

MEATH INDUSTRIAL HERITAGE SURVEY



August 2010



An Chomhairle Oidhreachta
The Heritage Council



An Action of the County Meath Heritage Plan 2007-2011

TABLE OF CONTENTS

PART ONE. DESCRIPTION OF MIHS DESK-BASED STUDY

1.0.	Introduction	1
-------------	---------------------	----------

PART TWO: OVERVIEW & PRELIMINARY ANALYSIS OF DATA

2.0.	Overview & Preliminary Analysis of Data	8
3.0.	Preliminary Analysis of Transport Infrastructure Data	11
4.0.	Preliminary Analysis of Data Relating to Extractive Industries & the Processing of Building Materials	22
5.0.	Preliminary Analysis of Service and Utility Data	30
6.0.	Preliminary Analysis of Data Relating to Mills.	35
7.0.	Preliminary Analysis of Data Relating to Manufacturing.	42
8.0.	Preliminary Analysis of Data Relating to Fishing, Urban Areas & Miscellaneous Features.	49
9.0.	Conclusions and Recommendations for Future Work.	55

APPENDIXES

1.0.	Appendix 1 Methodology	62
2.0.	Appendix 2 The Database	76
3.0.	Appendix 3 Discussion of Site Types, Sources and Limitations	86
4.0.	Appendix 4 List of Figures	101
5.0.	Appendix 5 Bibliography & Abbreviations	102

MAP VOLUME

MIHS Site Index

53 OS Map Sheets of County Meath in A3 format.

ACKNOWLEDGEMENTS.

The MIHS project was instigated and funded by Meath County Council and The Heritage Council.

The project partners are very grateful to Paul Ferguson, Simon Fernandez and Paul Mulligan at the Gluckman Map Library, Trinity College Dublin, who allowed us so much time to study their excellent collection of maps, and Simon was particularly helpful in translating some of the more obscure cartographic symbols. The assistance of the following in this project is acknowledged; the compilers of the Record and Monuments and Places, National Monuments Service, Department of the Environment, Heritage and Local Government, whose RMP maps we used as the basis for the marking of industrial sites.

The MIHS Project Steering Group.

Loreto Guinan, Heritage Officer, Meath County Council.

Rosanne Meenan, The Heritage Council.

Frances Tallon, Meath County Council Library Service,

Michael English, Senior Executive Engineer

Jill Chadwick, Conservation Officer.

Amanda O'Brien, IT Project Leader

MIHS Project Team (Arch-Tech).

Antoine Giacometti, BSc., MA., MIAI.

Siobhain Duffy, MsSc.

Steve McGlade, BA.



PART ONE: DESCRIPTION OF MEATH INDUSTRIAL HERITAGE SURVEY DESK-BASED STUDY

1.0 INTRODUCTION.

1.1. The Meath Industrial Heritage Survey (MIHS) Project.

This report presents the Meath Industrial Heritage Survey (MIHS). The MIHS is a database of information on 1,705 features of industrial heritage interest in Meath, and locational information on 1,676 quarries and lime kilns, derived from cartographic and written sources. The project was commissioned by Meath County Council in 2008, with the aim of producing a searchable computerised inventory of industrial sites in the county. It is intended that this inventory will constitute the initial stage of a broader survey of Meath's Industrial Heritage.

In compiling the MIHS, the parameters defining sites or places of industrial interest have been kept deliberately broad. These parameters are, however, based on a definition of Industrial Archaeology that sees it as 'a period study embracing the tangible evidence of social, economic and technological development in the period since industrialisation' (Palmer 1990, 281). The view of Industrial Archaeology as a period-based rather than a theme-based discipline reflects contemporary understandings that have developed since the emergence of Industrial Archaeology in the mid-20th century (Rynne 2006).

1.2. Industrial Heritage.

For Industrial Archaeologists working in Ireland, the period of interest (the 'Industrial Period') is generally understood to extend between 1750 and 1930 (Rynne 1999, 2; Rynne 2006). It should, however, be noted that the cut-off points in both instances are somewhat artificial and that industrial processes and remains dating from before and after the period in question sometimes fall within the remit of Industrial Archaeology. Thus, for example, the date range for industrial heritage on the website of the Industrial Heritage Association of Ireland (IHAI) is given as the broader 'late 18th century to the recent past'. This is of particular relevance to the MIHS, as one of its aims from its

earliest stages was to include as broad a range of Meath's 'places of work' as possible. As a result, a number of modern features such as post boxes and Bord na Móna infrastructure dating to the mid- and late 20th century - many of which are of particular relevance and interest to local historical groups - have been included in the MIHS. Additionally, the historic importance of Meath in antiquity has meant a relatively large number of industrial features of medieval date (weirs and mills, for example) have been recorded in documentary sources and identified through archaeological excavation, and these have also been included in the Survey where appropriate. Broadly speaking, however, in compiling the Survey, a chronological definition of 1750 to 1930 has been followed as it reflects both the primary period of industrialisation within County Meath, and the related development and printing of the primary sources used in compiling the Survey (i.e. cartographic sources from 1812/1830s to 1912).

At this initial stage of the MIHS project, industrial features have been identified from documentary sources alone. Field inspection to assess individual sites forms a critical second part to the survey, and will hopefully follow on from this project. This reflects the crucial role played by the examination and identification of physical remains in any attempt to reconstruct and reinterpret the industrial past (e.g. Palmer & Neaverson 1998, 15). Given the historical range of the MIHS and its documentary scope, generations of change and development within the Meath landscape have inevitably led to the destruction of some of the sites and features identified within the survey. This should be borne in mind when planning any subsequent programmes of field inspection as while some material remains are often visible and important elements of the modern landscape of Meath, in other instances no surface traces survive (e.g. backfilled quarries or razed mills). These, in many cases, may only be exposed through archaeological excavations or non-intrusive geophysical survey of subsurface remains.

Within the broad chronological definition of the subject matter of industrial heritage, the scope of what constitutes its different elements is generally defined through a series of categories (e.g. Hammond & McMahon 2002, 9; Rynne 1999, 3; IHAI website). These categories vary depending on the individual study, and often reflect the thematic interests of earlier methods of examining industrial remains. The very large numbers of categories considered as part of industrial archaeology reflect how the processes of

industrialisation altered and expanded over time, and how more and more people were drawn into earning a living within those processes. This means that the field of study of the industrial archaeologist can include such diverse phenomena as extractive, manufacturing and utility industries, transport and communications networks, service industries (banks, hospitals and cinemas), housing development, agriculture and fishing (e.g. Rynne 2006, 187-204, 435-448).

1.3. Aims and features of the MIHS project.

Given that the MIHS is designed only as an initial stage in the identification of Meath's industrial heritage, and as it is finite in nature, it does not attempt a comprehensive consideration of all of the categories listed above. Instead, the MIHS is aimed at creating an inventory of what may crudely be termed 'primary' industries associated with manufacturing and the establishment of industrial infrastructures (Rynne 1999, 3; also Hammond & McMahon 2002, 9). 'Tertiary' industries therefore only feature incidentally in the survey, or where their existence is considered to be directly relevant to the existence of a related primary industrial feature. Following on from the definition of industrial heritage given above, the MIHS is, in effect, a survey of extractive industries, manufacturing industries, fishing industries, utility industries, and transport and communications dating from c.1750 to the present day. The remit of the survey was also formulated to include an assessment of the scope, extent, nature and historic development of these industries in County Meath, based on existing cartographic and historical sources, and on information contained within relevant statutory databases such as the Record of Monuments and Places.

In order to identify and process the information contained within the maps and documents consulted, the design stages of the MIHS involved the creation of a system to categorise industrial features, and the establishment of a computerised database in which to record and organise the features. The database was also deliberately constructed to allow the inclusion of further information for each site following field inspection at later stages in the project, and to allow the easy addition of any further sites that may be identified in the future. The computerised database is fully searchable, by location, type or name of site, so that the data can be accessed by County Councils, researchers, local heritage societies and the general public.

Another important factor taken into account at the onset of the project was the presence of existing industrial heritage surveys for other Irish counties. Earlier Industrial Heritage Surveys have been undertaken in County Louth by Fred Hammond, in County Dublin by Mary MacMahon, in County Kildare by Giacometti, Duffy and Ní Cheallaigh, and in County Longford by Giacometti and Duffy. An important aim of the MIHS project was therefore to ensure that it would be comparable, and compatible,

with both previously existing and future industrial heritage surveys. However, the industrial heritage of County Meath can be seen as substantially different to that of other counties recently studied. In particular, the Project Steering Group considered that it was important that sites which reflected the fishing industry (such as weirs) would be included in the survey.

The database is accompanied by maps plotting the location of each of the industrial sites identified. Grid co-ordinates for each of the identified sites have also been compiled as part of the Survey in order to allow the future production of an integrated Geographical Information System for Meath's industrial heritage. Due to the substantial numbers of lime kilns and quarries, these sites have been treated in a separate manner, and they have not been included in the database, nor are individual grid co-ordinates for these supplied. Instead, the position of each such site has been noted from the First Edition of the Ordnance Survey (6-inch map) series (1836-7), and plotted on the maps to provide a distribution of lime kilns and quarries as they were represented on these mid-19th century sources.

1.4. Format of the Report.

The information presented in this report is divided into two parts, which are in turn sub-divided into a number of sections.

1.4.1. *Part One.*

Part One contains Section 1.0. This consists of an introduction, with an outline of scope and structure.

1.4.2. *Part Two.*

Part Two of this report contains an overview and preliminary analysis of the raw data generated by the survey insofar as this relates to the industrial heritage of County Meath. It also outlines proposals for the structuring of future phases of work on the MIHS project. Part Two comprises Sections 2.0 to 9.0 of the report.

Sections 2.0 to 9.0 present some of the preliminary results of the desk-based element of the Survey, which have, for ease of reference, been broken down and presented in

separate sections. These are transport infrastructure (Section 3.0), extractive and building-material industries (4.0), services and utilities (5.0), water mills and wind mills (6.0), manufacturing industries (7.0) and fishing, urban areas and miscellaneous industries (8.0). In each of these sections, brief summaries of the preliminary conclusions prompted by these results are outlined.

In Section 9.0, suggestions are made regarding possible future stages of activity and areas of study that will follow on from this preliminary desk-based stage of the MIHS. These have been drawn-up based on the identification of research opportunities identified in the course of the desktop study, and on a critical assessment of its limitations.

The report contains 5 Appendixes:

In Appendix 1, an account has been given of the methodology of the project, which includes a detailed explanation of the numbering system used throughout (Sub-section 2.10) and of the cartographic presentation of the industrial sites (Sub-section 2.11). This section also includes a description and analysis of the sources consulted, and of their significance to the overall project.

Appendix 2 comprises an explanation of the computerised database, its workings and its format. It is intended that this section of the report will function as a users' guide to the database, and it is further intended that it will be appended to the 'live' (internet-accessible) version of the databases by Meath County Council. Its aim is to provide a basic outline of the conventions and terms used in the database, as well as explaining basic organizing concepts such as database fields, typographical conventions and abbreviations used.

Appendix 3 consists of a discussion of the main categories used to structure the MIHS, and the theories and understandings underpinning their identification. The nature of the cartographic representation of sites is also considered, as are the limitations of cartographic analysis in the context of the Survey.

Appendix 4 contains a list of the figures used throughout the report.

Appendix 5 contains a Bibliography & Abbreviations section.

The report includes a hardcopy version of the inventory of sites identified through the MIHS, together with copies of the maps on which the location and extent of sites are marked, in a separate volume.

PART TWO: OVERVIEW & PRELIMINARY ANALYSIS OF DATA

2.0. INTRODUCTION.

2.1. Structure of the overview.

This and the following sections of the report constitute an overview and preliminary presentation of some of the patterns of information that have emerged in the course of compiling the desk-based element of the MIHS. A detailed analysis of the data has not been attempted, and it must be reiterated that the industrial sites identified at this stage of the Survey are primarily those depicted on the cartographic sources examined. It is likely that further stages of analysis (such as field inspection and further historical research) will lead to the identification of additional sites and the generation of further information that may alter some of the conclusions outlined below. This section should therefore be understood as a very general introduction to the large amounts of raw data generated by the Survey insofar as these relate to the main industrial features encountered, their occurrence and their geographic location.

The overall distribution of Industrial Heritage sites in the county is presented on Figure 1. As can be seen, industrial sites are distributed evenly throughout the county with concentrations at larger urban centres and along the main rivers. Figures 2, 3 and 4 provide information on the primary transport-related sites; the distribution of quarries; lime kilns and other extractive sites; and the distribution of windmill and watermill sites.

MIHS Sites and comparison with Longford Industrial Heritage Survey

Primary Function	MIHS	Per 1,000km²	LIHS/1,000km²
Transport	741	316	208
Extractive	42	18	22
Health & Hygiene	98	42	38
Post & Telecommunications	45	19	60
Power	17	7	5
Fishing	111	47	-
Manufacturing	563	240	271
Mills	257	109	78
Miscellaneous	84	35	32
Total	1,705	726	643

Lime kilns (1830s record)	738	315	459
Quarries (1830s record)	1,029	439	2,148

In presenting the data, the basic subdivision of the material into broad categories has been followed, and (as was the case in previous sections) the sub-categories and headings included under each have been individually considered. Each of the categories has been grouped into a series of sections for ease of reference, so that transport-related information is presented in Section 6.0, extractive and building materials in Section 7.0, services and utilities in Section 8.0, mills in Section 9.0, manufacturing industries in Section 10.0, and information on fishing, urban areas and miscellaneous sites in Section 11.0.

It should further be noted that the numbers of sites represented in each of these basic categories vary, and a number of sites were entered as having more than one category. Thus for example, in the table below the 256 windmill and watermill sites were also recorded as being part of the 561 manufacturing sites. Due to the very large number of lime kilns and quarries identified on the First Edition OS maps, which, representing just over half of the total sites identified (albeit by record only), skew the results of the survey, the percentages given on the table below are based on the 1,705 sites identified and entered into the MIHS database.

2.2. Relevance of sources to MIHS.

As noted in the preceding sections, the relevance of particular sources to the MIHS is dependent on the type of industrial feature and reflects changing map conventions, so that for example the First and Second Editions of the 6-inch OS maps are best for the identification of lime kilns whilst the Third Edition 6-inch OS map is the most relevant for the identification of smithies. Some overall conclusions can, however, be drawn regarding the relevance of consulted sources to the MIHS study as a whole. In the table below, the number of identified MIHS sites that appear on the main sources is listed. The total number of sites in the MIHS database is 1,705 (while a further 1,767 quarries and lime kilns have also been identified).

Source	Number of sites	% of total.
First Edition OS 6-inch map	917 (2,684 inc*)	54% (77% inc *)
Second Edition OS 6-inch map	939	55%
Third Edition OS 6-inch map	1,162	68%
c. 1910 Edition OS 25-inch map	1,153	68%
Post 1930 OS maps	58	3%
All Editions OS maps	1,490 (3,257 inc*)	87% (94% inc*)
Early 19 th century maps	117	7%
17 th & 18 th century maps	53	3%
Civil Survey c. 1656	87	5%
Record of Monument and Places	52	3%
NIAH database	241	14%
Protected Structures, MCC	188	11%
Meath Bridge Survey	384	23%

[* including 1830s lime kilns and quarries]

It is clear that no one single source could have been used alone to compile the MIHS, however the sites identified on the combined editions of the OS maps, constituting 87% of the sites in the MIHS database (and 94% of all identified sites including lime kilns and quarries), demonstrate that these were the primary source for industrial features in Meath.

The 17th, 18th and 19th century (pre-OS) maps examined in the course of the study tended to include watermills, windmills and major bridges only, perhaps reflecting the compilation biases of the maps, and in a number of cases sites that were not marked on the OS maps were identified through these sources. The NIAH and MBS surveys were of particular use as these included a field inspection, which provided significant additional information on surviving examples. The NIAH listed a large number of sites (especially post boxes) that could not have been identified on the OS maps. The Meath Development Plan presently lists 11% of the identified sites, for the most part those previously recorded by the NIAH. The Record of Monuments and Places was among least relevant source for the MIHS, listing only older bridges, weirs and mills (although the files associated with the RMP database contain incidental information on possible medieval windmill locations).

3.0. PRELIMINARY ANALYSIS OF TRANSPORT INFRASTRUCTURE DATA.

3.1. Introduction.

The dramatic improvement in the transport infrastructure that took place from the 18th century onwards provided a crucial impetus towards the industrialisation of County Meath. Infrastructural improvements have been divided into three main types that broadly follow a chronological sequence from the upgrading and extension of the road network from the mid-18th century, through the establishment and decline of the canal network between the later 18th to mid-19th centuries, to the establishment of the rail network in the mid-19th century. River transport was also important, particularly during the period of main use of the canals. Approximately 40% of the industrial features in the MIHS (excluding quarries and lime kilns) were related to transport infrastructure. Figure 2 presents the main transport sites identified in the Survey.

Category	Sites (inc)*	Sites (exc)*
Transport Road	542	24
Transport Rail	168	75
Transport Canal	91	77
Transport River/Sea	247	26
Transport Air	2	1
Transport Bridge	527	527
Transport Total	742	730

** 'inc' means all sites with this checkbox ; 'exc' means if each site is classified according to its primary function. Total of exc will add up to total of sites, but not to total within each section (e.g. bog railways are classed primarily as peat extraction sites, but also appear under transport/rail). In addition, bridges of all types are considered primarily 'bridges' rather than e.g. 'road'.*

3.2. Road transport.

Road transport in Meath was greatly improved as a consequence of the establishment and implementation of the Turnpike Road system from the earlier 18th century onwards. The system, which was aimed at upgrading transport links throughout the island of Ireland as a whole, involved a piecemeal series of road improvements by levying tolls on travellers. These tolls were collected at a series of toll-barriers or 'turnpikes' along the roads, which had often been improved on an individual basis by local landowners or authorities. The improved road network extended in all directions from Dublin to the rest of the country, with the result that many of the main 18th century turnpike roads in Ireland passed through Meath and Navan was a nodal point in the

turnpike system. In total, five turnpike roads passed through the county (refer Fig. 2), and these are listed below ('Acts' refer to the government acts authorising the roads):

- 1729 (Act 3 Geo.II, c.18) Dublin to Navan (N3) road and extension in 1733 (Act 7 Geo.II, c.22) from Navan to Kells (Broderick 2002, 36-8, Nos. 2 & 2b, 52, 54-5).
- 1731 Dublin (Blackbull) to Athboy (R154) (Broderick 2002, 36-8, No. 5).
- 1731 (Act 5 Geo.II, c.15) Dublin to Kinnegad (N4) (Broderick 2002, 36-8, No. 4).
- 1731 (Act 5 Geo.II, c.15) Dublin to Dunleer (N1) (Broderick 2002, 36-8, No. 3).
- 1733 (Act 7 Geo.II, c.22) Navan to Nobber (R162) (Broderick 2002, 36-8, No. 2a).
- 1795 (Act 35 Geo.III, c.19) Dublin to Curraha (Ratoath) (N2) and on to Slane (Broderick 2002, 131-2).

These roads are notable for their extreme straightness over large parts of County Meath, and for the fact that they do not deviate around topographical features. Several of these followed earlier medieval routes, for example the Dublin to Dunleer Road (N1) and the Dublin (Blackbull) to Athboy road, which crossed the Boyne near Trim, and which was the main road to west in 17th century, finally losing its importance (and its turnpike status) by 1752. Note that roads themselves were not included as MIHS sites.

The turnpike system was implemented within the county between *c.* 1730 and 1750 (Broderick 2002, 36-43), continuing on a smaller scale into the start of the 19th century, and consisted of widening, straightening and resurfacing existing medieval and later medieval roads. In some areas, new roads were built in conjunction with the systematic construction and upgrading of permanent and wider bridges over the county's waterways. These roads were further improved between 1789 and 1819 at the behest of the newly established Post Office Mail Service (Broderick 2002, 120-131), as good roads were necessary to accommodate its fast horse-drawn coaches.

The 18th century also saw the empowerment of Grand Juries in the construction and upkeep of roads at a local level (Rynne 2006, 312). These Juries were the predecessors of the present County Council system and were largely comprised of wealthy landowners within each county (*ibid.*, 311, 314). Despite legislation to prevent 'abuses in the system' (*ibid.*, 312) many of the most notable road improvements that can be identified on the early Ordnance Survey maps are located in the vicinity of the larger estates.

The programme of later 18th century road improvement is very clearly reflected in the industrial landscape of County Meath. The primary existing roads follow the courses established by the turnpike system, and although relatively few traces of the turnpikes themselves survive today, eight of these were recorded in the survey (refer Fig. 2). Turnpike toll booths were identified at Clonee (MIHS 051-01005), Blackbull (MIHS 050-011), Dunshaughlin (MIHS 044-00106), Kilcarn (Navan) (MIHS 025-01302) and Kells (MIHS 017-00135) along the main N3 turnpike route; at Primatestown (MIHS 039-007) and just south of Slane (MIHS 026-025) along the N2 turnpike route; and surprisingly at Duleek (MIHS 027-00901), which was not actually a turnpike route at all.

The erection of milestones, indicating distances from Dublin, was also carried out as part of the road improvement schemes. Although the MIHS survey did not record any of these along the main turnpike routes, a series of nine these (e.g. MIHS 006-027) were recorded along the road running north from Slane to Ardee. Four further milestones were identified elsewhere, recorded on the basis of their inclusion in the NIAH.

The smithies of the 18th and 19th centuries can also be understood in terms of road-related industry, as they catered for the large numbers of horses and wheeled vehicles that transported people, goods and canal-barges throughout the county. Other road-related sites included in the survey were eight car, carriage and coach manufactories (in the towns of Kells and Trim), one saddle and harness manufactory (in Trim) and three garages/filling stations (in Navan and Nobber).

3.3. Bridges.

As successive episodes of resurfacing and re-edging have obliterated many of the physical traces of the road improvement works of the mid- to late- 18th century, the bridges of Meath have come to comprise the primary surviving records of those programmes. In fact, bridges in general comprise the most common transport-related site-type recorded in the survey as a whole, numbering well over 500 sites (which is approximately two-thirds of the total number of transport-related sites). The most common types of bridge identified are road bridges spanning rivers, streams, canals and railways. While most of the bridges included within the survey comprise road bridges of masonry construction, a number of footbridges and tow-path bridges

crossing canals were also recorded. The survey also identified and recorded a number of mid- to later 19th century rail bridges, which crossed existing networks of roads, canals, rivers and streams. These are, however, less numerous than their road-related counterparts.



St. Peter's Bridge

A large number of bridges were replaced in the mid-19th century, and some in the 20th century, probably due in part to improved techniques (for example, the use of longer spans to minimise the area that can be eroded by the river; Rynne 2006, 328), and in part to deal with increased traffic using the bridges.

Although a significant number of surviving bridges appear to date to the later 18th century, many of these were constructed at established crossing points and where bridge-widening rather than reconstruction occurred, may incorporate elements of earlier 17th century or medieval bridges. Of particular note here are Johnstown Bridge (MIHS 048-012), Castle Street Bridge (MIHS 045-00802), Clonard Bridge (MIHS 047-002), Kilcarn Bridge (MIHS 025-01301), the Old Nanny Bridge at Duleek (MIHS 027-00205), Newtown or St. Peter's Bridge (MIHS 036-021), Poolboy Bridge (MIHS 025-00112), Slane Bridge (MIHS 019-02801), Castlejordan Bridge (MIHS 052-004), Bloomsbury Bridge

(MIHS 017-013), Donaghpatrick Bridge (MIHS 017-020), Mabes Bridge (MIHS 017-003) and an unnamed bridge at Trim (MIHS 036-03317), all of which may be medieval in date.



Old Bridge Trim

In many instances, therefore, while an 18th century date may be implied by cartographic and other evidence, further field inspection will be required in order to identify dates and sequences of construction or demolition at particular bridges.



Julianstown Bridge

3.4. The Royal Canal and Boyne Navigation Canal.

The establishment of the canal and river-transport networks from the mid-18th century has left Ireland with some of its best known and most loved industrial heritage monuments. The most critical canal system for the industrial and infrastructural development of County Meath was the Boyne Navigation Canal, however the Royal Canal also passes through the southern part of the County.

3.4.1. *The Royal Canal.*

The Royal Canal was constructed between 1790 and 1817 in order to connect the River Liffey at Dublin to the River Shannon in County Longford. The canal runs approximately east-to-west along the southern portion of the county (MIHS 040-003, 041-005, 047-010, 048-008 & 049-001). In the course of this journey, it passes through the town of Enfield at the southern end of Meath, whose development during the 19th century was shaped by the presence of the canal.

In addition to the main line of the Royal Canal, a second branch to the southeast of the county was identified as the 'Condemned Line of the Canal' (MIHS 040-005, 041-008 & 046-012). This appears to have been infilled during the 18th century.

A small number of other canal-related sites have been identified during the compilation of the MIHS. These included a number of masonry canal bridges, generally located at points where roads crossed the canal, but occasionally accommodation bridges where tow-paths crossed the canal were also constructed. Aqueducts carry the Royal Canal over the Kildare Blackwater at the county boundary (MIHS 048-00801) and over the Boyne (MIHS 047-01001). A third aqueduct was also noted where the canal crosses over a road near the Boyne Aqueduct, and this latter site had its own lock-gates (MIHS 047-01002). One other lock (Ferran's Lock and lock-house MIHS 049-00101 & -02) was noted.

As barges, goods and passenger traffic tended to converge on larger towns and villages, localised widenings of the canal channel were often constructed. Two localised widenings or docks were also identified near Enfield, one of which (MIHS 048-00801) appeared to serve a quarrying complex. As the later MGWR Railway line passed

alongside the Royal Canal for its course through Meath, railway features for example the Hill of Down Railway Station (MIHS 041-00602) and associated post office (-00603) are likely to have also served traffic along the canal.

One additional possible canal-related site was identified (MIHS 042-015), however this, complete with offices and warehouses, appears to have formed part of a wildly over-enthusiastic demesne folly.



Royal Canal Enfield

3.4.2. *The Boyne Navigation Canal.*

Meath is particularly fortunate in that its main towns are all connected by navigable river. Navan, Kells, Trim, Slane and Athboy are all situated on the Boyne-Blackwater river network, which in turn links these large Meath towns with Drogheda and the Irish Sea. The navigability of the river system, however, was seriously compromised by extensive milling and fishing constructions along the river system, which meant that it could not be navigated by larger vessels.

The Boyne Navigation Canal was thus linked with industrial development along the Boyne in two manners: firstly it was the extensive pre-18th century development along the river which made the canal necessary in the first place, and secondly it was the

existence of the canal which allowed those same mills to thrive, as for the first time a secure means of transporting goods from the larger towns to the eastern coast of the country, and abroad. This was particularly true in the case of the largest mills, for example the Slane Mills, the Athlumney Mills, and Spicer's Mills in Navan.

Construction of the Boyne Navigation Canal was begun in 1748, and it was completed to Slane (the Lower part) by the 1760s and to Navan (the Upper part) by 1800, making it one of the earliest river-transport infrastructure schemes in the country. The Navigation covers a length of 19 miles from Navan to Drogheda and is partly river and partly canal. The Upper Boyne Navigation comprises four long stretches of canal, at Oldbridge (MIHS 020-004), Stalleen (MIHS 019-031, 020-009 & 026-015), Brue (MIHS 019-030 & 026-014) and Slane (MIHS 019-029), and a short stretch at Slane Castle (MIHS 019-014). The Lower Boyne Navigation comprises four shorter stretches along the northwestern edge of the river at Carrickdexter (MIHS 019-013), Cruicetown (MIHS 019-012), Castlefin (MIHS 019-007) and Stackallan (MIHS 025-033 & 026-002), and one very long stretch from the Broadboyne bridge at Stackallan to just south of Navan town (MIHS 025-034). As mentioned, each of these stretches avoid major concentrations of watermills and fishing wiers.

Work also commenced to continue the navigation canal to Trim, but it was abandoned for financial reasons, however some parts of this aborted canal were identified in the Survey (MIHS 037-021 & -022, 036-034), including a canal lock (MIHS 037-02201).

There are twenty locks on the Upper and Lower Boyne Navigation, many of which were named after prominent shareholders in the original canal company. Ten of these were associated with lock-keepers houses. Other features such as milestones, aqueducts, bridges and mooring posts were also recorded along the canal, particularly where evidence of their survival (by their inclusion in the NIAH) was noted.

3.5. Rail transport.

Meath is traversed by numerous railway branches, all of which were instigated or became part of two main railway line companies: the Great Northern Railway or Dublin-Drogheda Railway (DDR) and the Midland Great Western Railway (MGWR)

(refer Fig. 2). As with the previous road and canal infrastructure, the nodal point in the rail infrastructure network was the town of Navan, at which the DDR and MGWR networks connected.

The earliest railway through Meath was the DDR which ran along the coastal edge of the county, linking Dublin with Drogheda and which opened in 1844 (MIHS 020-024; 021-005). In 1850 a branch of the DDR was constructed from Drogheda to Navan, and was later extended to Kells in 1853 and Oldcastle in 1863. This line, known as the DDR Navan, Kells & Oldcastle Branch (MIHS 009-002, 010-005, 016-014, 017-002, 020-010, 024-010, 025-036, 026-001, 027-001 & 028-018), served the main industrial centres of the county (Kells, Navan and Slane) along the same line as the earlier Boyne Navigation Canal, and contributed enormously to the demise of the canal.

The second main railway was the MGWR, the mainline (Galway - Dublin) of which passed through the south of the county alongside the Royal Canal (MIHS 040-004, 041-006, 047-009, 048-009 & 049-002). This line had numerous branches, including the Edenderry Branch Line (MIHS 048-015) and the much more significant (for Meath) Clonsilla-Kingscourt Dublin & Meath Railway (Navan & Kingscourt Branch of MGWR) (MIHS 002-015, 005-017, 006-002, 012-001, 018-009, 025-037, 031-011, 037-006, 038-002, 044-003, 050-019 & 053-006) which was completed to Navan by 1862 and to Kingscourt by 1875. A branch of this second line went from Kilmessan to Trim and Athboy in 1864 (MIHS 029-003, 030-002, 037-005 & 036-017).

As well as the railway tracks themselves, numerous railway-related sites have been included in the survey. The most common of these are the twenty-eight railway stations and over eighty railway bridges, but other features such as railway viaducts, railworker's houses, post-offices at railway stations, railcar stops, a railway hotel, railway junctions and railway sidings were also recorded. Many of the railway sidings served specific industrial needs, for example Thompson's Sidings at the Kingscourt Brick and Tile Works (MIHS 002-00902), the Gypsum Quarry Sidings (MIHS 002-01802), the Platin Cement Factory Sidings (MIHS 027-02302) and the Tara Mines Sidings (MIHS 025-04002). Railway stations were a focus of industrial activity, and are often associated with other features. For example Navan (New) Railway Station (MIHS 025-03602)

includes the main mid-19th century station building itself, as well as goods sheds, a crane, engine house, railway sidings, signal boxes, cattle pens, warehouses, oil and water tanks, and a station manager's house.

Smaller railways were also included in the survey. These include the narrow-gauge Bord na Móna railways (see below under peat working Section 7.0), the Athlumney Mills tramway (MIHS 025-02203) and the Gormanstown Aerodrome Railway (MIHS 028-009).



Railway Bridge Trim Area

3.6. River, sea and air transport infrastructure.

The vast majority of the transport infrastructure sites are associated with the road, canal (including Boyne Navigation) and rail systems, but some other types were also recorded by the MIHS.

Numerous navigation features were recorded at the Boyne Estuary to the west of Drogheda (MIHS 021-010, -012, -013, -014 & 015). These include lighthouses, navigation posts, beacons, and a late medieval watchtower called the Maiden Tower. One life-boat house (MIHS 028-017) on the coast at Corballis was also identified. A Military

Aerodrome was recorded in Gormanstown (MIHS 028-009). Finally, although few separate river-navigation features other than the Bone Navigation Canal were recorded in the survey, there were some harbours and docks, including the dry-dock near the canal entrance in Navan, as well as one ferry.

4.0. PRELIMINARY ANALYSIS OF DATA RELATING TO EXTRACTIVE INDUSTRIES & THE PROCESSING OF BUILDING MATERIALS.

4.1. Introduction.

The extractive and building materials processing industries in Meath are represented in this survey by brick and tile works, saw mills, mines, lime kilns, quarries, and peat-extraction related industrial railways. The sites discussed in this section are the 31 sites which were primarily extractive in function, a further 9 lime-manufacturing sites classified under 'Manufacturing – Chemical', a further 34 saw-mill, brick works and cement factory sites classified under 'Manufacturing – Building materials', and the 738 lime kilns and 1,029 quarries recorded from the 1836-7 OS 6-Inch maps.

A total of 1,841 sites associated with the extractive and building material processing/manufacturing industries were thus identified, constituting half of the total number of sites identified in the survey, however it should be reiterated that the 738 lime kilns and 1,029 small-scale quarries were recorded but not entered into the MIHS database. These are depicted on Figure 3.

Category	Sites (inc)*	Sites (exc)*
Extractive Quarry	26	20
Extractive Mine	9	6
Extractive Peat	5	5
Extractive Misc.	2	0
Manufacturing Building materials	36	34
Manufacturing Chemical	9	9
Lime Kilns (1830s record)	-	738
Quarries (1830s record)	-	1,029
Extractive & Building Material Total		1,841

** 'inc' means all sites with this checkbox ; 'exc' means if each site is classified according to its primary function. Total of exc will add up to total of sites, but not to total within each section (e.g. bog railways are classed primarily as peat extraction sites, but also appear under transport/rail).*

The development of the extractive industries in Meath was to a large extent dependent on improvements in transport infrastructure, which from the later 18th century allowed the cheap transportation of heavy raw materials to elsewhere in the county and country. As the Boyne Navigation Canal facilitated the extractive industries along its route, demand rose at the end of the 18th century, with large civic street paving projects being undertaken in Dublin, and new shipping laws passed requiring stores of ballast

at ports (Rynne 2006, 150-1). Just west of Enfield, a small dock complex constructed on the Royal Canal between 1837 and 1880 (MIHS 048-00802) seems to have been associated with a gravel-quarrying complex, perhaps to dock barges as they were loaded with quarried material. The extractive sites identified in this survey are overwhelmingly 19th century in date, however some of the larger complexes date to the 20th century (e.g. the Tara Mines, MIHS 025-040).

This pattern of small quarries, lime kilns and other extraction-related sites spread throughout the landscape is in marked contrast to the distribution of industrial features in more urbanised counties such as Belfast or Dublin, in which industrial features are either located in urban centres or along transport routes. The distribution of extractive sites suggests small-scale quarrying and building material processing by individual farmers throughout the county as a means of augmenting agricultural incomes from farmland, an option that became available following the significant improvements in transport infrastructure from the late 18th century. Thus in most ways the extractive industries in Meath are strongly related to rural and agricultural developments, rather than the more traditional view of urban-based industrial developments.

4.2. Quarries, sand pits and gravel pits.

Quarry pits (for stone, sand or gravel) are the most common industrial feature in the survey, with just over 1,029 identified from the First Edition Ordnance maps alone, and a total of 1,049 recorded in the MIHS survey as a whole. Quarries of various forms are consistently marked on every Ordnance Survey map sheet throughout the county, and in some rarer cases also appear on earlier maps. Due to the constraints of the project, only those quarries, sand- and gravel-pits marked on the First Edition OS 6-inch sheets were recorded, and the distribution of these features thus gives a 'snapshot' of early-mid 19th century quarrying activity in the County (refer Fig. 3).

The quarries identified varied widely in size and shape, in a similar manner to the quarries from County Longford, but in marked contrast to the quarries identified in County Kildare which were broadly uniform in morphology and scale. On average, 0.44 quarries per km² were noted, which is comparable with the 0.46 quarries per km² in County Longford. The quarries are also located in a relatively consistent manner

with respect to the local topography, usually at the edges or corners of fields, on or near higher ground or low rises. A further pattern noted is the location of many quarry pits at townland, parish and barony boundaries. In many cases small tracks lead from the quarries to the main road.

The distribution of the early and mid-19th century quarry pits shows that these features are distributed evenly over the county. There are concentrations along the Boyne and Blackwater rivers, which is unsurprising as these would have facilitated transporting quarried material, and further small concentrations around the major towns of Navan, Kells, Trim and Athboy. In terms of topography, there are slight concentrations of quarries in the Loughcrew and Slieve na Calliagh hills and in the Lough Sheelin uplands to the west of this, but otherwise topographical factors do not seem to have been a major influence. Furthermore, the underlying geology does not appear to have been an important factor in quarry location. These small quarries are likely to reflect localised *ad hoc* industry. Numerous quarries are mentioned in contemporary sources (e.g. Lewis 1837).

Although most of the quarry features noted in the Survey are small in scale (and this is partially due to the absence of later 20th century maps consulted during the Survey, refer Section 4.3.1. above), seven larger quarries, quarry complexes and gravel pits were noted. The most important of these was the Ardraccon Quarry (also called the White Quarry) (MIHS 024-01201). Limestone from Ardraccon appears to have been in use from the 14th century, and was very well known nationally by the 18th century (Ellison 1983, 96-7). Indeed Leinster House in Dublin, now housing the Dáil, is built from Ardraccon Limestone.

As well as the stone, gravel and sand quarries described above, 'marl pits' were also identified from early 19th century cartographic sources. Twelve of these were found, and these were concentrated in the northeast of the county, to the west of Nobber, however one was located just south of Dunshaughlin, which was well-known for its excellent pottery clay. A 19th century pottery was situated at Knock/Ladyrath, to the southwest of Nobber (MIHS 012-030) from documentary sources, however no ceramic-related industries were identified anywhere in Meath from cartographic sources.

4.3. Lime kilns.

Lime kilns show a different distribution to quarries, and are heavily concentrated in the highlands to the northwest of the county. Like quarries, they are usually situated at the edges or corners of fields and connected by paths to the main road. Rynne (2006, 157) remarks that '...the lime kiln [is] Ireland's most numerous and widely distributed industrial monument', and indeed this is the case in this survey during which a total of 738 lime kilns were identified from the 1836-7 OS 6-Inch maps, along with a further six lime kilns from other sources (generally those recorded by the NIAH), one lime works and a lime pits site. Lime kilns were usually small flared pit ovens constructed from masonry with domed roofs, in which limestone was 'calcined' or heated to produce quicklime, which had a variety of uses. Most lime kilns were 'intermittent use' kilns, which meant that they had to be cleaned out after each operation (Rynne 2006, 157). Larger 'continuous-use' lime kilns which could be operated without requiring cleaning out were also constructed from the later 18th century.

The main uses for quicklime were for laying on fields in order to neutralise overly-acidic soils, or forming the basis for a lime-based mortar by 'slaking' the quicklime in pits of water. Very large quantities of lime were used as fertiliser in Ireland, particularly during the period 1800-1840 (Walsh *et al.* 1957, 105-6), partially to counteract natural acidity in the soil. Other uses included the manufacture of soda, and the removal of hair from hides for tanning. While the primary uses of lime may, therefore, have been in agricultural or construction contexts, the variations in production scale and the existence of other uses meant that a range of processing features was erected on sites. This is true for the processing of building materials as a whole, and the physical remains associated with extractive sites can be very varied.

There is a concentration of lime kilns in the hills and upland areas of the county to the north and northwest, where over half of the lime kilns in the county are located, and which have soils derived from acidic parent materials (and thus potentially improved by lime). In this region there are approximately 1.25 lime kilns per km², significantly higher than the average of 0.32 per km² for the county. The relatively low amounts of lime kilns over much of the county may be explained by the generally good soil conditions. The lime kiln distribution is not, however, solely a result of the demands of

acidic soils, as these are also present in hills areas at Bellewstown, Tara and Skryne, and in the northeastern part of the county, where very few kilns have been identified.

There is not much bog coverage in County Meath, with the bogland being restricted mainly to the west and southwest near the border with County Westmeath. There is a moderate coverage of lime kilns in the lands at the edges of the bogs, though not as densely covered as in the north and northwest.

While the density of lime kilns in the north of the county corresponds with areas of sandstone and shale dating to the Carboniferous and late Silurian to Ordovician periods, this trend does not continue across the remainder of the county. Other areas with a similar underlying geology do not feature this higher density in lime kilns. As such, the underlying geology cannot be seen as a causal factor for the higher density of lime kilns.

The distribution of lime kilns in areas without limestone reflects the widespread processing of lime at site of use rather than extraction. Quicklime is highly corrosive, making it difficult to transport over distances (Palmer & Neaverson 1998, 54).



Julianstown Limekiln

4.4. Mines.

Six mine sites were identified from the survey (refer Figure 3). Rynne (2006, 129) mentions that 19th century mining in Ireland was widespread in rural areas and economically marginal, 'small-scale, sporadic [and] under capitalised', not unlike the quarrying described above. These sorts of mining operations would not be distinguishable from quarries, and may not be marked, unless they were labelled on the cartographic source.

Copper mines are marked on 19th century cartographic sources at Beuparc/Painestown to the south of Slane (MIHS 026-005 & -006), which was mined until the early 20th century, and further south (MIHS 032-004). Documentary sources mention 18th century copper mining in Meath (e.g. Ellison 1983, 58), but no cartographic evidence of 18th century mining was identified in the survey. There is documentary evidence of lead ore deposits at Ardcaith, Beuparc and Athboy (ibid. 59), however no lead mines were identified in the survey.

Mid-late 18th century coal mines were identified at Rathmaiden in Coalpits townland to the north of Slane (MIHS 019-035). These had been established near earlier disused coal mines at Gernonstown and Rathmaiden following a government subsidy scheme in the 1750s (Ellison 1983, 58). One coal yard was identified at Kells (MIHS 017-00107).

Later mining operations were also included in the survey, such as the Gypsum Industries Ltd. mine in the northern part of the county at Kingscourt (MIHS 002-01801) and the Tara Zinc Mines near Navan (MIHS 025-040). Both of these made use of their proximity to the railway network to transport mined material, and both had (or have) their own railway sidings. Another modern extractive industry which made use of the railway network is the cement factory at Platin (MIHS 027-023), and it too has its own rail sidings.

4.5. Brick and tile works.

Nine sites associated with brick and tile manufacturing were identified in County Meath (refer Figure 3). These were situated in three areas: around Athboy, at Kingscourt (to the north of the county), and in a larger area around Slane and Duleek to

the east. At a brickyard, the topsoil is stripped and a clay-pit (or trench) is dug by hand. The clay is left out to sour, cleaned and watered, then fired on a clamp kiln to make bricks, which became common in Ireland from the mid-18th century, although their use is recorded from the 16th century (Rynne 2006, 166-7). Larger brickworks were also identified, and these contained a wide range of industrial processes related to manufacturing bricks. The largest of these was the mid-19th century Kingscourt Brick and Tile Works (MIHS 002-00901), which had its own tramway (MIHS 002-00903) and rail sidings.

4.6. Timber manufacturing.

Saw mills were the only timber-working buildings identified in the survey (refer Figure 4). The MIHS Survey recorded that 21 of these were powered by water, whilst three (MIHS 029-00202, 017-00104 & 025-018) were probably powered by steam. River water would have been used not only to power the mills, but also to carry the wood to and from the mills. Interestingly, several of the saw mills were situated in or near the estates of landowning classes (e.g. MIHS 025-01201 at Athlumney Demesne), which is a pattern which was also noted in Counties Kildare and Longford. This suggests that in some cases local important and wealthy individuals constructed saw mills in order to stimulate local industries and supplement their own incomes.

Most of these saw mills were established at the turn of the 20th century. All of the saw mills were converted from, or constructed over, previously existing 19th century corn or textile mills, and do not appear to have operated for very long. As a result, they do not appear on 19th century documentary or cartographic sources, and are generally only depicted on the 1911-15 editions of the Ordnance Survey maps. The reason for the conversion of so many mills into saw-mills at this time was the falling demand for Irish-ground flour, which was being rapidly replaced by cheaper American imports (Cullen 2003).

4.7. The peat industry.

Although peat working was for the most part un-mechanised (Rynne 2006, 97-8), and relatively small in scale prior to the foundation of Bord na Móna in 1946, it was an important source of employment in boggy regions. A number of industrial sites relating to peat working have been identified during the survey, and the material remains of these sites is dominated by the Bórd na Móna railways (refer Figure 2). The range of sites associated with the peat industry overlap with the power and rail industries.

Peat became established as the main fuel of Ireland by 1800 (Rynne 2006, 98) as a direct consequence of the completion of the canal systems. During the 19th century, the peat extraction industry was notable for its relatively small scale and local emphasis – in fact its lack of industrialisation, despite the enormous potential of the canal infrastructure. In fact, no large-scale and commercially-successful peat extraction industry grew up anywhere in Ireland during the century following the completion of the main canal network, although a number of failed industrial ventures are recorded in the country (for example in Kildare). It was not until the mid-20th century and the establishment of Bord na Móna work that a real peat industry developed.

The narrow-gauge railway network (MIHS 046-001, 046-008 & 041-001) that runs over the Derrygrenagh, Kinnegad and Ballivor bog groups in the southwest of County Meath was constructed in the 1940s from cast-iron tracks that are of a narrower gauge (3 feet, 914mm) than other railways. Due to the mid-20th century date of these sites, they only appear on recent maps (e.g. Discovery Series map (1:50,00), 1996-8 Edition). They are also recorded by the NIAH, in the TCD National Civil Engineering Database and in Johnson's 1997 book on railways.

5.0. PRELIMINARY ANALYSIS OF SERVICE AND UTILITY DATA.

5.1. Introduction.

From the later 19th century, the utility industries of gas and electricity, and the ongoing development of the postal and telegraph communication systems, contributed significantly to the industrial development of the county. This period also heralded important advances in sanitation technology. The material remains of these utility industries, and also of the postal service, can be seen throughout Meath, and have been included in the MIHS survey. Many of the features associated with the service and utility industries in Meath are not specific to the county, and should be considered in light of industrial developments at a national rather than regional level.

5.2. Sanitation: water and waste.

Public health engineering, in the form of water and waste services, developed in tandem over the past 150 years in response to the understanding of the link between contaminated water and disease (Corcoran 2005, 1). Water supply and drainage systems, though not as visible as the canals, railways and road infrastructure, are nonetheless critically important for the development of towns, and can be considered to be 'the most fundamental and hidden infrastructure' (*ibid.* 3).

Category	Sites
Health & Hygiene Water	91
Health & Hygiene Waste	7
Health & Hygiene Total	98

Cast iron water pumps and water hydrants from the period 1880-1905, of which 45 were included in the MIHS, are amongst the best-preserved industrial monument of this category, and the survival of these is due in no small part to their aesthetic qualities. The large majority of these, whilst occasionally noted on the Ordnance Survey maps, are never noted on other maps or in documentary sources. However, many of these have been inspected and recorded by the NIAH.

Hydraulic Rams, which generally dated to the late 19th and early 20th centuries, are often associated with the larger estate houses, reflecting the adoption of rich

landowners of new technological advances that provided pumped water before the rural electrification schemes. 14 hydraulic rams were identified, mostly from Third Edition maps. Hydraulic rams were ingenious devices powered entirely by the water they pumped. They worked by forcing water into pressured constricted passages and using the pressure to force it upwards (Rynne 2006, 50).

Four late 19th or early 20th century wind-powered pumps were identified, and were probably used to pump water, and, in the unlikely case that these still survive on the ground, would be both rare and interesting to investigate. These would have been small wind turbines connected to a water pump (usually), and were mostly manufactured in England (Rynne 2006, 29). The example from Ballinter House (MIHS 031-036) was of a type known as the 'Climax Wind Engine' (*ibid.*). Another interesting site is the water engine (MIHS 023-00401) at Drewstown House, which sounds intriguing. More common are the 8 modern water towers, 7 pump houses or pump stations, 7 reservoirs and water works which were also identified in the Survey.

Late 19th century advances in drain and sewer systems are represented in the six freestanding cast-iron vent pipes which are still visible in towns today. A sewerage works of c. 1900 was also recorded near Kells (MIHS 017-00143).

The most intensively studied waterworks in the county is the Kells UDC Waterworks (MIHS 016-019) which pumped water up to the reservoir (MIHS 016-021) on the Hill of Lloyd. It has been the subject of a report by F. Hammond (2004), which documents its history from its establishment in 1897, the installation of late 19th century water-powered turbines and later electrical pumps, and surviving elements of the complex including the weir, channel and machinery. Kells Town Council owns the site of the Kells Waterworks and has leased it to the Kells Waterworks 1897 Restoration Group (a voluntary group who are undertaking its conservation). The Heritage Council provided substantial funding towards this project and the works are completed. The site will be officially opened in 2009.

5.3. Power: gas and electricity.

Relatively few power generation features were identified during the compilation of the survey, and of those recorded nine were gas-related and eight were electric related. A number of mills were steam-powered and/or installed steam power generators in the early 20th centuries, and these are discussed below in the mills section.

Category	Sites
Power Gas	9
Power Electric	8
Power Total	17

Nine gasworks, gashouses and gasometer sites were identified. Five of these were situated in the large towns of Trim (MIHS 036-03320 & 03321), Kells (017-00108) and Navan (025-00108 & -00109), whilst the remaining four were situated in Slanecastle Demesne (MIHS 019-009040), Gibstown Demesne (018-019), Oldbridge House Demesne (020-016) and Headford Demesne (017-03102). This pattern of gas works at larger towns and demesne estates was also noted during the compilation of the Kildare and Longford Industrial Heritage Surveys, where it was further noted that early 19th century gas works were confined to the larger estate houses, and only began to serve the larger towns in the second half of the 19th century. A number of these gasworks appeared in association with mills, either being situated within disused mills, or possibly providing power and/or lighting for larger mills. All of the gaswork sites recorded in the MIHS were constructed in the second half of the 19th century, and amongst the earliest was the large gasworks at Trim, built in 1852-3 to provide gas lighting for the town.

Nineteenth century gas works employed a complex system of carbonisation (see Rynne 2006, 423-4) to produce gas from coal, and the resulting gas was stored in large circular gasholders (occasionally labelled gasometers on the OS maps), which are often the only surviving element of the gas-processing industry. Due to the large amount of heavy raw materials needed for the gas works, they were often situated on the banks of the canals or rivers.

Eight electrical power sites were identified in the county. Four late 19th century engine houses were situated in Gibstown Demesne, Balrath Demesne and Headfort Demesne (MIHS 017-02105, 017-02701 & 016-02801). A fourth (MIHS 024-01202) formed part of the Ardbraccan Quarry complex. Three late 20th century electrical stations were also identified, the earliest being the E.S.B. substation at Canon Row, in Navan town, dating to c. 1950. A late 20th century hydroelectric station (The Boyne Hydro Ltd. Station, MIHS 025-00803) installed in the disused Millbrook watermill at Navan was also included in the MIHS Survey.

5.4. Postal services & other communications.

The establishment of the Post Office Mail Service contributed extensively to improvements to Meath's road infrastructure between 1789 and 1819 (Broderick 2002, 120-131). Post offices and post boxes comprise the most obvious physical remnant of the postal services.

Category	Sites (inc)	Sites (exc)
P & T Post	41	41
P & T Telephone	3	3
P & T Telegraph	7	1
P & T Radio	1	1
P & T Total	46	46

** 'inc' means all sites with this checkbox ; 'exc' means if each site is classified according to its primary function. Total of exc will add up to total of sites, but not to total within each section (e.g. bog railways are classed primarily as peat extraction sites, but also appear under transport/rail).*

5.4.1. *Post boxes.*

16 post boxes were noted. These date from c. 1880 to c. 1980, and are all cast-iron freestanding pillar boxes or flat wall-mounted post boxes. All of the post boxes in the survey have been recorded and photographed by the NIAH, and 10 of these were listed on the RPS. Late 19th century post boxes generally have the British Royal Insignia 'VR' (Victoria Regina, 1859-1901), for example the wall-mounted post box (MIHS 032-009) at Skreen, dated c. 1880. Post boxes from the beginning of the 20th century bear the mark of King Edward or George (ER VII & GR, 1901-1920), and these appear to be far more common in Meath. Following independence in the 1920s the country's red post boxes were repainted green, and newly erected post boxes no longer bore monarchs' initials.

They were instead marked 'S E' in Irish script (*Saorstát Eirinn*), and later 'P & T' (Post & Telegraph). One example of these later types is the c. 1940 post box at Station Road, Dunboyne (MIHS 050-016).

The NIAH points out that these post boxes have industrial heritage value for a number of different reasons. Firstly, for their functional industrial designs, and as markers of cast-iron decorative detail from Victorian times to the latter part of the twentieth century. Their aesthetic contribution to the urban, and also rural, streetscape is also important. As well as these factors, the markings and design of the post boxes chart the political changes in the governance of the country.

5.4.2. *Post offices.*

25 post offices were identified during the survey. Most of the post offices are situated in rural locations, usually at road junctions. Post offices were often associated with transport features of various sorts. Two of the post offices, at Ballasport/Hill of Down (MIHS 041-00603) and at Knockmark (044-00302) were clearly associated with railway stations. The post office at Ashbourne (MIHS 045-00805) was the main reason for the existence of the town, which was founded by its namesake Richard E. Bourne at the start of the 19th century as a direct result of it's being the first stop on the mail coach route from Dublin to Belfast (Cogan, undated, 32-3).

5.4.3. *Telegraph and Radio*

Post-offices, particularly those situated in towns and larger villages, also functioned as telegraph stations and, later, telephone exchanges. A single telegraph office (MIHS 043-012) was identified in the Survey at Summerhill Demesne. This was marked on the Second (1880) Edition of the OS 6-Inch map. The Tower of Lloyd (MIHS 016-020) constructed in 1791 was also included in the survey in terms of its later role as a radio tower.

6.0. PRELIMINARY ANALYSIS OF DATA RELATING TO MILLS.

6.1. Introduction.

Although mills are a sub-type of manufacturing sites, their importance in the industrial development of Meath is such that they are worthy of discussion in their own right. 256 mill-related sites were identified, and these were dominated by watermills (refer Figure 4).

Category	Sites (inc)	Sites (exc)
Windmills	21	21
Watermills	211	211
Steam (?)	4	4
Other*	20	5
Mills Total	257	241

*(Other = 15 Millraces/weirs associated with mills, 3 mill houses, 2 mill-worker's cottages, and *ex-situ* millstones).

6.2. Windmills.

Twenty-one windmills were identified in the survey (refer Figure 4). The majority are likely to be 18th century date, as they are usually depicted as ruins on the early 19th century cartographic sources. Rynne (2003, 23) notes that the Archaeological Inventory of County Meath (Moore 1987, Entries 237, 1247, 1265, 1308 & 1683) mentions a number of possible medieval windmill mounds at Diamor, Bartramstown, Derrypatrick, Hurdlestown and Agher in Co. Meath. These may be postmills.

The windmills identified here (with the exception of the five possible postmills mentioned above) are likely to be of the 'tower mill' type, with a fixed masonry base or shaft (which was circular in shape in most of the examples here) and rotating wooden sails powered by the wind to work the millstones. These became common in Ireland from the 17th century onwards (Rynne 2006, 13). All are likely to have been used for the milling of cereals.

Rynne (2006, 25-7 & 2003, 27) distinguishes between windmills constructed before 1770 and those constructed after 1770. The earlier type, he suggests, had a rubblestone masonry tower 3-4 stories high and 3-4m in internal diameter, which held wooden machinery (that rarely survives) operating a single pair of millstones. These windmills

had two doorways at the base, as their short stature meant that one doorway was periodically blocked by the sails. The post-1770 type is larger, at 5-8m internal diameter and 10m in height, and was able to operate two pairs of millstones (*ibid.* 25). At least one of these larger and later windmill sites was identified at Balrath (MIHS 032-033), built in 1780 to supplement the nearby watermill (MIHS 032-022). It measured 80' high, 46' diam and 12' diam at top, with four 20' sails (Ellison 1983, 53). It was also the only windmill noted that did not appear to be circular in shape.

6.3. Watermills.

Watermills (along with lime kilns) are the most common and widely distributed industrial building identified in the MIHS, and a total of 211 individual watermills (221 watermill-related features including millstones, mill houses and weirs etc.) were identified in the county. These are depicted or mentioned in every cartographic and written source consulted, and are present in every locality, however there are particular concentrations of watermills along the Boyne and Blackwater rivers. Watermills are present in almost all of the urban areas that have been listed for Meath (see Section 11 below) but their distribution is overwhelmingly rural, and catered for the needs of local communities. Rynne (2006, 30) describes watermills as 'the backbone of Irish industry' for the 18th and much of the 19th centuries.



Bective Mill

6.4. Watermill functions.

The functions of the 211 watermills identified in the survey are set out below (and see Figure 4). Note that the totals appear to add up to 219 due to the presence of eight dual-purpose (textile & corn) mills.

Corn/flour	135
<i>110 Corn</i>	
<i>15 Flour or Flour & Corn</i>	
<i>1 Corn/Boulting</i>	
<i>1 Threshing</i>	
<i>2 Corn & Flax</i>	
<i>4 Corn & Tuck</i>	
<i>1 Flour & Tuck</i>	
<i>1 Flour & Flax</i>	
Textile	29
<i>7 Tuck</i>	
<i>4 Wool</i>	
<i>7 Flax</i>	
<i>2 Cotton</i>	
<i>1 Calico</i>	
<i>8 Cereal & Textile mills (see above)</i>	
Saw:	20
Paper:	1
Unidentified	34
<i>31 Unidentified</i>	
<i>3 Medieval/Unidentified</i>	

In some cases, cereal and textile processing could be combined in one mill, and this has been noted in eight sites. More commonly, water-powered corn or flour mills lent themselves well to conversion to textile mills (Cullen 2003, 50) and the process is well documented in England. The conversion of mills occurred frequently in Meath, as demand for flour and other products grew and contracted. The Slane Mills (MIHS 019-02701 through to 02707), for example, were converted from a corn mill to a flour mill to a flax mill, and then to a cotton mill (Lotts 2008, MCDP 2007). Many flour mills were converted to other functions at the turn of the 20th century in response to a decline in demand for Irish-made flour, and diversification into furniture and farming tools was common, particularly around Navan, for example at Elliot's Saw Mill.

The functions of c. 16% of watermills identified in the Survey are not indicated on the cartographic sources, however the vast majority are likely to be cereal mills (either corn mills or flour mills), in particular those where a different function (such as textile mills or saw mills) has not been indicated. Hogg (2000, Appendix 'The Windmill, A Wider View & Summary') summarises the functions of the mills of Meath listed in Griffith's Valuation of 1854. Of the 39 mills identified by him, 10 are listed as 'corn-mills', 7 as 'flour-mills', 6 as 'tuck-mills', 1 as 'spinning mills' and 15 as 'other'. Hogg (2008, 7) also analyses mills appearing on the First Edition OS map, with similar results, and based on this analysis, conducted by himself over the country as a whole, considers that unidentified mills are most likely to be cereal mills. This conclusion is also likely to be applicable to the unidentified mills from Co. Meath, as most of these are of pre-1837 date, and are thus most likely to be corn mills.

Summary of function.

64% of watermills were definitely cereal mills
80% of watermills were probably cereal mills
14% of watermills were textile mills
10% of watermills were saw mills

6.5. Dating of watermills.

Watermills are one of the earliest industrial buildings in Ireland, and numerous Early Medieval examples have been excavated in the country. Several early-medieval and high-medieval water-mills have been identified in Meath from archaeological and historical sources.

147 Mills were noted in the Civil Survey of c. 1650 (Simington 1940). Of these, the majority are described as general mills, but others are described as water mills (14) [surely an unusual distinction], corn mills (25), tuck mills (12), fulling mill (1), tower [i.e. wind-] mill (1), wasted [i.e. ruined] mills (14). Although in many cases changes in townland and parish names make establishing their modern locations difficult, in just over half of the cases (89) the mill mentioned in the Civil Survey can be associated (through its presence in a townland and parish of the same name) with a mill present on other sources. It is likely that with further research on changing placenames, most of the Civil Survey mills would be represented by later documented mills. This is not to say that the mill remained in use for c. 200 years, but rather that a mill remained at

this approximate location for most of that time, and thus out of the 133 mills that were in use by the mid-17th century, we should surmise that the vast majority remained in use over the next century.

MIHS Watermills by earliest recorded date

C16th or earlier	7	3%
C17th	67	32%
C18th	10	4%
C19th	119	57%
C20th	8	4%

Thus the earliest recorded date in the table above is likely to err on the late side. It is interesting to note that just under half of Meath’s Mills appear to have been established by the 18th century, with the remaining number converted from earlier mills or established in the 19th century. In a number of cases where a mill has been inspected by the NIAH survey compilers, the NIAH records the building as dating to the late 18th/early 19th century, despite earlier records of the mill also existing. This situation recurs in many mills identified in the Survey which are also listed by the NIAH, and is a result of the re-building of many mills in Meath during the later 18th and early 19th centuries. Mills were often rebuilt at this time due to significant improvements in watermill technology driven by the corn bounties (Rynne 2006, 256-9), and the change from wooden millwheels to pre-cast metal wheels (which did not always fit the original building), which was partially due to the difficulty of sourcing suitable timber during the Napoleonic Wars (Rynne 2006, 36-7).

6.6. Description of watermills.

Watermills were generally small buildings (although large milling complexes have been identified, particularly in the later 19th century) and of course were always situated on a water source. A mill-wheel (originally made of wood, from the late 18th century onwards made of iron) was driven by the water and rotated a pair of mill-stones, which ground the cereal into cornmeal or flour. The earlier mills used a single pair of mill-stones, however by the 19th century two pairs became increasingly common (Rynne 2006, 36-7, 194). From c. 1760 mill buildings had grain kilns (to dry the cereal) built into the building (Rynne 2006, 198). Another feature sometimes associated with

corn mills are grain stores. These are not usually labelled on cartographic sources, and when identified it is usually from a documentary source.

Water mills are always situated on or near to rivers or streams, and mill-races were generally constructed in order to control the flow of water to power the wheel. These mill-races could be of various lengths depending on the location and requirements of the mill and many of them incorporated a mill pool to further control the water flow (Rynne 2006, 40, 43). These various components of the mill are sometimes individually labelled on the cartographic sources. In some cases, the presence of a mill has been identified by the presence of a mill-race or mill-pool alone. Weirs constructed in rivers to channel mill-races often survive well after the mill buildings have gone. Bridge-arches were also used to channel mill-races, and this has been noted at several sites.

6.7. Discussion of Watermills.

The ubiquity of cereal-processing watermills in Meath, particularly in comparison to other manufacturing sites, is partially due to the emphasis placed on them by cartographers from the start of the 19th century. Watermills are the only industrial site-type to be marked on every single one of the cartographic sources assessed for the MIHS.

Between 1757-8 and c. 1797, the government set up a system of flour subsidies for the production of flour for Dublin, and these were known as the 'corn bounties' (Rynne 2006, 256). County Meath was the earliest county to import flour into Dublin (Cullen 2003, 44), beginning in the period 1758-1762, and was advantaged in this regard due to its proximity and excellent communications with the capital, as well as by its good agricultural land and numerous strong-flowing rivers. The corn bounties were set up to stimulate the production of flour in Ireland, rather than importing it from England, and proved very successful. Not only did they encourage a boom in Irish cereal production, technological advances in milling practices, and mill construction in the late 18th century, but they also encouraged the development of better transport infrastructure (Broderick 2002, 91-3). Cereal production was once again given legislative encouragement from 1820 with the Corn Laws, which protected Irish and British millers from competition, but this was repealed in 1845 with unfortunate timing.

Despite this, the milling industry continued to expand in Ireland during the mid-19th century (Bielenberg 2003, 66-7), particularly at port mills, until the importation of increasing amounts of cheap flour from the United States in the late 19th century and early 20th century (Rynne 2006, 256) finally caused a long-term decline.

The cereal-processing industry straddles the line between industry and agriculture, and this is particularly clear in the case of corn- and flour-mills. As the mills of Meath became larger and could process more grain over the course of the later 18th century, so agricultural production and the improvement of land for agricultural use was encouraged. Thus the proliferation of lime kilns to make quicklime for improving the soil, and the boom in corn-mills are deeply inter-connected. The construction of these industrial features altered the landscape of County Meath during the late 18th and early 19th centuries in a manner that encouraged the production and supply of agricultural produce on a larger, and indeed industrial, scale.



Newhaggard Mill

7.0. PRELIMINARY ANALYSIS OF DATA RELATING TO MANUFACTURING.

7.1. Introduction.

Manufacturing industries in Meath were organised into a number of categories and sub-categories during the compilation of the MIHS database. These categories were based on both the nature of the power driving a mill (windmill or watermill) when these were the type of manufacturing site in question, and the function of the site, (sub-categories of food, drink, building materials & timber, textiles & leather, metal, chemical, other and unidentified). During the course of the Survey it became apparent that a number of these sub-categories held relatively few site types.

Category	Sites (inc)	Sites (exc)
Manufacturing Food	160	160
Manufacturing Drink	15	13
Manufacturing Building materials	34	33
Manufacturing Textiles/leather	48	47
Manufacturing Metalworking	248	246
Manufacturing Chemical	8	8
Manufacturing Other/unidentified	62	60
Manufacturing Total	567	567

** 'inc' means all sites with this checkbox ; 'exc' means if each site is classified according to its primary function. Total of exc will add up to total of sites, but not to total within each section (e.g. bog railways are classed primarily as peat extraction sites, but also appear under transport/rail).*

Overall, very few or no ceramic, glass, chemical manufacturing sites or large-scale metallurgical works were identified. This contrasts strongly with the variety of industrial sites in the port cities of Dublin and Belfast. The situation reflects the lack of emphasis on large-scale urbanisation in Co. Meath, and in particular the county's lack of port-cities, and its peripheral nature in terms of accessibility to coal and iron resources, which were imported into the country in the 19th century. Instead, the distribution of manufacturing industries in Meath reflects a dispersed and rural pattern, dominated by watermills, which were the most common manufacturing site-type identified after lime kilns. Excluding those manufacturing sites associated with the extractive and building-processing industries (which are discussed in Section 7.0 above, 526 manufacturing sites were identified in Meath, representing 30% of the total number of sites in the MIHS database.

7.2. Food and drink manufacturing industries.

The vast majority of sites associated with the food and drink manufacturing industries comprised of corn and flour mills, as discussed in the preceding section. Not included in the numbers of food and drink sites are the 34 mills of unidentified function, although as mentioned previously these are likely to have been corn mills. The drinks industry in Meath developed in tandem with, and for the same reasons as, developments in agricultural production and cereal milling.

Category	Sites
Corn or flour watermills	135
Windmills	21
Food-related factories	2
Dairies	2
Distilleries	2
Breweries	3
Malt houses	8
Food & Drink Total	173

In contrast to the dispersed rural distribution of cereal-mills in County Meath (water and wind, both of which have been discussed in Section 9.0), other food and drink-related industries are all located in large urban areas. Other than the mills, the only other food-related industries identified in the county were two factories, being Spicer's Bakery (MIHS 025-00142) and the Athlumney Mills Bacon Factory (MIHS 025-02206) in Navan, and two dairies, being the Oldcastle Co-op Creamery (MIHS 009-00308) and a second dairy at Navan (MIHS 025-02006).

Brewing involved the manufacture of beer, which in Ireland generally meant porter (otherwise known as 'stout'). 18th or early 19th century breweries were identified at Kells (MIHS 017-00109 & -00110) and Trim (MIHS 036-03325). Distilleries were common in Ireland from the 18th century onwards, and manufactured wine spirits and flavoured drinks as well as the more typical whiskey (Rynne 2006, 248-50). Two early 19th century distilleries were situated in Navan (MIHS 025-00135 & -00147). Distilleries were often converted from earlier corn mills in the early 19th century (generally the 1820s), however this industry suffered a significant set back in the mid-19th century due to the Temperance movement.

Four eighteenth century malt houses were identified in Kells (MIHS 017-00111 to -00114), two in Trim (MIHS 036-03302 & -03303) and two in rural areas at Garmanagh (MIHS 005-028) and Rathstephen (MIHS 004-012). The concentration of malt houses (and indeed all 18th century sites) in Kells and Trim is a function of the additional documentary sources (specifically the Irish Towns Atlas publications) available for these two towns. Malthouses provided both breweries and distilleries with the main ingredient in their respective products, which was manufactured through a process of spreading, heating (in kilns) and steeping (in water) the cereals. Many of the earlier malthouses would have been independent, but by the 19th century the larger distilleries would have controlled their own malt houses (Rynne 2006, 236), which is why 19th century independent malthouses are rare (and in the case of Meath, absent).

7.3. Textile Production.

7.3.1. *Introduction.*

Textile mills and factories (the words were used interchangeably in the 19th century; Rynne 2006, 231) and other textile-manufacturing sites in Meath were represented by 48 industrial sites.

Textile-manufacturing by type.

Wool manufacturing	17
Linen manufacturing	15
Cotton manufacturing	5
Leather Manufacturing	10
Other (carpets)	1
Total	48

7.3.2. *Wool production.*

In the 18th century, the various processes of wool production (spinning, weaving and finishing) were carried out at different locations (Rynne 2006, 222), using readily available sources of motive power. This led, for example, to the dual functioning of a number of corn-mills as both cereal and textile-manufacturing sites (*ibid.*, 221), of which many were noted in Meath.

Processing of wool did not just involve the spinning of thread into fabric, but also encompassed sites such as 18th century tuck mills, which were used to finish woollen

cloth by pounding it with soapy water (Rynne 2006, 221). The earliest reference to a tuck mill identified in the county was at the Mills of Trim (MIHS 036-03301), where a tuck mill is mentioned from the mid-16th century. Trim is also the location of one of the few records of an 18th century tuck mill (MIHS 036-020). Ten other 19th century tuck mills were identified, scattered throughout the county with a slight cluster in uplands to the north-northwest of Meath.

These scattered sites declined in the 19th century as they were gradually replaced by larger wool factories (where all the various processes were combined under one roof) from the mid-19th century. Four of these were identified, most of them in or around Navan, for example the Millbrook Woollen Mills (MIHS 025-00802).

A 16th century dyehouse was also identified at Trim (MIHS 036-03339), which provided work for approximately 100 people in the wool industry (Ellison 1983, 65; Simms *et al* 2004, 12)

7.3.3. *Linen production.*

Approximately the same number of linen-manufacturing sites were identified in Meath as the wool-manufacturing sites mentioned above, and covering the same period. 18th century flax scutching mills were identified at James Morgan's Mill at Navan (MIHS 025-00148), at Oldcastle (MIHS 009-00148), and at three other locations, and a further seven flax mills or corn and flax mills were identified from 19th century sources. These flax mills were concentrated in larger urban centres, far more so than the scattered woollen tuck mills. One of the flax mills (MIHS 020-00903 at Stalleen) was identified on the basis of the townland name (meaning 'House of Flax', Ellison 1983, 51), and indeed this mill is mentioned in the Civil Survey of 1654-6 as a tuck mill, demonstrating the fluidity of function over time. As well as the ten flax scutching mills, other linen-related sites identified including three flax ponds and two bleaching greens.

7.3.4. *Cotton production.*

Following the collapse in the demand for flour in the mid-19th century, some of the larger flour mills diversified into, amongst other products, linen manufacturing, and this is apparent for example at the Slane Mills (019-02705) in 1918, which was later

converted again into a cotton mill in the mid-20th century (MIHS 019-02704). A second cotton mill was also identified at Starinagh (MIHS 013-00103). Another example of a mill adapted for textile (possibly cotton or linen), although in this case at the far earlier date of 1787, was the Calico-Printing 'Mesney Mill' at Mosney (MIHS 028-00802).

Kells was a centre of the lace manufacturing industry (using cotton and silk) in the early 19th century, and both a lace workshop at Kenlis Place (MIHS 017-00102) and a lace factory (MIHS 017-00101) were identified in the survey. Lace was embroidered and exported from here until the 1950s.

7.3.5. *Leather production.*

Nine tanneries were identified in the MIHS. Six of these (MIHS 017-00124 through to -00129) were situated in Kells, and reflect the particular specialisation in leather and skin working of the individuals of that town. Other tanneries were identified in Navan (MIHS 025-00128), Oldcastle (MIHS 009-00309) and Trim (036-03330). All nine of the tanneries were of 19th century date. Tanneries comprised large complexes of buildings and yards, in which animal hides were steeped in pits filled with tanning solution (generally crushed oak bark) to turn them into leather. Tanneries were amongst the most important industrial complexes in the larger cities of Ireland in the late medieval and early post-medieval periods, and leather is historically one of the most important Irish exports. The leather-making (tanning) and leather-working processes are discussed in detail in a number of publications (e.g. Reed 1972, Thomson 1988). The location of the Meath tanneries at the edges of larger towns is a common pattern which can be noted on a national level. One saddle and harness manufactory at Trim (MIHS 036-03304) was also noted, whilst the tannery at Oldcastle may also have manufactured shoes and saddles (Slater 1881).

7.4. Metal industries.

The absence of extensive iron and coal deposits in Ireland meant that large iron-working industries only developed in the larger port towns during the 18th and 19th centuries (Rynne 2006, 105), and no large-scale metallurgical industries were identified in the Survey. On the other hand, small smithies and forges have been identified all over the county, despite being relatively under-represented in the cartographic sources

(refer above, Section 4.4.4). A total of 244 of these were identified. They would have manufactured and fixed agricultural tools, but primarily they would have been involved in shoeing horses. Horse-and-cart was the most common method of transport and carrying industrial products around Meath prior to the construction of the Navigation Canals and railways, and even in the canal age all the barges would have been pulled by horses. Thus the distribution of the smithies is generally at crossroads or along main roads. They are generally small buildings fronting onto the road, with a similar sized building located next to them, slightly offset from the road. This second building was probably the family farm.

Two possible medieval smithies were identified, one in Kells (MIHS 017-00123) and one in Cookstown near Ratoath (MIHS 045-003), and one 18th century smithy was identified at Trim (MIHS 036-03308). Otherwise, all of the smithies in the survey date to the period covered by the OS maps of 1837-1910, and are rarely mentioned on earlier sources. Although many smithies remained in use over the course of the 19th and 20th centuries, a number went out of use in the mid-19th century, perhaps due to the effects of the Great Famine, or perhaps of the rise of railways.

Very few metalworking sites other than smithies were identified in the MIHS Survey. A mid-19th century farming implement manufactory at Trim (MIHS 036-03331) is likely to have been similar in size to the smithies above. The Nash Foundry at Elliot's Saw Mills in Navan (MIHS 025-00104) also manufactured farming implements, but no large scale metallurgical works were identified in Meath. Small-scale metalworking was also carried out at other sites, for example the tanyard at Navan (MIHS 025-00128). The last important metalworking site was the medieval (15th century) mint at Trim Castle (MIHS 036-03336), amongst the earliest industrial sites identified in the survey.

7.5. Late 19th and early 20th century factories and miscellaneous manufacturing sites.

Factories show up rarely in the MIHS, as these date to the latter part of the 20th century, a period that was under-represented in the cartographic and other sources examined during the project, and which fell for the most part outside of the scope of the project. Nevertheless, 14 factories were identified, specialising in a range of manufacturing from foodstuffs (bacon and fishmeal), furniture, cement, textiles (including lace and

carpets). Factories were almost always associated with large urban centres and are generally located on the outskirts of the town.

Other miscellaneous sites included eight coach manufactories, a late 19th century cooperage in Trim (MIHS 036-03316) which was probably associated with the drinks industry there, two mid-19th century gun manufactories in Trim (MIHS 036-03313 & -03338), the Millbrook Paper and Frieze Manufactory (MIHS 025-00801) at Navan, a newspaper printers (MIHS 017-00105) in Kells, and an unidentified kiln (either a corn kiln or lime kiln) at Trim (MIHS 036-03326).

8.0. PRELIMINARY ANALYSIS OF DATA RELATING TO FISHING, URBAN AREAS & MISCELLANEOUS FEATURES.

8.1. Fishing sites.

Fishing related sites were dominated by eel and fish weirs on large rivers, particularly the Boyne. In many cases, it is unclear whether weirs were associated with mills, fishing or both. In total, 17 eel weirs, 16 fish weirs and 61 unclassified weirs were identified, excluding those weirs that were specifically associated with the Boyne Navigation Canal or watermills and for which there is no evidence they were utilised in fishing.

Category	Sites
Fishing weir	94
Fishing other	16
Fishing Total	110

Other than the weirs, 16 additional fishing-related sites were identified including two eel traps, a salmon trap, a salmon hatchery, eight fish ponds, a fish house, a fishmeal factory and two piers. With the exception of the factory and piers, all of these non-weir fishing sites were associated with demesne grounds and were of early 19th century date.

8.2. Urban areas.

Urban areas provide the most dense and varied collections of industrial monuments in Meath. These centres of population and services attracted industries due to the population densities, providing both a source of labour and a ready market, and generally superior transport links, and at the same time those same industries provided further impetus for their urban development. Nine urban areas have been listed for the county, and although not based on size, the population density of these settlements is likely to be represented in the range of industrial features.

The urban areas identified as being foci of industrial activity are: Navan (MIHS 025-001--), Kells (MIHS 017-001--), Slane (MIHS 019-015--), Trim (MIHS 036-033--), Oldcastle

(MIHS 009-003--), Nobber (MIHS 005-025-- & 006-001--) Ratoath (MIHS 044-002--), Dunshaughlin (MIHS 044-001--), and Athboy (MIHS 029-002--).

A total of 185 (i.e. just over 10%) of the MIHS industrial sites were situated in these nine urban centres. It should be noted that this includes only those sites fully situated within the urban core of the 19th century town, and that many sites slightly outside of the core would not be included as part of the urban area, for example the Slane Mills at Slane and Kells train station at Kells. This is also the case for workhouses, five of which were identified outside of the towns of Trim, Kells, Navan, Oldcastle and Dunshaughlin.

Certain types of sites occur almost uniquely in these nine urban areas. These include specialised manufacturing sites (leather, alcoholic beverages, dairies, coaches, guns) and market houses. Other types of sites are heavily represented here, but also occur elsewhere, and these include postal sites, power-generation sites, steam-powered saw-mills, health and hygiene infrastructure, and factories.

Types of sites in 9 urban centres	No.	Percent of total type
Drinks manufacturing & dairies	14	93%
Workhouses (outside towns)	5	100%
Postal features	17	41%
Power	6	35%
Leather-manufacturing	11	100%
Metalworking	35	14%
Coach Manufactory	8	100%
Health & Hygiene	21	21%
Misc. industrial sites	7	100%
Factory	7	50%
Watermills (corn, flour, flax)	14	7%
Steam-mills	2	50%
Market houses	5	100%
Garages	3	100%
Gun manufactories	2	100%
Dyehouse	1	100%
Lamp standards	1	50%
Mint	1	100%
Printers	1	100%
Weighing machine	3	5%
Other*	23	N/a
Total	185	11%

*(Other includes 15 transport-related sites, a lime pit, mill house, quarry, eel trap, workhouse, workshop, coal yard and a brick works).

The four largest urban centres of Navan, Kells, Slane and Trim were substantial population centres, generators of industry and nodal points in the communication network. All four had significantly greater concentrations of industrial features than anywhere else in the country (in the same order as above: 48, 43, 9 and 39 sites in the town centre). The far fewer industrial sites identified in Slane town is a result of the location of the Slane Mills complex just outside the urban centre itself, combined with the paucity of information on industrial sites within the town compared to the other three centres. All these towns have excellent transport links with the rest of Ireland (refer Fig. 2), in terms of road (all four are on National Roads and were on Turnpike Roads in the 18th century), river (Navan and Slane on the Boyne Navigation Canal, Kells and Trim on the Blackwater and Boyne rivers) and rail (three were connected to the rail network in the 19th century, all four if we include Bauparc Station near Slane). As a result, these centres have industrial heritage features associated with transport features.

8.3. Market-related sites.

Six market houses and sixty weighing machines were identified in the Survey. The former were situated in the larger urban areas, and were occasionally associated with other industrial features such as cranes, weighing machines, etc. They were identified in the towns of Athboy (MIHS 029-00208), Trim (MIHS 036-03335), Oldcastle (MIHS 009-00306), Kilmessan (MIHS 037-02301) and in Kells where two market houses were identified (MIHS 017-00136 & -00137). These are generally recorded from 19th century documentary records, however in some cases (for example at Trim) the market house may well be far earlier. The weighing machines were generally situated at crossroads or in market squares in towns and hamlets of all sizes, and to a lesser extent in demesne grounds.

Market Houses	6
Weighing Machines	60
Total Market features	66

8.4. Institutions.

Institutionalised industrial features comprise five workhouses and two industrial schools. As mentioned above, the workhouses were identified outside the larger urban

areas of Navan (MIHS 025-03801), Kells (MIHS 017-02901), Trim (MIHS 036-03334), Oldcastle (MIHS 009-004) and Dunshaughlin (MIHS 044-011). Workhouses were constructed under the 1838 Poor Law Act, and 130 were built throughout the county by 1846 (e.g. Barrett 2005; Duffy 2007, 129). Industrial schools were identified at Trim (MIHS 036-03333) and Kells (MIHS 017-00104). These opened in the late 19th century, and often contained within them features of significant industrial interest, for example a steam-powered saw mill was established at the Kells school in 1888.

Union Workhouses	5
Industrial Schools	2
Total Institutions	7

8.4. Miscellaneous Sites.

Thirteen miscellaneous sites were identified. In the same manner as the market houses and institutional industrial features, these sites tended to only be found in urban areas. They are listed below. The miscellaneous industrial site (MIHS 044-00104) and industrial building (MIHS 044-00107), both situated in the town of Dunshaughlin, were identified from the Record of Monuments and Places (where it is listed as an 'Industrial Site') and is probably of medieval date, and from the NIAH.

Tobacco Plantation	1
Coal Yard	1
Lamp Standards	2
Warehouses	3
Misc. Industrial site	1
Misc Industrial building	1
Flood Gates	4
Total Miscellaneous	13

The Randalstown Tobacco Plantation (MIHS 025-04502) was a major industry in the Navan area between 1898 to 1938, at its peak employing almost 100 people in tobacco growing and processing. It was set up by Sir Nugent Everard at his estate in Randlestown, and flourished until it's demise, primarily due to political interference, in 1938 (refer Internet Sources under Randalstown Tobacco Plantation below).

8.5. Large estate houses.

While large or private houses in general have not been included in the MIHS, a number of the larger estate houses deserve mention in terms of their importance in stimulating and structuring industrial development in their local areas



Mountainstown House

The activities of the occupants of these great houses are frequently well documented, and represent the power of individual initiative in driving industry in Meath. Many landlords saw the establishing of local industries and improvement of their land as having both moral and economic advantages. Such developments publicly fulfilled patriotic and religious duties, and simultaneously could act to increase estate profits.

89 sites were situated within the demesne grounds of the larger houses. This comprised 5% of the total number of sites in the MIHS database, however certain types of sites, notably hydraulic rams, wind-engines, power-generation sites, fishing-related sites and the single telegraph office in the survey were almost unique to demesne estates.

Category	No.	Percent of total type in demesnes
Telegraph office	1	100%
Hydraulic Rams	14	100%
Gas/Electric Power	8	47%
Fishing weirs	10	11%
Fishing other	10	63%
Corn/textile watermills	17	11%
Sawmills	4	19%
Tobacco Plantation	1	100%
Other*	25	-
Total demesne sites	90	5%

*(Other includes 6 weighing machines, 2 lime kilns, 5 smithies, 3 bridges, 2 reservoirs, 2 windmills, a marl pit, bleaching green, brickworks and a canal folly).

Many of the site-types which are heavily represented in demesne contexts are those using new and experimental technologies, for example the telegraph offices, hydraulic rams, tobacco industry, gas and engine houses, and the sawmills (many of which used steam or other non-traditional power to supplement the watermill). It is interesting to note that, very often, the owners and managers of the larger estates would be the first to adopt new technological developments that were then later adopted by the municipal authorities for use in towns (e.g. gas works, water reservoirs, hydraulic rams and other features).



Stackallen House

9.0. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK.

9.1. Introduction.

As noted elsewhere in this report, the MIHS desktop-based survey, which has been produced for Meath County Council, represents the initial stage of what is intended to be a larger and broader inventory of industrial heritage sites in Meath. It has succeeded in identifying 3,381 sites (including quarries and lime kilns which were not included in the database) of varying type within the county as a whole, and as such comprises a considerable body of information, which will form the basis for further work.

It is envisaged that such future work will involve both narrow specific studies focusing on particular site types or regions, and broader studies involving field visits over the entire county. It will, moreover, involve the identification of additional industrial sites, as well as the fleshing out of information on sites identified during the desk-based stages of the study. As many of the subsequent stages of the MIHS may be reliant on the interest of the local communities of Meath, and on information generated by dialogues with those communities, publicising the project as a whole will also be a crucial stage in its further development.

The desire to provide adequate protection of Meath's industrial heritage for future generations has been an important impetus behind this project. Section 12.3 below will outline the present status of protection for this heritage, which is primarily based on planning legislation, and Section 12.4 will discuss some of the limitations of the current legislation-led approaches to conserving industrial heritage. These centre on the fact that many classes of industrial heritage sites fall between existing means of protection, notably the Record of Monument and Places (RMP) and the Record of Protected Structures (RPS).

The ability to provide an adequate mechanism for ensuring the preservation of Meath's industrial heritage is dependent on firstly establishing the extent of this heritage in the county. The MIHS therefore represents a critical first step in this process, in that it has documented 1,705 sites for which cartographic and documentary evidence suggests the presence of industrial heritage features.

9.2. Survival of industrial heritage.

The MIHS survey has focused on the identification of industrial heritage sites from predominantly 19th century records, and as a result it is unclear what proportion of these features still survive today. Unfortunately, many industrial sites included in this survey are likely to be lost. As their original function became obsolete, they have become derelict or been demolished. This situation has been exacerbated by the frequent location of sites on or near canals and waterways and in towns, all of which are prone to residential development. Changing aesthetics have also had an impact on the survival of some sites, as they have come to be viewed as eyesores or as obsolete hulks.

By contrast, industrial heritage sites associated with canal and road transport, in particular bridges, and to a lesser extent rail transport, have survived remarkably well. This has been remarked upon in the Waterway Corridor Study (Buchanan et al., Section 4.2.9), which notes that these '...have been sympathetically upgraded to take account of modern usage requirements; those attributes which make them special are still clearly evident. The fact that they remain in use, even though many are over 150 years old, is testimony to their robust design and quality of construction'.

9.3. Current Protection of Industrial Heritage.

The primary existing means of protection for industrial heritage in Meath is through the Record of Protected Structures (RPS), which is compiled by the local authority under the 2000 Planning and Development Act. The existing Meath County Development Plan 2007-2013 (CDP) lists 1,096 Protected Structures (Appendix V), of which 188 are of industrial heritage interest and have been included in the MIHS. The features included in the CPD are generally those which were recorded during the NIAH Surveys of Meath and Navan (2002-3). The compilation of Local Area Plans (LAPs) by local authorities is presently ongoing, and these may recommend additional industrial heritage features for inclusion in the RPS by 2013. As a result, most upstanding industrial heritage features within those areas which have been the subject of LAPs should be protected from 2013.

A secondary means of protection for industrial heritage is through the Record of Monuments and Places, which lists 52 sites of industrial heritage in Meath, generally comprising older bridges, weirs and mills.

An additional and important body responsible for the protection of industrial heritage in Meath is Waterways Ireland, which was established in 1999 for the management, maintenance, development and restoration of the inland navigable system (rivers and canals), which includes many industrial heritage sites in County Meath.

9.4. Limitations of the present protective legislation and suggested remedies.

Although a significant quantity of Meath's surviving industrial heritage is protected, the primary method by which industrial sites are being protected is by way of a listing on the Record of Protected Structures. Whilst this does include upstanding elements of sites such as millraces associated with the mills within the protected curtilages, it does not afford a good means of protection for sites whose remains survive primarily underground. For example, in the case of tanneries where no above-ground remains are likely to survive, protection should not depend on the RPS alone. In addition, where most of a site has already been destroyed, additional elements of that site may survive in the vicinity as sub-surface remains. Protection of such sites (if considered

appropriate following site inspection) should be addressed through inclusion in the Record of Monument and Places (RMP), which lists archaeological sites.

Unfortunately, industrial heritage is often seen as a separate issue to archaeological heritage. Thus, for example, the four possible late medieval or early post-medieval windmills noted in the Archaeological Inventory for Meath are mentioned incidentally in passing, rather than as sites worthy of specific description or protection. This distinction is entirely artificial, and it must be noted that neither the definition of 'historic monument' as it appears in the legislation (National Monuments (Amendment) Act 1987, 1(1), p. 3), nor the RMP itself, is limited to sites pre-dating the year 1700.

The distinction between the inclusion of a site on the Record of Monument and Places and on the Record of Protected Structures should not therefore be based on the type or perceived date of a monument; rather on the likely forms of the remains, its condition and potential for re-use. Once a monument or feature is considered to be of sufficient interest to protect (whether it is an 18th century windmill or a prehistoric pathway), it should be placed on the RMP in the case of a site which survives primarily below the ground or which is derelict and will not be reused or renovated, or on the RPS if it is still standing and has the potential for re-use. This same point has also been raised during the compilation of other studies of industrial heritage elsewhere (e.g. Buchanan *et al* 2004), and is relevant for the protection of industrial heritage of Ireland as a whole.

9.5. Limitations of the present desk-based survey.

- 9.5.1. In addition to the summary of projected future stages described below, the following section has been included in this report as the compilation of the desk-based stage of the MIHS has led to the identification of further areas of potential work. These stem not only from areas of interest identified in the course of compiling the Survey, but also from a critical analysis of potential gaps in site identification arising from the nature of the Survey itself. As a result, and in order to clarify where these gaps and research opportunities occur, the limitations of the Survey to date are explicitly outlined below.

The aim of presenting the limitations in this way is to enable the development of general strategies within the different projected stages of future work, that will permit the effects of those limitations (such as skewed numerical information on sites, or the under-representation of site types in the record) to be overcome.

9.5.2. *Nature of the limitations.*

The use of the First, Second and Third Edition 6-inch scale Ordnance Survey maps as the primary sources for the identification of industrial sites in the Meath Industrial Heritage Survey (2007) has resulted in an over-representation of certain types of sites over others, and of sites in certain regions over others. Although the use of other cartographic sources (early 19th century pre-Ordnance Survey maps and early 20th century 25-inch scale Ordnance Survey maps), previously existing surveys (e.g. the Record of Protected Structures, Record of Monument and Places and National Inventory of Architectural Heritage) and written sources (e.g. Lewis 1837) led to the identification of numerous additional sites, the fundamental imbalances have not been addressed fully. These imbalances are site-type-based and region-based. They have been addressed in detail in Section 3.0. above, but are summarised here.

9.5.3. *Site-type imbalances.*

Whilst certain types of industrial sites, for example corn-mills, are consistently represented on cartographic sources over the period 1750-1930, others are less consistently represented (for example the cartographic representation of smithies prior to the beginning of the 20th century). Horse-powered industrial sites do not appear to be depicted in the county at all, despite being very common in the 19th century extractive industries elsewhere in Ireland. Changing map conventions have emphasised certain industrial site-types over others, and future work that depends less on cartographic sources should be able to address these imbalances.

9.5.4. *Distribution-based imbalances.*

The reliance on relatively large-scale maps (1:10,560 scale for the 6-inch OS maps), necessary in order to cover the entire county, has led to an emphasis on larger industrial sites at the expense of smaller sites, and an emphasis on industrial sites in rural areas at the expense of sites in urban areas. The former point is less problematic,

as even small features such as lime kilns are clearly marked on the 6-inch maps. The compact clustering of industrial sites in urban areas, however, means that the 6-inch maps often do not mark individual industrial features, emphasising instead the main routes and extent of the built environment. Even at a more detailed scale of 1:2,500 (the 25-inch OS maps) many industrial features are not marked individually. This is perhaps the most serious imbalance in the Survey, but it is also among the easiest to rectify with future work.

9.6. LIHS Project, Phase 2: Recommendations for Further Work.

9.6.1. *Further work in urban areas.*

As we have seen, the distribution-based imbalances inherent in the desk-based LIHS study necessitate further work which focuses on identifying industrial archaeology sites in urban areas. To that end, nine Urban Areas have been identified as requiring further investigation. Two of these (Kells and Trim) have been the subjects of significant urban studies (the Irish Historic Towns Atlas Nos. 4 & 14, Andrews & Simms 1990 and Simms *et al* 2004), and this is reflected in the range and detail of industrial sites recorded by the MIHS Survey in these two towns. The other seven towns, however, will require further study. Such detailed urban assessments might involve an extensive walking programme to identify industrial features followed by focused searches of industrial archives and historical information. Throughout the process, local historical societies should be involved.

9.6.2. *Site Inspection*

In addition to the detailed urban assessments, site inspection of the non-urban sites will be required in order to assess the survival of each identified site and the presence of associated features. A separate tab for field inspection has been included in the MIHS database to facilitate the recording of information gathered on site, which should include a photographic record.

It will not be necessary to visit all 3,381 of the sites identified by the MIHS. 1,676 are small-scale quarries and lime kilns that do not need to be visited, and 651 sites have been previously recorded during the compilation of the NIAH, Meath Bridge Survey, RPS and RMP. This leaves just over 1,000 sites that may require a field survey.

Many of the sites identified in the MIHS may have no surface traces, and this fact should be investigated and recorded. The assessment of the survival or otherwise of the industrial features identified in the MIHS will enable the protection of those sites which do survive. The site inspection will also enable the identification of industrial features associated with a site, such as mill-pools and mill-races with watermills, and pumping-towers, processing machinery and tramways with extractive sites, that may not have been marked on the cartographic sources. Detailed site inspection is critical in the case of certain site-types, for example windmills, in order to assess their date and type.

9.6.3. *Focused regional and site-type based studies.*

The existing MIHS database provides an excellent starting point for further focused studies, on a local or regional scale, or on a specific type of industrial site. Interest in undertaking such studies is likely to originate from academic institutions, local historical societies, the private sector (in the form of the EIS industry) and the public sector. Thus the database should be made available to these groups as a priority in order to encourage this work. The results of such focused studies can be integrated into the overall MIHS database, therefore gradually improving and enlarging the database. Future focused studies may incorporate additional information derived from industrial archives, such as those from private companies and semi-state bodies such Bord na Móna.

9.6.3. *Publication of MIHS.*

The hope that the MIHS will encourage the further study, and eventual protection, of the material remains of Meath's industrial past will only come to pass if the database is made widely available, in particular to local historical societies and to academic staff and students. The most effective method to publish the database is through the internet, which will also allow for the constant updating of the MIHS to reflect the contribution of ongoing work. To support online access, the 53 maps that form part of the survey could be linked to the database in a Geographical Information System.

1.1. Introduction: the database and record of sites.

The MIHS project methodology involved eight broad steps, which are individually described in Subsections 1.2 to 1.9 below. The system used to number individual sites, and the cartographic presentation of sites (including the maps used), is considered in Subsections 1.10 and 1.11 respectively. The eight steps can be listed as follows:

- 1). Establishment of site categories and database fields.
- 2). Setting-up of searchable computerised database.
- 3). Establishment of data set for initial identification.
- 4). Initial identification of industrial sites.
- 5). Further identification and database entry.
- 6). Cartographic presentation of industrial sites.
- 7). Detailed secondary analysis and archival research.
- 8). Establishment of grid references as basis for a future Geographical Information System (GIS).

1.2. Stage 1: Establishment of site categories and database fields.

The initial categories of sites to be included within the MIHS were discussed and decided at the initial meeting with the Project Steering Group in Meath County Council on 6th October 2008. The categories chosen, while reflecting locally specific concerns and phenomena, were informed by recent published works on Ireland's industrial heritage, particularly Colin Rynne's (2006) magisterial and comprehensive book on the subject (and see also Rynne 1999, 3) and the publication by Hammond & McMahon (2002, 9) which suggests a methodology for the identification and recording of industrial sites in Ireland (and see also the website of The Industrial Heritage Association of Ireland (<http://www.ihai.ie>)).

Another important factor taken into account was the authors' previous experience in compiling the Kildare Industrial Archaeological Heritage Survey in 2007 and Longford Industrial Heritage Survey in 2008, which provided an insight into field categories that had proved effective from the perspective of a person searching the finalised database.

Following on from that project, and as noted above, it has been one of the guiding aims of this survey that its format, database and categories would allow useful comparison between it and the existing Dublin, Kildare and Longford Industrial Heritage Surveys. The distinctive nature of County Meath's industrial heritage has also been accommodated within the final categories and fields that form the basis of the MIHS inventory. These fields and categories were identified from preliminary surveys of the cartographic sources and other material and in consultation with the Project Steering Group.

As a result, nine broad categories were initially identified which allowed the features, monuments and sites to be grouped into coherent inter-related units according to function and practice. Most of these categories are self-explanatory. A decision was also taken to separate out mills and mill-related features from manufacturing sites. This was done in order to facilitate searches for (for example) all watermills or all windmills. The 'Miscellaneous' category was created in order to allow the nature, number and extent of public institutions (e.g. workhouses) and urban areas to be assessed. Although not themselves strictly industrial, these features generated considerable manufacturing, extractive and other activities and were often symptomatic of various forms of industrial activity in the wider area. They have, therefore, been included within the remit of this survey and have been recorded and cartographically identified.

It should be noted that prisons have not been included in this survey, but could be added at a later stage of the project should evidence of significant industrial activity associated with them be identified.

It should also be noted that due to the very large number of extractive sites, lime kilns and small-scale quarries were treated in a different manner to other sites, and do not (with some exceptions) have corresponding database entries.

Thus, the structure of the survey comprises nine category headings, several of which overlap (refer Para 4.1 for further detail on these). The categories are:

- **Transport**
- **Extractive**
- **Health & Hygiene**
- **Post & Telecommunications**
- **Power**
- **Manufacturing**
- **Mills**
- **Fishing**
- **Miscellaneous**

These broad headings were further subdivided in order to allow the differentiation between different forms of activity within the categories (e.g. the 'Transport' heading was broken down to include separate road, rail, canal, river, sea, air and bridge categories). Within these different activities, specific site functions were also established so that individual features could be distinguished from each other (e.g. → 'Transport' → 'Canal' → 'Canal lock'). The categories and types are explained and discussed in more detail in Section 4.0.

1.3. Stage 2: Setting-up of searchable computerised database.

The MS Access 2000 database designed to store and present the results of the survey is described in detail in Section 3.0. Its format and operations are similar to those used by other similar surveys, such as the Dublin Industrial Heritage Survey, Kildare Industrial Archaeological Heritage Survey and Longford Industrial Heritage Survey, in that information was entered on computerised 'forms'. These forms included fields for all of the separate categories, subcategories and information requirements established in Stage 1 of the methodological process. Each form also includes a separate tab (presently blank) that is intended to provide space for information gathered during the later site-inspection and site evaluation stages of the survey. The database software also allows it to incorporate a range of digital information in addition to text, so that such items as scanned or digital photographs and other images may be included in the inventory as part of future phases of survey.

As ease of searching ('searchability') was considered to be essential to the use of the database, initial database design stages involved experimenting with the formatting and presentation of small numbers of feature entries in order to refine search processes.

As a result, the database is searchable by location (townland, parish, town, OS Sheet No., etc.), function (e.g. bridges, transport features, mills, etc.) and site name.

1.4 Stage 3: Establishment of data set for initial identification.

In compiling the MIHS, the 6-inch (1:10,560 scale) Ordnance Survey (OS) maps of Meath would form the initial data set or primary sources for the survey, and in this the compilers were drawing on the experiences of Hammond and MacMahon (2002), the compilers of the Laois and Dublin Industrial Surveys.

In the coverage provided by the 6-inch maps of Meath, the county is divided into 53 map sheets, which form the basis for the numbering and organisation of the inventory. Analysis of the chronologically sequential First, Second and Third Editions of these maps, supplemented by the Inventory and files of the Record of Monuments and Places (RMP; forming part of the archive of the National Monuments Section, Department of the Environment, Heritage and Local Government), led to the identification of the great majority of the industrial sites included in the survey.

The choice of the 6-inch maps was dictated by the fact that they represent a series of accurate 'snapshots' of the county on a field-by-field and townland-by-townland basis from the 1830s (First Edition of 1836-7) through to the 1910s, albeit reflecting the specific concerns of the surveyors. While the earliest edition of the maps included depictions of surviving industrial features from the later 18th century and before, successive revisions of the maps in 1879-82 (Second Edition), and in 1909-11 (Third Edition) also tracked their demolition and alteration, the construction of a range of 19th century industrial sites and places, and in turn their alteration and destruction. In some instances, particularly in the southwest of the county where 20th century Bórd na Móna railways needed to be identified, the map coverage was extended into the post-independence period, providing information on industrial developments after the 1920s.

The 'universal' geographical coverage of the maps and the fact that they record surviving 18th century elements (such as roads, mill, bridges, canals etc.) within the 19th and early 20th century landscape means that they are fundamental sources of

information on the configuration of Meath within the time frame of Industrial Archaeology. The fact that they also track the survival or destruction of individual features over time means that they are a valuable tool in pinpointing the former location (and, therefore, the possible extent of subterranean remains) of industrial features and sites that have not survived into the present day.

1.5. Stage 4: Initial identification of industrial sites.

This stage of the project entailed the identification of industrial heritage sites from the primary data set (the OS cartographic sources as described in Stage 3). The identification of features was conducted systematically and was based on a close examination of each of the 53 map sheets in the data set, beginning with Sheet 1 in the northwest of Meath, and ending with Sheet 53 in the southeast.

At this stage it was decided to expand the analytical process beyond the bounds of the primary data set by analysing two further sets of maps: the Ordnance Survey 25-inch (1: 2,500 scale) maps of the county (1910-1912), and the Discovery Series (1: 50,000 scale) maps (1996-8). Several reasons underpinned the decision to examine these two very different maps at this early stage in the survey.

Firstly, the different scales of these two maps facilitated the identification of industrial sites that were excluded because they were too small to be represented at the 6-inch scale, or that had not been explicitly labelled as industrial sites on the 6-inch sheets. The 25-inch OS maps were particularly useful for the identification of industrial features in larger towns, such as Navan, as the scale of the 6-inch maps generally precluded any detailed representation of industrial features within their dense fabric.

In addition, the much later date of the Discovery Series maps allowed the identification of 20th century industrial heritage features, notably Bórd na Móna industrial railways. Finally, technological improvements in cartography (the Discovery Series maps are compiled from aerial photography) have led to the inclusion of additional information that was not recorded on earlier OS maps.

Each of the identified industrial sites was sequentially numbered, from top left (northwest) to bottom right (southeast), and marked on print-outs of the maps (refer Section 2.10 for a description of the numbering format). Basic information was recorded for each of the examined sites, including details regarding the location of features; their presence or absence on the First, Second and Third Editions of the 6-inch OS maps; details regarding their cartographic representation; the names of features where recorded; and the types of features involved.

From an early stage of the project, it became clear that the quantity of lime kilns and quarries (including sand and gravel pits) was such that individual descriptions and numbering of these features would be impossible within the timescale available for the desktop study. In addition, it was felt that the visual representation of these features in the same manner as other industrial heritage sites would severely affect the potential use of the database, due to the fact that in large parts of the county, lime kilns are marked on almost every farm. Therefore, it was decided to record the overall distribution of lime kilns and quarries cartographically using colour-coded symbols, and that these sites would only be numbered and given corresponding database entries if they were of particular interest. In addition, with the exception of specific larger-scale features or quarries of particular significance, only the First Edition OS maps were used to identify lime kilns and quarries, and those marked on the Second and Third Editions were not recorded. This was based partially on the scale and number of sites identified and the fact that the First Edition is the best source for lime kilns due to early 19th-century soil improvement practices (they appear only rarely on the early 20th-century Third Edition). The distribution maps of the lime kilns and quarries generated by the MIHS survey therefore represent a 'snapshot' of small-scale quarrying and lime processing activities in and around the 1830s rather than a comprehensive survey of all 19th century activity of this sort. This approach was also a feature of previous industrial heritage surveys (e.g. for County Longford), where it was found to be effective.

The following Ordnance Survey maps were consulted during this stage of the project:

- OS 1st Edition 6-inch (1:10,560) maps (1836-37) – 53 sheets.
- OS 2nd Edition 6-inch (1:10,560) maps (1879-1881) – 53 sheets.

- OS 3rd Edition 6-inch (1:10,560) maps (1909-1911) – 53 sheets.
- Ordnance Survey 25-inch (1:2,500) scale maps (1910-1912).
- Ordnance Survey Discovery Series (1:50,000) maps (1996-8) – 8 sheets.

1.6. Stage 5: Further identification and database entry.

Stage 5 involved consultation of additional sources, particularly previous surveys of industrial heritage, or surveys that contained features of industrial heritage interest. These additional resources were consulted in order to obtain further details on sites identified in Stage 4 (the cartographic survey), and also to identify sites that were not marked on the Ordnance Survey maps.

A number of existing national surveys contain information on County Meath industrial sites and features. The Record of Protected Structures (RPS) of the Meath County Development Plan 2007-2013 contained 1,096 Protected Structures, of which 232 were of industrial heritage interest. The Record of Monument and Places (RMP) of the Archaeological Survey of Ireland was also consulted (both the 1996 printed edition and 2008 online edition), and it contained 49 sites of industrial heritage interest, generally weirs, mills, towns and bridges. The Archaeological Inventory of County Meath (Moore 1987) provided further information on these monuments. The National Civil Engineering Database, Trinity College Dublin, also provided useful information on a number of sites.

A number of Local Area Plans (LAPs) were recently compiled for 31 settlements in County Meath. These LAPs list features of industrial heritage of interest in their areas. Additionally, Architectural Conservation Areas (ACAs) listed by the Meath Development Plan 2007-2013, of which there are 18, often include industrial features, or, in the case of the Slane Mills ACA, focus entirely on industrial heritage.

Among the more useful surveys were the Meath and Navan sections of the National Inventory of Architectural Heritage (NIAH, 2002 and 2003). This source was of particular value in identifying industrial heritage sites such as water pumps and post boxes that had not been cartographically depicted. In total, the NIAH provided information on 241 sites of industrial heritage interest. A survey of the bridges of

County Meath (O'Leary 1989) was also utilised, and this identified and recorded 427 bridges of industrial heritage interest in the county, of which 384 were incorporated into the MIHS database.

The sources examined at this stage also included pre-1830 maps which had been compiled and published prior to the systematic surveys of the Ordnance Survey, and were published or produced between c. 1655 and 1816. They were examined as an initial step towards the establishment of rough dating sequences for the features under consideration, and were particularly valuable in drawing out information on sites for which there was little or no historical information. They included the Down Survey Barony and Parish Maps c. 1650s, Sir William Petty's map of the County of East-Meath 1685, Taylor and Skinner's Maps of the Roads of Ireland 1777-8, the maps of the Commissioners of the Bogs of Ireland by J. Alex Jones (District 4, 1810), William Larkin's Map of County Meath 1812 (Horner 2007), and D. A. Beaufort's map of the Diocese of Meath 1816. In addition, pre-1830s maps of adjacent counties often included features of industrial heritage interest in Meath. These included H. Moll's map of the Counties of Dublin and Louth 1728, Noble & Keenan's Map of Co. Kildare 1752, J. Rocque's An Actual Survey of the County of Dublin 1760, and John Taylor's map of the Environs of Dublin, 1816. Analysis of these maps led to the identification of numerous additional sites and features, particularly bridges and watermills, that had been destroyed before the compilation of the First Edition 6-inch sheets.

Information from Sir Richard Griffith's Primary Valuation of Tenements (1854) for County Meath has been extracted and reproduced in W. Hogg's (2000) *Mills: The Millers and The Mills of Ireland of About 1850*, including additional details on sites and, interestingly, a number of mill sites which had not been marked on the Ordnance Survey maps. Hogg has also recently published two further books which identify industrial sites from the OS maps. His book on mills published in 2008 identifies 131 mill buildings and four non-mill sites of industrial interest, and his book on smithies, also published in 2008, identified 74 mid-19th century smithies in the county based on the 1-inch to a mile maps of 1839-41.

Summaries of all licensed archaeological excavations carried out in the Republic of Ireland between 1970 and 2004 are available online at www.excavations.ie and in printed form as the *Excavations Bulletin* series edited by Isabel Bennett. This important resource was analysed for industrial heritage sites that may have been identified or investigated in the course of licensed archaeological works. Of those excavations that were carried out in Meath, 18 involved watermills, either through the excavation of medieval horizontal watermills, or excavations in 18th or 19th century mill complexes. A further three excavations also identified industrial activity, including an excavation at the Drogheda-Navan Canal.

The brief accounts of Meath parishes and towns which were compiled as part of Lewis' (1837) *Topographical Dictionary of Ireland* were also invaluable sources of information on potentially unidentified sites. They were particularly easy to access and search as they have been gathered together in an extremely useful online version by the Ordnance Survey of Ireland. Other contemporary historical documents or directories which mention industrial sites include The Civil Survey 1654-56 (Simington 1940), Pigot's Commercial Directory of Ireland 1824, and Slater's Commercial Directory of Ireland 1881, all of which provided numerous additional sites.

The following comprises a summary list of the sources referred to above (full details of the non-map sources are provided in the bibliography):

18th and early 19th century maps.

- Down Survey Barony and Parish Maps, c. 1650s.
- Sir William Petty's map of the County of East-Meath, 1685.
- H. Moll's map of the Counties of Dublin and Louth 1728.
- Noble & Keenan's Map of Co. Kildare 1752.
- J. Rocque's An Actual Survey of the County of Dublin 1760.
- Taylor and Skinner's Maps of the Roads of Ireland, 1777-8.
- Maps of the Commissioners of the Bogs of Ireland by J. Alex Jones (District 4), 1810.
- William Larkin's Map of County Meath, 1812 (Horner 2007).
- John Taylor's map of the Environs of Dublin, 1816.
- D. A. Beaufort's map of the Diocese of Meath, 1816.

Existing surveys of industrial sites in Meath.

- Record of Monuments and Places for County Meath, NMS DoEHLG 1996 & 2008.
- Archaeological Inventory of County Meath, OPW 1987.
- National Inventory of Architectural Heritage of Meath, 2002.

- National Inventory of Architectural Heritage of Navan, 2003
- Record of Protected Structures for Meath County, in MCDP 2007-13, Appendix V.
- National Civil Engineering Database, Trinity College Dublin.
- Valuation Office Mill Book, 1835-40 (Hogg 2000).
- Sir Richard Griffith's Primary Valuation of Tenements, 1854 (Hogg 2000).
- Hogg, W.E. 2008. *Smithies of Ireland of the 19th Century*.
- Hogg, W.E. 2008. *Mills of Ireland: A List Dated About 1850*.
- Johnson, S. 1997. *Johnson's Atlas and Gazetteer of the Railways of Ireland*.
- Broderick, D. 2002. *The First Toll-Roads: Ireland's Turnpike Roads 1729-1858*.
- Excavations Bulletins 1970-2004 (Bennett ed.)
- Meath Bridge Survey by Tim O'Leary (Meath County Council) 1987-1989.
- Architectural Conservation Areas for Meath County, in MCDP 2007-13, Appendix V.
- Draft Local Area Plans 2009-2015 (various towns), 2008. Meath County Council.

General historical reference.

- Lewis, S. 1837 *A Topographical Dictionary of Ireland*.
- The Civil Survey (AD 1654-56), County of Meath, Vol V,... (Simington 1940).
- Pigot's Commercial Directory of Ireland, 1824.
- Slater's Commercial Directory of Ireland, 1881.

By the end of this stage of the project, all of the industrial sites to be included in the MIHS had been identified, and basic locational, descriptive and dating records had been produced for each site. These records were entered into the computerised project database, and at the same time the sites were categorised into the established categories and types, as previously described. As noted above, information on the county's lime kilns and quarries was recorded in cartographic form only.

1.7. Stage 6: Cartographic presentation of Industrial Heritage Sites.

Upon its identification, the location of each identified site was digitally marked on a copy of the relevant sheet of the Archaeological Constraint maps for County Meath. These maps were compiled in the 1980s and substantially revised and updated in the 1990s as part of a national archaeological inventory aimed at producing a comprehensive state-wide Sites and Monuments Record. They now form part of the archive of the Record of Monuments and Places (RMP), and in the case of Meath, are predominantly based on the Third Edition 6-inch sheets (1909-11) of the county. They were chosen for use as part of the MIHS project as they provide a quick and convenient way to visually cross-reference Meath's industrial heritage with the location and occurrence of other earlier and less specialised archaeological remains within the county.

In order to distinguish between sites, each (with the exception of lime kilns and small quarries) has been assigned a unique number, marked on the map and entered into the searchable database in a way that reflects the established practice of the RMP and of other surveys. Where the exact location of a site is not known, a dashed line is used to indicate its probable approximate location. Urban areas that include numerous sites of industrial heritage are also marked, named and given individual site numbers. A detailed description of the numbering system is presented below (Sub-section 2.10), and for more information on map formatting, see Sub-section 2.11 and the maps in the accompanying separate volume. Both digital and paper copies of these maps have also been presented to Meath County Council.

1.8. Stage 7: Detailed secondary analysis and archival research.

This stage of the project comprised an assessment of the presence of additional historical and documentary sources relating to the industrial sites identified in Stages 4 and 5 of the project. Some of this information had already been generated during Stage 5 (see Sub-section 2.6), particularly where sites were mentioned by Lewis (1837). Where sites were identified through cartographic analysis only, or where they were not individually named on various maps, further consultation of more specialised historical sources was often required in order to yield additional information about them.

This stage therefore comprised a focused search of Internet and archival sources for appropriate material. Given the time constraints of the project and the scale of the analysis required in order to complete Stages 1 to 6, it was not possible to provide references for every site or feature identified. The references and historical information generated during this stage of the project should not, therefore be considered to be fully comprehensive, but should be used as starting points for further research on individual sites. Where possible, however, the location and full reference to relevant historical sources containing general or specific information regarding sites or features have been entered into the database. In relevant examples, the extent and potential of various archives and sources has been assessed.

General sources of information on Industrial Archaeology were also consulted at this stage in order to round-out some of the descriptions of sites in the database. References

to some of the more common site types have been included in Section 4.0 of this report under 'Additional Information', and full citations for these and other general references used are to be found in the bibliography at the back of the report. In most instances, however, the more specific or specialised references of relevance to particular sites or features are recorded on the data forms of the computerised database.

1.9. Stage 9: Establishment of grid references as basis for a future Geographical Information System (GIS).

Grid Co-ordinates have been provided for each of the sites and have been listed in a separate Excel spreadsheet so that the data can easily be linked with mapping data in a GIS system. Grid references are given as twelve digits (in the format EEEEEEE NNNNNN) representing a location accurate to 10m, and are based on the Irish Grid system (1975). Irish Grid Co-ordinates have also been included in the MS Access 2000 database as part of the basic information given on each site.

1.10. Explanation of numbering system.

The numbering system used in the MIHS (where individual sites are given 'Monument Numbers') is based on existing systems already used in Ireland to inventory archaeological monuments. The most influential and coherent of these is the numbering framework of the Record of Monuments and Places, which has influenced the similarly-conceived numbering scheme of the Dublin Industrial Heritage Survey implemented by Dublin City Council, and later industrial surveys in Kildare and Longford. All of these systems, like that of the MIHS, use OS 6-inch map sheet numbers as an organising principle.

The MIHS Site Number is a unique identifying number assigned to each site or place in the survey, and is presented in the format **MIHS 001-002--**. The first element of the code comprises the letter 'M' identifying the County (Meath) and IHS for 'Industrial Heritage Survey' as distinct from other forms of heritage. The next element (001 in the above example) gives the number of the Ordnance Survey 6-inch sheet on which the site is located. As the county is covered by 53 6-inch map sheets, the second element is always a number between 001 and 053. Three digits are used for consistency with existing systems.

The last element gives the number of the site or place within the sequence of different sites identified on the particular OS 6-inch sheet (so that the '002' in the above example means that the site corresponds to the location or features marked '2' in red on the relevant map). The final two dashes at the end allow related industrial features, or industrial sites situated in close proximity to each other in the dense fabric of towns to be given one overall site number, but at the same time to be individually identified. This is achieved by the use of sub-numbering within the overall site number. For example, the number MIHS 001-002 might denote a brewery complex, while MIHS 001-00201 might represent an individual malt house within the brewery complex; MIHS 001-00202, a warehouse within the complex, and so on. Each of these features, as well as the overall complexes within which they occur, have corresponding forms within the database.

The sub-numbering system is also particularly useful in the case of urban areas, for example Navan, where a large number of individual industrial sites lie within a compact area. The sub-numbering system also enables additional sites to be added as they are identified, and enables changes of use or ownership to be tracked and cross-referenced by assigning a different sub-number to the different phases of a site's existence.

1.11. Format of maps.

The maps on which the industrial sites are shown are reduced copies of Ordnance Survey 6-inch maps (i.e. 1:10,560 scale), as used by the Record of Monuments and Places. These maps have been reproduced at a scale of approximately 1:24,000 for the MIHS project, a scale dictated by readily available paper sizes (in this case A3).

The archaeological sites identified as Recorded Monuments by the RMP are identifiable on the MIHS maps as black circles or as areas clearly delineated and numbered in black. In order to distinguish the industrial archaeological sites of the current project from those of the RMP, all sites identified as part of the MIHS have been circled or approximately outlined on the maps using thick red lines. They have also been numbered in red according to the system set out above, while the names of towns and villages have also been added to the map sheets for ease of reference. In a number of

cases several sites have been outlined together because of their close proximity to, or association with, each other. It is important to note that although the circles and outlines around the MIHS sites are intended to indicate their relative positions, the circles and areas are not intended to define the exact extent of sites or any precise zones within which associated features might be found.

As noted above, a shortened version of the appropriate MIHS number as given in the database appears on the maps beside each circle or outline denoting a site or sites. The first elements of the MIHS number (the MIHS part and the number indicating the 6-inch sheet) have been omitted for reasons of space and simplicity. Thus, the first site marked on Sheet 1 will simply have the number 1 written in large red type beside it, rather than the full number MIHS 001-001.

Dashed red lines are used where the exact location of an industrial heritage site has not yet been ascertained, and only an approximate location is known.

On each of the 53 map sheets, lime kilns and quarries (for sand, gravel or stone) appear on the 1836-7 OS map are marked by coloured shapes: blue dots for lime kilns and green squares for quarries.

In addition to the 53 OS map sheets, five figures (Figs. 1-5) have been included in the report. These show the overall distribution of all MIHS sites in Meath (Fig. 1), transport infrastructure (Fig. 2), extractive sites (Fig. 3), watermills and windmills (Fig. 4) and the index page for the 53 OS maps sheets (Fig. 5).

2.1. Introduction.

The survey database was set-up using MS Access 2000, and was designed with the aim of providing an easily usable format and allowing for maximum searchability. This section is intended as a basic guide to reading, searching and entering new information into the database. It is primarily intended for those unfamiliar with the MS Access software.

2.2. Reading the Database.

When the survey file 'MIHS' is opened a dialogue box with a number of options, in the left of the box, appears. This offers a choice of how the information contained within the database can be viewed and used. Of primary importance for reading information stored in the database are 'Forms' and 'Tables'.

2.2.1. *Form View.*

Form View is the most useful way to read and enter information on the database. In this view each entry within the survey is shown as a separate page or form, with a series of categories or 'fields' into which the information is entered. For the purposes of this survey the form was divided into three areas:

- (i) The top half of the form contains the basic information for the site (name, type, location, etc.). This is visible at all times and is considered as the primary information.
- (ii) The second half of the form is tabbed, with the upper tab containing all the information obtained from the desk-based survey. This involves analysis of a number of maps, information contained in other related surveys and other sources. It also contains some comments/analysis of sites, with possible dates suggested, and references to where further information can be obtained.
- (iii) The lower tab in the second half of the form is labelled 'Field Survey', and has been left blank for future completion.

The formatting of the primary information stored for each site is explained in tabular form below:

<i>Field Label</i>	<i>Comments</i>
MIHS Ref.	This is the unique identifying number for each industrial site.
MIHS No.	This is identical to the Site No. , but is broken into two separate fields (the 6-inch Sheet No. and the unique Site No. within that sheet), to increase searchability of the database.
Site Name	The name listed for a site is generally as labelled on maps, or named in other sources. However, many sites were unnamed and in these cases rather than leaving the field blank the sites have been given generic names such as 'Mill' or 'Bridge'. This was solely to give an extra field for searches within the database.
Site Type	This contains the type of feature listed. Information within this field has been kept as brief as possible. However, in many cases the type had to be qualified, particularly in the case of uncertain sites where (possible) has been added after the type.
Same Site as MIHS-	This is generally of use for sites that extend across map sheets, e.g. canals and railways, and allows for a feature to be traced across the 6-inch maps.
Associated with	This contains the MIHS ref. no. for features related to the site in question. For example bridges crossing a railway, would contain the MIHS Ref. No. of the railway in the Associated With box.
Location	This is set at Co. Meath by default
Townland	Where a feature extends into/ across two or more townlands these are separated by semi-colons. Where a feature is located on the boundary of two or more townlands this is indicated by '(junction)' after the townlands names. Townland spelling is based on the 3 rd Edition (1909-11) of the OS 6-inch maps.
Civil Parish	Multiple parishes are separated by semi-colons.
Barony	Multiple baronies are separated by semi-colons.
Address	This is primarily used for locating urban sites, or where a feature is located within demesne grounds.
Nat. Grid Ref.	Location of the feature on the Irish Grid system (1975)
Point / Polygon	This relates to the Irish Grid Reference given. The point box is ticked where the co-ordinates refer to the centre point of a discrete site, e.g. a bridge. The polygon box is ticked where the co-ordinates refer to a

<i>Field Label</i>	<i>Comments</i>
	single point on a linear site or one that extends over a larger area or has multiple features, e.g. canals, most mills, urban areas. Both boxes are left blank in cases where the exact location of a site is uncertain.
Classification	The function of the site by category is shown by tick-boxes. More than one category may be ticked.

The screenshot shows a software interface with a 'Classification' tab selected. The form contains several categories with tick boxes for selection:

- Transport:** Road , Rail , Canal , River , Sea , Air , Bridge
- Extractive:** Quarry , Mine , Peat , Other
- Health and Hygiene:** Water , Waste , Other
- Post and Telecommunications:** Postal , Telephone , Telegraph
- Power:** Gas , Electric
- Manufacturing:** Food , Drink , Building Materials/Timber , Textiles / Leather , Metalworking , Chemical , Other / Unidentified
- Mills:** Windmill , Watermill , Millrace / Millpond , Other Mill Features / Residence
- Fishing:** Weir , Other
- Miscellaneous:** Urban Area , Institution , Market , Other

At the bottom, there is a record navigation bar showing 'Record: 419 of 1700' and a 'Form View' label.

The formatting of the information from the desk-based survey is as follows:

<i>Section</i>	<i>Comments</i>
Maps	The primary source of cartographic information were the first three editions of the Ordnance Survey (OS) 6-inch maps (1836-7; 1879-82 and 1909-11) and the 1 st Edition 25-inch map (1910-12). The most relevant historic maps are also listed. Presence or absence of a site is denoted by tick-boxes, and a short description of the depiction of the site on the relevant map is included. 'Other maps' contains the names of other, less relevant, historic maps or maps from other surveys. Further information regarding the appearance and labelling on these ' Other Maps ' is contained in the 'Comments' field.
Surveys	This contains information regarding the presence of the feature in other surveys, primarily the Record of Monuments and Places (RMP); the Record of Protected Structures (RPS), the National Inventory of Architectural Heritage (NIAH) and the Meath Bridge Survey (MBS).
References	This contains references of sources for information in the ' Comments ' and ' Additional Information ' fields.
Comments/ Estimated Date of Site	Containing some basic analysis of the information derived from the maps and from secondary research, descriptions of features as they appear on historic maps, and where possible a date.
Additional Information	This field is used where information included is too lengthy to fit in the Comments or References fields.

To navigate around a form page use the scroll bars at the bottom and right-hand-side of the window. It should be noted that using the scroll-wheel on a mouse moves between pages in the database and cannot be used to navigate within a page. Where information for a field is not fully visible within a text-box, because it is too long for the text-box, clicking into the box will bring up an internal scroll-bar for that box, making it possible to scroll down and read all the information entered. In particular, this may occur where a feature passes through numerous townlands, which although all entered into the **Townland** text-box, may not be fully visible.

Microsoft Access - [MIHS Form]

Meath Industrial Heritage Survey

Nat. Grid Ref. | 274104 275848

Point Polygon

Classification: **Maps and Surveys** | Comments and References | Field Survey

Maps:

OS 1st Edition 1836-37 1:10560

Label / Description: Large complex of buildings arranged around two yards to south of Headford Place and to the east of Kells town.

OS 2nd Edition 1879-1881 1:10560

Label / Description: Not marked on map.

OS 3rd Edition 1909-1911 1:10560 OS 25" Edition 1910-1912 1:2500

Label / Description: Complex appears to have been demolished.

17th Century Maps Specify

18th Century Maps Specify

19th Century Maps Specify: Ordnance Survey 1-inch(1:1,056) map of Kells, 1836
Map of Kells by Sherrard, Brassington & Greene, 1816-17

Other Maps Specify

Surveys:

Record: 419 of 1700

The total number of entries in the database is visible at the bottom of the window. This shows up relative to the entry opened in the form (e.g. 100 of 670). To move between pages of the database, use the 'forward' (▶) and 'back' (◀) symbols at the bottom of the page. The forward and back symbols with a line after/before them will bring up the last or first page of the database respectively. As mentioned above, the scroll-wheel on a mouse can also be used to move between pages in the database.

To enter a new site into the database in form view, click on the '►⊖' button at the bottom of the window. This will bring up a blank form page into which information can then be entered. Click into a text-box in order to type data for that particular field. Clicking on a tick-box will create a '4' in the box, clicking on it again will delete this.

To delete an entire record from the database, go to the form page for that record. Select 'Delete Record' from the Edit drop-down menu in the menu bar. A dialogue box will appear asking to confirm the deletion. Once confirmed the record is no longer in the database. Please note, this action cannot be undone.

Microsoft Access - [MIHS Form]

Meath Industrial Heritage Survey

MIHS Ref: 017-00109

MIHS No.: 017 - 00109

Site Name: Brewery

Site Type: Brewery

Same Site as: MIHS-

Associated with: MIHS- 017-00103

Location:

County: Meath

Townland: Townparks

Civil Parish: Kells

Barony: Upper Kells

Address: Headford Place, Kells town.

Nat. Grid Ref.: 274104 275848

Point Polygon

Classification: Maps and Surveys **Comments and References** **Field Survey**

References

Irish Historic Towns Atlas of Kells (No. 4). 1990. Andrews, JH & Simms, A. (eds).
 Registry of Deeds, Dublin, memorials of deeds, 1834/29/37 [and possibly 207/140/136415].
 Pigot's National Commercial Directory of Ireland (19th Century), Dublin.
 Valuation Reports: Manuscript revision books & maps, Kells District Electoral Division, 1877-1928, Valuation Office: Dublin.

Estimated Date of Site 1817-1824

Comments / Additional Information

The brewery appears as a large complex on maps from 1817 onwards, and is mentioned in Pigot's Directory of 1824 and valuation records in 1837. It went out of use by 1854-5, when a flax mill (refer MIHS 017-00103) was constructed on the site (HTA, 10). A brewhouse, possibly this building, is also noted in the Registry of Deeds in 1760.

Ordnance Survey 1-inch (1:1,056) map of Kells, 1836: large complex of buildings arranged around two yards to south of Headford Place and to the east of the town.

Map of Kells by Sherrard, Brassington & Greene, 1816-17: large complex of buildings arranged around yard to south of Headford Place and to the east of the town; seems slightly smaller than OS 1837 depiction.

Record: 419 of 1700

Form View

2.2.2. *Table View.*

The database can also be viewed as a table. To open the database in Table View, click on the 'Tables' icon in the original dialogue box (see 3.2.1.). The file 'MIHS' should appear in the right-hand-side of the dialogue box. This is the database in the form of a table.

The amount of information stored for each entry in the database means that reading the database in table view is difficult and unwieldy. Likewise entering new data in table view may not be practical. For both of these form view would be the preferred option.

The columns in table view correspond with the fields visible in form view. The column 'Dbase ID' appears only in table view. This is an automatic identity number given to each entry and is used as a key by the database programme to recognise/identify a given entry.

The main advantage of viewing entries in table view rather than form view, is that a number of entries are visible at the same time, allowing for quick comparisons between sites. Both form and table views of the database can be sorted by a single field, in ascending or descending order, by selecting an entry in that field and clicking the 'sort ascending' (or 'sort descending') icon from the menu bar.

2.3 Searching the Database.

Simple searches can be carried out in either form or table view of the database, using the 'Find'; 'Filter by Selection' or 'Filter by Form' functions. These are explained below for form view, but are also applicable to table view.

The 'Find' function is most useful to find a specific entry. Although it can be used to search for a group of sites, it will automatically find the first entry, which matches the search. The search has to be repeated for each subsequent matching entry. As such, it does not allow for comparisons between sites and no information is given as to how many entries match the search.

To perform the find function in form view (using 'mill' as an example):

- Click into the text-box of the field to be searched (in our example click into the 'Site Type' box).
- Click the 'Find' icon in the menu bar (denoted by a pair of binoculars).
- A dialogue box appears. Enter the search data into the 'Find What' text-box. E.g. enter 'mill'.
- Choose 'Any Part of Field' from the drop-down menu for the 'Match' text-box at the bottom of the dialogue box. This allows for entries with multiple types, and also windmills. Note that searches are not case sensitive.
- Click 'Find Next'.
- The database will jump to the first entry in the database, which matches the search information. 'Find Next' must be clicked each time to find the next entry. If there are no matches a dialogue box with this information will appear.
- It is better to keep search information as simple and short as possible (using key words).

The 'Filter by Selection' function filters all entries matching a search from the database, presenting them as a sub-set of the database. In this way it is more useful than 'Find' for searching for a group or type of entries. It is however, necessary to first find an entry with the required search information. As a result it is more useful in table view than form view. In form view it would be necessary to first 'Find' a relevant entry before performing a 'Filter by Selection'.

Once again using 'mill' as an example, to perform a 'Filter by Selection' the following steps are required.

- Select the category to be filtered. Therefore to find mills, click into the text-box of Site Type containing the text 'Mill'.
- Click on the 'Filter by Selection' button in the menu bar. This is represented by a 'funnel and lightening bolt' symbol.
- All entries with 'Mill' in the **Site Type** field are filtered from the database. The total number of matches for the search is visible at the bottom of the window.

- To undo the filter and return to the main database, click the Filter button (represented by a funnel) in the menu bar.
- The main disadvantage with Filter by Selection is that it finds exact matches only. Therefore, in our example, entries with 'Mill (possible)' or 'Windmill' in the **Site Type** field will not show up in the filter results.

The 'Filter by Form' function is more versatile than the other two search functions. As with 'Filter by Selection' the results are presented as a sub-set of the database, with the total number of matches visible at the bottom of the window. It also allows for multiple information to be searched and contains an 'or' function. To perform a 'Filter by Form' search in form view:

- Click on the 'Filter by Form' button on the menu bar (represented by a funnel with a form page). This brings up a blank form page (however, if a previous filter was carried out the information for this may still appear and should be deleted before carrying out a new search).
- Type the information for the search into the appropriate field. Using an asterisk (*) before and after the search word acts similar to the 'Any part of field' in the Find function, and increases the success of a search. It is recommended this always be used. Thus to search for mills, enter **"*mill*"** into the **Site Type** text box.
- Click the 'Filter' button in the menu bar (represented by a funnel symbol).
- All entries matching the search information are presented as a sub-set of the database. This sub-set can then be further searched by any of the search functions above.
- To undo the filter and return to the main database, click the Filter button (represented by a funnel) in the menu bar.
- More precise searches can also be made. For example, to find all mills associated with the textile industry, enter **"*mill*"** into the **Site Type** text box and tick the **'Textile/Leather'** box in the **Classification** section. Clicking the Filter button then produces a sub-set of all mills classified as textile mills.
- In form view, at the bottom of the search form is a tab labelled 'or'. Clicking on this produces a second search form, to allow for wider searches.

2.4. Queries.

Queries provide another way of searching the database. The main advantage of queries is that they are saved as sub-databases within the overall database. They are also versatile, and the number of fields viewed in a query can be controlled. Queries are particularly useful to store commonly used searches, or to store versions of the database with less fields, which are easier to read in table view (and example of this latter is the stored query 'MIHS List' already on the database).

Queries open in table view and can be searched in the same way as the overall database in table view. As queries are linked to the database, any information altered/entered into the database is automatically altered/entered into saved queries.

To create a query:

- Choose 'Queries' in the original database dialogue box (see 3.2.1.).
- From the right-hand-side of the dialogue box double-click 'Create Query in Design View'.
- A new dialogue box appears called 'Show Table'. This allows for a choice of what table/set of information is used for the query. Both full database tables and query tables can be queried. To query the main database select the Table 'MIHS' and click 'Add'.
- Click 'Close'.
- A box resembling a short blank table is visible in the window. At the top left-hand-corner of this is a small menu box listing all the fields in the chosen table. Double-click each field that is to appear in the query. The fields will then appear in the short table. Include as a minimum all the basic information fields, and those fields specific to the query. It is possible to include all the database fields in a query, although this is usually unnecessary.
- For example, in a query for mills, it may be useful to include the 'Manufacturing' set of Classification fields as well as the basic map information and NIAH information, but those fields with lengthy amounts of information may be omitted.
- It is also possible to include a field in a query for search purposes but hide it on the query results. To do this, un-tick the 'Show' cell for the relevant field.

- To specify the information required in the query, use the row labelled 'Criteria'. For example to query mills, enter '*mill*' in the Criteria cell for **Site Type**. Note that the asterisks perform the same function here as in Filter by Form.
- As with the Filter by Form, more specific queries can be undertaken by entering criteria to be met in more than one field, e.g. To query mills which appear on Larkin's map of 1812, enter '*mill*' in Site Type and 'yes' in the Criteria cell for **Wm Larkin 1812**. (Fields with tick boxes recognise 'yes' and 'no' for query criteria).
- As with the Filter by Form, queries have an 'or' row for Criteria, so broader queries can be carried out.
- To view the query results simply click the Datasheet View button (with a Table icon, located at the left-hand side of the menu bar). This brings up the query as a table.
- The query can then be saved.
- To alter a query, click on the View button again (this time with a ruler icon denoting 'Design View'). This brings up the design view of the query and the information contained in the query can be altered.

2.5. Reports

Reports are the printable views of the database, displaying the information in a more reader friendly way. As they are intended primarily for printing, they lack the search functions of the other views of the database. However, as with other views of the database, any changes made to the database are automatically up-dated in a report. Therefore, once a report is created it is not necessary to manually update it at any point.

A report has been created as part of the initial stages of the survey, namely 'MIHS List', which contains the basic information for the sites within the database, presented in columnar form. The printed version of this report is included with this report.

3.1. Introduction.

As noted in Sub-section 2.2 above, a number of basic categories of industrial site were defined from the outset of the study. These included ten main categories nine, which were in turn divided into a range of sub-categories in order to enable the organisation and comparison of data generated from cartographic and historic sources. These categories are:

- **Transport**
 - Road
 - Rail
 - Canal
 - River
 - Sea
 - Air
 - Bridge
- **Extractive**
 - Quarry
 - Mine
 - Peat
 - Other extractive
- **Health & Hygiene**
 - Water
 - Waste
- **Post & Telecoms.**
 - Postal
 - Telephone
 - Telegraph
 - Radio
- **Power**
 - Gas
 - Electricity (inc. Hydro & Peat)
- **Manufacturing**
 - Food
 - Drink
 - Building materials & timber
 - Textiles & leather
 - Metallurgical
 - Chemical
 - Other/Unidentified manufacturing
- **Mills**
 - Windmill
 - Watermill
 - Millrace/millpond
 - Other mill features/residential
- **Fishing**
 - Weir
 - Other
- **Miscellaneous**
 - Urban Area
 - Institution (workhouse or industrial school)
 - Market (market house or weighing machine)
 - Other

The following sections comprise brief descriptions of each of the site types identified within the categories listed in terms of their representation on cartographic sources. Within these descriptions, consideration is given to the roles played by different sources and changing mapping conventions in the identification of the different site types. Where sources other than maps were also used to identify sites, these are described, while the limitations of the Survey (and possible resulting biases) will also be addressed within each sub-section. Additional sources and references that give further information on each of the site types have been listed in individual entries in the database itself, and these are also repeated below. A more analytical consideration of each of the site types can be found in Section 5.0, which outlines some of the results and conclusions drawn from the compilation of the Survey.

3.2 Transport Related Sites

Industrial sites recorded under the broad category of transport were subdivided into seven sub-categories: railways, canals, roads, rivers, sea, air and bridges. Many of the sites fell under multiple categories, for example the Boyne Navigation Canal was entered under both 'river' and 'canal', and a road bridge crossing the canal was entered under each of the categories 'canal', 'road' and 'bridge'. A road bridge crossing a named river (named on the Ordnance Survey maps) was recorded as being in the category of 'river' as well as 'road' and 'bridge', whilst one crossing an un-named stream or millrace was simply categorised as 'road' and 'bridge'. This enables the cross-referencing and comparison of similar sites and features that were constructed for different purposes, and also allows the numbers of particular site types to be estimated. It is also hoped that the multiple categorisation of site types will facilitate future specialised or site type-based studies based on the data generated by the survey.

3.2.1. *Roads.*

Roads were generally not separately included as individual sites within the survey. However, a range of road-related features such as turnpike toll booths, milestones and garages/filling stations were listed, while some of the accounts of road bridges contain incidental information on the construction or configuration of individual stretches of road. Amongst the best sources for road-related sites are the range of cartographic sources, and particularly Taylor and Skinner's Road maps of 1777-8, which between

them depict the evolution of the road transport network of the county. A further excellent source for turnpike-related features is Broderick's 2002 book on the subject. Other road-related sites in the MIHS included car, carriage and coach manufactories.

3.2.2. *Bridges.*

Bridges were the most numerous transport-related sites to be individually identified in the course of compiling the survey. Identified examples included road and foot-bridges that spanned rivers, streams, canals and railways. The criteria for including a bridge in the MIHS were: that it had been named in the cartographic or historical sources; and/or crossed a named river; and/or had been previously recorded as a Protected Structure in the National Inventory of Architectural Heritage (NIAH), the Record of Monuments and Places (RMP) or the Meath Bridge Survey (MBS). These criteria have resulted in the inclusion of all major bridges over rivers, minor named bridges, unnamed bridges over significant rivers, and bridges crossing canals (which are all named, and which are often recorded in the NIAH). This approach has ensured that almost all structurally significant or historically recorded bridges have been included within the survey. Less common, but also present in significant numbers, were rail bridges which crossed roads, canals, rivers and streams, and which were always included even though these are rarely named. The decision to exclude unnamed crossings of roads over minor streams or drainage ditches was taken on the basis of the impossibility of cartographically distinguishing between bridges, informal culverts and culvert pipes at these points. It also reflects the impossibility of adequately recording the extremely large numbers of these features within the time limits and scope of the survey project.

Bridges are generally marked on all three examined editions of the OS maps by strengthening or adding bold lines along the edges of a road at the point at which it spans a channel or body of water. Larger bridges are shown with angular piers, the number of which often does not correspond with the actual number of arches observable on the ground. Bridges are, in general, more likely to be named on the Second and especially Third Editions of the 6-inch sheets. Railway bridges, given their origins in the railway-building decades of the 1840s to c. 1880s, are, of course, only marked on the Second and Third 6-inch map Editions (post 1850s).

Many bridges (both small and large) are marked on earlier historic maps from the 17th and 18th centuries, particularly if those bridges lie at county boundaries or on major regional or national routeways. Canal bridges only occur on those maps of Meath that were compiled following the extension of the canal network into the county in the second half of the 18th century. Where the names of bridges are marked on 18th century maps, these names are almost always the same as the names by which the bridges are known at present, with some exceptions. Although bridges of all types are rarely mentioned in the historical sources, they are well represented in all of the surveys consulted (NIAH, RMP, RPS & MBS). Overall, therefore, the most useful source of information on the bridges of Meath in general is the Third Edition 6-inch OS map (c. 1907-9). Consultation of O’Keeffe and Simington’s (1991) *Irish Stone Bridges* is also recommended as the majority of the bridges identified (with the exception of the railway bridges) are likely to have been built of stone.

During the compilation of the MIHS, a number of medieval bridges which had fallen into disuse or were abandoned before the industrial period (c. 1750), were identified. This was not the case in the previously compiled Longford or Kildare Surveys, and results from the extensive historical documentation that exists for County Meath. Following consultation with the Project Steering Group, it was decided to include such sites in the MIHS.

3.2.3. *Railways.*

Railway tracks, stations and associated features (station buildings, level crossings, bridges, goods sheds, etc.) are clearly depicted and labelled on the Second and Third Editions of the OS 6-inch maps, and absent on earlier sources. The tracks themselves, comprising track corridor and tracks, are generally represented as two or four parallel lines, often flanked by hachures indicating cuts or embankments and by further lines denoting the presence of adjacent drains. Railways constructed after the 1930s, such as the Bórd na Móna railways in the east and southeast of the county, are not marked on the Second and Third Edition 6-inch sheets maps and, for information on these, Johnson (1997) and the OS Discovery Series 1996-8 maps have been consulted. Railway stations and railway bridges are also often listed in the NIAH, but were not recorded as part of the Record of Monuments and Places.

There are a number of additional references for the railway lines and other railway features of County Meath. These have been entered into the relevant entry in the MIHS database where appropriate and include a number of general books on railways (Baker 1995; Hajducki 1974; Johnson 1997; Mulligan 1990; O'Farrell 1990; Share 2006), and specialised publications on individual railway branches. As noted, bog railways and quarry railways for industrial use are discussed by Johnson (1997).

3.2.4. *Canals.*

Canals and associated features (locks, bridges, aqueducts, canal-supply streams, harbours, lock-houses, etc.) are labelled and depicted on all three editions of the OS 6-inch sheets. The Royal Canal channels are usually represented by two or four parallel lines, occasionally flanked along their external edges by hachures denoting embankments and by further parallel lines denoting networks of drains. The Boyne Navigation Canal is occasionally depicted in this manner, but is more usually depicted as a narrow unembanked channel of two parallel lines running adjacent to the Boyne River, in stretches with a lock and lock house downstream, and a weir upstream. Details such as tow-paths and locks are depicted in more detail on the First Edition than on later 6-inch maps. This is probably due to the fact that canals lost some of their importance following the establishment of the rail network, and also because the expansion and resulting mapping of an urban areas often obscured the clear labelling of features on canals. Locks are usually depicted by a '>>' symbol (denoting the presence of two sets of lock gates). Lock houses can usually be identified by their proximity to a lock, but are rarely labelled specifically. In terms of non-cartographic sources, the NIAH is an excellent source of information on canal-related features, and lists and describes many of the canal sites cited in the MIHS in the database. The NIAH is particularly useful in that it also lists canal-related warehouses that are generally not marked on the OS 6-inch Maps.

There are a number of additional references to sources of information on canals in County Meath and these have been entered into the relevant entries in the MIHS database where appropriate. These include general books on waterways (Coyne 1902a; Delany 1993), and books on the Royal Canal (Clarke 1992; Delany 1992) and Boyne

Navigation Canal (Ellison 1983). The Inland Waterways Association of Ireland website (www.iwai.ie) is also an excellent source of general, historical and other information on the canals, and it has a dedicated section (www.boyne.iwai.ie) for the Boyne Navigation Canal from Drogheda to Navan. The National Library also includes photographic images from the Irish canal systems among its archives.

3.2.5. *River, Sea and Air transport.*

Although the Boyne and Blackwater Rivers form a hugely important transport network connecting the main towns of County Meath with Drogheda and the Irish Sea to the east, relatively few river-transport industrial sites were identified in the MIHS survey, with the exception of the Boyne Navigation Canal and bridges which crossed rivers. Amongst the river-related sites that were included are several docks or small river harbours, and a series of riverine and marine navigational sites (lighthouses, direction posts, beacons, etc.) situated around the Boyne Estuary. The only air-transport-related site was the Gormanstown Aerodrome.

3.3. Extractive industries.

3.3.1. *Quarries.*

Quarries account for the vast number of extractive sites in the survey, and indeed they are the second most common industrial feature in Meath, only exceeded in numbers by lime kilns. As noted above (with the exception of named quarries or quarries of particular historical or industrial interest) only quarries on the First Edition map were recorded by the MIHS, and these have not been assigned individual numbers, nor have they been given individual MIHS entries.

The First Edition 6-inch OS map explicitly differentiates between quarries, sand-pits and gravel-pits in the legend and key accompanying its sheets, however in practice the difference between a sand-pit (shown by an area of thin dots) and a gravel-pit (slightly thicker dots) is difficult to distinguish because of the relatively small scale of the map. Stone or other types of quarries are generally depicted as rocky hollows, but at times very small quarries are difficult to identify. Fortunately, almost all quarries are clearly labelled on the First Edition map.

Those wishing to further investigate the occurrence of quarries on the First Edition 6-inch map of Meath should also note that the National Library of Ireland's microfiche copies of this map are particularly difficult to use, as numerous minor blemishes on the microfiche surfaces look identical to quarries. For this reason these were not used in the survey. In addition, the marking of parish boundaries by a thick green line can obscure fainter features, although this is not a problem when the quarries are labelled.

Large scale and historically important quarrying operations were included in the survey, and these appear both on pre-19th century and 20th century cartographic and in publications (e.g. Lewis 1837). Additional sources of information on 19th century quarrying in general were also examined (Kinahan 1889; Rynne 2006).

3.3.2. *Lime kilns.*

Although strictly a manufacturing/processing feature rather than an extractive one, lime kilns were considered under the heading of extractive industries because of their strong association with extractive sites, and because they were treated (due to their ubiquity) in the same manner as quarries. Thus, as noted above (with the exception of lime kilns considered to be of special interest) only lime kilns on the First Edition map were recorded by the MIHS, and these have not been assigned individual numbers, nor have they been given individual MIHS entries.

Lime kilns are depicted on the First and Second Edition OS 6-inch maps as a small circle with the lower portion shaded in. They are not depicted on the Third Edition 6-inch map, although they do appear infrequently on the 1910-12 edition of the 25-inch OS map as small square structures labelled 'L.K.'. Unsurprisingly, lime kilns are often associated with quarries, although this relationship is not as strongly marked as it was in other counties studied (e.g. Kildare). It is of interest, given the fact that they are the single most common built industrial site type in Meath, that they are almost absent from the historical literature. This is likely to reflect not only the relatively modest importance generally assigned to them as built structures, but also their frequent association with agriculture (where burnt lime was to neutralise acidity in soils), the poor 'visibility' and isolated occurrence of their physical remains, and their limited survival.

3.3.3. *Peat-related sites.*

As many of the features and sites associated with the industrial extraction and processing of peat in County Meath date to the later 1930s and thereafter, they are generally under-represented in the Survey. However, in order to redress this issue, and given the historical importance of the peat industries to Ireland as a whole, the recent OS Discovery Series maps of Meath (1:50,000) were examined for peat-related industrial features. This resulted in the incorporation of a number of peat railways marked on the map in the Survey. Additionally, historical sources, particularly Johnson's (1997) work on bog railways, proved invaluable in adding to the cartographically-derived information.

3.3.4. *Mines, brickworks and other extractive industrial sites.*

Mines and tile/brickworks are depicted relatively rarely on the cartographic sources, but do occasionally appear. No specific cartographic symbols were used to depict mines on the Ordnance Survey maps, although small circles indicating mine pits were occasionally used, and the existence of such features instead tended to be indicated by text labels (for example 'pits'). The same is true of tile- or brickworks, brickyards (although these were occasionally marked with symbols), and tile or brick kilns, which include both the extraction and processing of clay to make bricks and tiles. Marl pits were also marked on OS maps generally only of the First Edition) and these have also been included in the survey. Although scattered mines and brick or tile works are occasionally marked on all three editions of the 6-inch OS maps, and also on the 25-inch OS sheets, such sites do not appear on other cartographic sources. Modern industrial sites were included when these were considered to be of particular importance for the county (for example the Tara Mines and Platin Cement Factory)

3.4. Health and Hygiene.

3.4.1. *Water.*

Water services were recorded in the MIHS where they were considered to be of potential industrial heritage value or where they were likely to have involved the application of significant industrial engineering technologies. For this reason, the MIHS database contains information on water pumps and hydrants, and hydraulic rams. Given their small scale, most of the information on water pumps and hydrants in

the MIHS derives from the recording of such features in the NIAH survey. The identification of hydraulic rams, by contrast, was primarily based on their depiction on the Third Edition 6-inch OS sheets. Water towers, where cartographically depicted, were also included in the Survey and a proportion of the entries concerning these structures also include information generated by their inclusion in the NIAH. Reservoirs and water plants were also included when they predated 1930.

3.4.2. *Waste.*

Cast iron sewerage vents considered by the NIAH to be of engineering and/or architectural value have been included in the MIHS. Sewerage plants were also included where they predated 1930.

3.5. Post & Telecommunications.

3.5.1. *Post.*

Post offices and post boxes were recorded in by the MIHS. As a significant part of the impetus for the improvement of the road infrastructure came from the burgeoning postal service, early post offices marked on the First Edition 6-inch maps (and occasionally also Second or Third Edition where other sources suggest particular significance) have been given MIHS numbers. Additionally, cast-iron post boxes listed by the NIAH and considered to be of engineering and/or architectural value have also been included.

3.5.2. *Telephone, telegraph and radio.*

Many post-offices in Meath also functioned as telegraph points and as banks. Although these additional functions are not marked on cartographic sources, they are recorded in Slater's Commercial Directory of Ireland from 1881, and from this Telegraph Offices have been recorded in Ashbourne, Athboy, Duleek, Dunshaughlin, Kells, Navan, Oldcastle and Trim. One radio-related site, the Tower of Lloyd, was also recorded.

3.6. Power.

The industries associated with the generation of power, and of power provision infrastructure, have been included in the Survey under the sub-headings of Gas and

Electricity. 19th and early 20th century gas works are marked on cartographic sources (generally the Third Edition 6-inch maps) and are generally small in scale and associated with large private houses or private mill complexes, with larger complexes associated with large towns, in order to provide lighting. Electricity generation sites include small engine houses as well as larger hydro-electric schemes and peat-fuelled power facilities. These sites date to the 20th century, and are therefore not marked on the primary cartographic sources analysed in this study, however they have been included in the Survey when they appear on other sources.

3.7. Manufacturing industries and mills.

3.7.1. *Mills and cereal processing.*

Two types of mill were included in the survey: watermills and windmills. No horse-powered mills were identified in the survey (despite the fact that these were almost certainly present in 18th and 19th century Meath), however steam-power was often used in the larger water mills at the end of the 19th century. Mills are marked on all of the cartographic sources, including all three editions of the 6-inch Ordnance Survey maps and the early 19th century sources (with a range spanning from *c.* 1812 to 1914), and they are well represented in the documentary sources and previous surveys (e.g. Hogg 2008). Windmills are shown as small circular buildings and are generally labelled 'Windmill', or if dismantled 'Windmill stump'.

On the OS maps, watermills are generally depicted as T-shaped or L-shaped buildings associated with or situated adjacent to a range of water sources (most frequently streams, canals or millraces). They are in most cases labelled 'Mill' (and sometimes 'corn-mill', 'tuck-mill', 'saw-mill', etc.). Flour mills are explicitly differentiated from corn mills on the OS map depictions, as are woollen and tuck mills. The existence and location of ruined watermills was also often indicated through the position of text labels denoting their 'ruined' or 'disused' status next to depictions of any surviving remains.

On the pre-OS cartographic sources watermills are always depicted with a symbol of a spoked mill-wheel, and are usually simply labelled as 'mill'. It is interesting to note that this symbol is rarely explained in any of the keys for the maps, and presumably the

cartographer assumes his reader will find it self-explanatory. In the case of the Down Survey Barony and Parish Maps, watermills are occasionally depicted with a spoked wheel, and in other cases with a small diagram of a vertical watermill building, and in practice can be difficult to discern. Windmills are less prevalent than watermills and are depicted on pre-OS maps using small windmill symbols consisting of triangles or cones topped by four or more triangular sails, and are rarely labelled.

Watermills are often associated with millraces, weirs and millponds, and these are marked and usually labelled on the OS, but not on earlier maps. These features have generally not been given separate MIHS numbers as they are considered to form intrinsic parts of the related mills. In some cases, the presence of a mill has been inferred from the depiction of millraces and millponds alone, and in the absence of any associated buildings, these features have been given their own separate MIHS numbers.

The NIAH is a good source for watermills that have survived to the present day, and provides photographs and descriptions of identified and recorded features. In many cases, it provides a 19th century date for mill buildings which are marked on 18th century maps, suggesting that many of the mills were reconstructed in the 19th century, or were older than assumed by the compilers of the NIAH.

In the majority of cases where mills were identified, the specific functions of individual mills were marked on the OS maps. However, mill functions are very rarely identified on the pre-OS maps, and as a result most of the earlier mills recorded in the survey have been classified as mills of uncertain manufacturing function. In the sites of the MIHS, where function could be assigned, it was usually associated with the processing of food (with a high incidence of corn mills) or textiles (e.g. tuck mills), although saw mills were also occasionally marked, particularly on early 20th century OS maps. The majority of watermills and windmills marked on the pre-OS 18th century maps, and on the First Edition 6-inch OS map of Meath are likely to have been involved in the processing of cereals (Hogg 2000, Appendix).

A further source used in identifying mills for the MIHS was Sir Richard Griffith's 'Primary Valuation of Tenements' (1854) which lists numerous mills (including their

owners, functions, associated land and buildings, and value) from that time. These have been listed by Hogg (2000) in his book *The millers and the mills of Ireland of About 1850*, and accounts generated using these sources has also been supplemented by information gathered from the Ordnance Survey Memoirs of Meath County (1820-40). An excellent source on milling matters is the book *Irish Flour Milling* edited by Bielenberg, which contained numerous papers of relevance to the MIHS Survey (Bielenberg 2003; Cullen 2003; Rynne 2003).

During the compilation of the MIHS, a significant number of medieval watermill sites were identified which had fallen into disuse or were abandoned before the industrial period (c. 1750). This was not the case in the previously compiled Longford or Kildare Surveys, and results from the extensive historical documentation that exists for County Meath. Following consultation with the Project Steering Group, it was decided to include such sites in the MIHS. For this reason, the Civil Survey c. 1654 was also examined for references to mills. Over half of the 147 mills listed in the Civil Survey were included in the database. Unfortunately, the remainder were not located, usually due to changes in townland names.

3.7.2. *Breweries and distilleries.*

Breweries and distilleries are generally marked on the First, Second and Third Editions of the 6-inch OS maps, often as large buildings or complexes of buildings near water sources in urban areas. They are generally labelled as 'distillery' or 'brewery' on the OS maps, but tend not to be depicted on pre-OS cartographic sources. Information on entire brewery complexes, as well as on individual surviving features or structures, also appear in the NIAH survey. Malt houses were also depicted on OS maps (but not pre-OS maps) and have been included in the survey.

3.7.3. *Textile and leather manufacturing.*

Textile-manufacturing sites in general were rarely cartographically depicted prior to the compilation of the OS maps, and as a result the preponderance of sites identified in the Survey are of 19th century date. These sites are labelled as 'Woollen mill', 'Tuck Mill' or 'Flax mill', and are depicted in the same manner as corn mills. Bleach greens and flax ponds were also depicted on the OS maps. Other textile manufacturing sites such as

lace workshops, dyehouses and carpet factories were not depicted on maps, and have been identified from historical sources.

Where they occur, tanneries (leather manufacturing sites) are depicted as large yards partially surrounded by ranges of buildings, marked 'tannery' on the 6-inch OS maps. Tanneries have a tendency to be situated on the outskirts of larger urban areas, presumably on account of the distinctive malodorous smells associated with the industry. They are generally not recorded in other sources, with the exception of the 19th century commercial directories (e.g. Slater's), which also list other leather-related sites such as saddle and harness manufactories that were not marked on the OS maps. Individual tanning pits, which might be indicative of smaller-scale leather manufacture, are not, however, depicted on any of the cartographic sources examined.

3.7.4. *Smithies and metalworking sites.*

Smithies are frequently depicted on the Third Edition 6-inch OS maps (c. 1909-11) and on the 1910-12 Edition of the 25-inch maps of Meath. They are generally depicted as small rectangular buildings fronting onto a main road and labelled 'Smy' or 'Smithy'. The First and Second Editions of the OS 6-inch maps use a small horseshoe symbol on a roadway to denote smithies, however in practice these are very difficult to spot, and in some cases impossible to distinguish from trees and other small features, and possibly as a result fewer symbols of this type were identified on the actual maps themselves. This has led to a situation where relatively less smithies of 19th century date or earlier have been identified on either the First or Second OS 6-inch maps, or on any of the pre-OS cartographic sources than on the Third Edition. This phenomenon was previously noted during the compilation of the Kildare and Longford Industrial Heritage Surveys, where very few smithies were identified from First and Second Edition maps.

Given the pre-automobile era dependence on horses for transport and motive power, including the use of horses to tow barges along the canal, it is very unlikely that so few forges or smithies existed in the county before the 1880s. In order to rectify this imbalance in the MIHS, other non-cartographic sources were consulted. Despite this, the resulting situation is that smithies in use during the 19th century, and disused by the beginning of the 20th century or before, are under-represented in the MIHS.

3.7.5. *Building materials and timber manufacturing.*

Other than brick and tile works, cement works, and lime kilns (considered under the Extractive heading above), the only other identified site types relating to the manufacture of building materials were saw mills. These appear only on the Third Edition OS map and in several cases have been converted from corn mills.

3.7.6. *Factories.*

Few factories or larger-scale manufactories were identified in the course of compiling the survey from cartographic sources. This is partially due to the fact that most buildings or complexes identified as factories came into existence in Meath later in the 20th century. A number of modern factories mentioned in other sources, however, have been included.

It is important to note, therefore, that the picture of County Meath manufactories and factories presented in the survey is far from comprehensive. Given that factories generally postdate the compilation of the maps used in the Survey, it is likely that many of the more prominent or locally significant examples in Meath are not represented in the database. Furthermore, as modern factory buildings are not generally considered to be of architectural value, they are unlikely to appear in NIAH or Protected Structure surveys (with some exceptions, which have been recorded), which might otherwise be expected to pick up some sites missed during the primary and secondary analysis stages of the MIHS.

3.8. Fishing industries.

Industrial features associated with the fishing industries comprised for the most part of weirs, which were situated on rivers and are cartographically depicted and generally labelled 'weir', or sometimes 'eel' or 'fish weir'. In many cases, weirs appear to have been constructed in association with watermills and canals, and mill and canal weirs often had a dual function. They are virtually impossible to date based on cartographic identification alone, and stone weirs are known to have been constructed in Ireland from the Iron Age to the modern day. Other fishing-related sites included fish ponds, fish traps and fish hatcheries, which were marked and labelled on 19th century OS maps, almost always in demesne grounds.

3.9. Urban areas, and miscellaneous industrial features.

A number of urban areas were identified during the survey. This category included both genuine urban centres such as Navan, and also smaller rural villages, which have a concentration of industrial sites. While a considerable number of these towns and villages contained sites and features of industrial interest that have been included in the MIHS, other industrial sites lying within their bounds have not been recorded as part of the Survey. This has generally occurred where sites or features were established in the decades following the 1940s or where sites were not represented or individually labelled on cartographic sources. While the under-representation of sites in urban areas is to be expected on the relatively small-scale 6-inch maps, examination of the larger scale Third Edition 25-inch sheets showed that industrial sites were equally likely to be unlabelled at this scale.

Once again, however, the consultation of historical sources (e.g. Lewis 1837) enabled the identification of additional sites not marked on the cartographic sources and their inclusion in the Survey. Many of the larger towns of Meath have been the subject of extensive documentation of their industrial features (e.g. Pigot's Commercial Directory 1824; Slater's Commercial Directory 1881; Irish Historic Towns Atlas for Meath & Trim, 1990 & 2004, etc.). It was recognised very early on in the MIHS that further work focusing on urban areas will very likely lead to the identification of even more industrial sites of interest, and thus almost all of the larger towns have been given specific MIHS numbers.

A number of miscellaneous industrial features which have not been discussed in the preceding sections, and which were generally associated with urban areas, were also listed in the MIHS. These included workhouses and market-houses, in which potentially significant industrial technologies were used. Lamp standards and weighing machines were also recorded under this classification. Weighing machines are marked with the initials W.M. on the OS maps, and are generally situated at market squares in towns, or at crossroads at small hamlets, or associated with larger houses. As with many of the more straightforward urban industrial features, these miscellaneous sites appear only sporadically on cartographic sources and are not always labelled. They are, therefore, likely to be under-represented in the Survey.

APPENDIX 4

LIST OF FIGURES

- Figure 1. Distribution map of sites identified in the Meath Industrial Heritage Survey. Scale 1:250,000.
- Figure 2. Distribution map of rail, canal, river, road and air transport infrastructure in Meath recorded in the Meath Industrial Heritage Survey. Scale 1:250,000.
- Figure 3. Distribution map of rail, canal, river, road and air transport. Scale 1:250,000.
- Figure 4. Distribution map of windmills and watermills by function in Meath recorded in the Meath Industrial Heritage Survey. Scale 1:250,000.
- Figure 5. Index map of OS Sheets in County Meath. Not to Scale.

APPENDIX 5

BIBLIOGRAPHY & ABBREVIATIONS.

NOTE: This is a bibliography of the more general sources used during the MIHS project. Individual detailed sources are listed in individual site entries within the database.

- | | | |
|-------------------------------------|-----------|--|
| Aalen, F., <i>et al.</i> | 1974 | <i>Atlas of the Irish Rural Landscape</i> . Edited by F.H.A. Aalen, K. Whelan & M. Stout. Cork University Press: Cork. |
| A.C.A. | 2007 | Architectural Conservation Areas, in Meath County Development Plan 2007-2013, Appendix III. Meath County Council. |
| Andrews, J.H. | 1974 | <i>History in the Ordnance Map: an Introduction for Irish Readers</i> . Dublin: Published by the Director at the Ordnance Survey Office, Phoenix Park. |
| Andrews, J H.
& Simms, A. (eds.) | 1990 | Irish Historic Towns Atlas of Kells (No. 4). Royal Irish Academy. |
| Baker, M.H.C. | 1995 | <i>Irish Railways Past and Present, Vol. I</i> . Peterborough: Past and Present. |
| Barrett, R. | 2005 | 'Dunshaughlin Workhouse, 1838-1849: Part One', in <i>Ríocht na Midhe</i> 16 , 105-119. |
| Bennett, I. (ed.) | 1990-2003 | <i>Excavations Bulletin: Summary accounts of archaeological excavations in Ireland, 1989-2003</i> . Bray: Wordwell. Also available on the internet at www.excavations.ie |
| Bielenberg, A | 2003 | 'A Survey of Irish Flour Milling, 1801-1922.' In Bielenberg, A. (Ed.) <i>Irish Flour Milling: A History 600-2000</i> . Lilliput Press: Dublin. Pages 57-85. |
| Bradley, J. | 1985 | 'Urban Archaeology Survey Part II: County Meath'. With contributions by Heather King. Unpublished report commissioned by the OPW. |
| | 1989 | 'The Medieval Towns of County Meath', in <i>Ríocht na Midhe</i> 8 (2) 1988-9. |
| Broderick, D. | 2002 | <i>The First Toll Roads: Ireland's Turnpike Roads 1729-1858</i> . Cork: Collins Press |
| Clarke, P. | 1992 | <i>The Royal Canal: the Complete Story</i> . Dublin: ELO Publications. |
| Cogan, A. | 1862 | <i>History of the Diocese of Meath, Vol I</i> . |
| Corcoran, M. | 2005 | <i>Our Good Health: A history of Dublin's water and drainage</i> . Dublin: Dublin City Council. |
| Coyne, W.P. | 1902a | 'Canals and Waterways of Ireland'. In Coyne, W.P. (ed.). <i>Ireland Industrial and Agricultural</i> . 82-119. Dublin: Browne & Nolan. |
| | 1902b | 'The Brewing Industry in Ireland'. In Coyne, W.P. (ed.). <i>Ireland Industrial and Agricultural</i> . 451-93. Dublin: Browne & Nolan. |
| Cullen, L. | 2003 | 'Eighteenth-Century Flour Milling in Ireland.' In Bielenberg, A. (Ed.) <i>Irish Flour Milling: A History 600-2000</i> . Lilliput Press: Dublin. Pages 37-56. |
| Delany, R. | 1992 | <i>Ireland's Royal Canal 1784-1992</i> . Dublin: Lilliput Press. |
| | 1993 | <i>Ireland's Inland Waterways</i> . Reprint of the 1986 edition. Belfast: Appletree Press. |

Duffy, P.J.	2007	<i>Exploring the History and Heritage of Irish Landscapes</i> . Dublin: Four Courts Press.
Ellison, C.	1983	<i>The Waters of the Boyne and Blackwater: A Scenic and Industrial Miscellany</i> . Blackwater Press: Dublin.
Giacometti, A., S. Duffy	2008	'Industrial Heritage Survey of County Longford'. Unpublished report for Longford County Council, Arch-Tech Ltd.
Giacometti, A., S. Duffy & M. Ni Cheallaigh	2007	'Industrial Archaeological Heritage of County Kildare'. Unpublished report for Kildare County Council, Arch-Tech Ltd.
Gilligan, J.	1998	<i>Graziers and Grasslands: Portrait of a Rural Meath Community 1854-1914</i> , Maynooth Studies in Local History 16. Dublin: Irish Academic Press.
Graham, B. J.	1975	'Anglo Norman Settlement in County Meath', <i>PRIA</i> 75 (C), 223-248.
Hajducki, S.M.	1974	<i>A Railway Atlas of Ireland</i> . Newton Abbot, UK: David & Charles.
Hamond, F.	2004	Kells Waterworks, Commons of Lloyd, Kells, Co. Meath: Industrial Heritage Survey. The Heritage Council.
Hammond, F. and McMahon, M.	2002	<i>Recording and Conserving Ireland's Industrial Heritage: an Introductory Guide</i> . The Heritage Council of Ireland Series: Dublin.
Hanley, J.	1965	'Oldcastle & Loughcrew 1778, in <i>Riocht na Midhe</i> II(3), 249-50.
Hogg, W.E.	2000	<i>Mills: the Millers and the Mills of Ireland of about 1850</i> . Dublin: Published by W.E Hogg.
	2008	<i>Mills of Ireland: a List Dated about 1850</i> . Dublin: Published by W.E. Hogg.
	2008	<i>Smithies of Ireland of the 19th Century: a list compiled by William E. Hogg</i> . Dublin: Millbrook Press. SMIRE.
Johnson, S.	1997	<i>Johnson's Atlas and Gazetteer of the Railways of Ireland</i> . Leicester, UK: Midland Publishing.
Kinahan, G. H.	1889	'Economic Geology of Ireland'. <i>Journal of the Geological Society of Ireland</i> , 8: 325-8.
L.A.P. (Draft)	2008	Draft Local Area Plans for Clonard, Ballivor, Enfield, Kildalkey, Kilmessan, longwookd, Rathmolyon & Summerhill, 2009-2015. Meath County Council.
Lewis, S.	1837	<i>A Topographical Dictionary of Ireland</i> [etc.]. London: S. Lewis & Co.
Lotts... (Anon.)	2008	Slane Mill Complex Architectural Conservation Area: Statement of Character. Unpublished report by Lotts Architecture and Urbanism Ltd.
M.B.S.	1989	Meath Bridge Survey, (refer O'Leary 1989).
Middlemass, T.	1981	<i>Irish Standard Gauge Railways</i> . Newton Abbot, UK: David Charles.
Moore, J.H.	1895	'Notes on the History of Navan', <i>JRSAI</i> 25, 155-62.
Moore, M.	1987	<i>Archaeological Inventory of County Meath</i> . Dublin: Archaeological Survey of Ireland, OPW.
Mulligan, F.	1990	<i>One Hundred and Fifty Years of Irish Railways</i> . Belfast: Appletree Press.

N.I.A.H.	2002	<i>National Inventory of Architectural Heritage, County Meath.</i> DoEHLG.
	2003	<i>National Inventory of Architectural Heritage, Navan.</i> DoEHLG.
O'Boyle, E.	1989	<i>A History of Duleek.</i> Published by Duleek Historical Society.
O'Connell, P.	1960	'Kells: Early and Midiaeval, Part II', <i>Riocht Na Midhe</i> 2(2) , 8-22.
	1978	'Changing Forces Shaping a Nineteenth Century Irish Town: A Case Study of Navan'. Occasional Papers, No. 1. Geography Dept., Maynooth College.
	2004	<i>The Land and People of County Meath, 1750-1850.</i> Dublin: Four Court's Press.
O'Connor, K.D.	1998	The Archaeology of Medieval Rural Settlement in Ireland, Discovery Programme Monograph No. 3, Dublin: RIA.
O'Farrell, P.	1990	<i>By Rail Through the Heart of Ireland.</i> Cork: Mercier Press.
O'Flannagan, Rev. M.	1923	<i>OS Letters Relative to the Antiquities of Co. Meath, 1836, reproduced by Rev. M O'Flannagan.</i> Bray.
O'Keeffe, P. & T. Simington	1991	<i>Irish Stone Bridges.</i> Dublin: Academic Press.
O'Leary, T.	1989	Meath Bridge Survey. 1987-1989. Meath County Council.
Palmer, M.	1990	'Industrial Archaeology: a thematic or period discipline'. <i>Antiquity</i> 64 (243) : 275-85.
Palmer, M. & P. Neverson	1998	<i>Industrial Archaeology: Principles and Practice.</i> London: Routledge.
Pigot's Directory	1981	<i>Pigot's National Commercial Directory of Ireland</i> (available for various years in the 19 th century). Dublin.
Reed, R.	1972	<i>Ancient Skins, Parchments and Leathers.</i> London and New York: Seminar Press.
R.M.P	1996	Record of Monument and Places, Archaeological Survey of Ireland (unpublished database, 1996, National Monuments Service, formerly Dúchas, DoEHLG).
R.P.S.	2007	Record of Protected Structures, In Meath County Development Plan 2007-13, Appendix V. Meath County Council.
Rynne, C.	1999	<i>The Industrial Archaeology of Cork City and its Environs.</i> Dublin: Dúchas.
	2003	The Development of Milling Technology in Ireland, c. 600-1875. In Bielenberg, A. (Ed.) <i>Irish Flour Milling: A History 600-2000.</i> Lilliput Press: Dublin. Pages 11-36.
	2006	<i>Industrial Ireland 1750-1930: An Archaeology.</i> Cork: Collins Press.
Share, B.	2006	<i>In Time of Civil War: the Conflict on the Railways, 1922-3.</i> Cork: Collins Press.
Shepherd, E.	1994	<i>The Midland Great Western Railway of Ireland: an Illustrated History.</i> Earl Shilton, Leicester: Midland Publications.

Simington, R.C.	1940	<i>The Civil Survey (AD 1654-56), County of Meath, Vol V...</i> Dublin: The Stationary Office.
Simms, A., Clarke, H.B. & Gillespie, R. (eds.)	2004	<i>Irish Historic Towns Atlas of Trim (No. 14)</i> . Royal Irish Academy.
Slater's Directory	1981	<i>Slater's National Commercial Directory of Ireland</i> (available for various years in the 19 th century). Manchester.
Thomson, R.	1998	'Leather Working Processes'. In Cameron, E. (ed.) <i>Leather and Fur: Aspects of Early Medieval Trade and Technology</i> . 1-10. London: Archetype Publications.
Vince, J.	1978	<i>Mills and Millwrighting</i> . Shire Album 33, Shire Publications Ltd: Princes Risborough.
Walsh, T., Ryan, P. & Kilroy, J.	1957	'A Half Century of Fertiliser and Lime Use in Ireland'. <i>Journal of the Statistical and Social Inquiry of Ireland</i> 19 : 104-136.
Whelan, K.	2000	'Settlement and Society in 18th Century Ireland', in Barry, T. <i>A History of Settlement in Ireland</i> . London & New York: Routledge.
White, NB (ed)	1943	<i>Extent of Irish Monastic Possessions, 1540-1541, from manuscripts in the Public Record Office, London</i> . Published by the Stationary Office for the Irish Manuscript Commission/ Coimisiúna Láimhscríbhinní na h'Eireann: Dublin.

List of Internet Sources.

National Civil Engineering Database, Trinity College Dublin. (<http://www.tcd.ie/civileng/research/heritage>)

Inland Waterways Association of Ireland. (<http://www.iwai.ie>)

National Library of Ireland: Images of railways, also some of canals. Catalogue (<http://www.nli.ie>)

Website of The Industrial Heritage Association of Ireland. (<http://www.ihai.ie>)

Randalstown Tobacco Plantation <http://www.askaboutireland.ie/reading-room/environment-geography/flora-fauna/the-tobacco-growing-indus/>