score	22		28	
	Valley System Surviving: Score	5	7	17	<4
	Valley System Percentage Surviving	22.7%	31.8%	60.7%	<14.3%
	Maximum Potential Surviving Value	54.6%		<75%	

The data, as it relates to visible survival of water management features (survival value B only) in relation to individual ironworks, giving the archaeological potential of the core ironwork areas expressed as a percentage of the original resource as identified on the first edition OS maps, is presented in Table 12, below.

Table 12. Water management systems in relation to individual ironworks using reservoirs and leats (survival value B only) as indicators of survival

Ironworks Number	Ironworks Name	Ironworks: archaeological potential	Surviving Reservoirs	Reservoirs: visible survival rating	Surviving Leats	Leats: visible survival rating	Combined survival rating
IW002	Varteg	C	1	20%	0	0%	8%
IW003	Golynos	C	0	0%	1	33%	17%
IW004	British	A	1	17%	1	25%	20%
IW005	Pentwyn	C	0	0%	0	0%	0%
IW007	Blaina	C	4	33%	1	14%	26%
IW008	Coalbrookvale	C	3	75%	4	80%	78%
IW009	Nant-y-glo	A/B	10	29%	20	53%	42%
IW010	Ebbw Vale	A/C	5	20%	4	17%	18%
IW011	Victoria	C	3	33%	2	18%	25%
IW012	Beaufort	C	2	20%	4	44%	32%
IW013	Tredegar	C	9	33%	18	86%	56%
IW014	Sirhowy	A	4	16%	4	29%	21%
IW015	Rhymney	A/C	7	33%	21	54%	47%
IW024	Hirwaun	A	4	44%	6	50%	48%
IW025	Llwydcoed	B	1	33%	6	100%	78%
IW026	Gadlys	A	0	0%	2	100%	100%
IW027	Abernant	C	0	0%	3	50%	25%
IW028	Aberaman	D	0	0%	0	0%	0%

Analysis of the data as it relates to visible survival of water management features (survival value B only) in relation to individual ironworks indicates that 77.8% of the ‘systems’ relating to individual ironworks survive to less than 50% of their original extent. Indeed from the results it is clearly emphasised that there is little useful correlation to be made between good surviving ironwork core areas and the survival of associated water management features as a percentage of the original resource; the highest combined survival ratings, eg water management features associated with Llwydcoed and Gadlys, generally relate to a small and insignificant original resource.

The results also lend support to the assertion that water management features and indeed systems, where they survive to any extent, should now only be viewed as useful additions, rather than major definitive factors in increasing the heritage value of historic ironworks landscapes within the study area, and thus lack of such systems should not detract from the overall value of an historic ironworks landscape. This general assertion, however, does not extend to those ironworks within Merthyr Tydfil or Blaenavon, beyond the current study area, where good survival of water management features and systems coincide with nationally important surviving core ironworks areas.

It should be noted that the scope of the current year’s project was necessarily limited to allow a greater geographic area to be rapidly covered, and as such could not facilitate the exact assessment of archaeological value/potential; the method employed neither included site verification visits necessary for establishing condition, nor underlying detailed documentary and cartographic studies, necessary to examine a whole host of other considerations, such as rarity, precise historical association, group value, and time/depth development/complexity. In this way

the limited methodology employed provided at best a blunt indication of the potential extent of the water management systems surviving of the Heads of the Valleys area, and was not intended to provide a detailed assessment/analysis of archaeological value, which would normally include consideration of the following:

- **Rarity** – in terms of period, type, etc
- **Representativeness** – representative range of elements
- **Survival** – percentage survival
- **Condition** – overall condition of surviving elements
- **Group Value** – structural/functional coherence of surviving features, but also wider ironwork group value
- **Coherence** – retention of historic meaning and significance
- **Integrity** – survival of original character or form
- **Potential** – potential for future study or analysis
- **Amenity** – potential for development for public educational recreational amenity
- **Association** – to events, figures, technological advancement, or availability of documentary evidence
- **Status** – statutory protection

6.4 Current Protection

The statutory protected archaeological resource (ie Scheduled Ancient Monuments and Listed Buildings) for water management features within the whole of the Heads of the Valleys Initiative area is limited to only seven Scheduled Ancient Monuments (SAMs) and nine Listed Buildings (LBs). The SAM data collated for the purpose of the present study is summarised below in Table 13, and illustrated together with LBs in figure 16.

Table 13. Summary of archaeological resource in relation to current statutory protection (Scheduled Ancient Monuments)

SAM Number	SAM Name	NGR	UA	Site Type	Relevance
BR230	Glynneath Powder Works	SN919084	Rhondda Cynon Taff/Powys	Various	N/A
GM478	Gurnos Quarry Tramroad and Leat	SO034083	Merthyr Tydfil	Leat	N/A
GM479	Tai Mawr Leat for Cyfarthfa Iron Works	SO031076	Merthyr Tydfil	Leat	N/A
GM494	Sarn Howell Pond and Watercourses	SO086062	Merthyr Tydfil	Pond	N/A
GM467	Cyfarthfa Canal Level	SO042053	Merthyr Tydfil	Canal Level	N/A
GM554	Iron Ore Scours and Patch Workings at Winch Fawr	SO017068	Merthyr Tydfil	Iron mine	N/A
MM216(TOR)	British Colliery Pumping Engine House	SO258036	Torfaen	Engine House	Yes

Of the SAMs six are ironworks related; five lie within the Merthyr Tydfil UA, the other within Torfaen. Of the listed buildings only four were found to be ironworks related and of these two lay within Merthyr Tydfil UA and two within Torfaen (one within the Blaenavon World Heritage site).

Those SAMs and Listed Buildings within the Heads of the Valleys Initiative area but lying within Merthyr Tydfil UA and the Blaenavon World Heritage site have been excluded from the study and therefore the only SAM relevant to the study area is the Colliery Pumping Engine House (MM216(TOR)) at the British Ironworks, which also is the only listed ironworks feature linked to ‘water management’ within the study area. There are no reservoirs or leats currently protected through statutory protection within the study area itself. The Listed Buildings data collated for the purpose of the present study is summarised below in Table 14, and illustrated together with Scheduled Ancient Monuments in figure 16.

Table 14. Summary of archaeological resource in relation to current statutory protection (Listed Buildings)

Record Number	Name	NGR	UA	Grade	Relevance
18595	British Colliery Pumping Engine House	SO25850	Torfaen	II	Yes
22383	Former Pump House at Dunlop Semtex Factory	SO18850	Blaenau Gwent	II	N/A
26829	Cantref Reservoir dam, including valve house and spillway	SN99650 15350	Rhondda Cynon Taff	II	N/A
26830	Llwyn-on Reservoir dam, including valve house and spillway	SO01060 11350	Rhondda Cynon Taff	II	N/A
80964	Aqueduct on Dowlais Free Drainage System	SO07440 08380	Merthyr Tydfil	II	N/A
16143	Timber Aqueduct over Former Taff Bargoed Railway, Cwmbargoed	SO07830 06130	Merthyr Tydfil	II	N/A
80963	White Gate Road Bridge and Aqueduct	SO07080 08820	Merthyr Tydfil	II	N/A
21731	Compensation Basin at Pontsticill Water Treatment Works	SO06050 11730	Powys	II	N/A
15292	Balance Tower, Blaenavon Ironworks	SO24990 09280	Torfaen	I	N/A

The scope of the current year’s project was not designed to provide a level of site specific information, especially on current condition and archaeological/historic value, detailed enough to allow identification of potential sites, which would benefit from protection; this is to follow in future years.

6.5 Threats and Recommendations

General potential threats to water management features range from general dereliction reclamation, opencast and road schemes and in the areas close to the core ironworks themselves from insensitive and uninformed urban and industrial renewal. Specific threats to water management features come from the continued upgrading of water supply (where reservoirs and related features are continually modified for drinking water provision). Change of use through discontinuance of reservoirs, often done to relieve maintenance burden, is also evidenced. The latter, can be achieved with minimal and localised damage of the resource, through breaching

dam structures, as recently exemplified in Ebbw Vale, leaving the features extensively intact, largely preserving articulation and coherence, where this survived.

It was proposed that threats to the water management systems could be identified using Unitary Authority development plans as a basis in the initial project proposals. It was found, however, that all Unitary Authority development plans are currently under review. Identification of specific threats on this basis has therefore been deferred until a later stage in the project.

6.6 *The Valley Systems and Recommendations*

For practical reasons the current study has identified five water management systems, broadly corresponding to the major river valleys within the study area; these area systems are as follows: Eastern Valley (Cwm Sychan and Cwm Ffrwd); Nant-y-glo and Ebbw fach; Beaufort and Ebbw Vale; Sirhowy and Tredegar; and the Rhymney, Cynon with the Dare and Aman water management system(s).

The following descriptions are intended to present a general overview of the valley systems and are based on the evidence of larger features identifiable from aerial photographs, ie the reservoirs and leats and do not expound on the smaller features identified from the first edition OS mapping, for example sluices and weirs, which were recorded as point features and are summarized in section 6.2, above and detailed in the Appendix.

Eastern Valley (Cwm Sychan and Cwm Ffrwd)

A fairly small-scale system by comparison with those noted elsewhere in the study area, that draining the Cwm Sychan and Cwm Ffrwd tributary valleys exploited the natural drainage along the southeastern flanks of Mynydd Varteg fach and Waun-wen, via weirs and a number of small reservoirs, most of which appear to have been formed by damming the fast flowing mountain streams (ie natural tributary water courses) of the area. The water management features of the system served the following ironworks IW002 Varteg, IW003 Golynos, IW004 the British, and IW005 Pentwyn. A small area of drainage to the south of the core ironworks area of the British Ironworks is considered more likely to relate to the adjacent Cwmbyrgwm Colliery, rather than the nearby adjacent British Ironworks; the scope of the current year's project did not allow the exact association to be established.

Of the 46 interests¹³ identified for this system 20 (or so) are either reservoirs or ponds, of these only two appear to survive intact (full condition yet to be unestablished condition, with a further 11 reservoirs/ponds, which potentially survives. Of the 15 stretches of leat two have been identified as surviving, with six other potentially surviving.

The surviving water management system in this area appears to be largely fragmented, with connections to the core areas now largely lost. This equates to a corresponding loss of integrity and coherence as a system, and therefore implies a reduced overall conservation/presentation value. It should be noted that the current survey and hence these assertions are based on desktop studies alone (through comparing modern mapping and aerial photographic material with the original resource), and remain to be proven in the field.

¹³ Note: this total includes features other than leats, ponds and reservoirs, ie 2 streams.

Recommendations

The level of previous work undertaken for this area is sparse compared with the level available in respect of other systems in the study area, for example, for Dowlais and Ebbw Vale. As the survival of water management features in this area appears to be low, and the system now largely removed, a rapid field survey to verify the findings of the current work is recommended.

Should additional surviving water management features be revealed through the rapid survey then further detailed documentary work and field survey might be recommended. Any further work would aim to increase the level of data and information on the water management system, and, as well as identifying additional features, would in particular ascertain the condition of the surviving resource, provide developmental history and attempt to confirm the exact associations and purposes of water management features of this 'valley system'.

This detailed work would form the basis for the formulation of conservation/management plans, which could include the provision of information to the public on the water management system through displays at the Ironworks core areas and at accessible surviving key water management sites.

Nant-y-glo and Ebbw-fach

This comprised an extensive system, which supplied the ironworks of IW007 Blaina, IW008 Coalbrookvale, IW009 Nant-y-glo, and extended from Blaen Clydach in the north to Cwm-celyn in the south. The system drained the southern slopes of Mynydd Llangatwg and Beaufort Hill to the west of Bryn Mawr; with its most extensive reservoirs located around and to the north of Winchestown and Nant-y-glo; larger reservoirs established across tributary valleys characterise the area. To the south the system extends in linear form draining the slopes of the Ebbw-fach valley through a series of characteristic linear ponds/reservoirs leats and feeders, which contour the slopes. Within Cwm-celyn to the south east of the system a number of linear feeder and other smaller reservoirs were located; these appear to have fed the Ironworks of Blaina IW007 and associated collieries and ironstone mines of the vicinity. A review of the first edition OS map allowed the identification of 123 water management features, 50 of which are reservoirs (including a pond). The remainder predominantly leats and feeders, though includes two rivers, which have been substantially utilized and modified for water supply purposes.

There are 42 water management features surviving (ie value B) with a further 14 potentially surviving (value U) within the system identified through comparing modern mapping and aerial photographic material with the original resource; 17 of the surviving sites are reservoirs (including the pond) whilst nine additional reservoirs potentially survive in addition, the remainder of features being leats and feeders.

The study of the Ebbw Vale drainage system undertaken in 2005 by Archaeological investigations (Oakey 2005) touches briefly on the developmental history of the system supplying Nant-y-glo, within its discussion of the adjacent linked system of Ebbw Vale, and primarily gives detailed descriptions of the latter system's main elements based on available cartographic and other sources and a site visit. The report notes that the Nant-y-glo system and the adjacent Ebbw Vale drainage system both evolved between the 1840s and 1880s, in a similar manner to those noted within Merthyr Tydfil. The report also uncovered evidence that much of the system appears to have developed from enlarging and adapting ponds, which formerly supplied balance pits for colliery/iron ore workings within the area. The evolving nature and

interconnectivity of drainage systems between the neighbouring valleys is also emphasized. For example, by 1901 the Farmer's Pond within the Ebbw-fach Valley had been leased from the Beaufort Estate by the Ebbw Vale Company and linked by underground pipe to the adjacent Valley System. The report states that this pond, although ideally located to serve the Nant-y-glo ironworks, did not appear to have been integrated into the system serving Nant-y-glo. It also indicated that the appearance of the Farmer's Pond reservoir and associated features relates to upgrading carried out during the mid-20th century (Oakey 2005). It would appear from the current work that this assertion could be extended to other reservoirs in the valley, however further detailed study and site visits are needed to confirm this.

From examination of aerial photographs and modern mapping it would appear that the connection of the system to the ironwork core areas has become severed, though this would need to be confirmed through site visit. Nevertheless, despite the fact that the surviving system is now fragmentary over its original extent, there is sufficient remaining to allow an appreciation of the extent, nature and function of the system and its main individual elements (predominantly reservoirs). The most significant surviving remains are to be found at Waun-dew, Tai Humphrey-Hughes, and Winch's Row to the north west of Nant-y-glo, where a largely articulated system can still be seen.

Recommendations

The level of available study undertaken for this area is sparse compared with the level available in respect of other systems in the study area, for example, for Dowlais and Ebbw Vale. Archaeological Investigations work in the area does, however, suggest some level of surviving value and additional water management features may be revealed through archaeological fieldwork; as a result further detailed documentary work and field survey is recommended. This further work would aim to increase the level of data and information on the water management system, and, as well as identifying additional features, would in particular ascertain the condition of the resource fully, provide developmental history and attempt to confirm the exact associations and purposes of water management features of this 'valley system'.

This detailed work would form the basis for the formulation of conservation/management plans, which would seek to increase the future survival of the resource, in tandem with increasing wider public awareness and enhanced visitor experience. This could include the provision of information on the water management system to the public through displays at the Ironworks core areas and at accessible key water management sites.

Beaufort and Ebbw Vale

A linear water management system extending from Rassau in the north and Waun-llwyd in the south, draining both sides of the Ebbw Valley, with its larger reservoirs restricted to the northern basin chiefly to the north west of Beaufort. To the south of this area on the western side of the valley and entirely along the eastern slopes, the system extends in linear form characterized by a series of largely linear ponds/reservoirs leats and feeders, which contour the slopes, capturing and harnessing the natural drainage of the area. The main ironworks supplied by the system were Ebbw Vale (IW010a, IW010b, and IW010c), Victoria (IW011), and Beaufort (IW012) ironworks.

The Ebbw River either passes through or adjacent to the ironworks of the area, and would have provided a major source of water to the works, and the first edition OS map indicates the location

of several feeder channels and weirs. However, the mapping provides little evidence of uninterrupted links from the surrounding water management system (ie reservoirs and leats) to the core ironworks areas; these links were likely to have accessed the core areas via culverted or underground routes.

The first edition OS maps allowed the identification of 107 water management features for the area; 44 of which were reservoirs or ponds, the rest being predominantly leats, feeders and header reservoirs. From the comparison of modern mapping and aerial photographic material with the original resource it is considered that 20 water management features survive including 10 reservoirs or ponds. In addition there is a possibility that 18 other features may survive in a buried or drained state, including five reservoirs, as yet to be fully established.

The most comprehensive of studies undertaken on the Ebbw Vale drainage system is that undertaken in 2005 by Archaeological Investigations (Oakey 2005). This provides a detailed developmental history of the Ebbw Vale system with detailed descriptions of the system's main elements (Guide Mill Pond, Long Feeder, Rhyd-y-blew Pond and Small Rhyd-y-blew Pond), based on available cartographic and other sources and a site visit. The report notes the Ebbw Vale drainage system and the adjacent linked Nant-y-glo system, both evolved between the 1840s and 1880s, in a similar manner to those noted within in Merthyr Tydfil. The report also uncovered evidence that much of the system is likely to have developed from enlarging and adapting ponds, which formerly supplied balance pits for deep pits associated with colliery/iron ore workings within the area. Alternatively some reservoirs within the area may even have originated as scouring ponds, used to expose surface mineral deposits. Examples of this process include the following reservoirs: the Rhyd-y-blew ponds, and possibly Guide Pond and the Long Feeder, the latter possibly developing from a series of smaller ponds. The evolving nature of the system and time-depth interconnectivity with drainage elements within the neighbouring valleys is also discussed (Oakey 2005).

From examination of aerial photographs and modern mapping it would appear that the connection of the system to the ironwork core areas has become largely severed, apart from a single connection to the southwest extent of IW010a Ebbw Vale. The surviving system is now fragmentary over parts of its original extent, particularly in the area around IW012 Beaufort and to the southwest of IW010a-b Ebbw Vale, though good surviving and articulated elements do survive, notably around Rhyd-y-blew and Waun-y-pound, north west of Willowtown, and on the eastern side of the Ebbw Valley to the south of IW010b-c Ebbw Vale along the west-facing slopes of Mynydd Carn-y-cefn. In these areas enough remains of the system's main elements (predominantly reservoirs and leats) to allow an appreciation of the extent, nature and function of the system and its individual elements. The detailed assessment report by Archaeological Investigations Ltd (Oakey 2005) indicates that the main elements of the system had attained their current form by the 1880s and that later developments were largely limited to modification of details (eg. sluices) and treatments (concrete renders to leats etc).

Recommendations

Whilst a thorough archaeological assessment has been undertaken on the Ebbw Vale system (Oakey 2005), this concentrates on three major elements within the Ebbw Valley (ie Rhyd-y-blew ponds, Guide Pond and Long Feeder). It is therefore recommended that an additional detailed study of the remainder of the system is undertaken to compliment and build on the previous work.

Sirhowy and Tredegar

A system utilizing water draining from both sides of the Sirhowy Valley between Blaen-y-cwm in the north and Troed-rhiw-gwair in the south, and formerly supplying IW013 Tredegar and IW014 Sirhowy Ironworks. This system is predominantly characterized by linear reservoirs and feeder leats contouring the steep lower valleys sides. Exceptions to this pattern are to be noted in the area east of Georgetown above the steep valley sides, where reservoirs have been formed by damming tributary streams at the break of slope, where they exit the less steep upland ridge. A further example once occupied the gentle north facing slopes above Tafarnau-bach. Whilst the latter is now lost, it has been replaced by the extensive recreational lake at nearby Parc Brynbach. The sub-system supplying Sirhowy Ironworks is clearly depicted on the first edition OS map with a series of substantial reservoirs north of Ysgubor-wen (Rhoslan), which linked to the core area from the north via a linear feeder reservoir; other smaller reservoirs lie immediately to the east of the core area. The system also appears to have been linked into the adjacent valley system, supplying the Beaufort and possibly Ebbw Vale Ironworks, through links to the reservoirs at Waun-y-pound and Rhyd-y-blew in the neighbouring valley. The reservoirs at Ysgubor-wen have been lost to urban expansion, whilst the majority of the reservoirs at Waun-y-pound and Rhyd-y-blew appear to survive.

The rapid cartographic search of the area adjacent and west of Tredegar revealed a highly complex and fragmented area of drainage on the eastern slopes of Tredegar Hill, which appeared to have been severely disrupted by patch workings and colliery activities by the survey of the first edition OS maps. The exact link to the core ironworks area of Tredegar through the urban area was difficult to establish from the first edition OS map alone; it is also possible that the leats were to an extent culverted in this area. From the rapid cartographic search 97 water management features were identified from the first edition OS maps, 52 of which were reservoirs or ponds. The remainder of features identified were largely leats and feeders. An area of complex drainage has been identified on the slopes above Georgetown, centred on Scotch Peters Reservoir; the relationship of the features in this area to a particular ironworks is at present uncertain and further detailed work is recommended.

In terms of surviving features, identified through comparing modern mapping and aerial photographic material with the original identified resource, 35 water management features are considered to survive in an unverified condition, of which 13 are reservoirs (including one pond), the remainder are leats/feeders. In addition four water management features, all reservoirs, were identified as possibly surviving in a buried or drained state.

From examination of aerial photographs and modern mapping it would appear that the connection of the system to the ironwork core areas has become completely severed. The part of the system which served Sirhowy Ironworks (IW014) has been all but completely removed by a combination of urban development and opencast operations, as has that which supplied Tredegar Ironworks (IW013). The surviving remains within the valley area comprise the area of complex drainage above Georgetown and the isolated remains surviving on the open common at the southeast end of Rhymney Hill to the west. The current project has not been established whether the surviving water management features of these two areas are directly or indirectly associated with supply to the area's ironworks, indeed the system above Georgetown was linked to that in the neighbouring valley to the east, and the water management features in this area is likely to have supplied IW010 Ebbw Vale.

Recommendations

The level of previous work undertaken for this area is sparse compared with the level available in respect of other systems in the study area, for example, for Dowlais and Ebbw Vale. As the survival of water management features in this area appears to be low, and the system now largely removed, a rapid field survey to verify the findings of the current work is recommended.

Should additional surviving water management features be revealed through the rapid survey then further detailed documentary work and field survey might be recommended. Any further work would aim to increase the level of data and information on the water management system, and, as well as identifying additional features, would in particular ascertain the condition of the surviving resource, provide developmental history and attempt to confirm the exact associations and purposes of water management features of this 'valley system'.

This detailed work would form the basis for the formulation of conservation/management plans, which could include the provision of information to the public on the water management system through displays at the Ironworks core areas and at accessible surviving key water management sites.

Rhymney

The extensive water management system associated with the Rhymney Valley and its ironworks IW015 Rhymney and IW015a Rhymney 'Old Furnace' drains the southern flanks of the Brecon Beacons, namely Pen March and Cefn Pyllau-duon. The main reservoirs of the system are located at the junction of the various tributary valleys, for example at Blaen Carno and Blaen Rhymney, with the system extending south in linear fashion down the valley utilizing enhanced natural lateral drainage channels and leats to supply smaller localized reservoirs and ponds, characteristically linear in shape, in the vicinity of Rhymney. To the west the system drains the northern area of Gelligaer Common, where it links into the Dowlais Free Drainage System. To the east it drains the slopes of Rhymney Hill through what now appears as a less developed network of leats with small reservoirs, largely within a tributary valley south of Gnoll. This eastern network, however, may be the remnant of a once wider network of dispersed reservoirs, which formerly covered the area of Twyn Carno and Bryn Oer Patches, and which, by the survey of the first edition OS map, had been severely fragmented by extensive coal and iron ore patch workings.

Consultation of the first edition OS maps of the area allowed the identification of 85 water management features, 21 of these features were reservoirs or water storage features, the remainder are leats and feeder channels, and five natural water courses which have been adapted for ironworks water supply. An extensive and complicated area of drainage was identified at the northern extent of the system, lying between Bute Town and Rhyd-y-milwyr. This area, characterized extensively by a regular grid of drainage, was not mapped in detail as this was beyond the scope of the current project.

Of the originally identified 85 water management features, through a comparison of modern mapping and aerial photographic material with the original resource, only 28 survive, seven of these are reservoirs (including a reservoir with associated feeder tanks at Bute Town), the remainder being leats and feeders.

Examination of aerial photographs and modern mapping indicates that the connection of the system to the ironwork core areas has been severed, largely due to infrastructure and industrial estate development. Despite significant losses to opencast activities to the east at Bryn-brith and on the west around Blaen Carno and Bryn Pyllog, the surviving remains (predominantly reservoirs, but also leats) at Bute Town (also part of the Dowlais Free Drainage System) and to the north of Fochriw provide an indication of the former extent, nature and function of the system. The close association with the extensive and nationally significant Dowlais Free Drainage system, primarily located to the west, considerably enhances the value of this valley system.

Recommendations

The level of available study undertaken for this area is sparse compared with the level available in respect of other systems in the study area, for example, for Dowlais and Ebbw Vale. Additional water management features may be revealed through archaeological fieldwork; as a result further detailed documentary work and field survey is recommended. This further work would aim to increase the level of data and information on the water management system, and, as well as identifying additional features, would in particular ascertain the condition of the resource fully, provide developmental history and attempt to confirm the exact associations and purposes of water management features of this 'valley system'.

This detailed work would form the basis for the formulation of conservation/management plans, which would seek to increase the future survival of the resource, in tandem with increasing wider public awareness and enhanced visitor experience. This could include the provision of information on the water management system to the public through displays at the Ironworks core areas and at accessible key water management sites.

Cynon with the Dare and Aman

The water management system in this area appears to have depended largely on the watercourses of the Cynon River and its tributaries, with the large reservoirs of Hirwaun Pond and New Pond, established immediately to the west of Hirwaun fed by Nant-yr-Ochain and other watercourses and leats supplied IW024 Hirwaun ironworks in addition to smaller reservoirs to the north of the works. South of Hirwaun and at Gamlyn feeders channeled water via weirs on the Afon Cynon towards the works at Llwydcoed, IW025, controlled by sluices, with sparse use of holding reservoirs.

The Ironworks of Abernant (IW027) was supplied via a series of small reservoirs to the east of the core area, fed by leats and the watercourse of Nant-y-wenallt, which linked into an extensive area of drainage on the south-west facing slopes of Mynydd Aberdare; the latter has been indicated but not dealt with in detail for the purpose of this report. Part of the system was Forge Pond, which supplied the adjacent Abernant Forge and Mills. The water course/leat to the southeast, which supplied the reservoir, was fed from a small system (surviving), which supplied the nearby Wyrfa (Werfa) Colliery. The same water course/leat was tapped by two water pipes linked to the Aberdare Canal; this appears to have formed part of an integrated water management system. The site of the old Abernant Forge is currently under housing, whilst the site of the associated reservoir is buried and partly taken by school playing fields and part of Aberdare Golf Club.

The Ironworks of Gadlys, IW026, appears to have been fed directly via weirs from the Cynon and Dare Rivers, though a system of leats and small reservoirs formerly extended over Aberdare Common, and possibly up the Dare Valley. This area of complex drainage appears to be part of a more extensive drainage area extending down the western side of the valley from Nant-y-Cnapau near Hirwaun in the north to Gadlys in the south. This area appears to relate primarily to colliery sites, though could at least in part form an integrated ironworks and colliery supply system. For this reason the main extent of this area has been indicated and awaits further detailed investigation, as necessary. That part of the area adjacent to Gadlys Ironworks has seen extensive remodelling during the 20th century, and little appears to have survived of the associated water management features on the ground. The system may possibly have included the now altered 'fish ponds' of Aberdare Park.

Of the 85 water management features identified for the main part of the system from a rapid survey of the first edition OS maps, 18 were reservoirs or 'ponds', the remainder leats and feeders, with the exception of two water pipes linking to the Aberdare Canal, the Aberdare Canal itself, and eight watercourses, utilised and possibly enhanced for the supply of water to the ironworks and associated workings. These features are associated with the following ironworks: IW024 Hirwaun, IW025 Llwydcoed, IW026 Gadlys, and IW027 Abernant.

A further area of drainage to the south within Cwm Aman though viewed as part of the wider valley system, is essentially detached. The system here was of a fairly simple linear type extracting water from the Afon Aman via a weir upstream and West of the Ironworks, with additional supply coming in from Nant Du to the south, and displayed a number of small holding reservoirs within the core ironworks area. Examination of the first edition OS mapping identified 10 water management features, four of which were reservoirs; the remainder divided between leats and natural watercourses. Only part of one leat is thought to possibly survive, as a result of comparing modern mapping and aerial photographic material with the original resource, though confirmation through fieldwork is needed.

Examination of aerial photographs and modern mapping indicates that the connection of the system to the ironwork core areas appears to survive largely intact, at least for IW024, IW025, and IW026. Few of the former reservoirs now survive, however this system appears to have largely depended on the Afon Cynon for direct supply, with water storage capacity almost exclusively provided by the large reservoirs of Hirwaun and New Pond; the site of these has been largely buried by waste from nearby Tower Colliery. Elsewhere the few small reservoirs that survive, such as those at Hughes's Patches and Bute Pit, are considered likely to be associated with coal and ironore workings, rather than direct ironworks supply.

Recommendations

The level of study previously undertaken for this area is low compared with the level available for other systems in the study area, such as Dowlais and Ebbw Vale. Additional water management features may be revealed through archaeological fieldwork; as a result further detailed documentary work and field survey is recommended. This further work would aim to increase the level of data and information on the water management system, and, as well as identifying additional features, would in particular ascertain the condition of the resource fully, provide developmental history and attempt to confirm the exact associations and purposes of water management features of this 'valley system'.

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This detailed work would form the basis for the formulation of conservation/management plans, which would seek to increase the future survival of the resource, in tandem with increasing wider public awareness and enhanced visitor experience. This could include the provision of information on the water management system to the public through displays at the Ironworks core areas and at accessible key water management sites.

7 Conclusions and Recommendations

7.1 Introduction

The Heads of the Valleys Initiative identifies among its opportunities ‘vast areas of accessible countryside within a rich historic and built environment’ and notes that these are subject to issues of ‘poor maintenance and management of key natural and historic assets’. The ‘protection and enhancement of such sites, as well as the historic landscape and its components, are significant issues, as is the general quality of the natural and semi-natural environment’.

The industrial ironworks landscapes of the Heads of the Valleys area provide a valuable resource both regionally and nationally, and water management features and systems form an integral element of that resource. Industrial ironworks landscapes have definite and potential relevance and value in relation to a number of areas set out in WAG strategies, such as the Heads of the Valleys Initiative, the Wales Spatial Plan, the DEIN’s Business Plan; these range from heritage, wildlife/ecological value (for maintenance and development of habitat) to activities obviously related to leisure, tourism and sustainable development (eg. micro-generation), urban and rural renewal.

7.2 Water Management Features

The level of available study undertaken for water management features in general is low, with the exception to an extent of the Dowlais free drainage system, parts of the systems, which supplied Cyfarthfa and Ebbw Vale. Whilst the current study allowed a rapid establishment of baseline data across the Heads of the Valleys area, it has been by its very nature limited in scope and detail. On this basis further detailed documentary work and targeted field survey is recommended. This further work would aim to increase the level of data and information on water management systems, and, as well as identifying additional features, would in particular ascertain the condition of the resource fully, provide developmental history, and if where possible, attempt to confirm the exact associations, and how the water management features of any particular ‘system’ operated.

The following recommendations for further archaeological work are made:

- Undertake detailed review of available cartographic and documentary sources, including map regression, to increase the level of detailed information available on the following water management systems: Eastern Valley (Cwm Sychan and Cwm Ffrwd); Nant-y-glo and Ebbw fach; Sirhowy and Tredegar; Rhymney; and Cynon with the Dare and Aman systems, and to a lesser extent the Beaufort and Ebbw Vale system, the latter has been largely covered by recent assessment work (Oakey 2005).
- Undertake site visits to inform site descriptions and assess condition of the resource in detail on the following water management systems: Eastern Valley (Cwm Sychan and Cwm Ffrwd); Nant-y-glo and Ebbw fach; Sirhowy and Tredegar; Rhymney; and Cynon with the Dare and Aman systems, and those sections of the Beaufort and Ebbw Vale system not covered by recent assessment work (Oakey 2005).
- Production of detailed management and conservation recommendations (based on the above)
- Production of protection recommendations (as necessary)
- Undertake topographic surveys and detailed recording (as necessary)

The water management features of the Heads of the Valleys area offer a particular opportunity, as they are frequently located in close proximity to urban, or semi-urban areas, areas targeted for renewal under Welsh Assembly Government Initiatives. The appropriate management of water management features would lead not only to environmental, educational and leisure benefits, but would ultimately lead to the retention and maintenance of what is now a relict archaeological resource.

Sensitive conservation and management of the water management systems could be linked to environmental projects such as habitat restoration/creation, improving ecological diversity and nature conservation. The provision of sensitively designed small-scale low-key facilities, primarily for nature observation, such as hides, or the promotion of pursuits such as fishing on the larger bodies of water, could be investigated. Most of the major reservoirs, and many of the remainder, are either adjacent to public rights of way, or located within areas of open access land. The potential for improvements in public access to the main water management features should also be explored; the proximity of current access to many of the sites, for example the reservoirs at Waun-y-pound and Tai-Humphrey-Hughes at Nant-y-glo, indicate it should be possible to design and set out heritage trails, which largely use the existing footpath networks and wherever possible surviving relict industrial rail and tramroad routes, to link up the core ironworks areas with their surviving extraction areas (yet to be explored as part of next years project), taking in the best surviving elements of related water management systems along the route.

7.3 Provisional Historic Industrial Ironworks Landscapes

On the results of years one and two of the project reviewed in section 5 of this report, with the additional information provided by the results of this years rapid cartographic based study of the water management features, the most significant surviving ironworks landscapes within the study area have been provisionally identified and mapped (see Table 15, and Figures 17-21). It should be noted, however, that this has been done prior to the identification and mapping of related extractive landscapes, yet to be undertaken during the coming year's project (2007-08), and that for this reason are subject to further revision.

The process of identifying the boundaries of the wider provisional historic industrial ironworks landscape areas, is to an extent subjective: the provisional historic industrial ironworks areas were based firstly on core ironwork areas having the highest archaeological potential, (ie the most significant and best surviving), as identified during year one of the project (Category A and Category B cores), expanding these areas to take into account related surviving transport networks and water management sites selected from year's two and three of the project on grounds of overall survival, condition and archaeological significance (transport networks), and 'potential' combined survival rating (Category B – water management sites). Whilst some fragmentation and severance had occurred to both transport networks and the water management systems, it was considered that where sufficient articulation survived to provide a reasonable level of coherence, then these features/areas should be allowed inclusion within historic industrial ironworks landscapes.

Table 15. Ironwork core areas, ironworks transport networks, water management systems and giving archaeological value/significance¹⁴

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value ¹⁵ of Ironwork Core Area(s)	Associated Ironworks Transport Network and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape
Eastern Valley (incl. Cwm Sychan and Cwm Ffrwd)	IW001 Pontypool (Upper Race, Blaendare)	C	N/A	N/A	N/A	N/A	N/A
	IW002 Varteg	C	N/A	N/A	N/A	8%	-
	IW003 Golynos	C	N/A	N/A	N/A	17%	-
	IW004 Abersychan (British)	A	IWT001 Abersychan Limestone Railway	55%	High	20%	Yes
	IW005 Pentwyn	C	N/A	N/A	N/A	0%	
Clydach Gorge	IW006 Clydach	A	IWT002 Llam-march Railroad	11%	High-Medium	N/A	N/A (Yes)
			IWT002a Llam-march Railroad (Waunllapria)	4%	Medium-Low		
			IWT003 Llam-march Tramroad	35%	High		
			IWT003a Llam-march Tramroad Pen-Ffyddlwn	0%	Low		
			IWT004 Clydach Railroad	20%	High-Medium (includes listed tramroad bridge 23837)		

¹⁴ Information not provided for ironworks not included in this years study: these are shown by N/A.

¹⁵ Archaeological significance values based on those established in Year one report.

¹⁶ Numbers prefixed by IWT in main text. Note Transport links often extend beyond the water management Valley System.

Southeast Wales Industrial Ironworks Landscapes

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value of Ironwork Core Area(s)	Associated Ironworks Transport Network Number and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape
Nant-y-glo and Ebbw Vale	IW007 Blaina (inc. Cwmcelyn)	C	IWT006 Disgwylfa Main Tramroad	100%	High	26%	No
			IWT006a Disgwylfa Pant Draenog	100%	High		
			IWT006b Disgwylfa East	100%	High.		
			IWT006c Disgwylfa West	94%	High		
			IWT006d Disgwylfa Main (conjectured)	0%	Low		
			IWT006e Disgwylfa Main (south)	9%	High-Medium		
			IW008 Coalbrookvale (inc. Trostre)	C	N/A		
IW009 Nant-y-glo	A/B	A/B	IWT005 Bailey's Llangattock Tramroad	<1%	Low	42%	Yes
			IWT006 Disgwylfa Main Tramroad	100%	High		
			IWT006a Disgwylfa Pant Draenog	100%	High		
			IWT006b Disgwylfa East	100%	High.		
			IWT006c Disgwylfa West	94%	High		
			IWT006d Disgwylfa Main (conjectured)	0%	Low		
			IWT006e Disgwylfa Main (south)	9%	High-Medium		
			IWT025 Nant-y-glo -Beaufort	0%	Low		

Southeast Wales Industrial Ironworks Landscapes

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value of Ironwork Core Area(s)	Associated Ironworks Transport Network Number and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape
Beaufort and Ebbw Vale	IW010 Ebbw Vale with Victoria Ironworks: Rassau Railroad	A/C	IWT007 Trevil Railroad Main Line	61%	High	18%	Yes
			IWT007b Trevil Railroad Ebbw Vale Line	<1%?	Low		
			IWT007d Trevil line to Victoria	0%	Low		
			IWT008 Rassau Railroad	14%	Low-Medium		
			IWT019 Ebbw Vale Private Line	2%	High (includes listed causeway and tunnels 2532).		
			IWT019a Ebbw Vale Private line addition (via Harford's Tunnel)	<1%	Low		
			IWT021 Beaufort Tramroad	0%	Low		
			IW011 Victoria: Beaufort Tramroad	C	IWT007d Trevil line to Victoria		
	IW012 Beaufort: Rassau Railroad	C	IWT004 Clydach Railroad	20%	High-Medium (includes: listed tramroad bridge 23837)	32%	No
			IWT005 Bailey's Llangattock Tramroad (2nd Llangattock Tramroad)	<1%	Low		
			IWT007 Trevil Railroad Main Line	61%	High		
			IWT007a Trevil Railroad Beaufort Line	<1%	Low		
			IWT007b Trevil Railroad Ebbw Vale Line	<1%?	Low		
IWT008 Rassau Railroad			14%	Low-Medium			
IWT021 Beaufort Tramroad			0%	Low			
IWT025 Nant-y-glo -Beaufort			0%	Low			

Southeast Wales Industrial Ironworks Landscapes

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value of Ironwork Core Area(s)	Associated Ironworks Transport Network Number and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape
Sirhowy and Tredegar	IW013 Tredegar Ironworks	C	IWT018 Tredegar Tramroad	4%	Low	56%	Yes (water management features only)
	IW014 Sirhowy Ironworks	A	IWT007 Trevil Railroad Main Line	61%	High	21%	Yes
			IWT007c Trevil Railroad Sirhowy Line	0%	Low		
			IWT008 Rassau Railroad	14%	Low-Medium		
			IWT019 Ebbw Vale Private Line	2%	High (includes listed causeway and tunnels 22532).		
			IWT019a Ebbw Vale Private line addition (via Harford's Tunnel)	<1%	Low		
Rhydney	IW015 Rhydney Lower Furnace	C	IWT016 Rhydney Limestone Railway	29%	Medium	47%	Yes
			IWT017 Bryn Oer Tramroad (via Hall's Trevil Tramroad)	0% (within Glamorgan – Gwent)	Low		
			IWT020 Bute Tramroad (via Dowlais' Twynau Gwynion line 4)	0%	Low		
	IW015a Rhydney Upper Furnace	A	IWT009 Hall's Trevil Tramroad	7%	Medium-Low		
			IWT010 Rhydney Tramroad Branch	3%	Unknown		
			IWT015a Twynau Gwynion Tramroad line 2	50%	High-Medium		
			IWT017 Bryn Oer Tramroad (via Hall's Trevil Tramroad)	0% (within Glamorgan – Gwent)	Low		

Southeast Wales Industrial Ironworks Landscapes

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value of Ironwork Core Area(s)	Associated Ironworks Transport Network Number and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape	
Merthyr Tydfil	IW016 Dyffryn	C	N/A	N/A	N/A	N/A	N/A	
	IW017 Pentrebach	D	N/A	N/A	N/A			
	IW018 Plymouth Ironworks	A/C	IWT012 Morlais West Tramroad	34%	High			
	IW019 Ynys Fach	A	N/A	N/A	N/A			
	IW020 Cyfarthfa	A	N/A	N/A	N/A			
	IW021 Penydarren Ironworks and tramroad	B	IWT012 Morlais West Tramroad	34%	High			
	IW022 Dowlais Ironworks	A/B	IWT011 Morlais East Tramroad and Railway	39%	High-Medium			
				IWT015 Twynau Gwynion Tramroad Line 1	25%			High-Medium
				IWT015b Twynau Gwynion Tramroad line 3 (partly under later Rhymney Limestone Railway)	87%			Medium
				IWT015c Twynau Gwynion Tramroad Line 4 (partly under route of Rhymney Limestone Railway)	19%			Medium
IW023 Ivor works	A/B	IWT011 Morlais East Tramroad and Railway	39%	High-Medium				

Southeast Wales Industrial Ironworks Landscapes

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value of Ironwork Core Area(s)	Associated Ironworks Transport Network Number and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape	
Cynon with the Dare and Aman	IW024 Hirwaun	A	IWT013 Tappendens' Tramroad	29%	High	48%	Yes	
			IWT013a Tappendens' Tramroad West	16%	Medium			
			IWT014 Mr Glover's Railroad	65%	High			
			IWT014a Mr Glovers Railroad Bryngwyn Extension	6%	Medium-Low			
	IW025 Llwydcoed	A	A	IWT013 Tappendens' Tramroad	29%	High	78%	Yes
				IWT013a Tappendens' Tramroad West	16%	Medium		
				IWT014 Mr Glover's Railroad	65%	High		
				IWT014a Mr Glovers Railroad Bryngwyn Extension	6%	Medium-Low		
	IW026 Gadlys	A/B	A/B	IWT013 Tappendens' Tramroad	29%	High	100%	Yes
				IWT013a Tappendens' Tramroad West	16%	Medium		
				IWT014 Mr Glover's Railroad	65%	High		
				IWT014a Mr Glovers Railroad Bryngwyn Extension	6%	Medium-Low		
	IW027 Abernant	C	C	IWT013 Tappendens' Tramroad	29%	High	25%	Yes (on edge of only)
				IWT013a Tappendens' Tramroad West	16%	Medium		
				IWT014 Mr Glover's Railroad	65%	High		

Southeast Wales Industrial Ironworks Landscapes

Valley System	Ironworks: Number(s)/Name(s)	Archaeological Value of Ironwork Core Area(s)	Associated Ironworks Transport Network Number and Name	% Overall Survival of Transport Network	Archaeological Significance of Transport Network	Surviving Water Management System	Provisional Historic Industrial Ironworks Landscape
Cynon with the Dare and Aman	IW027 Abernant	C	IWT014a Mr Glovers Railroad Bryngwyn Extension	6%	Medium-Low	25%	Yes (on edge of only)
	IW028 Aberaman	D	N/A	N/A	N/A	0%	No
Tawe, Dulais and Nedd	IW029 Ystalyfera	A/B	IWT024 Ystalyfera	>1%	Low	N/A	N/A
	IW031 Onllwyn	D					
	IW032 Banwen	A	IWT023 Banwen Quarries Tramroad	33%	Unknown (On private land)		
				IWT023a Banwen Coelbren Junction	87%		
	IW034 Venallt	A	IWT022 Protheroe's Tramroad	26%?	High (IWT022(i) is protected within Scheduled Ironworks Area GM423).		
				IWT022a Venallt Tramroad	0%		
IW035 Abernant	D	N/A	N/A	N/A	N/A		

Bibliography

The work reported here has been informed by underlying literature as cited below. However, the nature of this study and the method of reporting is one that in only a few instances requires direct citation. Furthermore, this bibliography does not include works cited in the summary abstracts from the regional Sites and Monuments Record or the National Monuments Record, these can be found by consulting the full entry of the relevant record.

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Cartographic and Aerial Photographic Sources

The following digital maps were consulted:

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OS Landline Data.

OS 1:25,000 (Raster).

Aerial Photographic Resource Getmapping Digital Data (2000) scale 1:10000

Figures

Figure 1. Revised study area to the Heads of the Valleys Initiative and areas entered on the Historic Landscapes Registers

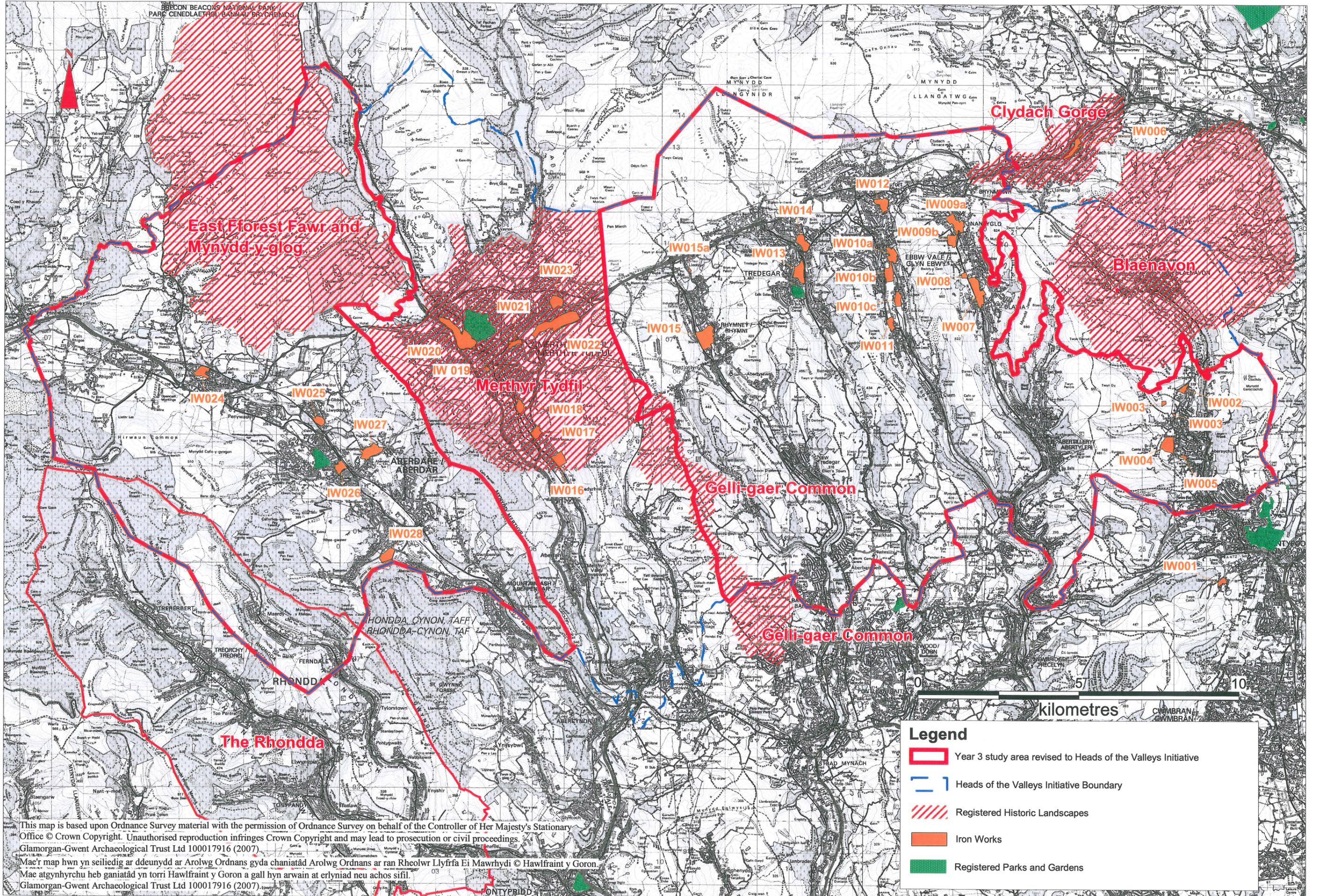


Figure 2. Water Management Features: SMR/NMR data and point data from 1st edition OS maps

