THE USE OF AERIAL PHOTOGRAPHY FOR SPOILED AND DERELICT LAND STUDIES - WITH SPECIAL REFERENCE TO GLAMORGAN

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Submitted for the degree of Doctor of Philosophy

May 1976

SUMMARY

An examination of the definitions of derelict land has shown that confusion exists between the economic and aesthetic concepts of the term. In order to resolve this, it is proposed that the term "spoiled landscape" be used to describe the total landscape despoiled by man's activities and that "derelict landscape" and "actively disfigured landscape" be used to distinguish those landscapes which are unutilized from those that are visually despoiled.

Having defined the major subject of study, national surveys, and the reclamation of derelict land are assessed. Recent changes in surveying requirements and the need for rational reclamation programmes based on accurate data indicate that new approaches to the survey method are required. Reference to recent studies suggests that this requirement may be satisfied by utilizing aerial photography.

In this context, a survey of the spoiled landscape in the old County of Glamorgan has been conducted by using 1:5000 scale aerial photographs. The data have been recorded on Ordnance Survey 1:10,560 scale maps and also plotted on survey transparencies for use by the Welsh Office. Since the research has been concerned with the methodological problems of conducting large scale surveys, emphasis is given to discussing the processes and difficulties of air-photo interpretation and of using the Welsh Office Transparencies. Nevertheless, a general analysis of the collected data has been undertaken, indicating that 3.4% of the County was spoiled in 1971. Of this almost two-thirds consists of derelict landscapes while the remainder is associated with active land uses.

The uses of spoiled landscape are considered and, as an example, comparison is made between the spoiled landscape and landscape quality

of parts of Glamorgan. It is suggested that the two variables are inversely related.

The concluding discussion suggests improvements in the collection of spoiled landscape data and indicates several fields for future research.

Acknowledgements

The author gratefully acknowledges the assistance given by the following people in the completion of this work : Dr. W.G. Collins for supervising the research; Mr. W.G. McArdle for invaluable assistance with the Survey; members of the Remote Sensing Unit, University of Aston, who formed the Survey team; staff from the Planning Department of Glamorgan County Council; and last but not least, Mrs. R. Holmes for her excellent typing of the final draft.

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Introduction

The problem of dereliction and despoiled land, which forms the greater part of this thesis, is one which is covered by many disciplines and where emphasis may be placed on any particular aspect of those disciplines. PART ONE gives emphasis to three major aspects to show the context of the work which is described in PARTS TWO and THREE. The first, and perhaps the most important, of these concerns the definition of the terms derelict or spoiled, since one cannot usefully discuss the subject until it has been adequately defined.

The second aspect relates to the survey of dereliction at the National level. It is considered at this level since the Government Departments concerned (Department of the Environment and the Welsh Office) mostly determine that which is surveyed at the local level as they provide the definition commonly used and determine the smallest number of categories of derelict land that are to be considered.

The third aspect consists of the ultimate aim behind the survey work - that of reclamation. This is related again to surveys at the National level since grant allocations are made as a result of those surveys. The criteria of reclamation, however, should influence the type of data which are collected since those data may be important to the planning and execution of reclamation schemes.

Although these aspects are relatively self contained there are obviously areas where they merge, and consequently there is an element of repetition in this thesis. This has been kept to minimum, but in order to do so cross references have been made between the chapters discussing the three aspects mentioned above. This may appear to give an apparently loose structure to each chapter but it is felt that the whole section, when considered <u>in toto</u>, will provide the necessary background to the following parts.

CHAPTER 1

The Definition and Concept of Derelict Land

"It has been said that 'any landscape is a condition of the spirit.' Indigestion can make the most enchanting countryside dismal, as those who have gazed listlessly at scenes which they have savoured long in anticipation will know. But if it is true that the spirit dulls the eye then certainly the spirit is quite as certainly depressed by what is seen."

Hilton (1965)

1.1 The Definition of Derelict Land

For more than twenty-five years, the definition of "derelict land" has caused much argument and discussion, particularly since the mid 1960's. To most people the words "derelict appearance" produce a similar picture of decay and ugliness, but to define rigorously what is meant by the term is difficult.

As early as 1946, one of the foremost pioneers in studying dereliction, S.H. Beaver, realised in his classic study of the Black Country, that the exact meaning of the term "derelict land" raised an initial difficulty (Beaver, 1946). If the legal meaning of "land left or abandoned by its owners" were to be adopted, he maintained that there is little land which could be so described. At the other extreme, however, land appearing to be waste and derelict might in fact be part of some industrial activity, and as an example, Beaver quotes spoil banks at Oldbury being used by I.C.I. as filters for industrial effluent. In an attempt to solve the problem of this apparent contradiction, therefore, Beaver initially recorded all land which "to the eye" was in a derelict condition.

Government thinking in subsequent years, however, was not as aesthetically orientated in looking at this problem since the narrower definition of derelict land was used. Oxenham, another important pioneer, circulated a questionnaire to local planning authorities in 1954 to ascertain the extent of dereliction in the whole of England and Wales. The results of the survey, the first of its kind, were summarized in a Technical Memorandum (M.H.L.G., 1956), but it was not until 1963, with the appearance of "New Life for Dead Lands" (M.H.L.G. 1963), that any definite policy was brought to light. In that report derelict land was defined as,

"Land which has been so damaged at some time or other by

> industry or other development that it is not capable of full use without special treatment."

The definition was slightly altered a year later when it was incorporated into a Ministry Circular (M.H.L.G., 1964) which, in requesting local planning authorities to submit the first returns of what was to become an annual survey of dereliction, defined derelict land as,

> "Land so damaged by industrial or other development that it is incapable of beneficial use without treatment."

This definition, which remained unchanged until 1969 in Wales, and 1971 in England, was criticised by those planning authorities and research workers most concerned with the problems of dereliction (Lowe (1967), Barr (1969), Atkinson (1969), Collins and Bush (1969a), Nottinghamshire/Derbyshire Sub-Regional Planning Unit (1969), and Bush (1970) for example). The reasons for this were that under a list of exclusions to the definition active areas of industrial land use were not considered, and certain types of land use which to all intent and purpose seemed derelict (e.g. war damaged land and War Office areas) were ignored. It was argued that the effect of these exclusions was to grossly underestimate the total extent of derelict land in England and Wales as can be seen by comparing the local and regional planning authority estimates with the returns for National Government purposes (see Chapter 2). Even Study Group 12 in reporting on the reclamation and clearance of derelict land for the second "Countryside in 1970" conference, adopted the Ministry definition for ease of data collection, but agreed that the Ministry figures only indicated the "hard core" of the dereliction and that the true amount could easily be twice as much (Study Group 12, 1965).

In all fairness, however, the Ministry definition was, as far as it went, a valid and useful one as was argued by Oxenham (1969) when he stated that the survey definition, with its exclusions, was used to ascertain the amount of dereliction likely to rank for grant aid. He conceded that it was essential from a technical standpoint to know the total extent of dereliction in order to plan a comprehensive programme of reclamation, but pointed out that it might not be necessary from the administrative standpoint.

The official view, however, has recently undergone a change. In 1971 the Welsh Office introduced a new survey which would solve some of the problems already discussed, and a year later the Department of the Environment (D.O.E.) in London followed suit, although their new survey became operational only when the reformed local authorities came into existence in 1974. The new D.O.E. definition now refers to "derelict and despoiled land", the "derelict land" term still being defined as,

> "Land so damaged by industrial or other development that it is incapable of beneficial use without treatment." (D.O.E. 1972)

There are some exclusions where, for example, planning conditions provide for after treatment but these may now be considered under "despoiled land" which includes sites that are abandoned but where restoration conditions or other arrangements have been found to be unenforceable or ineffectual. The major changes are that certain forms of dereliction such as military and other service installations are now included, and that active areas of industrial working and waste tipping are also considered. It will be some time, however, before the effect of this more liberal approach can be assessed. Looking again at earlier definitions one finds that many are quite similar in concept to the former Ministry one, although the wording is more varied. In the same year that the Ministry published their Memorandum (M.H.L.G. 1964) the Civic Trust published a definition of:

> "Land which has been so damaged by extractive and other industrial processes that in default of special action it is unlikely to be effectively used again within a reasonable period and may well be a public nuisance meantime." (Civic Trust 1964).

Exclusions made to this definition were similar to those of the Ministry, and consisted of "land encumbered by disused service installations, land devastated by enemy action, land cleared for development and land which is being actively used for the tipping of refuse or soil". As Bush (1970) pointed out, however, these categories still strictly come under the definition and should be included.

Some years after the Civic Trust report, Oxenham stated in his excellent book "Reclaiming Derelict Land" (Oxenham 1966) that, in the broadest sense, "the commonest conception of 'derelict land' refers to a neglected appearance which is such as to give offence to the eye", and incorporated this observation into his own definition of,

> "Land which has been damaged by extractive or other industrial processes, which in its existing state is unsightly and incapable of reasonably beneficial use and which is likely to remain so unless subjected to special reclamation treatment." (Oxenham 1966).

The visual aspect of derelict land was also used by Thomas (1966) when he defined derelict land as being,

> "all those areas where the original contours have been disturbed."

Although this may seem to be an extreme definition, in the last analysis there may be some truth in it, for as Fairbrother has written,

> "All large modern buildings are in effect built on derelict land since whatever the quality of the site to begin with their very creation destroys it." (Fairbrother 1970).

The definitions which have been discussed so far were evolved to some extent for individual purposes, but Collins and Bush (1969a) attempted by appraising the earlier definitions, to evolve one which was more widely applicable. They eventually decided upon,

> "Land which has been so damaged by extractive or other industrial processes that it gives offence to the eye and is likely to remain so until subjected to special forms of restoration."

Thus, as with the old Ministry definition certain categories of land use, i.e. non industrial, were excluded, but in complete contrast to that same definition, active as well as disused industrial sites were considered because the former were regarded as potentially derelict.

Criticisms by McDonald (1969), however, showed, that if active areas were to be considered, the term "derelict" was inappropriate, and further, that buildings and installations (also considered in Collins and Bush's study) since they fall outside the generic concept of derelict land, were also invalid. As a result of these criticisms the term "spoiled" was introduced to include both active and disused (derelict) areas, and "landscape" replaced "land." At the same time the definition was altered to,

> "Land which has been so damaged through the activity or neglect of man that it gives offence to the eye, and is likely to remain so until subjected to special forms of treatment,"

so that non-industrial areas could be included (Bush 1970).

If, however, the generic concept is to be "spoiled landscape" as Bush eventually decided, then logically this latter definition should begin "landscape which.........", instead of "land which.........". This, however, could then lead one to argue that features such as pylons should be included, since to many people they damage the landscape. Similarly, in looking at the active/disused components of "the activity of man", one can accept that, say, "disused railways" are part of the spoiled landscape, but logically "active" railways should be too since they come under the category of potentially derelict land, as Collins and Bush consider active land uses to be. How many surveys, however, would need to consider pylons or railways which are in use, as "spoiled features"?

To explain these apparent anomalies it is necessary to examine the basis of Bush's approach to the study of spoiled land. Firstly, of course, there is the visual or aesthetic approach whereby features that "give offence to the eye" are termed "spoiled". Secondly, there is an economic or "landuse and activity" basis which is related to the activity causing the "offensive feature" and to whether the activity has ceased, i.e. resulting in 'derelict' features, or is still in operation and results in features that are potentially derelict.

It is the confusion of these two approaches that has produced problems in the interpretation of "spoiled landscape" and "derelict land". To refer back to the example of railways, derelict railways are considered as spoiled on the basis of their disused state (i.e. the economic basis). The question of aesthetics is not considered here since active railways are ignored; there is little difference in the appearance of an active or disused railway network except where track has been removed and in this case the disused track may even be more visually pleasing than active areas. When one looks at spoil heaps resulting from coal mining, however, the aesthetic argument has been considered when both active and disused heaps are included since both are intrusive and offensive to most people, but the economic argument is used to justify the inclusion of active heaps when they are described as "potentially derelict".

These criticisms, however, do not apply only to Bush; a further examination of the definitions previously discussed will show that they have been approached from one or both of the two bases although with no more success. Thomas's definition, for example, is of the visual type; the Civic Trust has an economic basis although some social bias is introduced by the term "public nuisance", and Oxenham's definition is similar to that of Bush in containing both elements. That the confusion of the two approaches has been important in preventing an adequate definition of spoiled or derelict land from being evolved seems to have escaped the attention of most workers in the field. To the author's knowledge, the only exception is Wallwork (1974), who, although recognising the problem, has not entirely solved it.

But although the confusion of aesthetics and land use has presented problems, it is not true to say that the two approaches, if applied singly, will not perhaps produce others. Before any attempt to arrive at a definition of spoiled or derelict landscape is made, therefore, the relationships that exist between the concept of that landscape and the aesthetic and economic components of it will be presented and discussed.

1.2 The Concept of Derelict Land

1.2(i) Aesthetic considerations

With the rise of landscape design, architecture and planning there has come a growing awareness of landscape, particularly where it has been marred by man's activity. This has been reflected in the number of books dealing with landscape that have appeared in recent years (see for example Colvin (1970); Fairbrother (1970); Crowe (1958); Bracey (1973)).

Most of these works have been written by landscape architects and consequently references to spoiled landscape have been from an aesthetic standpoint, although the causes of this landscape are attributed, of course, to economic development.

To summarize the principles of good landscape design as presented in the works of Crowe, Colvin and others is outside the scope of this work, but it is essential to deal briefly with aspects of landscape appraisal in order to show the problems involved in examining the spoiled landscape.

<u>The appreciation of Landscape</u>

The attraction of landscape in any form is nothing new as can be seen from studying the historical development of landscape painting or the literary works of past authors and poets. The term itself is derived from the Dutch, <u>Landschap</u>, and is thought to have made its earliest appearance in English in 1598 (Vyle 1968). But even if the word made little impact at that time, the Dutch landscape painters of the seventeenth century - Jacob van Ruysdael, Rembrandt, Hobbema and others - with their expert control of light and shadow in the representation of vegetation certainly inspired our own landscape painters of the eighteenth and nineteenth centuries. The rustic serenity of Constable's English countryside is well known and appreciated by many people, just as the London or Venetian townscapes of Italy's Cannalleto have been. Less famous, but just as important, artists such as John Crome and the Norwich school of landscape painters, indicate how much importance was attached to this form of painting. Similarly with literature, the romantic and picturesque notions of landscape have made the works of Wordsworth just as popular.

Although people can readily agree on what constitutes a good landscape, however, there can never be a universal acceptance of which types of landscapes are the best. The reasons for this are complex and would be explained more adequately by a sociologist or psychologist working in the field of general environmental perception, but some possible influencing factors are discussed here so that their relevance to appraising the spoiled landscape can be seen.

Probably the most obvious factor is the influence of one's usual or home environment. Such a manifestation of this influence might be in that people from the highly urbanized and industrially developed areas of lowland Britain are attracted by the less developed upland areas since they provide a complete contrast to the surroundings of everyday life. A reversal of this factor, i.e. a knowledge or experience of other environments affecting how one views the home environment may, however, be just as important. A sociological study of people in the Lower Swansea Valley certainly found this latter point important when it was stated that:

> "People vary in their assessment of the visual appearance of the valley depending on .... their knowledge of the other places." (Hilton, 1967)

These types of factors can be regarded as constant since the impression one gains of the home environment or the landscape of some other place is usually quite fixed. There are, however, some factors which could be regarded as variable since their influence changes our opinions of landscapes, as the state of the factor itself undergoes a change. For example, in the discussion following a paper given by Beaver at the Royal Geographical Society in 1944, mention was made of the difference in attitude towards the waste tips resulting from china-clay extraction. The President of the Society in his summing up of the meeting, remarked that

> "I have an open mind about the pyramids (china clay spoil heaps) in Cornwall. Sometimes I like them; sometimes they fill me with dismay. It is mainly a question of weather. On a typical Cornish summer day they have their attraction. When the weather is lowering and the fog is coming up, the pyramids are, to me, frightful". (Discussion, Beaver 1944).

Thus, the changing state of the weather equally changes the appreciation of the landscape; few people will be appreciative if the landscapes are viewed in the uncomfortable state of being cold and wet, but once the sun makes an appearance opinions will soon change.

It must not be assumed, however, that fine weather will make all forms of spoiled land attractive. Where, for example, conditions are hot and dry, features such as spoil heaps might give off odours and dust which would more than detract from any visual appreciation that might exist.

Other variable factors which may be important in influencing appreciation are movement on the part of the viewer, and the distance of the main attraction in the landscape from him. The former factor is now important enough to warrant inclusions in landscape analyses as is illustrated by the Durham Motorway Study (Clouston 1967), where observations were made at various points along the proposed motorway route to determine how frequently specific landscape could be seen and also to determine the quality of them. To some extent the study also considered the question of distance from the viewer, particularly with regard to the "threshold distance" beyond which the landscape elements became less definite and less meaningful.

A discussion of the factors influencing our appraisal of the landscape, including some of those above, is usually found in specific landscape studies or projects, such as the Durham Motorway Study, but to the author's knowledge, no comprehensive survey has been made of the types of landscapes that are appreciated, the type of person that appreciated them or the reasons for that appreciation. The Lower Swansea Valley Project mentioned above (Hilton 1967) came close to this, and gives a more balanced picture of environmental perception than one can gather from listening to the more vocal sections of the community (see, for example, Blake 1964) or by reading such statements as the following:

> "We live in a period of hope because, now that the eyes of the public have been opened, very many of these devastations can be avoided."
>
> (Dr. E.B. Bailey in the discussion following Beaver, 1944)

or else

> "We have to accept the fact that the British people have not yet reached a very high level of visual awareness." (Atkinson, 1963).

Of all the evidence so far presented, these last two quotations alone are more than adequate in showing that few people can really know how people regard their environment.

<u>Subjectivity in appraising Spoiled Landscape</u>

The latter point is important since it means that a definition of spoiled land based on landscape aesthetics can never be entirely satisfactory; what might appear "spoiled" to one person could be quite acceptable to another. Compare, for example, the attitude of Delap and Nicoll (1959) with that of Dudley Stamp (discussion following Beaver, 1944) towards chalk quarries. The former authors stated that:

> "........ with some care and enterprise these unsightly areas of bare chalk could be made not

> only beautiful but also more productive,"

whereas Dudley Stamp had remarked:

> "Secretly, I love that break in the otherwise uninteresting line of chalk escarpment which is afforded by the slash of white of the old, or new, chalk quarry. Seen from a distance it seems to me just that point of contrast which adds to beauty."

These quotations are important not because they illustrate the factors underlying landscape appraisal (although Stamp implies the effect of distance as mentioned in Section 2.1 (i)) but because they show the complete polarization of spoiled landscape appraisal that arises through subjectivity. This variability in viewing such landscapes does not only exist at the present time since throughout the history of industrialisation attitudes have differed. Klingender (1972) has shown this in his fascinating study of the British Industrial Revolution as portrayed by artists and writers at each stage of its development. Initially contemporary art shows a detached fascination with the progress of science and the resulting expansion of technology. Gradually this purely observatory stage passes to one where industrialisation is put into a sublime and picturesque context culminating in a romantic period when simple industrial scenes are placed in a neo-classical setting. Up until then industry and all its associated spoilation was at best tolerated and at worst glorified.

There then followed, however, an age of despair when the problems of such development became more obvious and artists reflected the fear of a technological process completely out of control. This period coincides with social reform in factory working, for example, and the interest in housing conditions. Once these social problems had apparently been solved, continuing economic development was again actively encouraged and on the philosophy of "where there's muck there's money" the landscape of industry was again tolerated. It is only in the last twenty-five years that some dissenting voices have been heard and only in the last ten years or so that grave concern has been expressed over our spoiled landscapes.

These changing historical attitudes are perhaps a little more objective than modern attitudes to appraising the spoiled landscape, since they are more intricately tied up with socio-economic developments, but nevertheless the subjectivity is still there.

Objectivity in Landscape appraisal

It is not that attempts to look more objectively at the landscape have not been made, for within the comparatively new field of "landscape planning" several techniques have been evolved. One such method, as outlined by Higgins (1967) for example, looks at both the quantity and quality of seven elements in the landscape. These elements were not defined but will relate most likely to the natural features such as geology, topography and vegetation, and the cultural features of the total landscape. For each locality of about one square kilometre, each element is considered in turn and given two scores, the first to indicate the quantity of elements present, and the second to describe the quality of those elements. The products of these scores for all elements are summed and the resulting total is the "evaluation score" for the one site under consideration.

A simpler but more commonly used technique, is that which was applied more recently by Glamorgan County Planning Authority in their "Strategy for Gower" report (Glamorgan County Council, 1971(2)). Two surveyors stopped at one kilometre intervals along all roads and assessed the quality of the non-urban landscape at each site. The assessment was made according to a ten point classification and the appropriate weighting arrived at by agreement between the two surveyors. The average score for each quarter kilometre square was then calculated ranging from "superb landscapes of national importance" to "poor and substantially despoiled landscapes". The report pointed out that the evaluation needed to be interpreted with great care since, for example,

> "areas of lower value in themselves usually appear in wider views as foils which set off the more spectacular elements",

but nothing was said about the factors or criteria that were considered in giving an area a certain score, or what reliability could be attached to a survey based on the opinions of two people. At the moment these questions must remain unanswered, although further discussion will be found in PART THREE.

The two methods mentioned above have been concerned with town or landscape planning but work in other fields does exist. Leopold (1971) evolved a method of evaluation in an attempt to quantify the aesthetic impression gained in looking at the landscape of river valleys, but the results were only meaningful within the context of the sixteen valley sites examined, since part of the techniques involved the ranking of sites on the basis of their valley character. In other words, values indicative of the landscape were relative rather than absolute.

This criticism aside, however, Leopold's methodology follows the pattern of all the techniques of landscape evaluation - a quasi-quantitative approach in which landscapes are measured on a scale of aesthetic values. The application of such techniques indicates that they are of some use to planners, but the fact remains that the subjective decisions inherent in the assessment casts some doubt on the validity and comparability of the results obtained.

Summary and Conclusions

It has been shown that as a result of various factors such as the influence of the home environment, a knowledge of other environments, weather conditions and movement and distance effects, the appreciation of any landscape may vary from one person to another, although it is not clear exactly which factors, and to what degree, they are important. Despite attempts to quantify landscapes by means of assigning an evaluation or appraisal score, the subjective element causing differences in opinion still exists and tends to cast doubts on the validity of such "objective" studies.

It is concluded, therefore, that a definition of the derelict or spoiled landscape based on aesthetic consideration can never be entirely satisfactory. Were more comprehensive studies undertaken to determine the factors influencing the appraisal of such a landscape, then these factors could be incorporated, as some form of constraint, into some definition. It might be that several definitions would then be necessary for several corresponding sets of conditions but perhaps there would be less room for the free interpretation that is possible at the present.

1.2 (ii) Land Use and Activity Systems

Some mention has already been made of the relationship between the concept of derelict land and land use and activity, i.e. that derelict land is that land which has been abandoned or is disused. Usually this relates to the activity to which the land was originally subjected so that, for example, a derelict quarry is an area where quarrying has been abandoned and a disused spoil heap is where tipping has ceased.

Where the present status of the land is directly related to some past activity there is little problem in designating land derelict but where a new activity system has been superimposed on the old system there can be some difficulties. If, for example, a strip of land which was once a railway is now in use as an unmetalled road, is that land a derelict railway or an active road? The realistic solution is to regard the land parcel as a road since that is the current land use. One could add that it was also the site of an old railway to indicate its past land use in the same way that archaeological sites are indicated on Ordnance Survey maps. This would then be putting the feature into more of an historical framework than an economic one as the active/derelict dichotomy implies.

<u>Space time relationships in land use/activity systems</u>

This solution, however, will work only where new land uses and activities are industrial, commercial, agricultural or residential. These are land uses which usually operate in frameworks that are fixed both spatially and temporally. The spatial framework relates to the physical layout and dimensions of the land use and is usually equivalent to buildings and installations. Thus gardens and houses form the basic spatial framework of residential land use, and factories, storage yards, ware-houses and offices, etc. will constitute the framework of industrial and commercial uses. The temporal framework relates to the time of occurrence and duration of the activity associated with the land use. The two time variables will vary from one activity to another so that, for example, retail and commercial activities will normally operate about 9 a.m. to 5 p.m. every day for six days per week (i.e. a duration of 8 hrs. per day), whereas manufacturing industries might work around the clock by means of shifts, thus achieving a duration of 24 hrs. per day. There can be considerable variation in these variables within one type of activity as is the case of residential activities where the life styles and habits of the individual households will determine where and for how long people will reside in the house. In general, however, the temporal characteristics of these land uses will be quite regular and may be regarded as fixed.

In the case of recreational activities, however, this is not the case and consequently has some bearing of the concept of derelict land. The sorts of activity envisaged are small group participation outdoor activities such as walking, climbing and fishing which can be organised but are often spontaneous. Less common activities are scientific observations of the natural environment, and studies of the man-made or cultural environment. In all these instances the spatial and temporal frameworks already discussed are usually variable, i.e. there is no regular pattern to the occurrence of these activities.

The significance of this point is that unless the above mentioned activities are witnessed at the right time and in the right place then the area in which they take place will be regarded as unused. A hypothetical and rather simplified example will illustrate this point. Consider a large disused stone quarry containing a small pond and several stable rock faces. These features might well be used for activities such as the sailing of model boats by children, climbing, or just walking by anyone who happens to be there. On other occasions the site might be visited by geologists, who in taking advantage of the exposed rock faces can examine the rock types or structure of the area. Similarly, biologists may find examples of flora and fauna, or even whole eco-systems (perhaps associated with the pond), which are worth observation. If well preserved buildings or installations representative of some historical process or development associated with quarrying were also to be present, then the chances are that the site would also be visited by industrial archaeologists. Thus it can be seen that what might simply be a derelict quarry can be a complex system of numerous activities existing side by side or interactively.

It might seem from the above that both the temporal and spatial frameworks of activities are usually either fixed or variable. This is not always the case, any more than, say, regarding all industrial or commercial activities as always fixed. The retailing of goods by travelling salesmen, for example, is usually variable in the spatial framework of the activitiy and quite likely, but not exclusively, variable in the temporal framework also. An example of this which is relevant to the concept of derelict land concerns the tipping of colliery spoil. Tips are "active" when tipping is currently in operation, "closed" when tipping has ceased but is likely to continue in the future, and "derelict" when tipping has been completely abandoned. Thus the activity is fixed spatially but not temporally. The practical significance of these distinctions is that the first two tips fall within the curtilage of the mine and are the responsibility of the National Coal Board, while the latter is the responsibility of the local authority. The problem of this situation is that the "closed" tip is more or less intermediate between "derelict" and "active" but for survey purposes needs to be considered as one of either of those categories. This last problem of distinguishing that which is truly derelict from that which is superficially derelict but which supports some activity, introduces a further point.

There is the problem of the time interval between an activity ceasing to operate, and the observation of the resultant derelict feature. Initially the problem is that some features such as spoil heaps and quarries will have similar appearances before and shortly after activities cease. Thus a quarry might be observed to be active whereas it has recently become derelict. As time passes, however, the environment will change and result in a vegetation cover which would be inconsistent with active working. The quarry will then be correctly identified as derelict, assuming, of course, that none of the previously mentioned problems are evident. With a further increase in time, though, the boundary between the man-made environment and that which one could almost regard as natural will be less clearly defined. The quarry may then be regarded as having "reverted back to nature", or "merged into the natural surroundings", and could be ignored either through a conscious wish to do so or through the inability to recognise the feature. The conscious motivation for excluding the feature might arise if one is engaged in reclamation since it would be a waste of limited resources to reclaim a derelict feature which presented neither a threat to public safety nor a general environmental nuisance.

The example of the three types of tips quoted earlier will also fit into the changing environment sequence and the closed tip will possibly be identified according to whether it is nearer to the "no vegetation" or "complete vegetation" ends of the scale.

Summary and Conclusions

The problems of examining the concept of and defining derelict land in terms of land use and activity systems are related to the spatial and temporal frameworks within which those activities exist and operate. The temporal framework is particularly important since it governs whether an area is perceived to be derelict or in use.

No definitions of derelict land have been concerned solely with land use or activities so that it is difficult to assess those definitions in view of the problems raised. One can now, however, relate the land use considerations with those of the visual or aesthetic type in order to arrive at a definition suitable to this research.

1.3 A new definition of Derelict Land

From the above it can be seen that for a definition of Derelict Land to be acceptable to most people, several points need to be considered. Firstly, some account must be taken of the "visual offensiveness" which is foremost in most peoples' minds when the concept of derelict land is considered by them. This is shown by examining the definitions which were reviewed earlier although, as has been pointed out, the subjective appraisal of the landscape will produce problems. Secondly, the economic side of the problem needs to be looked at in terms of land use and activity, although again there are problems. It is unlikely that a universal definition can be arrived at since the differing definitions of derelict land are a result of different disciplines producing contrasting conceptions of the term as well as general environmental perceptions and attitudes. It is hoped, however, that the following can be used as a framework for serving the interest of all the different disciplines involved. It is suggested that the term "Spoiled Landscape" be used, as suggested by Bush (1970), to include land and installations. The definition, however, should be changed to the following:-

> "The spoiled landscape is that landscape which through the activity and subsequent neglect of man has become an unutilized land resource, or because of the activity of man causes visual intrusion."

Thus the land use/activity components are separated from the landscape aesthetics one so that the following subdivisions can be catered for. The first of these is the "derelict landscape" which is defined as,

"that landscape which through the activity and subsequent neglect of man has become an unutilized land resource."

This will then include all the features of the economically derelict land concept. The second subdivision is termed the "actively disfigured landscape" and is defined as,

"that landscape which through the activity of man causes visual intrusion."

This will include all those features which are a result of some current activity and which are offensive to the eye.

1.4 The application of the new Definition

This separation of the economically derelict landscape from offensive active areas will enable all sites to be classified without confusion. This may be illustrated by referring back to Section 1.1 where the examples of active and derelict railways and spoil heaps were considered. If one asks the following questions: "Is this feature derelict in the economic sense?" or "Is this feature offensive to the eye?" the answers will show how the feature is to be classed. If the answers are tabulated for the examples quoted one might find the situation as shown in Table 1.1.

Table 1.1 : A method of classifying spoiled landscape

Feature	Question 1 Is this feature Derelict in the economic sense?	Question 2 Is this feature offensive to the eye?	Class
derelict railway	YES	-	Derelict landscape
active railway	NO	NO	Unclassified
derelict spoil heap	YES	-	Derelict landscape
active spoil heap	NO	YES	Actively disfigured landscape

Once the answer to question 1 is "yes" then question 2 is ignored for that feature. This is because one is interested in dereliction from the unutilized landscape concept. Even if a derelict landscape is offensive to the eye it is classed as an unutilized landscape since when reclaimed to beneficial use the visual aspect is almost certain to improve. Features classed as belonging to the "actively disfigured landscape", however, are already a utilized resource and the treatment they require is purely cosmetic (e.g. screening by trees).

The subjective visual element discussed in previous sections is now confined only to the "actively disfigured landscape" so that, for example, where one person might wish to include pylons, another may not. This leaves the derelict landscape free of any ambiguous interpretation since all observers will only be examining the economic status of that landscape.

The other advantage once the two landscapes are separated is that any classification can be superimposed to account more fully for the type of landscape under examination. This will be shown in PART TWO where the definition is applied to the Welsh Office classification of Derelict Land and that used in this research project.

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CHAPTER 2

National Surveys of Derelict Land

"I read the news today oh boy
Four thousand holes in Blackburn, Lancashire
And though the holes were rather small
They had to count them all
Now they know how many holes it takes to fill
the Albert Hall."

Lennon and McCartney (1967)

2.1 Introduction

Most of the history behind National Derelict Land Surveys has already been mentioned in the review of definitions of Derelict Land (section 1.1). A few more historical details will now be given, but emphasis will be on the purpose and method of conducting the surveys since they give the context of the next chapter and most of PART TWO.

2.2 The form of the earlier surveys

When the Ministry of Housing and Local Government issued its circular (M.H.L.G. 1964) requesting local authorities to submit the first derelict land returns in 1964, it served all the authorities in England and Wales. In following years, however, the Ministry, and of late the Department of the Environment, covered only the English authorities, while Wales was administered by the Welsh Office. The circulars which came from those Departments consequently differed in name (M.H.L.G. 1964-1970; D.O.E. 1971-1972; W.O. 1965-1969); although in kind they were identical. The survey usually followed the procedure as set out below:

(i) a circular for the current year would be sent out to authorities requesting information on derelict land for the same year

(ii) the authorities (using the definition quoted in the previous chapter) would compile their returns under the following headings:

I. Amount of derelict land at 31st December (current year)

(a) acreage justifying reclamation

(b) acreage justifying landscaping

(c) acreage not requiring treatment

II. Amount of derelict land treated during the year (current year)

(a) acreage reclaimed

(b) acreage landscaped

III. Amount of derelict land to be reclaimed during the year (year following current one)

(a) acreage to be reclaimed

(b) acreage to be landscaped

Each heading was sub-divided into "Spoil Heaps", Excavations and Pits", and "Other forms of dereliction", and figures were given to the nearest acre.

(iii) during the summer or early autumn of the year following the circular and survey, the returns for the two countries were published, summarizing individual returns to the level of counties. Although the returns were always published in tabular form, they were often depicted graphically by means of pie charts.

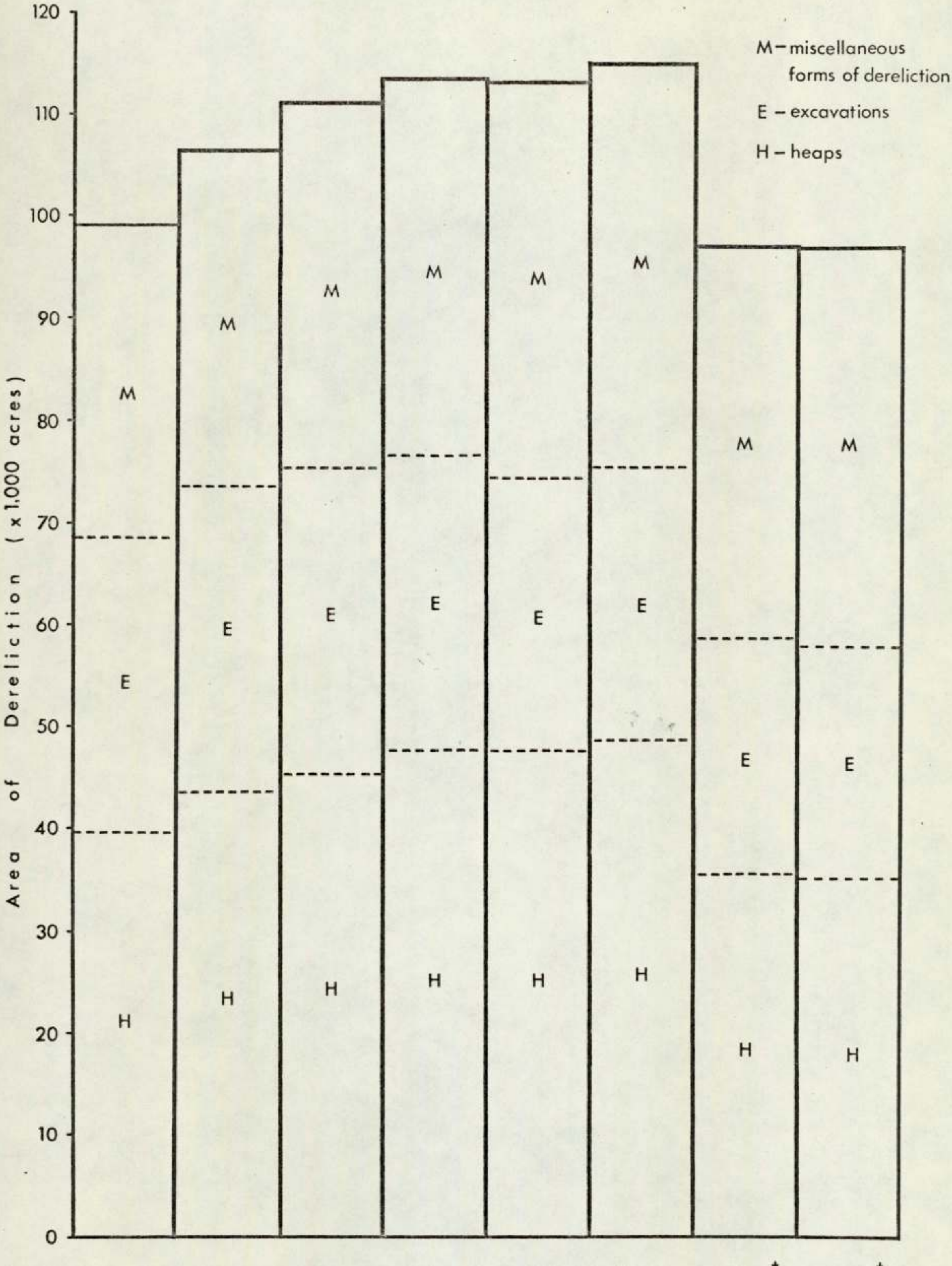
The data which were obtained during 1964-1971 for England and Wales are summarized in Fig.2.1, while the figures relating to Glamorgan, with which this thesis is largely concerned, are shown for the years 1964-1969 in Table 2.1.

2.3 The change to the new surveys

The purpose of the original surveys has clearly been stated in numerous documents since 1964. The separate returns for England and Wales in 1964 were both prefaced by a note which stated that,

> "The purpose of the survey was to ascertain the amount of such (derelict, as defined by the Ministry) land which in the opinion of the local authorities justified

Fig. 2.1a
DERELICT LAND IN ENGLAND AND WALES
1964 - 1971



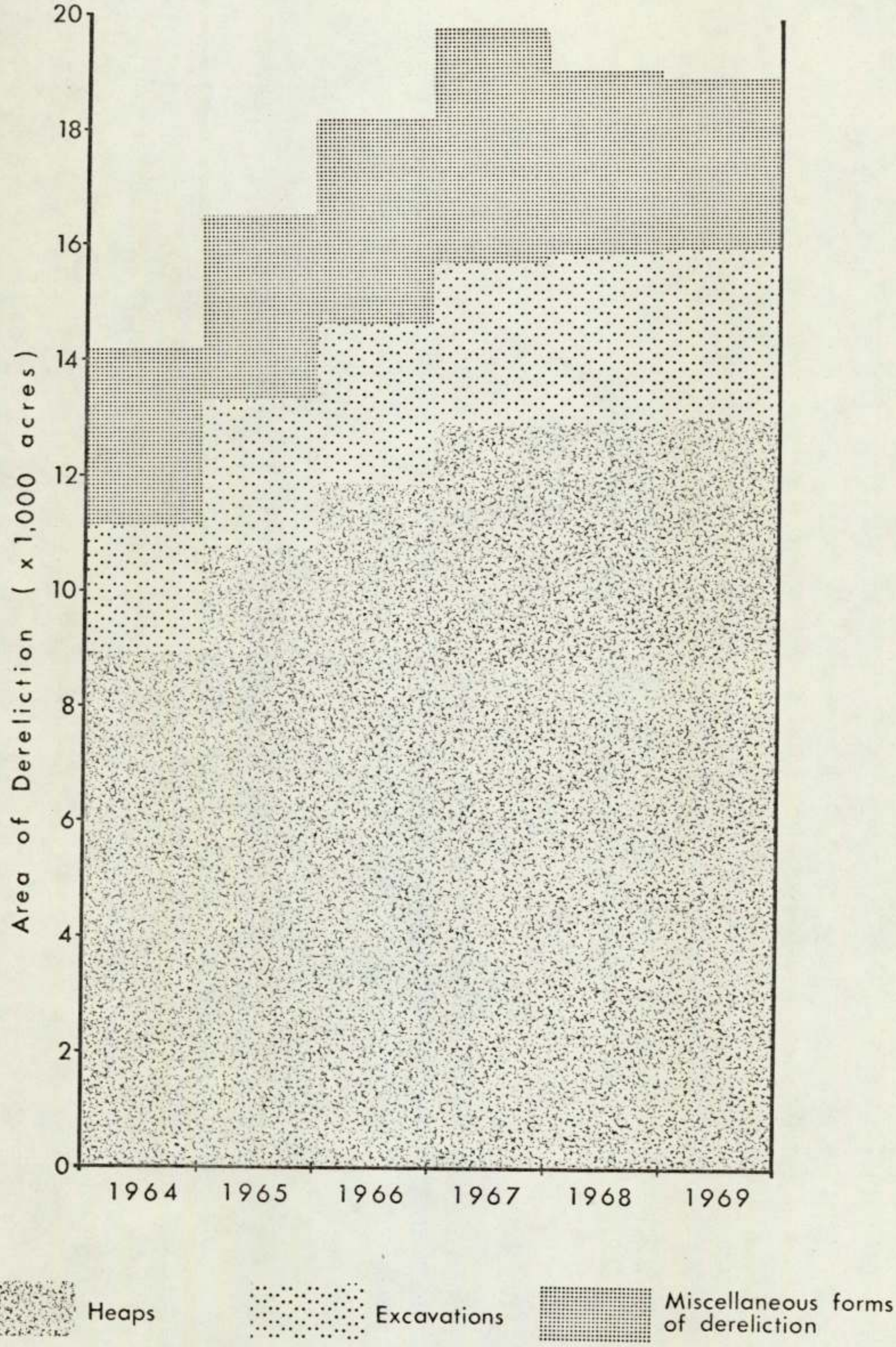
Histogram based on MHLG, DoE, and Welsh Office statistics.

‡ Figures for England only; Wales abandoned the MHLG survey in 1969.

Fig. 2.1b

DERELICT LAND IN WALES 1964 - 1969

Source: Welsh Office



rehabilitation and which was unlikely to be treated except by the authorities or other public authorities. Sites such as those subject to statutory or other arrangements for restoration to use or landscaping or for further development were, therefore, excluded from the definition".

(M.H.L.G. 1965)

The Welsh Office alone prefaced their returns with the same words in successive years but, as was mentioned in Chapter 1, Oxenham (1969) later restated that the aim of the surveys was to ascertain the amount of dereliction likely to rank for grant. The Department of the Environment reaffirmed this policy in 1973 when they said in reviewing earlier surveys that,

"...... information ...... has been confined broadly to land for which the government grants for derelict land reclamation are available" (D.O.E. 1973)

Mention has been made earlier of the fact that many authorities and research workers were critical of the Ministry definition of derelict land. It was not only the definition per se which was criticised, however, but the fact that the narrow definition led to a gross under-estimation of the total problem and consequently reduced the amount of available grant. In the West Riding, for example, it was found that the total area of spoiled land which should be considered was four times that figure regarded as derelict for Ministry purposes (Bush and Collins 1973). The Nottinghamshire and Derbyshire Sub-Regional Study indicated that an area of 2,350 ha (5,800 acres) was a more realistic estimate than the officially recognised 1,540 ha (3,800 acres), while Monmouthshire thought that their area of dereliction should be almost twice as great as that officially accepted (Notts./Derby. 1969;

Welsh Office, 1972, respectively).

Increasing dissatisfaction combined with greater environmental concern eventually influenced Ministerial policy to the extent that significant changes were made to the survey both in concept, as was discussed in Chapter 1, and the procedure to be adopted. Wales led the way when, in 1969, the Ministry definition and survey were abandoned. The Welsh Office had been concerned that some categories (as mentioned in Chapter 1) were being excluded, but more importantly that there was too much scope for difference of interpretation between the large number of authorities making the return (Welsh Office, 1972).

Thus the returns that were being compiled were suspect (Courtier, 1972) since not only did they probably underestimate the true nature of the situation, but that they were not truly comparable from one year to another, or between authorities across the country.

The Department of the Environment, in considering the scope of the survey for England, put a different emphasis on the problem. They regarded that a more comprehensive survey was desirable "to cover additional categories of industrially scarred land and to provide up-to-date information about land used for surface mineral workings and refuse tips or for which planning permission for such purposes has been given". (D.O.E. 1973).

Irrespective of how the new surveys have been justified by the two Government Departments, however, the purposes of both are probably identical, particularly since the information required is basically very similar. Because of this, emphasis will be given to describing only the Welsh Office survey since it is of fundamental significance to the survey of Glamorgan, which is described in PART TWO. In any case, experiences with the English (D.O.E.) survey have yet to be reported in detail.

2.4 The new Derelict Land Surveys

The change in the concept of the surveys has already been discussed with reference to England (Chapter 1), but it has been difficult to locate any policy documents relating to Wales. It is known that the survey return form, referred to as the Welsh Office Transparency (W.O.T.), was the result of several consultations between the Welsh Office and Local Planning Authorities and that the first survey was to be operational for 1971, although the total returns for the whole of Wales were completed only in early 1974.

It is also documented that a sample of W.O.T. was circulated to planning authorities in 1971 and accompanied by a memorandum which set out the classification of areas to be mapped, listed additional information that was required (site location, priority for treatment and future use), and gave brief notes on the procedure to be adopted (Welsh Office, 1971). Quite simply, a site would be mapped in outline on a W.O.T., of which Fig. 2.2 is a copy, and the appropriate boxes marked. Reference to the categories listed on the W.O.T. are made in detail in PART TWO, since experience of the survey with regard to the old County of Glamorgan has suggested that although the survey is satisfactory in principle there have been numerous problems of a practical and methodological nature.

2.5 Summary and Conclusion

It has been shown that dissatisfaction with the older Derelict Land Survey of England and Wales and greater environmental awareness has led to a greatly enlarged survey in each country(compare, for example, the items in Section 2.2 with those of Fig.2.2). Since no exhaustive search has been carried out it is not known how authorities have undertaken the new surveys, but it would not be unreasonable to assume that a combination of ground survey, personal knowledge and other

Year	Spoil Heaps	Excavations and Pits	Other forms of dereliction	Total area of dereliction	Total area of dereliction justifying reclamation	Total area reclaimed or landscaped in preceeding year
1964	666 (1646)	95 (234)	275 (680)	1036 (2560)	860 (2125)	72 (177)
1965	1472 (3638)	93 (229)	287 (709)	1852 (4576)	1514 (3741)	38 (94)
1966	1932 (4773)	159 (394)	389 (961)	2480 (6128)	2098 (5184)	52 (128)
1967	2246 (5550)	193 (477)	473 (1169)	2912 (7196)	2558 (6322)	34 (84)
1968	2238 (5529)	201 (497)	501 (1237)	2939 (7263)	2586 (6389)	90 (223)
1969	2280 (5633)	189 (467)	446 (1101)	2914 (7201)	2560 (6327)	121 (298)

Table 2.1 Derelict Land in Glamorgan 1964 - 1969

Areas are given in hectares; acreages are indicated in brackets

(Source: Welsh Office 1965-1970)

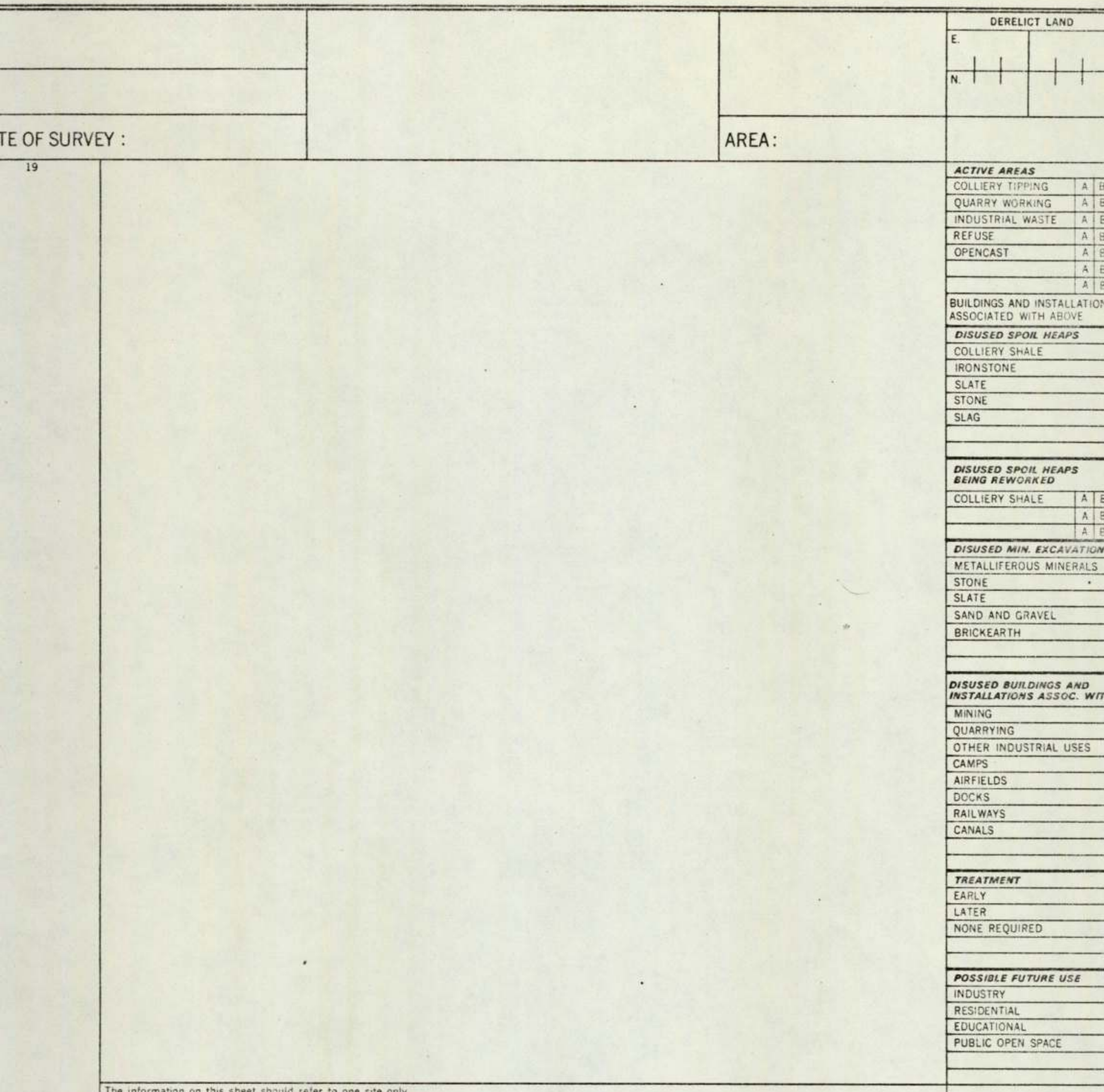


Fig. 2.2 The Welsh Office Survey transparency (WOT)

records have been used. These are methods which have been applied, however, to the older surveys, yet it would seem that their inherent problems of time consumption, inconsistency and incompatibility are not suited to the new survey approach where a sounder data base is required. The new surveys then suggest that perhaps a new method of collecting the data is required. Such a method, involving the use of aerial photography, is suggested in PART TWO where the previous use of aerial survey is reviewed.

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CHAPTER 3

The Reclamation of Derelict Land

"The percentages of derelict land for which the local authorities considered reclamation or landscaping justified also vary. Some counties say that 100 percent of their dereliction justifies treatment. Some, with very large areas to deal with, ... consider that between 70 and 90 per cent justify treatment. Cornwall on the other hand expects to treat only ... 13 per cent. It would be interesting to know how far these variations reflect differences in practicability, policy or financial capacity."

Planning Commentary (1966)

3.1 Introduction

The preceding chapters have considered the difficulties involved in defining the concept of derelict and spoiled land, and of the way such land has been surveyed at the National level.

The question now arises as to the purpose of this work. Assuming a suitable definition has been arrived at, why is it necessary to survey derelict land? The reasons given by National Government, as discussed in 2.3, provide one possible answer. This was that the survey (and associated definition) was to ascertain the amount of dereliction likely to rank for grant. Implicit in this view, and indeed explicit in the definition's words of "land ..... incapable of beneficial use without treatment" (D.O.E. 1972), is that the ultimate aim is restoration or reclamation. This aim is taken up more directly at the local level, where the local authority deals with the planning and administrating of such schemes. They will be a little less concerned with the grant issue than National Government, although, of course, the authority will attempt to obtain as much financial aid as they think necessary. At the local level, however, there are perhaps other factors obscuring the need for a derelict land survey *per se*, and it is hoped that these factors will emerge in Section 3.4 below. Before that, however, one needs to know what "reclamation" can entail.

3.2 The meaning of Reclamation

For the purposes of this research, reclamation is regarded as referring to all activities associated with the conscious effort to change the status or appearance of derelict or spoiled land. This will, therefore, range from the extensive treatment of earth moving and landscaping of a site, to the purely cosmetic treatment of "tidying-up" sites.

If these activities are to be successful then the experience and expertise of the planner, the engineer, the landscape architect, the pedologist and the botanist are required. Obviously, with a field as broad as this it would be difficult, and indeed presumptuous, to examine them in depth, but the author will briefly attempt to introduce those aspects which are relevant to the general theme of the thesis.

3.3 Reclamation Projects

Reclamation projects have usually been of two types, (i) those involving research work into the differing aspects of the subject, or (ii) those carrying out reclamation schemes at specific sites.

3.3 (i) Research work

This type of work is usually carried out by the normal research establishments (largely the universities) and has been applied to all the disciplines relevant to reclamation. Rodin (1973), for example, has described the geotechnical characteristics of colliery spoils (including lagoon deposits) from various coalfields, and indicated the processes which operate on and in spoil heaps. Penman (1973) has shown the problems of subsidence when building on open cast backfill, and has contradicted the commonly held view that a certain elapse of time will allow sufficient consolidation of backfill to enable building to commence (see Bennett (1969) for example). These examples of engineering research have not just indicated the problems of reclamation since they have suggested some possible solutions. Penman, for example, has indicated that the backfill problem may be solved by the use of flexible structures which would tolerate the differential settlements which occur, by advancing the rate of consolidation, by the use of piling, or by using a combination of these techniques.

A great deal of research has been carried out on the problems of soils and vegetation in reclamation schemes, with particular reference to spoil heaps. Crampton (1967), for example, has described soil profile development on tips in South Wales which have been afforested with Japanese Larch (Larix leptolepis) and various species of pine (e.g. Pinus sylvestris), while Whyte and Sisam (1949) and Whyte (1959) have discussed experiments in re-vegetation with emphasis on tree planting. The planting of various grass mixtures is often reported, with hints on fertilizer application (e.g. De Soissons, 1968), while techniques such as hydraulic seeding (Lowe 1966) have been developed to increase the chances of success, particularly on steeper slopes. Occasionally, the results of research such as that outlined above are brought together in a multi-disciplinary approach. Oxenham (1966), for example, has brought together experiences of the financial, legal, engineering and ecological aspects of reclamation. Similar fields were examined during the Lower Swansea Valley Project (Hilton 1967), while a team from the University of Newcastle has concentrated on pedological, botanical and aesthetic (landscape architecture) problems (University of Newcastle, 1971 and 1972).

Some of the above-mentioned work has been carried out in conjunction with specific reclamation schemes, but generally the research follows the form of controlled laboratory or field experimentation. Discussion of specific schemes must, therefore, be examined separately.

3.3 (ii) Reclamation schemes

Specific reclamation projects have been carried out and described by various bodies. Wilkins (1903) quotes a Mr. Richard Fothergill, an ironmaster of Aberdare and Merthyr Tydfil as "clothing unsightly tips with trees", and although a date is not given, it was probably carried out about 1870. Examples of individuals carrying out work on their own initiative (let alone reclaiming their own dereliction) are rare, although Russell (1947) reports that a group of such individuals formed the Midland Reafforestation Association in 1903 with the aim of afforesting spoil heaps.

The majority of reclamation schemes have been, and continue to be, carried out under the guidance of the local authorities, although the Opencast Executive of the National Coal Board has illustrated that in areas such as Northumberland the process of open cast working can greatly benefit the environment (N.C.B. 1967 and Pardoe 1973). The work of the authorities has ranged from the small and generally unpublicised schemes such as that carried out by Rhondda Borough Council between 1947 and 1958 (Anon. 1958), to the County-wide projects such as those in County Durham. It would seem that those authorities who have reclaimed areas on a large scale have also been prominent in reporting on their success. To refer to the example of County Durham, one finds a regular commentary on original plans for reclamation and of the progress with the programme (Durham County Council (1965), although this is not the earliest reference to reclamation work, Atkinson (1969), and Briggs (1973) for example).

But although there is a wealth of literature on specific schemes, it is not clear why reclamation has been carried out or why some sites have been selected in preference to others. The aims of those concerned with the research aspect of reclamation, however, are more apparent since generally they are attempting to discover, and provide the best solution to, the numerous problems involved.

It is, however, the motivation of the people carrying out the reclamation which is of importance to this thesis and in order to gain some notion of what this motivation is, it is necessary to look at the criteria which have been used in the past.

3.4 Reclamation criteria

There are very few indications in the literature as to the specific aims of reclamation. The Ministry surveys, as mentioned in Chapter 2, refer to derelict areas "justifying treatment" but no guide has been given as to how one "justifies" this treatment. Indeed, when asked about the matter it was stated by the D.O.E. that it was left to the judgement of the local authorities concerned. It was even stated that little significance should be attached to the terms "treatment", "restoration" or "reclamation" since the D.O.E. did not interpret them rigidly (Armstone 1972).

The broad aims are certainly given in almost all the references discussing reclamation schemes and usually include the need to improve the environment for the indigenous population (and hence curb outward migration), and to provide an attractive environment for new industry and an associated influx of people. The relative importance of these two aims is less clear although, whereas earlier work concentrated on the economic aim (i.e. bringing in new industry), more recently there has been a tendency to attach importance to the social goal. An indication of this is found in examining the costs of conducting reclamation work and comparing them with the estimated after value of the site. Table 3.1 gives some examples of schemes approved by the Welsh Office under the Industrial Development Act of 1966. In the majority of cases the gross eligible cost of reclamation and the amount of grant approved greatly exceed the after value of the site. If one looks at the 157 schemes approved between 28.2.67 and 26.6.72, one finds that the 4,006.98 acres were reclaimed with the aid of grants totalling £6,034,797 (including a few grants awarded under the Local Government Acts of 1966 and 1970) while the after value has only been listed as £770,115 (Welsh Office 1972).

Authority	Site	Area of Derelict land reclaimed - ha (acreage in brackets)	Gross cost eligible £	Nett cost eligible £	After value £	Grant Approved £	Date of Approval
Rhondda MBC	Lewis Merthyr Colliery Tip	20.2 (50)	140,744	140,744	-	119,632	26.6.67
Neath RDC	Neath Abbey Industrial Site	3.4 (8.29)	12,335	-	12,500	-	30.11.67
Pontardawe RDC	Ystalyfera Colliery Site	4.0 (9.77)	5,596	5,596	-	4,757	4.1.68
Pontypridd UDC	Sardis Road	6.5 (16)	56,866	49,866	7,000	42,386	7.2.68
Glyncorrwg UDC	Duffryn Rhondda Tips	5.6 (13.74)	77,592	77,592	-	65,953	3.2.69
Aberdare UDC	Railway land, Robertstown	5.5 (13.61)	29,270	-	55,000	-	24.2.69
Glamorgan CC	Railway bridge; Waunrhydd Rd Tonyrefail	0.2 (0.50)	4,236	4,236	-	3,601	17.8.70
Maesteg UDC	Forge factory site	1.7 (43)	30,172	28,372	1,800	24,116	24.2.71
Ebbw Vale UDC	Gas Holder Site	5.3 (13)	48,186	48,186	-	40,958	20.10.71
Gelligaer UDC	Cefn Brithdir Tip-Phase II	19.3 (47.78)	53,991	53,991	-	45,892	25.1.72

Table 3.1 Examples of Reclamation Schemes approved by the Welsh Office (under the Industrial Development Act 1966 (Section 20))

(Source: Welsh Office 1972)

Neither these considerations nor the broad aims mentioned above, however, are going to indicate which areas should be reclaimed first, or even how extensive the reclamation should be. Glamorgan County Council had begun the process of establishing a basis for choosing sites by considering the following criteria:

A. Danger to life and limb

B. Threat of economic loss by physical damage

C. Development potential

D. Environmental considerations

E. Resource considerations

(Glamorgan County Council 1970)

but an actual list of sites had not been produced on this basis by the time that the County was split into three on April 1st, 1974. It remains to be seen whether a list will be produced by the new counties of West and Mid-Glamorgan, where most of the dereliction is concentrated.

Briggs (1973) has implied several criteria used in County Durham's reclamation policy which are virtually equivalent to C, D and E of Glamorgan's list (safety and economic loss by physical damage are not as important in Durham as in South Wales, where the ghost of Aberfan still haunts all those connected with dereliction). Category E shows an interesting contrast in approaches since Glamorgan regards the use of spoil heaps for coal or hardcore retrieval as significant in possibly confirming the viability of a scheme, while Durham regards such salvage as of little value since "it is more advantageous to the area as a whole to reclaim the eyesores than to allow their perpetuation for mineral salvage" (Briggs 1973). This point indicates how differences in approach to the question of reclamation is tempered by local factors and characteristics.

3.5 The potential role of aerial photography in reclamation schemes

From the brief discussion above, it is hoped that one can see firstly that reclamation involves several disciplines, each of which requires certain distinct data. Secondly, these disciplines must work together to provide the best solution to particular reclamation problems which occur with each site. Thirdly, and perhaps most importantly, despite the fact that a need for a comprehensive overall plan of reclamation is usually accepted, that this need is rarely fulfilled. Consequently, reclamation takes place in an ad hoc fashion, ultimately making inefficient use of available resources and possibly being of detriment to strategic planning goals. The lack of such a reclamation framework, which has been noted by other workers (University of Newcastle, 1971 and Durham County Council, 1965, for example), is probably due to a lack of policy on reclamation criteria and an associated lack of relevant data.

It is felt that this need can be partially met by the use of aerial photographic survey since various types of relevant data may be readily obtained, as will be shown in PART TWO. Even where data are not directly obtainable, aspects of the photographic image can be used to derive such data, as will be demonstrated later.

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PART TWO

THE SURVEY OF SPOILED LAND IN GLAMORGAN

Introduction

The commonest concepts and definitions of the Derelict and Spoiled Landscape have been reviewed in PART ONE and a definition proposed for this current research. The significance of National survey policy and reclamation criteria to surveys of derelict land has been discussed and it has been suggested that a new survey procedure (as described in the following chapters) is desirable for two main reasons. Firstly, the increased amount and changed nature of the data required by National Government means that faster methods of data handling are needed if surveys are not to take any longer than the older forms. Quicker surveys, however, must not result in the collection of unreliable data so that a method giving consistent and accurate results is required. Secondly, the increasingly important need to reclaim dereliction on a rational basis indicates that data relating to the reclamation criteria needed for that rationality must be as sound as possible.

The following chapter indicates how the use of aerial survey might be of use in meeting the above requirements, while Chapters 5-8, inclusive, describe how this proposal has been applied in the case of Glamorgan. The final chapter of PART TWO gives an account of the survey results, while an appraisal of all aspects of the survey is presented in PART FOUR.

CHAPTER 4

Background to the Survey

"... there were no regulations. Tip stability had received negligible attention anywhere; no survey of the Aberfan tip complex was ever made and such survey maps that existed were ludicrously inaccurate. There was no statutory obligation ..."

Austin (1967)

4.1 Previous work on the use of Aerial Photography in Spoiled Landscape Studies

4.1 (i) Aerial Photography and Planning

The use to which aerial photography has been put in studying the spoiled landscape is a reflection of how little use has been made of the technique in the broader field of planning. Despite the many works extolling the virtues of aerial survey (Childs (1967), Collins (1969), Joseph (1957) and Mott (1967), for example, planning authorities, at least in this country, have been reluctant to take advantage of them. White (1970), in conducting a survey of the sources of information that planners use, found that while only 15% of her sample did not use any in practice, the remainder had little regard for them whem compared with the use of other data sources. It is hoped that White's follow-up work listing the sources of planning information including aerial photographs (White, 1971) may have encouraged the 81% of her original sample, who thought that aerial photographs could be better exploited, to make more use of them.

The later and more comprehensive survey by Denton (1973) would certainly seem to offer more hope. In spite of the fact that he had used a different sample base (the survey by White had sought answers from individual planners about how they personally used the photographs, whereas Denton directed his survey at a broader "departmental" level of use), his results suggest a much greater degree of use than the earlier work. About 90% of sample authorities in Great Britain had made "some" use of photographs in the five years preceding the survey and just under half of these used aerial photography "regularly". The remainder of the sample, however, used photographs only "occasionally" or "infrequently", or "not at all".

The use of aerial survey, particularly for land use purposes, has been recognised overseas, especially in the developing countries, as the works of Collins (1966) and Warren (1969) show, and also in the United States as McLellan (1975) has pointed out. In this country, however, most use is made in research institutions. McDonald (1971) and Collins and El-Beik (1971a), for example, have examined the aerial photograph as a source of data for urban land use mapping, while the latter authors (Collins and El-Beik (1971b)) have extended the use by applying it to conducting a population census. More recently McLellan (1975) has usefully assessed various scales of photography for mapping land uses in different urban and rural environments.

Although the works mentioned above make a potentially useful contribution to the planning field, their lack of application suggests not only a reluctance on the part of the planner but also a lack of knowledge since usually the works are unpublished (in the case of research degree theses) or else appear in publications which a planner would not normally consult. In this respect the research worker must be equally responsible for the present state of affairs.

4.1 (ii) Aerial Photographs and Spoiled Landscape

Much of what has been discussed in the previous section applies equally to the use of aerial photographs in spoiled landscape studies. It is true that photographs have been used for quantitative surveying (for the production of maps and plans, i.e. photogrammetric purposes) and papers such as that of Belling (1966) in which photogrammetric techniques are applied to open cast mining with considerable advantages over field survey methods are not uncommon. But the use of photographs to provide qualitative information is much more limited.

Beresford and St. Joseph (1958) have used aerial photographs for illustrating aspects of medieval industrial remains, but this is more appropriate to industrial archaeology than derelict land survey. In any case most sites described by those authors are now in use as agricultural land, or have "reverted back to nature" sufficiently to perhaps exclude them from being considered as part of the spoiled landscape.

The survey by Denton (1973), mentioned previously, included several questions relating to the use by local authorities of air photos for derelict land studies. It was found that 45% of those authorities in Great Britain which had used aerial photography in the five years preceding the survey had done so in relation to derelict land studies, and that this application was eighth out of a total of nineteen listed. In Scotland, however, the relative importance of photographs for use in derelict land studies is recorded as being considerably greater, although it is not known exactly how the photographs were used.

It has, again, been the research institutions which have contributed most to the field. Collins and Bush (1969(b); 1971) and Bush (1970) after having derived an air photo key from a sample area used aerial photographs to survey an area of 200 sq.km. South East of Leeds. The work showed that a high order of accuracy could be obtained in such surveys, although difficulty was experienced with identifying disused railways on the 1:10,500 scale photographs used (Collins and Bush, 1971). This work has been criticised for not going very far, and certainly appears to have become a little too preoccupied with problems of classifying spoiled landscape, resulting in the compilation of a classification which was admitted to be impractical for survey work (Bush, 1970). This point is insignificant, however, when one examines the main virtue of the work. This was that, despite the fact that the research was exploring completely fresh ground and that the survey was conducted solely with aerial photographs, virtually all sites of spoiled landscape were discovered, correctly identified and mapped. Had the survey been conducted with the additional use of other data sources, the results would probably have been no worse and most likely may have been improved.

Although another project went no further in this respect (James, 1970), it was certainly more applied than the work of Bush. A survey of the spoiled landscape in the Cambourne-Redruth area of Cornwall was carried out using the same method as evolved by Bush, but the resulting map was used for a planning exercise. By taking into account the land use requirements of the area and the nature, amount and distribution of spoiled land, James was able to assess how the derelict areas might best be reclaimed. The method used for this did involve subjective scoring and this, coupled with the implications of the mechanics of allocating scores, does tend to cast some doubt on the validity of the outcome. That, however, is of little concern to this work; the fact that the survey was <u>successful</u> is of greater significance.

4.1 (iii) <u>Conclusions</u>

Despite the fact that there is an adequate body of literature indicating the uses to which aerial photographs can be successfully put, in both planning and spoiled landscape studies, planning authorities have been slow to realise the potential of such a technique. Individual research workers, however, must be partially responsible for this, in not bringing their findings to the attention of a wider audience of planners.

The works of Bush (1970) and James (1970), in particular, have shown almost conclusively that aerial photographs alone can be successfully used for the survey of spoiled landscape. These studies, however, were not specifically carried out to satisfy the needs of the local authorities of the areas concerned, and it must be examined whether aerial survey would be of help to them, by reference to the work carried out in the old County of Glamorgan.

4.2 The Need for a survey by Glamorgan County Council

Discussion with Glamorgan County Council officials early in 1972 had shown that nowhere was there a complete and accurate record of the amount, type and distribution of various forms of spoiled landscape in the County. Some records did exist, for example a series of 1:25,000 scale maps showing the location (but not the extent) of colliery tips, both active and disused, but these were based on old mine plans, the occasional small survey and the personal knowledge of certain areas familiar to employees of the County Council. The reliability of these data sources varies considerably, not least that of personal knowledge, with all the inherent problems of general environmental perception (an indication of this was shown in Section 1.2).

It became obvious, therefore, that there was a need for a method of collecting data on the spoiled landscape which would overcome these problems. This need tied in with the County's ideas on reclamation policy which, as mentioned in the previous chapter, was attempting to take into account the many criteria relevant to a rational policy.

There was also the point that the County were required to complete a Derelict Land Survey for the Welsh Office on the basis outlined in Chapter 2, while finally the data could be used as an input into the computerized data bank which was also being set up at that time.

From the references to, and discussion concerning the use of, aerial photographs made above (4.1), it can be seen that aerial survey methods seemed appropriate to the County's requirements, particularly since the County Council was in the process of having complete air photo coverage flown. Accordingly, a research programme was formulated which is described in the following two chapters.

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CHAPTER 5

The Preliminary Study of the Area around Neath

"It is not surprising, given the random incidence of dereliction that in much of the country the present rate of reclamation is wholly inadequate. The responsibility for treatment rests with local authorities and quite small authorities may find themselves faced with problems for which they lack the necessary resources, whether of money, technical expertise or qualified staff."

(H.M.S.O. 1969, para. 460)

5.1 Introduction

The initial research programme was drawn up after the meeting held at Cardiff early in 1972, and sent to the County Planning Officer, A.J. Williams. Briefly, the programme indicated that the research would be carried out in two stages:

Stage 1: A Feasibility study

A) To review the definitions and compile a classification of spoiled and derelict land to be applied in the work.

B) To determine the suitability of existing 1967 and 1971 aerial photography as a source of information for surveying spoiled (derelict) land in the County and to compare the situations for these two years and to relate them to the social and/or economic environment.

Stage 2: A Regional study

To apply the methodology evolved in Stage 1 at the regional level.

5.2 The Feasibility Study Area

The initial study area was chosen by the County Planning Department for several reasons; firstly because it was felt to contain a representative sample of the different types of spoiled land in Glamorgan, and secondly because it was the only such area at that time to have sufficient air photo coverage. As has been mentioned, the County was being flown over at that time, providing aerial photographs at a scale of 1:5,000, but the whole County had not then been covered, although the original contract with the air survey company had specified 1971 as the year of the survey. In fact areas in the northern half of the County (i.e. the valleys, where most of the dereliction is found) were having to be reflown since the original cover taken in November, 1971, was largely obscured by shadow (some parts of the valleys receive no direct sun in the Autumn and Winter due to their aspect and the low angle of sunlight). As it happened, these areas were never completely reflown and although complete County coverage was theoretically achieved by September 1972, some areas were covered only by these shadowy photographs.

The area chosen for the Feasibility study, therefore, was centred on Neath and covered 100 sq.km. coincident with the Ordnance Survey 1:25,000 scale map (SS 79). The location and size of this area with respect to the whole County is shown in figure 5.1.

5.3 Available Data Sources

In the first instance there were four data sources readily available:

1. air photo coverage for 1971 at a scale of 1:5,000
2. land use maps, prepared at a scale of 1:10,560 by the County Planning Department and dated September 1969
3. geological maps, produced by the Geological Survey on the new grid base at a scale of 1:10,560
4. Ordnance Survey base maps, scale 1:10,560

The last three items were covered by map numbers SS 79 NW, SS 79 NE, SS 79 SW, SS 79 SE, and in addition an Ordnance Survey map at a scale of 1:25,000 (SS 79) was used.

5.4 The Feasibility Study-Method

5.4(i) Stage 1(A) - Definition and classification of spoiled land

The first part of the study was to review the existing definitions of spoiled and derelict land but this was carried out concurrently with the actual survey of the Feasibility study area. In fact when the survey was finished and an Interim Report written, (Gibson 1972), this aspect of the research was still being carried out. As the Report pointed out,

"A review of the definitions and classifications of spoiled land is a continuous process since fresh ideas and thoughts (as well as some older ones) come to light regularly, particularly at a time when people are more aware of environmental problems"

Because of this no formal definition of spoiled or derelict was, at that time, formulated but several points were considered relevant to the concept of derelict or spoiled land and were regarded as being possible inclusions in any future definition. These points related to the economic and aesthetic concepts discussed in PART ONE and included the ideas of disuse or abandonment, offensiveness to the eye, and the incorporation of certain non-industrial causes of dereliction. The definition which has now been derived and presented in 1.1 can be seen to have taken these ideas into consideration and it is felt that the definition can be applied quite easily to this earlier work.

The work on the classification of spoiled land followed a slightly different course. The research carried out by Bush (1970) was felt to have more than satisfactorily reviewed existing classifications and it was regarded as inappropriate to re-examine this aspect of the subject. Similarly, the work of McDonald (1971) had shown full well the general philosophy and principles behind classification theory and needed little further comment.

These points, taken into consideration with the fact that Bush's theoretical classification proved unworkable in practice (Bush and Collins 1974), and that in any case "classifications of derelict land have been compiled .... for the specific purposes of individual surveys" (Bush 1970), convinced the author that there was little point in attempting to compile a classification of universal application, or which was as logically sound as McDonald would perhaps wish. Accordingly, a more empirical approach of classifying that which <u>was</u>

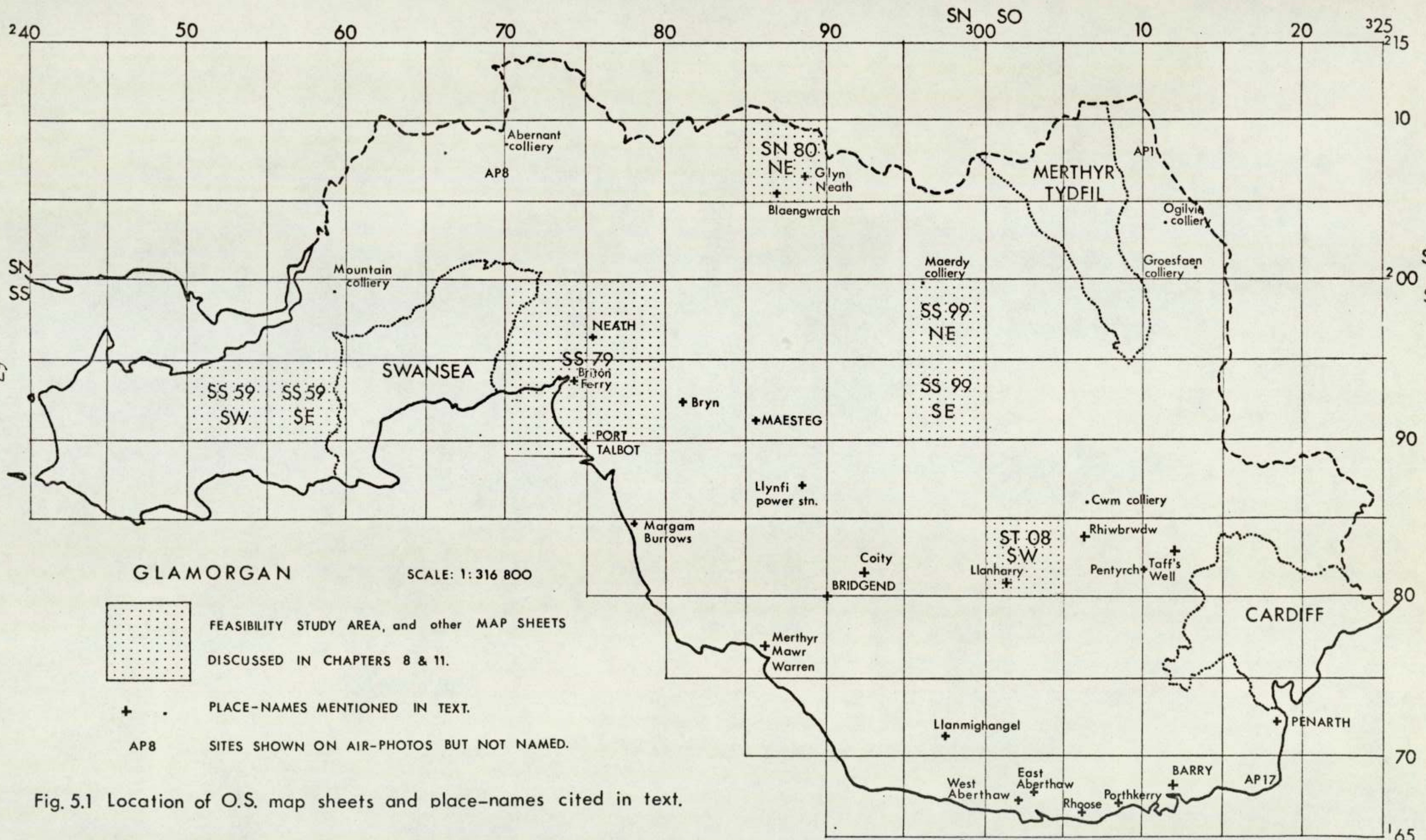

Fig. 5.1 Location of O.S. map sheets and place-names cited in text.

present rather than deciding beforehand what could be or might be present, was used. This was achieved by first examining the form and nature of the spoiled landscape and then deciding the activity or process which had resulted in that landscape. The result of this procedure can be seen in Section 5.4(ii) which discusses the types of spoiled landscape which were found.

5.4(ii) Stage 1(B) - Surveying the area around the Neath

Using the data sources outlined in Section 5.3, most of the area of SS 79 was surveyed to the maximum level of detail possible. This was done by examining the aerial photographs under a Wild ST 4 mirror stereoscope using, where necessary, 3x and 8x magnifying binoculars, and supplementing the subsequent interpretation with data from the maps. A detailed description of the techniques used in the interpretation will be presented in Chapter 6 which covers the regional aspect of the survey. The information derived in this first survey was initially marked onto transparent acetate overlays (placed over alternate photographs) and recorded in the form of short descriptive phrases such as "flat topped tip-motorway construction", or "derelict buildings; walls mainly intact; no roofs, probably farm buildings (marked Pen-Lan on 6" map)".

When as much of the area had been surveyed as possible (even this area had incomplete cover for reasons outlined in Section 5.2), the descriptive phrases were grouped into more logical classes, as shown in table 5.1. Each class was then given a colour code which was used when data were transferred by eye from the transparent overlays to 1:10,560 scale base maps. The classes into which sites were put were first derived on the basis of form and nature, as mentioned in the previous section. Thus, referring to part A of Table 5.1, sites were

TABLE 5.1 - ORIGINAL CLASSIFICATION OF SPOILED LANDSCAPE DATA

Features of the SPOILED LANDSCAPE

A. General Features — Symbol

(i) Buildings and Installations

(a) buildings and installations externally intact ....

(b) buildings in a state of ruin ....

(1) broken roof but walls intact ....

(2) roof collapsed or removed but walls intact ......

(3) no roof; walls present but few intact ....

(4) ruins reduced almost to generally ground level ..

(c) installations in a state of ruin ....

(d) unrecognisable installations/buildings ....

(ii) Tips and Heaps

(a) single heaps (0) no vegetation specified ....

(1) bare of any vegetation ....

(2) sparsely vegetated ....

(3) well vegetated ....

(b) group of several heaps not separately delimited (0)) (1)) (2)) (3)) as A(ii)(a)

(0) ....
(1) ....
(2) ....
(3) ....

(iii) Excavations

(a) single excavation (0)) (1)) (2)) (3)) as A(ii)(a)

(0) ....
(1) ....
(2) ....
(3) ....

(b) group of excavations lying within others and not separately delimited ....

(0))
(1)) as A(ii)(a) ....
(2)) ....
(3)) ....

Those excavations containing water have their suffix (, or) followed by the symbol - e.g. : single excavation, wet and having no vegetation cover.

(iv) Spoiled or degraded land at the general level of its surroundings ....

B. Special and Complex Features

(i) Heap-Hole combinations

(a) Excavation within a heap. The symbols of A(ii) and A(iii) are combined, e.g. A single unvegetated heap containing a single unvegetated excavation (location of excavations known) ....

(b) Heap within an excavation. The symbols of A(ii) and A(iii) are combined, e.g. A single unvegetated excavation containing a single unvegetated heap (location of heap known) ....

If the position, i.e. geographical location, of the internal feature is unknown, its symbol is drawn parallel to that of the surrounding feature, e.g. A single unvegetated heap containing a single unvegetated excavation whose location is unknown ....

(ii) Special cases of spoiled or degraded land at the general level of its surroundings

(a) Foundations or site of building(s) and installations which has (have) been reduced to ground level ......

(b) Spoiled or degraded land associated with railway networks ....

(iii) Special coal-mining features

(a) site of adit or mine entrance ....

(b) site of pit or mine shaft ....

Activities/Land-Use Associated with Features

I. Extractive Industries

(i) Coal mining ....

(ii) Sandstone quarrying ....

(iii) Others (state name) ....

II. Other Industrial Workings

(1) Steel works ....

(2) Tinplate works ....

(3) Fabrication plant ....

(4) Others (state name) ....

III. Miscellaneous Tipping Practices

(1) Subsoil ....

(2) Topsoil ....

(3) Material unknown ....

(4) Domestic refuse ....

IV. Storage Dumps and Yards

(1) Coke-coal dumps ....

(2) scrap cars ....

(3) scrap metal ....

V. Intra-Urban Residential Usage & Open Spaces

(i) Residential ....

(a) under construction ....

(b) demolition ....

(ii) Allotments ....

(iii) Residual Open space ....

VI. Agricultural Activities

VII. Transportation Networks and Associated Activities

(i) Roads ....

(a) disused roads ....

(b) road construction ....

(ii) Railways ....

Track

(a) (1) track intact but overgrown ....

(2) track partially dismantled ....

(a) stretches of complete track removed ....

(b) line removed, sleepers in position .

(c) line/sleepers removed; sleepers present in piles ....

(3) line completely dismantled but position of sleepers still visible ....

(iii) Waterways ....

ADDITIONAL NOTES (applicable to features and activities)

A - active. ? - unknown if active or derelict.

n.v. - not visible on photo but present on map.

R - area undergoing restoration, reclamation or reworking.

generally classed as buildings and installations, tips and heaps, excavation or spoiled or degraded land at the general level of its surroundings. The basic reasons for this division are that firstly it is the morphological characteristics of a site which indicate its full identity, secondly that those characteristics tend to suggest the nature (i.e. physical composition) of the site (e.g. a heap is almost invariably a waste product), and lastly that form and nature will influence the future state or use of the site.

These reasons are even more appropriate when one considers the four general classes at a greater level of detail. A derelict building such as an engine shed, for example, may involve a different situation from an installation such as colliery pithead gear if one is considering their removal (if only because the pithead gear implies that a shaft is lying beneath it). Similarly, the reclamation of one large tip or excavation will provide different sets of problems than a scattered collection of small heaps or excavations will do. In addition, if a heap or excavation is well vegetated with shrubs or trees one might consider whether it should be reclaimed at all.

The general features of building/installations, tips/heaps and excavations ((i), (ii) and (iii) respectively in Table 5.1) are self-explanatory, although there might be some debate about the differences between buildings and installations. For the purposes of this research, buildings are regarded as structures generally giving shelter to people (dwellings of all types), goods or raw materials (warehouses, barns, etc.) or industrial, commercial and agricultural practices (factories, offices, etc.). Whereas the forms of buildings are not necessarily related to their function, installations have a much closer form-function relationship. This is because installations are structures built for specific purposes whether they be for transportation (railways, docks, bridges, etc.), utilities (pylons, gasholders, sewage treatment plant, water tanks, etc.), industrial processes (colliery pit head gear, conveyor systems, slurry ponds, kilns, etc.) or defence (rifle ranges, gun emplacements, etc.).

The least obvious general feature in the classification is "spoiled or degraded land at the general level of its surroundings", which refers to land following the general form of the surroundings and which is neither a heap nor an excavation. It is true that in some places it is not easy to say where ground level is, or where a tip or excavation ends, particularly in an area such as South Wales where original contours have been disturbed almost beyond recognition. The use of aerial photography, however, does alleviate the problem since due to the inherent vertical exaggeration of the stereo image, breaks in slope and levels in the ground surface are easily differentiated, even where such changes are subtle when viewed on the ground.

Part B of Table 5.1 shows how certain complex and special features of the spoiled landscape were classified. The heap-hole combinations (Bi) were designed to cover the situations where spoil heaps were being excavated (for fill material etc., and/or reclamation), or where excavations were being filled. The foundations of buildings and installations, and land associated with railway networks were regarded as special cases of spoiled and degraded land at the general level of its surroundings, since it was illogical to class foundations as "buildings and installations" (Ai), and inapplicable to class railway networks as "spoiled or degraded land ..... surroundings"(Aiv) since with so many cuttings and embankments, the term "general level of its surroundings" was meaningless.

Coal mining features such as adits, mine entrances and shafts were common enough and significantly different from the other major features to warrant putting them in a separate class.

Having described the form and nature of the spoiled landscape, the activity which had resulted/was resulting in that landscape could then be described. Each group of activities is identified by a Roman numeral in Table 5.1 and since most of them are self-explanatory only some classes will be dealt with here. The first four groups are of a basically industrial nature, but Category V, "Intra-Urban Residential Usage and Open Spaces" attempts to describe the non-industrial urban activities contributing to the general spoiled landscape. The group included residential areas under construction (Via) or being demolished (Vib), disused allotments, and residual open spaces. The latter class was designed to include those areas generally superfluous to development or resulting from irregularly shaped gardens and housing plots and having no apparent use. This class will be examined in more detail in Chapter 7 since problems arose in the regional study in its interpretation.

The only other group requiring comment at this stage is "Agricultural Activities" (VI) which refers almost entirely to abandoned hill farms, even though the general description implies a wider interpretation.

5.5 The Feasibility Study - Results and Appraisal

The final result of the methods outlined in the previous section was a series of four maps showing the type, location and distribution of spoiled land around Neath. A portion of one such map is shown in Figure 5.2 but it only gives an approximate idea as to the situation found in the whole area, since in the original maps the colour coding involved the use of nine colours.

It became clear that once the maps had been compiled there were difficulties in retrieving the information from them, although they were visually effective in showing the general distribution of the various types of spoiled landscape. One reason for this is that no restriction had originally been placed on the size of land area to be surveyed, except that it had to be capable of being mapped from the air photo. Although this was reasonable when examining the 1:5,000 scale photograph, it became a different matter when the data had to be reduced areally by a factor of about four to the base map scale of 1:10,560. This had the two effects of firstly making it almost impossible to apply the complicated colour coding system to very small sites; and secondly, where it could be applied, it was often difficult to distinguish one colour from another (e.g. black from brown or violet).

It was also decided that problems arose because too much data had been collected, as can be seen by reference to Table 5.1. The "buildings and installations" category, for example, (A(i)) contains seven separate classes, while the "transportation networks and associated activities" group contains five classes of railway track bed. Initially, this very detailed classification was designed to reflect the amount of information which could be derived from the photograph, particularly in view of Bush and Collins' difficulty in picking out derelict railways from 1:10,560 scale photographs (Collins and Bush, 1971). In appraising the Feasibility study, however, it was decided that such a level of detail was at best inappropriate and only served to create problems. Similarly, the complexity of the "heap-hole combinations" in the Special Features group (B(i)) was finally decided to be too academic an approach since if, for example, a heap occurred within a hole, and was large enough to be mapped as such, the classification already made provision for it. If, however, the heap

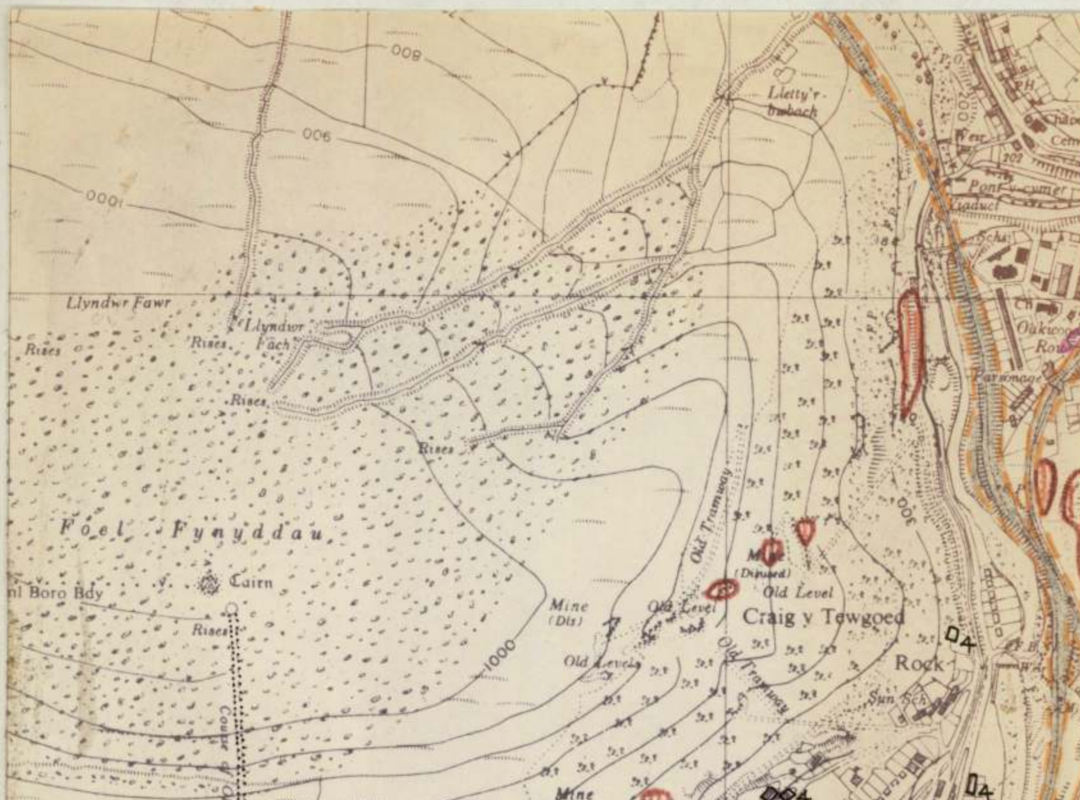

Fig. 5.2 Part of the spoiled landscape around Neath.

was insignificantly small, then it could be ignored altogether.

Although these initial doubts were felt immediately after the mapping of the Feasibility study area, others soon followed. It was doubted, for example, whether sheet number SS 79 really did contain a fair representation of the types and scale of spoiled land found elsewhere in Glamorgan. The Feasibility study had revealed only two types of extractive industry, for example, and the first of these, coal mining, was not at all represented by open cast workings, patchworking, deep mining or coal rewashing, which was known to exist elsewhere. There were also doubts about the significance of some classes to the rest of the County (e.g. III and IV) and whether they were in fact over-representative of the total area of Glamorgan. These particular problems will be discussed at more length in the following chapter since they led to a revision of the spoiled land classification as used in the Regional study, but they are mentioned here since they contributed to the abandoning of the second part of Stage IB of the Feasibility study. This was to have been a survey of the spoiled land situation in 1967 (see Section 5.1) and a subsequent comparison of the two years 1967 and 1971. Later discussions with Glamorgan County Council, however, suggested that there was unlikely to be any change in so short a time interval, and this factor, coupled with the one discussed above, led to the idea being dropped.

It was decided instead to solve the problems of the Feasibility study, and then attempt a Regional study as described in the next chapter.

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CHAPTER 6

The Regional Study of Glamorgan

"..... where local authorities lack the experience or do not have the specialist staff to undertake schemes of reclamation, the (derelict land reclamation) agency would have a useful contribution to make, for example in making preliminary surveys ....."

(H.M.S.O. 1969, para 467)

6.1 Introduction

In spite of the limitations of the Feasibility study of the area around Neath as discussed previously, there was a strong indication that the technique of surveying spoiled land using aerial photographs could be applied successfully to a larger area. The question now arose as to what that area should be, and to what degree the concept of "regional", as mentioned in the initial proposals (Section 5.1), ought to be interpreted. The latter point seems to be retrospectively significant in view of the recent debate within the discipline of geography as to whether the old form of regional studies should be reviewed (see Farmer (1973) for example).

It was clear that, irrespective of the size and location of the area chosen, the problems of the original study would have to be solved, but that the solution could partly lie in such a choice of area. Accordingly, the area of the regional study was chosen before any solution to these problems was attempted.

6.2 Choice of Region

It was eventually decided that the regional study would consist of the administrative County of Glamorgan, excluding the County Boroughs of Swansea, Merthyr Tydfil and Cardiff. The reasons for this decision were as follows :

1. To satisfy the needs of Glamorgan County Planning Department

   In an applied context the choice satisfied the Glamorgan County Council's needs as detailed in Section 4.2. Briefly these were to provide a complete and systematic record of spoiled landscape within the County, and to apply this to the Derelict Land Survey for Wales of the Welsh Office.

2. <u>To ensure that all forms of spoiled landscape were examined.</u>

Studying the County as a whole seemed to be the only way of ensuring that all forms of spoiled landscape would be examined, and that the problem of "unrepresentative samples" as in the case of the Neath area, could be solved. It might be argued that the problem could be similarly solved by applying random sampling methods but this would assume that it was undesirable or impossible to gather data about the whole of the County. In any case it would be difficult to justify the size of such a sample.

3. <u>To study the specific requirements and problems of a large scale survey.</u>

Spoiled landscape surveys using aerial photographs, which have been conducted in the past, have been concerned with the viability of such an approach, but from the point of view of the accuracy of interpretation. In the current research this viability has been accepted, with some reservations (section 4.1(iii)), and as such the repetition of earlier work by studying a small area would produce little extra knowledge. Conducting similar work on a larger scale (i.e. at County level), however, should provide a different emphasis to a spoiled landscape survey since aspects of survey procedure and management would probably take on greater importance.

4. <u>To provide data on a basis compatible with other data for future studies.</u>

The limited areal extent of the data collected in the works of Bush (1970) and James (1970) has meant that the use of such data in conjunction with others is also limited since the latter will rarely have been gathered on the same basis. Collection of data at the County level, however, will ensure that they have a common base with other data and can be more easily used in any future studies (including for example that discussed in PART THREE).

6.3 Preparation for the County Survey

6.3(i) Reappraisal of the earlier classification

Having decided to conduct a County-wide survey, it became necessary to revise the spoiled landscape classification as used in the Feasibility study, firstly to solve the problems it had caused (Section 5.5), and secondly to ensure that the requirements for the Welsh Office survey were met.

The revision mainly took the form of ommissions from the original classification (refer to Table 5.1), for the reasons outlined in the previous chapter. In the case of "Features of the Spoiled Landscape", for example, the "buildings and installations" class (A(i)) has been reduced purely to "buildings in a state of ruin", "installations in a state of ruin" and "unrecognisable installations and buildings". The alpha-numeric designation has been retained in order to prevent confusion since the concept of each class remains the same.

Other categories within "Features of the Spoiled Landscape - A. General Features" remained unchanged, although the category of "spoiled or degraded land at the general level of its surroundings (Aiv) was expanded in concept to include disused railway routes. The original reason for classifying these features separately (as B(ii)b) was that the term "general level of its surroundings" was meaningless where, in many cases, the railways had been embanked or were found in cuttings. It was decided in the light of the Neath experience, however, that the class was really superfluous. If a parcel of land was found to be classified as being "spoiled or degraded land at the general level of its surroundings", and associated with railways, then it could easily be inferred that the phrase was not to be too literally interpreted.

In the case of "Special and Complex Features" (Part B of the classification), the "heap-hole combinations" (B(i)) were excluded as being cumbersome, and the B(ii) classes were reduced to "B(ii) - Sites or foundations of buildings or installations". The special features relating to coal mining (levels, adits, drift entrances or shafts) remained unaltered.

The changes indicated above were not influenced by the Welsh Office Derelict Land Classification as shown in figure 2.2, since the two are only indirectly related. The relationship between the research classification of "activities and land-use associated with features" and that of the Welsh Office is much more direct, and the latter has been important in influencing changes which have been made. Category II "other industrial workings", for example, has been brought directly in line with the Welsh Office concepts of "industrial waste" and "other industrial uses." These terms require no further sub-division into particular industries as was originally done in the Neath study, and it was decided to act similarly in the County survey. This would have the advantage of reducing what might be a very long list of individual industries, alleviating the necessity of a "miscellaneous or unknown industry" class for those industries which could not be identified (generally in the manufacturing or processing industries), and generally enabling the survey procedure to be carried out more quickly than would otherwise be possible. The research class was, therefore, changed to "II - other industries (including utilities)".

The group of "extractive industries" (I) remained unchanged since it was possible to add to it as other types of extraction were encountered, and its sub-divisions were compatible with those of the Welsh Office.

Activity III, "miscellaneous tipping practices", was altered quite significantly both in concept and content. The first three items, for example, were abandoned and substituted with "source and composition of tipping material unknown". It was perhaps unfortunate that this class was designated as III since it later led to confusion between the new class and the general class of which it was part, but at the time it appeared to be the only way of retaining the policy of having the old and revised classifications identically coded where items remained the same or were slightly amended. The last class within the general category of III in the earlier classification, for example, was "III(iv) - domestic refuse". In the revised form the emphasis was slightly altered and the resulting class became "Refuse (usually domestic)", although the designation III(iv) remained unchanged.

The remaining classes of the original classification were either omitted or compressed in the revised version. "Storage dumps and yards" (IV) and "Agricultural activities" (VI), for example, were omitted completely, the former because it was regarded as being covered in classes I(i) and II, and the latter because it gave a false impression. As discussed in the previous chapter, most agricultural spoilation was found to be in the form of disused farm buildings, but the general class also suggests disused farm land. It would be dangerous to attempt to survey such land from aerial photographs, in the same way as it would be to survey so-called "natural dereliction" of marshes, etc. The reasons for this are firstly that the difference between, say, rough pasture and overgrown fields can be difficult to see, but more importantly, that the author is not knowledgeable enough in agricultural practices to distinguish between them, whether they are active or derelict.

In discussions with the Planning Department of Glamorgan, following completion of the Feasibility study, it appeared that they felt that the class of residential areas under construction or being demolished (V(i)) was not entirely appropriate to a survey of spoiled land. Taking this viewpoint into account, and also considering that such areas were usually in such a state for short periods, it was decided that the class would be omitted in the revised classification. The classes of "allotments" and residual open spaces", however, were retained in a slightly amended form, and the general category was shortened to "intra-urban residential uses".

On reappraising the category of transportation networks (VII), it was noticed that there was no mention of the term "disused" in any of the individual classes, thus implying that "active" networks were also being considered. To remove this implication an amendment was made, and in addition the classes were condensed. Thus "roads" became "disused roads" (VII(i)), "railways" were simplified to "disused railways, (a) track present (VIIii(a)) and (b) track removed (VIIii(b))", and "waterways" was altered to "disused waterways" (VII(iii)).

The final change to the original classification was the addition of a new category of "VIII Ministry of Defence", which was simply sub-divided into "airfields (VIII(i)), camps (VIII(ii)), and others, e.g. rifle ranges, coastal defences, etc. (VIII(iii))". This category is shown in the new classification as set out in Table 6.1.

In future the new classification will be referred to as just the "survey" or "research" classification and should not be confused with that of the Feasibility study, although in PART FOUR further amendments will be proposed.

6.3(ii) Reappraisal of the earlier survey method

It was mentioned previously that great difficulty was encountered with the method of recording spoiled land data by means of a coloured code (Section 5.5). The reduction of items in survey classification would obviously have solved part of the problem, but it was felt that the improvement was not significant enough to simplify data handling. There was also the point that multi-coloured maps were almost impossible to duplicate easily and quickly. As a result of this it was decided that data would be recorded in a monochromatic form using an alpha-numeric code. This code was given by the class designations used in the survey classification (Table 6.1) and employed in the manner described later.

The use of the code also meant that the acetate overlays used with the aerial photographs during interpretation could be more quickly marked, and the spoiled land data could be more easily recorded than in the earlier work. Thus the whole data collection, storing and retrieval process would become more efficient.

Efficiency was also improved, however, by imposing an areal limitation on the data which were to be collected. The limitation, which had not been applied in the Feasibility study, meant that areas of land less than 0.25 hectare in area would be excluded, resulting in the advantages mentioned above. In addition, the process of scanning the aerial photographs was made easier since the minimum area was

Table 6.1 : Revised Classification of Spoiled Landscape

The code is in two parts, the first being separated from the second by an oblique stroke (/).

Morphology			Code
Buildings and installations			A(i)
Buildings			Ai(b)
Installations			Ai(c)
Unrecognisable buildings or installations			Ai(d)
Heaps (Tips)			A(ii)
Single heaps	(1)	unvegetated	Aiia(1)
	(2)	sparsely vegetated	Aiia(2)
	(3)	well vegetated	Aiia(3)
Groups of heaps	(1)	unvegetated	Aiib(1)
	(2)	sparsely vegetated	Aiib(2)
	(3)	well vegetated	Aiib(3)
Holes			
Single holes	(1)	unvegetated	Aiiia(1)
	(2)	sparsely vegetated	Aiiia(2)
	(3)	well vegetated	Aiiia(3)
Groups of holes	(1)	unvegetated	Aiiib(1)
	(2)	sparsely vegetated	Aiiib(2)
	(3)	well vegetated	Aiiib(3)
Degraded land at general ground level			A(iv)
Special features			B
Sites or foundations of buildings or installations			B(ii)
Levels, adits or drift entrances to mines			Biii(a)
Mine shafts			Biii(b)

In the case of heaps (A(ii)) and holes (A(iii)), the vegetation code refers to the amount of cover. An indication of the type of cover is given by a simple written description, e.g. "grass", "bushes".

Where holes are found to contain standing water those areas are indicated by the letter "W".

Activity	Code
Extractive industries	I
Coal-mining	I(i)
Sandstone quarrying	I(ii)
Limestone quarrying	I(iii)
Lead	I(iv)
Iron (haematite and ironstone)	I(v)
Sand and gravel	I(vi)
Brickearth	I(vii)
Other industries (including utilities)	II
Miscellaneous tipping	
Source and composition of tipping material unknown	III
Refuse (usually domestic)	III(iv)
Intra-urban residential uses	V
Abandoned allotments	V(ii)
Residual open spaces (waste ground)	V(iii)
Transportation networks	VII
Disused roads	VII(i)
Disused railways (a) track present	VIIii(a)
(b) track removed	VIIii(b)
Disused waterways	VII(iii)
Ministry of Defence	VIII
Airfields	VIII(i)
Camps	VIII(ii)
Others (e.g. rifle ranges, coastal defence works, etc.)	VIII(iii)

Some examples

Ai(c)/VIII(ii) - A disused installation associated with an M.O.D. camp

Aiia(3)/I(i) - A disused colliery spoil heap well vegetated with grass

A(iv)/V(ii) - Disused allotments

Prefixes

The code may be prefixed by the letter "A" to indicate that an activity is currently in progress, e.g. AAi(b)/I(i) ... an active colliery building. The prefix "R" indicates that a derelict feature is being reworked or reclaimed, e.g. RAiiia(1)/I(iii) ... a disused and unvegetated limestone quarry being reclaimed.

equivalent to an area of about one centimetre square on the 1:5,000 scale photographs. It was realised, however, that very few buildings would even approach this minimum and the restriction was consequently not applied to buildings or installations.

Further aspects of the mapping code and the use of a secondary size restriction did not involve the reappraisal of the Feasibility study and will be discussed subsequently where appropriate.

6.3(iii) Assembling of Survey material

The items used in the County survey were similar to those employed during the Feasibility study and included, in the case of hardware items:

(1) Wild ST4 stereoscopes fitted with parallel guidance mechanisms and 3x and 8x magnifying binoculars

(2) Conventional drawing implements, inks, etc.

Items of software included those listed in section 5.3, namely:

(1) aerial photographs

(2) land use maps

(3) geological maps

(4) Ordnance survey base maps

and in addition

(5) dyeline copies of Ordnance survey maps

(6) transparencies for the Welsh Office Derelict Land survey

(7) acetate rolls (of the type used in overhead projectors)

Other data sources were utilised as the survey progressed and will be considered in the following chapter.

6.4 The Survey method

The method used in conducting the survey involved several distinct processes, and although each will be commented upon in following chapters, all will be considered generally here. The processes, depicted schematically in Figure 6.1, involved the following:

(1) The interpretation of the aerial photographs in conjunction with all other data sources excluding the geological maps.

(2) The recording of the results of (1) on transparent acetate sheets aligned with the aerial photographs

(3) The transference of the data to the dyeline maps

(4) The checking of processes (1) - (3) by an independent surveyor

(5) The insertion of geological data, where appropriate, onto the checked map sheet

(6) The final drafting of the map

(7) The compilation of the Welsh Office Transparency from the final map.

It must be stressed that this is the way the survey <u>was</u> conducted rather than <u>should</u> or <u>could</u> have been conducted since in some cases there was no alternative method at hand. The checking of the geological data (6), for example, was listed as the penultimate process since it was the best position for it in view of the circumstances. The choice of the Neath area for the Feasibility study had, in one way, been fortunate since there were readily available copies of geological maps on the new grid-based six-inch scale basis. Much of the rest of the County, however, was covered only by the old "County series" of maps which could be consulted at the Library of the Institute of Geological Sciences in London, and perhaps in a few other places, but could not be purchased or borrowed. It was, therefore, necessary to visit London (the nearest place in terms of travel time) periodically, and to examine the geology of several maps at the same time, even more

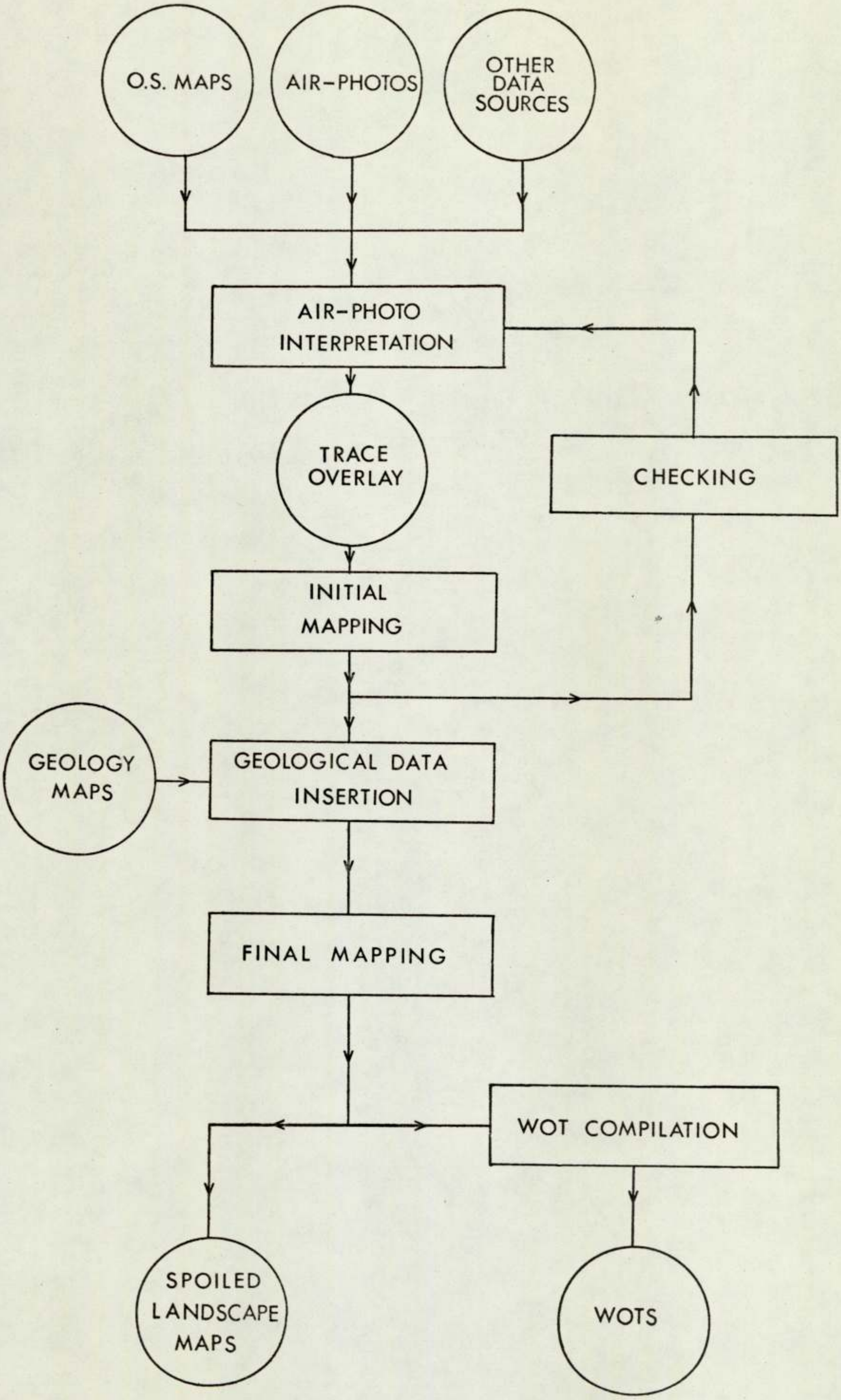

Fig. 6.1 The survey method.

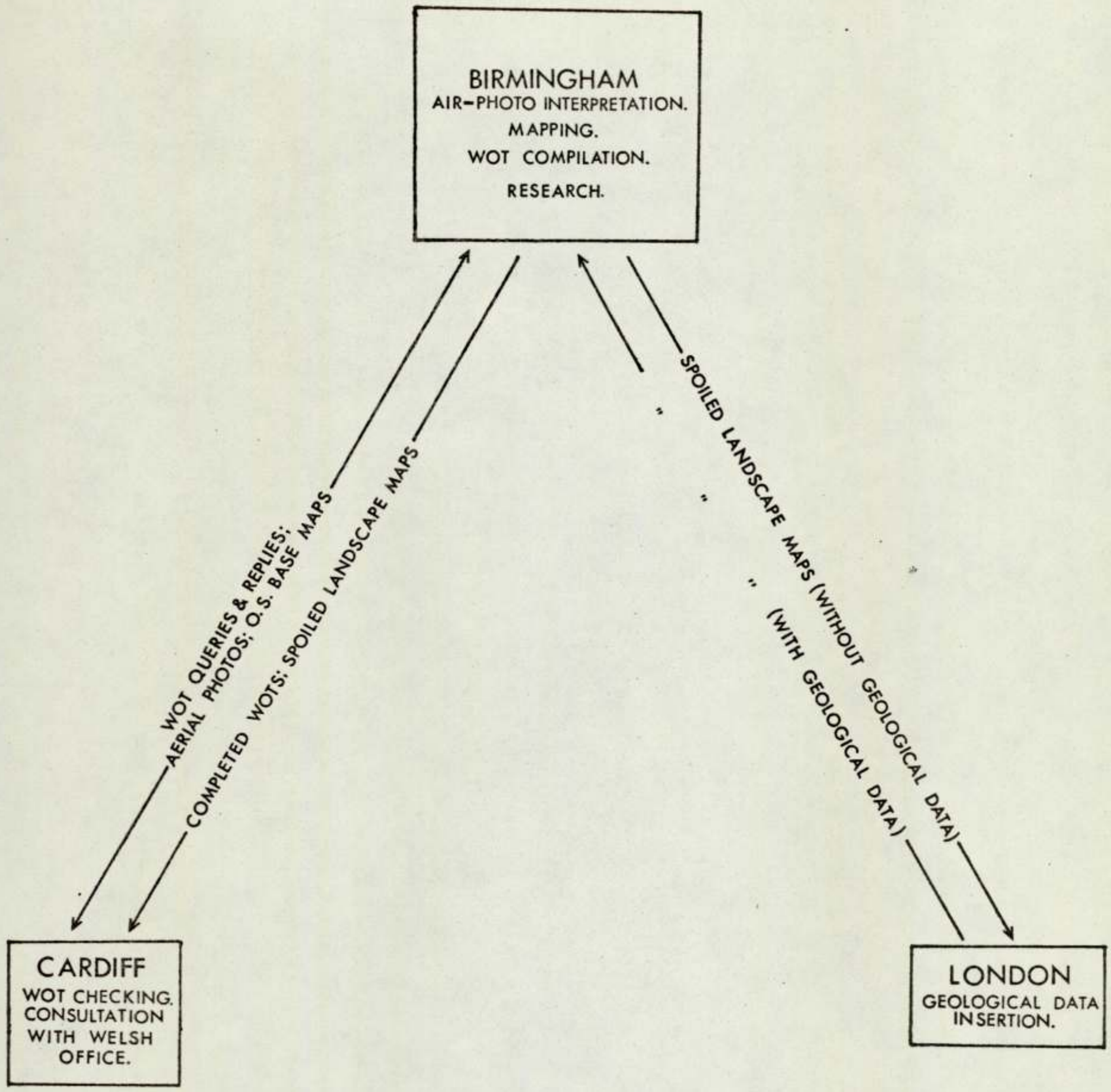

Fig. 6.2 Overall survey management.

so since single six-inch Ordnance Survey maps are covered by up to four County series geological maps at the same scale.

In view of this and other factors affecting the progress of the survey, it is as well to discuss the management aspects of the overall survey before dealing with specific processes in later chapters.

6.5 Management of the Survey

Overall management of the survey revolved around the cities of Cardiff, Birmingham and London, as shown in Figure 6.2. The need to consult geological maps in London has already been commented upon but the movement of survey material between Birmingham and Cardiff has yet to be mentioned.

Since the planning department of Glamorgan needed to use the aerial photographs and land use maps for day-to-day purposes within that department, they were unable to loan the complete set at one time. This meant that photographs and maps were borrowed in blocks of varying sizes, but related to complete areas of six-inch scale map sheets. Each consignment would be despatched from Cardiff and received in Birmingham where it would be checked, firstly to ensure that the correct photographs and maps had been sent, and secondly to establish whether any photographs were missing. The first check rarely indicated any error, but the second often showed photographs to be absent. The explanation for this absence was simple in that specific photographs were often borrowed internally within the planning department, but without the loan being recorded. This resulted in the situation where it became difficult to trace photographs with a consequent delay to certain areas in the survey.

Once material had been checked, it was catalogued by the Ordnance Survey six-inch map sheet numbers. This was an easy task since the numbers not only obviously corresponded directly to the maps used in the survey, but also to the areas into which the photographs had been divided and filed. Thus a term such as "SS 79 NE" would refer to six-inch scale maps (O.S. base map, dyeline copy and land use map) and their corresponding photographs, and could be used to identify that area covered by maps and photographs at all stages of the survey.

On completion of all the processes necessary to the survey, including the compilation of the Welsh Office Transparencies, the maps and photographs (excluding the survey maps of spoiled landscape) were "checked out" and returned to Cardiff. Usually these were returned as the unit which had originally been received, but on occasions single sheets were requested by Glamorgan where a particular problem or project was to be dealt with.

The Welsh Office Transparencies (WOTs) were usually despatched separately to Cardiff, although they were also grouped by map sheet numbers. At the planning office they would be checked by staff of the Land Reclamation Unit before being circulated around the Department for completion. Where discrepancies were noticed, the WOT would be queried and Birmingham informed of the problem. Since copies of all WOTs were retained in Birmingham as an assurance against loss of the originals, it was a simple matter to trace the disputed transparency and examine the nature of the problem. The reply would then be communicated to Cardiff.

Finally, when all the WOTs had been submitted the master sheets of all spoiled landscape maps were copied and the originals were then given to the planning authority.

This brief description of the management of the spoiled land survey, as opposed to the processes outlined in section 6.4 and discussed at length in the following chapters, is of a general nature.

More specific points will arise and be dealt with later, but prior to that the role of the author in the above management system will be discussed.

Originally the author was the sole participant in all those aspects of the survey shown in Figures 6.1 and 6.2. This was so that the survey procedure could be formulated, its problems and their solutions discovered, and its results produced in the most accurate and consistent manner. In addition, the system of management could be examined in order to achieve optimum efficiency. All of these aspects were primarily of a research nature with the production of spoiled landscape maps and WOTs taking secondary importance. Once this goal was virtually achieved, other experienced research workers were employed for the processes of air-photo interpretation, the mapping of the spoiled land and to a limited extend, the compilation of the WOTs. The reasons for this were as follows:

1. <u>To minimise subjectivity within the survey</u>

   The survey procedure entailed the checking of original photo interpretation and mapping, and it was felt that this would be better conducted by an independent observer.

2. <u>To test the survey procedure</u>

   If the survey procedure, including the use of the spoiled landscape classification, was to be well designed and easily understood, then it should be possible for other members of a research team to successfully apply it to the problem in hand.

3. <u>To extend the understanding of the management system</u>

   Since each member of a research team would be involved at different times with the various processes of the survey, it would be important to ensure that production of maps and WOTs proceeded at a consistent rate, and that the working of the team fitted into the overall management system.

4. <u>To complete the production of spoiled landscape maps and WOTs for the whole of the County</u>

   The research team was generally involved with all processes of air photo interpretation and mapping (including checking), although the author also participated in these. Usually, however, his activities were confined to the supervision of the arrival and despatch of land use maps and photographs, supervision of the main survey processes, completion of the spoiled landscape maps by inserting geological information, and compilation of the WOTs. These last two processes acted as a "final check" upon the work of the research team and ensured that all aspects of the spoiled land situation in the County were at least partially seen.

The extent to which this approach has been successful will be described and discussed in PART FOUR following the discussion of the survey procedure and use of the spoiled landscape data.

6.6 Summary

Taking into account the problems of the Feasibility study, the needs of Glamorgan County Council, the need to examine the management of spoiled land surveys, and the provision of spoiled land data on a basis compatible with other information, it was decided to survey the County of Glamorgan (excluding the County Boroughs) in a regional study.

Preparation for the study was undertaken by reappraising the classification and survey method of the earlier work and assembling the necessary hardware and software requirements.

This preparation resulted in the formulation of a procedure to be adopted in the regional study, and influenced the management of the overall survey system. The processes used in the survey procedure, formerly by the author alone, and subsequently with the help of a research team, are discussed in the following two chapters.

An assessment of the management system is given in Chapter 12.

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CHAPTER 7

The interpretation of spoiled landscape from aerial photographs and other data sources

"In this Visual recognition of the solid form of an object by the mental combination of its two dissimilar perspectives, we have an exercise of judgement, the decision of which ..... really rests on the basis of Experience".

(Carpenter, 1879)

7.1 Introduction

This chapter is primarily concerned with the survey process (1) as listed in Section 6.4, that of air photo interpretation. Before this is discussed, however, attention will be paid to the characteristics of the photograph itself, and to the physical examination of photographs in a stereoscope.

Some aspects of the photographs used have already been described in Chapter 5, where the scale and date of photography were given and the problem of shadows was raised. The air-photo date of 1971 is nominal since for reasons explained in a previous chapter, some of the County was not covered until 1972. The result of this was that seasonal variation in the time of photography ranged from late spring through to mid-autumn and caused problems in interpretation as mentioned below.

Other characteristics of the photography used, such as being vertical, black and white, and of a 9 x 9 inch format are common to much aerial photography and details concerning these properties can be found elsewhere (see for example American Society of Photogrammetry (1960), Howard (1970)).

One point which does warrant fuller discussion here relates to the stereoscopic viewing of the photographs. When this is carried out, the eyebase (distance between the eyes) is equated with the airbase of the aeroplane which took the photographs (the air base being the distance between the positions at which the photographs were taken. This results in the vertical exaggeration which is observed in the relief of features, and generally, the larger the scale of the photography the greater the exaggeration appears to be. This can be an advantage where it is necessary to detect small changes in relief (as in the case of shallow coal or iron stone workings), but if, as in parts of Glamorgan, there is a relief change of 600-800 feet, it becomes impossible to view the complete stereo model at one time. Rather, it is a case of first examining, say, the summit of a valley slope, and then concentrating on the lower slopes. This does not affect the accuracy of any interpretation but does result in discomfort for the interpreter and a retardation of the interpretation process. The solution to the problem probably lies in the employment of smaller scale photographs, but the effect of using these would more than likely slow down interpretation and could even affect its accuracy.

7.2 The general principles of air photo interpretation

7.2(i) The interpretation process

Having dealt briefly with aspects of the aerial photograph and referred to the physical process of examining them, it is now apposite to consider the mental process of air photo interpretation.

Two basic stages are involved in this latter process:

1. converting the aerial image of an object to one which can be understood, i.e. to one which would be recognised on the ground. This is finding the identity of the image.

2. to establish how the image is related to those about it. This is discovering the significance of the image.

To illustrate these points, consider the following example in which an area is identified as one of cultivated vegetation. As this stands the interpretation is of limited value since the area could be a garden, a field, a timber forest, a nursery, a market garden or allotments and still be termed "cultivated". If, however, it was noted that the area was quite small, seemed to contain short cultivated patches and a number of small buildings, was in or close to an urban area and fenced off with access from one road, then it could be concluded that the area was perhaps an allotment. By considering several factors about the area, the significance of the initial observation has, therefore, been discovered.

7.2(ii) Factors used in air-photo interpretation

Although specific factors have been described in this example, they can be considered in the general situation. Those factors which generally assist in completing both aspects of air-photo interpretation are as follows:-

(1) size
(2) shape
(3) texture
(4) tone
(5) site
(6) situation
(7) distribution (pattern)
(8) shadows

The use of all of the above factors is not always necessary since one alone may be sufficient in leading to a successful interpretation. Where two or more interpretations could be made from several factors, however, it is necessary to examine further factors in order to distinguish one interpretation from another. But irrespective of how the factors are used, their importance is as follows:

Size and Shape

These factors are rarely considered separately since there is often a strong relationship between them so that, for example, a factory chimney (shape) is more likely to be tall and narrow than short and wide (size). The importance of size lies in being able to scale one feature against another so that, for example, a telegraph pole when compared with high voltage electricity pylons will appear much shorter. Shape, on the other hand, is more significantly related to the function of the feature. A traffic roundabout, for example, has a shape contained by smooth curves and not angular lines since the former facilitates an easier flow of traffic.

Texture and tone

These are two factors which can also have close associations since the coarser the texture of a feature the greater the possible variation in tonality within that feature. It is difficult to generalise about the effects of these two factors since they can be greatly affected by difference in the scale of photography such that a feature which appears coarse in texture on large scale photos will appear finer on small scale photographs.

The real value of these two factors, however, lies in distinguishing features which to all intents and purposes are identical. In fields, for example, the mid-grey tones and fine textures of grazing land can be differentiated from the darker or lighter tones and coarse textures of arable land. Similarly, the varied tones and coarse texture of domestic refuse distinguishes that form of waste from the even grey tone and fine texture of power station waste.

Site, situation and distribution (pattern)

The site of an object is the ground on which it stands and the immediate vicinity of the feature, while distribution refers to the frequency and place of occurrence of a particular feature. Situation, on the other hand, relates to the context of the feature in a regional setting. Looking at semi-detached houses in a city as an example, the house and its garden would be equivalent to the site (i.e. the local setting), the city would be equivalent to the situation (the regional setting), while the distribution would refer to the fact that most semi-detached houses are found in the suburbs or on the outskirts of the city.

Shadows

Shadows are a function of ground relief and the angle of the sun in relation to the ground. The latter itself is related to the time of day and the season at which the photography is taken.

Depending on these factors, shadows can be an important asset to, or else cause some difficulty in air-photo interpretation. Their usefulness usually lies in providing information about the size and shape of an object, particularly one which is difficult to see. A telegraph pole or a lamp post, for example, may not be in itself easy to see, but the shadow would indicate the approximate side view and size of the feature (assuming the sun angle is low). If, however, the photographs contain areas of deep shadow for reasons stated earlier, then whole features and certainly many details will be obscured.

A second problem relates to the juxtaposition of small areas of deep shadow with equally small areas of bright photographic tones, such as would be found in areas where there are numerous changes in the relief (usually townscapes or highly dissected uplands). The difficulty here is that the highly contrasting tones cause eye strain in the interpreter so that interpretation may be either slowed down or less accurate than under normal conditions. Although this problem has been perceived in the current work, it has not been possible to assess the significance of any effects which may have been detrimental to the survey as a whole.

It has been pointed out that it is not necessary to use all the above factors when interpretating photographs. When several are used, however, they are usually considered together in an automatic and unconscious manner. This is partly why tone and texture, size and shape, etc., have been described jointly. Once the interpreter begins to recognise the associations between factors used to identify and interpret a feature, then those associations become stored in his memory such that when an identical feature is observed, interpretation is virtually automatic. This is exactly the process which occurs when perceiving objects on the ground. It is known, for example, what the common conception of "a book" is and the characteristics of such an object could be described. Few people, however, would need to consciously think of these characteristics before reaching a conclusion that the object they are observing is a book.

Related to this concept of an "instantaneous interpretation" is the idea of instinct or intuition. After becoming familiar with the air-photo characteristics of a particular feature, similar features often appear to be interpreted more by a "sixth sense" than by logical interpretation. It can be difficult to describe the evidence which supports this sense in such instances, and an inexperienced interpreter might regard any decision made on this basis as guesswork. The fact remains, however, that a competent interpreter with a close affinity for his particular discipline will often appear to make interpretations without apparent reason.

The sensing of interpretation will not, of course, overcome some of the general factors which cause problems in the normal interpretation process. The question of shadows obscuring detail has already been mentioned, but the same problem can arise through the presence of extensive vegetation cover, and in particular the existence of a tree canopy. Even if vegetation does not hinder interpretation it may prevent the full plan-shape of a feature from being assessed. The problem, therefore, indicates the importance of seasonality in the timing of aerial surveys, although there is the paradox that while summer and spring have the best lighting conditions, the vegetation cover is at its greatest, and that the reverse is true of late autumn and winter months.

Another temporal factor of importance concerns the day, and time of day that the survey was undertaken. Occasionally photography may be obtained when little human activity is evident such as on a Sunday or before 8.0 a.m. or 9.0 a.m. on a week day. This will affect the number of interpretations which can confidently be made, and also dictate the level of detail attained in the interpretation.

Most of the discussion above has centred on factors of the aerial photography, but it is also important to consider factors relating to the interpreter of such photography. The most important of these are training, educational background and depth of personal knowledge, although temporary factors such as ill-health will obviously have a limited influence on photo-interpretation. The effects of the major factors are relatively self evident since an expert in say, industrial land use, will probably be unable to interpret different species of tree. Thus the interpreter will be most successful when dealing with his own particular discipline, although the possession of a basic knowledge of other disciplines will be obviously advantageous. For example, an elementary knowledge of physical geography or geomorphology would be useful in deciding whether a well vegetated heap is an outlier or hill, or an old spoil heap.

In discussing the interpretation of spoiled landscape, the disciplines are not easily defined since so many different sorts of knowledge are required. It is necessary to know something of the history and present state of mining, quarrying, and other industrial practices; to have some information about changing trends in other land uses (e.g. the decline of allotments in post war years, and the recent demand for their re-use as an aid to counteract the rising cost of vegetables and fruit); and to be aware of the use of derelict areas for other purposes such as rewashing colliery spoil heaps for coal extraction, filling old quarries with domestic and industrial waste, and using old Ministry of Defence buildings for agricultural purposes.

The possession of such knowledge, however, will be of limited value if the interpreter is uncertain as to what he is interpreting. A parallel may be drawn with the process of classification where there is a prerequisite that the classifier must know for what purpose he is classifying. In both cases, if the purpose is unknown then the interpretation will ultimately contain an excessive or incomplete amount of data.

7.2(iii) Air photo keys

A significant amount of literature relating to aerial photography, and its interpretation, has been concerned with air photo keys. These keys usually provide a word description of important features of objects within the key, and photographs illustrating each description. The aims and merits of using such a device have been stated as "a training aid for teaching photo interpreters to recognise objects with which they have had little or no previous interpretation experience; and, ... a photo image reference file which the trained interpreter can consult periodically to ascertain whether he is still interpreting certain types of photographic images correctly" (American Society of Photogrammetry 1960). Acceptance of this general premise has resulted in the production of numerous photo keys ranging from those used for vegetation studies to those dealing with industrial land uses, although those used in spoiled landscape studies have been limited to the works of Bush (1970) and James (1970).

With all photo keys, however, there are problems of a practical and conceptual nature if they are applied to other studies. Stone (1952), for example, has argued that keys are limited to a specific set of photography. An area of, say, vegetation may vary greatly in photographic tone, texture and stereoscopic appearance with changes in scale, time of photography (e.g. season), shadow characteristics (of the nature described in Section 7.2(ii)), and photographic factors (exposure, development, resolution, and lens quality).

There is a second problem in that the key may not be applicable to areas differing from that for which the key was originally designed. The key developed by Bush (1970), for example, includes reference to colliery spoil heaps whose shape is not generally found in South Wales. This is because the physical environment is quite different from that of Yorkshire, to which the key applies, and tipping practices, although generally the same in both places, gave rise to different forms of heaps. This particular problem might be solved, as Lewis (1957) has indicated, by using the concept of analogous area keys. In this method a key is prepared for one area and then applied to an identical or very similar area, but the problem of using different photography still remains.

A third practical problem relates to the ease with which keys can be used by other workers. Stone (1952) is of the opinion that the level of knowledge required by the user of a key is usually very high, and perhaps too high compared with that which the user possesses. This generally arises where the key has been invented by an expert whose own level of knowledge is particularly and necessarily great in his field of study. As a result the expert either over estimates the level of knowledge held by independent and inexperienced workers, or is unable to convey the concepts he understands to those who may have little or no awareness of those concepts. Any key which is produced under these criteria will consequently cause difficulty to a prospective user, and give rise to doubts about the genuine usefulness of such devices.

This introduces the conceptual problems which are involved with air-photo keys. The degree of knowledge necessary to the use of a particular key has been already questioned, but further doubts are raised from examining the way in which the key has been formulated. By its very nature a key would in some ways have to be a simplified summary of the "real-life" situation, and the features described would need to be typical of those found in the area from which the key was derived. There is a danger, however, that when subsequent users apply such a key to other areas, the "typical" features will tend to be regarded as the "ideal" or "model" objects. This could result in a situation where a feature under study is seen to differ from the "typical" one, and is not classified since it is perceived as not being the same as the "ideal". The problem might be solved by introducing sets of variations in the key, but the danger then is that the key approaches the level of complexity existing in the real-life situation and becomes impractical or even unworkable.

Having examined a few of the problems associated with applying air-photo keys to areas unrelated to those from which the keys were originally derived, attention will now be paid to the intra study use of keys, particularly with reference to the present work.

Where photo interpretation is carried out by one person, it is presumed that the advantage of using a key lies in the second of the two merits quoted above from the American Society of Photogrammetry. This regards the key as a "photo reference file" which can be used to periodically check that interpretations are correct. The general validity of such a use is doubtful since there are probably only two situations in which an interpreter would need "to ascertain whether he is still interpreting certain types of photographic images correctly". These are:

(1) where the interpretation of features relies greatly on using very few of the factors discussed in Section 7.2(ii). An example of this is the study of vegetation irrespective of whether it is natural or related to agricultural land use.

(2) where the interpretation of features relates

to several disciplines as in a regional geographical study, i.e. the interpretation is non-specialist in nature.

In all other situations such as studying the physical form of the landscape (i.e. relief) or examining the built environment, the features can be identified without reference to a key, more so where the interpreter is a specialist in the discipline under study. Ryerson (1974) has also made the latter point in describing the two basic approaches to air-photo studies. The first is defined as a "structured" approach where photo keys are used, but the second is "unstructured" where the specialist knowledge of the interpreter would not be improved by the use of a key.

7.3 Adopted approach to interpretation

In view of the points discussed above, it was decided that an "unstructured" approach would be used in the current research and that a photo key would not be utilised. Each site would be examined on its own merits and no formal comparison would be made between it and any "typical" site. The approach was maintained even when a team of interpreters was assembled, as described in the previous chapter. All were experienced in photo-interpretation, although in other disciplines, and training was briefly carried out, without reference to any keys, in the following manner:

1. The purpose of the spoiled land survey was outlined.
2. The survey classification was discussed, and included description of the spoiled land classes and stating the reasons for inclusion of classes.
3. Where interpreters were unfamiliar with certain forms of the spoiled landscape, ground photographs of the relevant features were used to provide the necessary background knowledge.

4. Very broad indications were given as to how certain types of spoiled land <u>might appear</u> on photographs.

5. The team were given trial sets of photographs to interpret as much as they could, and to discuss individual problems with the author.

6. The individual interpretations were checked by the author and suitable interpreters were allowed to continue with the main survey.

Items 1-4 inclusive were designed to show the purpose of the work and to give the survey team the more significant aspects of knowledge possessed by the author. Experience with practical classes for undergraduates had indicated that interpretation was severely limited if the purpose of that interpretation was not made clear. Once the purpose was known, however, the interpreter became more adept in looking for the characteristics vital to a successful interpretation.

Item 3 listed above was particularly important to successful interpretation and overcame a problem of air-photo keys not discussed earlier. Keys generally depict familiar features from an unfamiliar (i.e. aerial) viewpoint as an aid to their interpretation. If that feature, however, is not familiar to the interpreter, i.e. he does not know how a ground view of the feature will appear, then the key will be of little value unless it contains ground photographs. Showing the survey team such photographs indicated those aspects of the feature which would be seen on the aerial photograph and, therefore, suggested which characteristics should be sought.

Having gained some expertise through tuition, the survey team gained further knowledge through the experience of encountering problems and discussing their solutions with the author. Once a problem had been raised and solved it was unusual for it to recur, but the "feedback" process was nonetheless maintained at all times.

7.4 The use of additional data sources

Although the aerial photograph is used as the major source of information in surveys of this nature, there are additional data sources which can be usefully employed. The value of such sources varies with the type of feature that is being interpreted, but normally their utilization occurs in one of three ways:

(a) by providing general background knowledge.

(b) by confirming or supplementing an interpretation which was initially made with the sole use of the aerial photographs.

(c) by providing information which was unobtainable from the aerial photographs.

The first of these (a) is closely related to the knowledge and experience of the interpreter since these facets of the interpreters background do not remain static but are continually supplemented and revised. The major source of data of this type lies in the literature relating to the interpreter's disciplines, which in this case include studies of the derelict and spoiled landscape, industrial development and general land utilization.

Occasionally this data source may also be used in confirming or supplementing the initial interpretation made from the aerial photograph. This occurs where literary reference is made to a specific site that appears and is being examined on the photographs. Section (b) above, however, is more commonly carried out by using data sources such as Ordnance Survey and Geological Survey maps, and the utilization of such sources is described in subsequent sections.

Similarly, those sources which provide data unobtainable from the aerial photographs usually include maps, particularly those showing geological information, as is described in more detail in the following sections and Chapter 8.

7.5 Interpretation of spoiled landscape - general considerations

Having discussed several aspects of the photo-interpretation process, attention will now be paid to some general points concerning the interpretation of spoiled landscape. This will provide a broad basis on which to discuss the specific interpretation of individual types of spoilation.

The division of the spoiled landscape into four general morphological classes has been discussed previously (Section 5.4). These classes were designated as,

(1) buildings and installations

(2) tips and heaps

(3) excavations

(4) degraded land at general ground level

The interpretation of these forms from the aerial photograph is usually straightforward and there is only a small chance of any error. The first group, for example, is readily identified since the forms of buildings and installations are unique. The only problem which may occur is in identifying the sites or foundations of these features since there is no vertical dimension, or where the sites are overgrown with vegetation.

Tips and heaps are usually recognised as an unnatural "lump" on the surface of the ground, although the size and shape will vary with the composition of the tip and the manner in which it has been deposited. Problems of recognition may occur if the tip is well vegetated and is confused with a natural feature such as an outlier, but this is rare.

The problem of confusing the third class, excavations, with natural features (such as solution hollows) is even less common and will only occur where the holes are very small. The major problems are in recognising small excavations masked by tree cover, and delimiting boundaries of holes which have been made in moderately steep or undulating hillsides.

The category of degraded land at ground level is generally complimentary to classes (2) and (3) above, since it tends to surround or be juxtaposed to those features. It may occur as isolated areas, however, as in the urban territory where the problem of interpretation is more acute, not through the limitations of the photographic image but because of the understanding of the concept of the class. This point is dealt with at greater length in subsequent sections.

Once the above features have been identified, the interpretation process is completed by discovering:

(1) the activity or process which has caused, or has been associated with the feature

(2) whether that activity or process is currently in operation, or has ceased, i.e. whether the feature is active or derelict.

These two items are at the root of the interpretation, and as can be expected with something so vital, they are difficult to obtain. The first, for example, is closely related to the form and function of the feature. In the case of a tip or heap, the form will show that "tipping" as a process has occurred, and on closer inspection will indicate the method of tipping which has been used.

An indication of the composition of the tip will also be obtained, since the material influences the overall form of the tip through its angle of repose, and affects the surface configuration by its particle size. From this it is possible to begin to decide whether the activity causing the feature is industrial, agricultural or associated with urban activities (such as domestic refuse disposal).

Where the form/function relationship of a feature is obscure, however, problems arise and more additional information is required for a satisfactory interpretation. The additional data may come from examining the photograph for other factors such as the situation of the feature (see Section 7.2(ii)), or from independent sources (Section 7.4).

Assuming the type of activity has been established, however, it is then possible to decide whether the feature is active or derelict. This is usually done with the sole use of the photograph, although other data sources can be used to confirm the interpretation (by field work, for example). The presence of additional features such as parked cars, mobile industrial plant and machinery, smoke issuing from chimneys and the absence of vegetation are good indicators of "activeness". The reverse may also be true, although one needs to take account of temporal factors as described earlier (Section 7.2(ii)). There are, of course, problems, but these are usually of a specific nature and they will be considered later.

Subsequent sections will now relate to the specific interpretation of the spoiled landscape with examples drawn from the County survey. It should be stressed that the following is not an air photo key since the device is not generally approved of for reasons discussed earlier (Sections 7.2(iii) and 7.4). Neither is the discussion exhaustive, since to detail the complete interpretation of all the spoiled land types would require a volume at least as large as the present one. Instead the following will attempt to illustrate the interpretation process so far discussed and show how particular problems can be solved.

7.6 Interpretation of extractive industries

The extractive industries which have been predominant in Glamorgan are coal mining and sandstone and limestone quarrying, although lead, ironstone, brickearth and sand have also been removed. Discussion here, however, will relate more to the forms of the industries rather than to the industries *per se*, starting with the older types of extraction and ending with the modern form of rewashing.

7.6(i) Early mining methods

The oldest form of mining, possibly dating back to Roman times, is found in areas where very shallow pits were dug for lead or iron minerals (Fig. 7.1). Such sites are difficult to identify from the ground, although from the aerial photograph they are clearly recognised from their hummocky surface. At the scale of photography used (1:5,000) the texture is fine and tonal variations small, but the short shadows cast by the small mounds and shallow depressions are sufficient to accentuate the form. Examples of these small pits can be seen in area 1 on the aerial photographs 1(a) and 1(b) (AP1*), although these particular features are more isolated and distinct than most.

* all future references to stereo pairs of aerial photographs will be made in a similar fashion, i.e. AP2, AP3, etc.

The aerial photograph gives the form of this particular feature but tells little of its cause, which needs to be ascertained from other sources. The geological map, the use of which is dealt with in the following chapter, is the obvious source of data, although this is not necessarily conclusive, since often the presence of minerals is not always clearly indicated. The geological map is best used with a knowledge of the history of the industry in the region, such as is provided by Humphrys (1972), or Bevan (1956).

The latter author, in writing about the sixteenth century ironmasters who moved from Sussex to Glamorgan, describes how the area between Coity and Pentyrch was mined, partly by means of pits, for haematite ore which occurs as veins in the limestone. Information such as this, if obtained before interpretation begins, is useful in indicating areas where iron extraction can be expected and will greatly accelerate the interpretation process.

Other useful "indicators" are place names on the Ordnance Survey maps. For example, the place name Pant-y-Pyllau (less than two miles north of Coity) probably indicates early mining activities since the Welsh "pyllau" means "pits". In addition, the variations of the word "coed" (forest or wood) in nearby place names (e.g. Cefn Hirgoed, Pencoed), indicate the previous existence of the extensive woodland that would have been used for charcoal burning in the iron-smelting process.

The pits described above are found where the mineral bearing rocks outcrop at or near the surface of the land. A similar situation occurs with "cropworking" or "trenching" where coal seams and/or ironstone bands outcrop at the surface, usually on valley slopes. The form of the resulting dereliction (Figure 7.2) is clearly

Fig. 7.1 Pit resulting from lead mining

Fig. 7.2 Cropworkings

recognisable both on the ground and on the aerial photograph. A series of scooped out hollows or trench in the hillside is immediately juxtaposed with a parallel series of spoil heaps on the downslope side. Occasionally an isolated hollow and spoil heap are found where trial excavations were begun but not extended because there was no coal or ironstone present, or because the geological structure inhibited exploitation of the seam.

Trenches marking the extraction of ironstone can be seen in area 1 on AP2 and shows the features described above. This type of dereliction occurs most in the northern coalfield (the example shown is situated near Bryn), although cropworking for coal is common throughout the region.

Extraction of coal and iron by this method was limited to the visible length and height of the outcrop while the seam itself could be worked to a depth of only a few metres before the overhanging strata collapsed. Where the seam was not too deep below the surface, however, it could be worked by removing the thin overburden. This resulted in a shallow and disorderly form of opencast working known as patchworking, which has the appearance of irregular heaps and excavations on the ground (Fig.7.3) and on the aerial photograph (area 2 on AP1). The latter image differs from that of simple pits in that the features are larger, the area covered by the spoilation is generally more extensive and little of the original surface can be seen. The area outlined on AP1 is representative of these characteristics although the original extent of the patchworking is disguised by the later spoil heaps which resulted from drift mining (area 3).

Patchworking was often used for mining ironstone as well as coal, and in fact they were often worked together. This is because ironstone nodules ("balls") or bands ("pins") commonly occur in close proximity to the coal seam, and it was obviously economically sensible to remove both at the same time. As a result of this the interpretation of such features is difficult, even when geological maps are used (this is discussed more fully in Chapter 8), and fieldwork can add little since an examination of spoil heaps will show similar composition irrespective of whether coal ir ironstone were worked. The only probable way of showing which were extracted would be to establish which coal seams were worked since ironstone is not associated with all of them.

All the above types of spoilation have several points in common, in that they are all derelict, are well vegetated (but only with grass as a rule), and have rarely been reclaimed. The second point probably results from the first in that the features are between 100 and about 350 years old. The third point results from the fact that the features have to some extent become part of their surroundings, and that they occur in areas where reclamation is not economically (and often not socially) viable. Those areas which have been reclaimed are usually those which have been absorbed into modern opencast coal workings, such as area 4 on AP1, where the costs of reclamation are negligible compared to the overall budget for the opencast operation.

A fourth method of mining which is at least as old as patchworking is the use of drifts or levels, but since this has a modern counterpart it will be consodered separately.

7.6(ii) Drift mining and private mines

Whereas the above forms of mining have been used for winning lead, ironstone and coal, drift mining and the more recently

Fig. 7.3 Patchworking

Fig. 7.4 Dendritic spoil heaps

termed "private mines" have been used almost exclusively in Glamorgan for extracting coal. Drifts or levels were a logical development of cropworking in that they drove into the seam rather than along its outcrop. The underground extent of such workings depended on such limiting factors as the geology, ventilation and drainage (see Lewis (1971) for example), and where these limitations could not be overcome by the prevailing technology the mine would be closed.

The external appearance of these derelict mines is similar to isolated cropworkings in appearing as a scooped-out hollow in the hillside. These mark the entrances to the mine, although generally the opening has been sealed up after abandonment. The spoil brought from the mine usually fans out from the drift entrance and results in a form of heap which differs from that associated with cropworking. In addition, where large amounts of spoil were removed from the mine, the heap may have a dendritic form (Fig. 7.4).

The most common appearance of a spoil heap on the aerial photographs is shown in areas 2 on AP2, and more spectacularly in area 3 on AP1. In all cases the form of the feature is basically the same, although there is obviously a difference in size. Texture is also similar in every case, but there is a marked difference in tonal variation. Area 2(a) on AP2, for example, shows light tones indicative of a poor vegetation cover, and contrasts with the grey-toned, more vegetated heaps of the remaining area 2 of AP2 or of area 3 on AP1.

Although greatly reduced in number, drifts or levels are still worked today but they are generally referred to as private mines (Marnell and Humphrys, 1965). They are on a very small scale with work forces of only a few men but the extent of the underground workings is larger than in earlier drifts since ventilation and drainage is more efficient.

The exterior of the mine (Fig. 7.5) rarely exceeds one hectare in area while the coal loading plant and buildings housing winding engines (if they are used) usually occupy only one per cent of that area. The rest is taken up with the spoil heap(s), the neighbouring areas designated as "degraded land at general ground level", and storage of pit props and trams. The presence of these last two items when seen on the aerial photograph (area 3 on AP2), is an important indication of the activity of the mine, although vehicles used for transporting coal by road from the mine can also be important in confirming that the mine is active.

In the example shown, it is possible to see the tramway route along which the coal and waste are brought to the loading plant. This route slopes gently downhill to the east of the main site and disappears into the mine entrance which enters the hillside in a northerly direction. A similar entrance (the original one) enters in the same direction immediately from the main site but is no longer used as the main entrance. This information is not discernible from the aerial photograph and can only be obtained by field inspection, but the significant data as outlined above (i.e. that the feature is an active private mine) is readily obtained.

When examining other sites such as those which are found north and north-west of Swansea, however, the task of deciding whether such mines are active is more problematic. Often there is little to see other than mine entrances and coal loading plant. In these cases, activity is indicated by the apparent openness of the mine entrance and the appearance of well used and unsurfaced roads leading from the loading plant. The latter is significant since the small amounts of coal carried from the mine mean more journeys by the coal carrying lorries, while the former acts against the general practice of disused mine entrances being sealed. The presence of light toned heaps may also be a useful indicator, although as shown in the example above, the absence of any vegetation is not conclusive evidence of current activity.

In view of the average dimensions of private mines given above, it is clear that they contribute little in areal terms to the spoiled landscape, and probably even less in aesthetic terms (more of this in PART THREE). The next form of spoilation, however, is probably the most significant in the whole of the County.

7.6(iii) Deep mining

The developments which had led to the extraction of coal by means of drifts and levels also gave rise to the use of deep mining by means of vertical shafts. Whereas levels, however, were generally located on hillsides so as to exploit the seams found within them, the deep mines were sited on the valley floors in order that the deeper lying coal could be won. Since the valleys were narrow and quickly became occupied by the settlement and transport networks attendant upon the collieries, the spoil had to be transported to the surrounding hillsides. This resulted in the general pattern of spoilation which is found in Glamorgan today and which is commonly seen on the aerial photographs.

The interpretation of active collieries is relatively straightforward, and for this reason is considered first. An example, Cwm colliery, is shown on AP3. This particular colliery was re-organised in the 1960's and the adjoining coke works (area 15) was built to convert about half of the colliery output into high

Fig. 7.5 Private mine

SCALE: approx. 1: 5 000

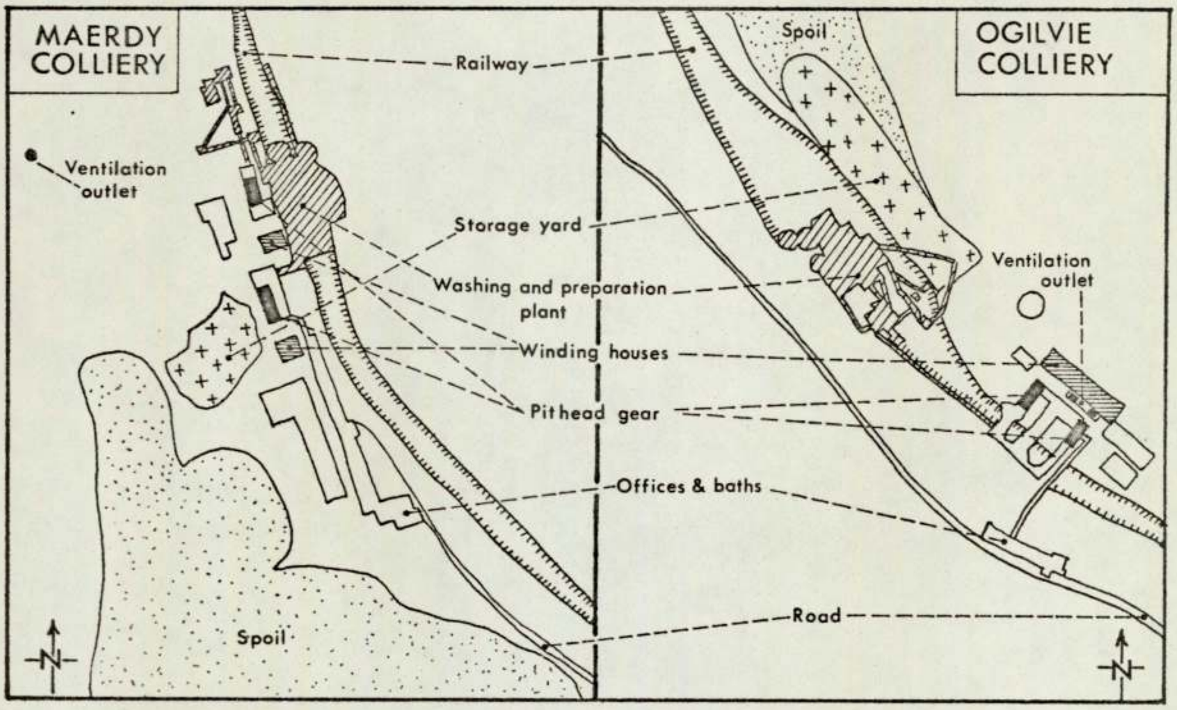


Fig. 7.6 Plans of Maerdy and Ogilvie collieries

grade metallurgical coke and other by products (Thomas 1961). The main features of the mine are clearly visible and include the pithead winding gear (at 1), the winding house (2), the preparation plant (3) connected by covered conveyors to the pit head, and the spoil heap (4). The left-hand set of headgear at 1 is situated above the upcast shaft to the right of which is the rectangular shape of the installation used for ventiliation (5). To the left and below the upcast shaft on the photographs there is a white-toned covered walkway (6) which crosses the road running south from the colliery site. This walkway connects the upcast shaft to the baths (7) and is covered so that miners returning from the pit have time to adjust from the warmer temperatures which they will have encountered underground.

The remaining buildings near the baths are probably offices as is the building at 8, while most of the buildings west and north of the winding house are repair workshops (9). The nearby area is part of the colliery storage yard where objects such as pit props (10) may be seen, but most of the yard extends northwards for a further 300m.

The preparation plant, where the coal is washed and graded, is most characterised by the series of rising and falling conveyor systems along which the coal travels as it is successively screened, and the series of railway lines running between the supporting pillars of the building. These are placed so that wagons can be loaded at various places with the differing grades of coal before being transported from the site. In this particular example coal is also fed directly to the nearby coke works by means of the conveyor system at 11.

The appearance of the standard gauge wagons contrasts greatly with the trams which can be seen on the pit head surface (12). The presence of these, particularly since several of them are full, is an indication of the site being active, as is the parking of cars near the site offices and baths. The tip also suggests activity since for the greater part it is unvegetated, some surfaces (e.g. at 13) show recent spreading of spoil, and earth moving vehicles are present.

All of the above factors have indicated that the site is an active colliery, and virtually all the features described (1-5 and 7-9 inclusive) are common to all collieries. There can, however, be major variations in the appearance of these features depending on the age of the mine, its geographical siting and its role in the modern mining industry.

As examples of these variations, plans are shown in Figures 7.6 of two other active collieries. These plans are based on aerial photographs and there may be slight inaccuracies in exact locations of buildings, but the general relationships between the different buildings are obvious. Both of the collieries shown, Ogilvie (Fig. 7.6(a)), and Maerdy (Fig. 7.6(b)), differ from Cwm, firstly in geographical location. They are sited in deep narrow valleys, Ogilvie in that of the Nant Bargoed Rhymni, and Maerdy at the head of the Rhondda Fach, and the restriction on space has resulted in a more compact arrangement of buildings than at Cwm.

Other differences are evident if the sites are examined in detail. At Maerdy, for example, there are separate winding houses for the two sets of pithead gear, while Ogilvie has a similar arrangement to that at Cwm. Compared to the latter, however, Ogilvie has a different ventilation system which immediately adjoins the winding house. Other differences include the smallness of the colliery yard, and the difference in arrangement of the preparation plant at Maerdy, and the lack of direct road access to Ogilvie.

Apart from these aspects, the two valley sites are more similar to each other than to Cwm despite the fact that Ogilvie is an old colliery and Maerdy has undergone major reconstruction making it almost contemporary with Cwm. Tipping, for example, has had to occur on the valley slopes near Maerdy and Ogilvie, and is carried out after spoil has been moved from the pithead by trucks and not conveyor system. Another similarity is that the engineering and repair workshops, situated close to the pithead and connected by tramways, are smaller and more compact than those at Cwm.

In spite of all the above differences and similarities between the three collieries, other variations can be found throughout the county. For example, none of the three so far considered have any large slurry lagoons, although there are remaining traces of earlier ones, as at Cwm (number 14 on the aerial photograph). These lagoons consist of the water and dust (mainly coal) which have come from the washery of the preparation plant, or pumped out of the mine, and are usually contained within walls made of colliery spoil. By the use of a series of stepped lagoons and the action of gravity the dust is settled out of the water, which can then be re-used. When a lagoon has been filled with the resultant sediment it can be excavated and the lagoon further used.

Since most active collieries now employ plant such as "thickeners" for the sedimentation of dust and recovery of water in the preparation process, most slurry lagoons are associated with the removal of excess water from the mine workings. Examples of these are shown on AP4, which shows the anthracite colliery of Abernant (see Fig. 7.7 also). Viewed stereoscopically the lagoons (1) drop in level from north to south and the last in the line contains a much greater volume of water. Just above the highest level it is possible to see an older lagoon which is being excavated (2).

The rest of the mine is of interest since it illustrates yet again the variations in the normal assemblage of buildings and installations. The most striking feature is the absence of the traditional girder structure of the pithead gear. This is because Abernant is a new colliery, utilising the most recent technology, which in the case of winding has resulted in the tower winders (3). These tall buildings combine the winding house and associated head gear in one unit which is completely enclosed. In the example shown the tower over the downcast shaft (the southern most of the two) is larger than its companion since it handles more traffic in the way of coal and waste. The upcast shaft has its associated ventilation outlet (4) just to its right, and this shows a further difference to those so far shown. Other features such as the offices and baths (5), workshops (6), storage yard (7) and preparation plant (8) are much the same as those elsewhere although the preparation plant is a little smaller. Since the colliery is situated on the flat wide floor of a valley the tip (9) is not as confined as in other cases, so that it is similarly wide-based and small in height.

Other heaps which can be seen, as at (10), are stockpiles of coal although the one at the northern edge of the photographs has the appearance of a tip with evidence of gullying in its surface. This is because the coal is very fine and is easily eroded by rainfall during the time it has been stockpiled. (Demand for this particular type of coal, used in power stations, was in low demand at that particular time and accounted for the age of the pile).

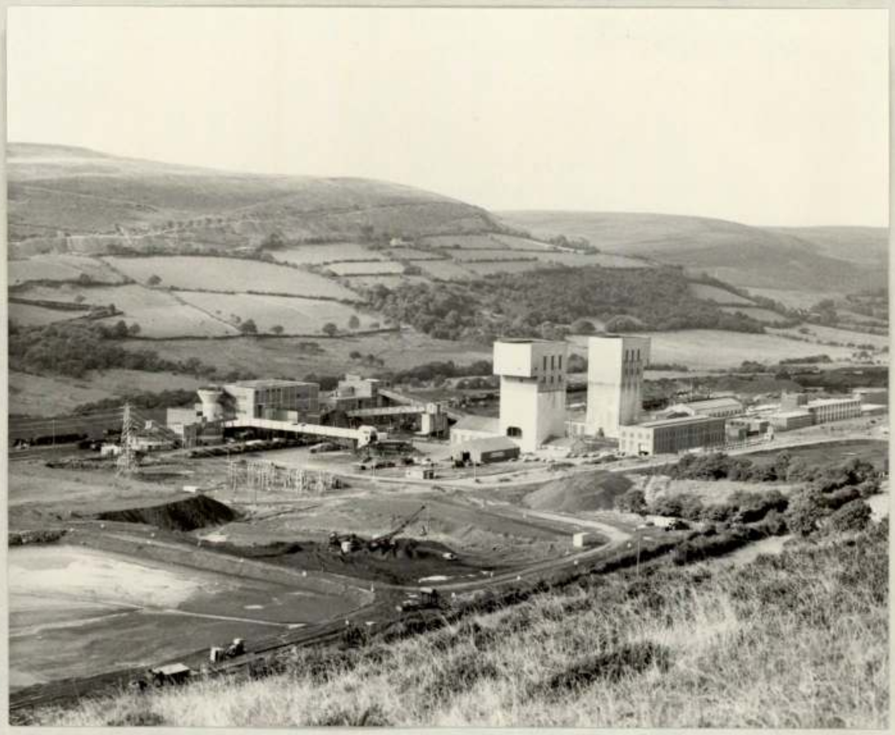


Fig. 7.7 Abernant colliery

Fig. 7.8 Mountain colliery

These then are the major features and some of the variations which are found at active collieries, but there are several points to bear in mind when interpreting such sites. As an example, pithead gear may not always be visible since being dark toned (the true colour of the painted metal is usually dark green or blue, or black), it may be lost in shadows cast by nearby buildings. Here is one instance, however, where its own shadow may indicate the presence of headgear.

Secondly, there is the important point that not every mine site which appears active may necessarily be producing coal. It may be used as a training centre or for emergency access, or maintained purely for pumping water from the workings. In all of these cases there is bound to be a complete lack of preparation plant and associated railway wagons and no signs of any recent tipping. Other buildings may or may not be present depending on the nature of the work carried out on the site. In the case of pumping, for example, there may be almost nothing present as can be seen at 5 on AP1. Here a shaft is being utilised for pumping in order that workings elsewhere are not flooded, and all that are visible are an apparently capped shaft, a nearby pumping station and an enclosing high fence. A field visit to the site has shown that the shaft is not in fact quite capped in the usual sense, but is covered by concrete blocks, between which the pumping equipment is lowered (and raised for maintenance).

Other sites which are still active may contain only preparation plant, all other buildings and installations having been removed. The raw material for such plant will come from several nearby collieries where perhaps their individual outputs are now too small to justify using their own original plant. This situation is found where one or more collieries has closed and neighbouring ones are kept open only by the economic rationality of sharing facilities.

Since the above sites could conceivably be interpreted as derelict, it is now appropriate to examine the interpretation of derelict deep mines. The major difficulty in recognising these is in in the fact that there is no definite relationship between how long the mine has been closed and its surface condition. This means that while derelict collieries may be almost intact, as with Mountain Colliery on AP5, others may just consist of a few remaining buildings (Groesfaen colliery on AP6), or may just be represented by a cleared site, capped shafts and the spoil heap (as with Bryn on AP2).

Considering first Mountain Colliery (AP5 and Fig. 7.8) it is still possible to see pithead gear (over one shaft) at (1) the winding house (2), preparation plant (3), offices (4), baths (5), workshops (6) and power generating house (7). The open conveyor system (8) connecting the pithead to the tip (9) is still present and a second set of pithead gear can be seen at (10). In spite of the fact that all of these features are characteristic of active collieries as described above, it is obvious that this particular colliery is derelict. This is shown in the bad state of repair of buildings, particularly in the case of the preparation plant, the absence of any railway track to the site, especially near the loading points, and a complete lack of any vehicles or railway wagons. In addition, there is no sign of a storage yard.

Looking at another site, however, that of Groesfaen colliery (AP6), much less of the colliery remains, although both were closed in the mid-1960's. All that is visible at present is part of the preparation plant (1), the pithead surface (2), workshops (3), and offices and baths (4). The latter are, in fact, in use for storage but this can only be established from a field visit since no evidence of their current use is presented on the photographic image. Nothing remains of any pithead gear or winding house(s) although the site of a shaft can be seen at 5 on the pithead surface. This particular shaft has not been capped but filled with rubble, a practice which has appeared to be more common in this County than in those associated with other coalfields.

Other features which indicate that Groesfaen is no longer active include the lack of railway track and rolling stock (although the route to the main line route is visible at 6), and the provision but non-use of a car park at 7. This latter evidence is not signifcant when considered alone, as can be seen by referring to Abernant (AP4) where there is a car park which is occupied by only one vehicle (11). Evidence such as this is of use only after more significant features have been examined, so that whereas the information confirms that Groesfaen is derelict, it does not add to the fact that Abernant is active.

Looking now at the site at Bryn (AP2), there is no possibility of an active deep mine being identified. There is the danger, however, of no mine being recorded at all since the site is entirely cleared. All that remains is the entrance to the site (5), the tip (6) and two square, white toned areas (7) which are in fact capped shafts (verified by field inspection). Apart from these features, and intuition, there are other items of evidence which indicate the previous existence of a colliery. Firstly, the photographs indicate a railway connection (8) between the site and main railway route (9). More importantly, however, the six-inch scale Ordnance Survey map marks many more buildings on the site, as well as the word "mine". The geological map at the same scale also has this latter information with the additional legend of "Bryn colliery". Thus, in this particular instance, other data sources are of greater significance than the aerial photographs which have been used. If, however, use had been made of an older set of photography dating back to perhaps the 1940's, then the colliery would have been as easily identified.

The role of non-photographic data sources is of special significance to a unique area of Glamorgan where deep mining has been carried out for the extraction of haematite ore (as distinct from the extraction of ironstone by "trenching" or "patchworking" which was discussed in section 7.6(i)). The mine sites in this area, around Llanharry, show many similarities to those colliery sites elsewhere since pithead gear, storage yards, trams and standard gauge rolling stock, and spoil heaps are all present. The major noticable difference is that there is an absence of extensive washing or preparation plant, but it is the utilisation of other data sources such as the geological maps and literature on the economic geology and industrial development of the coalfield which give the full significance of the mine sites.

7.6(iv) Opencast coal extraction

Although deep mining has contributed most to the spoiled landscape in Glamorgan, the individual sites have been relatively small in areal extent. This contrasts greatly with the size of individual opencast sites where in some areas the extraction of coal has occupied up to about five square kilometres.

The working of coal by opencast methods is known to have been carried out since Roman times (Davies *et al*, 1974), but it has only been since 1941 (when it was used to meet wartime needs) that the practice has been carried out on a large scale. In addition, it has only been since 1958, with the introduction of the Opencast Coal Act, that closer control over opencast working and restoration has been exercised.

Since this control has been so tight, the methods used in the opencast operation and the overall manner in which that operation is carried out have become very standardised. As a result, one opencast site will look very much like another and any major differences can be explained by the degree to which the site has been developed. The implication of this situation is that opencast sites are easily identified on the aerial photograph, assuming, of course, that the interpreter is familiar with the method of coal extraction.

Work on any particular site is commenced by the removal of the topsoil which is then placed around the site in dumps. Bush (1970) regards these dumps as helping to identify sites as opencast and indeed the photographs he examined for Yorkshire do exhibit such features. In Glamorgan, however, these soil dumps are rarely conspicuous possibly because other features tend to dwarf them. Alternatively they may not be noticable since as Davies et al (1974) have pointed out, the dumps are usually grassed over to improve their appearance.

Once this activity has ceased, sub-soil is also removed and put in separate dumps around the site. The initial cut is then made by face shovels which load the removed overburden into dump trucks. This material is placed above ground in the most advantageous position, having regard to the position of the final void or the consideration of where levels are to be raised during restoration. Subsequent forward reduction of the overburden is also carried out by face shovels but excavation at deeper levels is carried out by dragline excavators.

Once the coal seams are exposed their surfaces are cleaned by graders or traxcavators, followed by handcleaning with shovels or brushes. The coal is then lifted by face shovel, hydraulic excavator or loading shovel into road vehicles for transportation to washeries, or direct to disposal points.

As areas of the site are worked out, the workings move forward and the mined area is restored, firstly by the replacement of selected overburden and then by the subsequent desposition of subsoil and top soil. At a later stage drainage and ditches are installed followed by the establishment of shelter belts and seeding.

All active sites will exhibit most of these features depending upon the extent to which the site has been worked. Photographs AP7, for example, show part of a well developed site situated north west of Blaengwrach and Glyn-Neath.

Area 1 is currently being excavated by the dragline situated at 2, while the overburden cast by this excavator is being used to fill the cut in area 3. Other overburden dumps can be seen in area 4, while smaller dumps can be seen in area 5. The smaller plant used for coal removal can be seen at 6 and 7 while other vehicles can be seen scattered over the site.

Area 8 contains site offices and the presence of parked cars may be noted (a diagnostic characteristic of activity). There is no trace on this particular stereo-pair, however, of a disposal point.

The direction in which the site is being worked is clear from the features which can be seen since, apart from those already described in the obviously active part of the site, the areas which are restored or undergoing restoration are located in area 9, while the area of fresh activity can be seen in 10 where blasting has been used to break up the overburden. The workings are therefore progressing from left to right.

The general appearance of areas which have already been restored (area 9) is quite distinctive such that sites which have been completely restored are easily picked out. The major feature is the strong striated pattern which, in fully restored areas, is broken only by ditches and drainage patterns. Often the tones of the underlying soil are varied, ranging from an off-white to a mid-grey over small areas, and indicate the fact that the ground has been disturbed at some point in time.

As a result of the strict planning controls exercised over the workings, all sites are invariably restored so that all sites interpreted as being opencast workings will be usually active. In special cases, however, some sites might be abandoned and may be regarded as derelict.

Photographs AP8 and Fig. 7.9 show one such site where activity had ceased due to bankruptcy on the part of the contractor. The major indicators of dereliction are a complete lack of plant and other vehicles, an absence of offices, although ruined buildings can be seen at 1 (these may not have been connected with the site), and pronounced vegetation growth (as in area 2). In addition the roadways show no sign of being maintained as was evident on AP7. Although these factors were sufficient to indicate the derelict status of the site, it was necessary to consult the six-inch geological map and pay a field visit to firmly establish that the site was an opencast coal site and not perhaps a quarry. This situation illustrates again the value of additional data sources to the interpretation process.

7.6(v) Quarrying

The extraction of minerals (in their broadest sense) by the practice of quarrying is the second most important industry to have contributed to the spoiled landscape in Glamorgan. Unlike mining, however, the effects of quarrying are not so great except in the case of large active quarries which can be aesthetically displeasing as well

Fig. 7.9 Derelict opencast working

Fig. 7.10 Derelict limestone quarry

as taking up large agricultural areas. On the other hand, those quarries which are derelict are usually unobtrusive, particularly where they are vegetated, and will only be a slight nuisance to a limited number of people (for example, farmers who need to circumnavigate such features while ploughing, or are required to fence their perimeter for the safety of livestock).

Since there are many varieties of rocks to be found in Glamorgan with a high proportion having some economic value, it is not surprising that a variety of quarries are to be found. To examine these on a strict geological basis, however, would take much time and more space than this research warrants. Consquently, only the broad types of quarry will be considered, since basically all quarries have the same form and present the same problems if they are to be reclaimed.

Limestone and dolomite quarries

The form, size and location of limestone quarries, whether active or derelict, depend and have depended largely on the uses to which the limestone has been put. Before the industrial revolution, for example, small quarries were worked for local building stone or for lime burning. These quarries, now derelict, are found scattered throughout the Vale of Glamorgan and are easily interpreted from the aerial photograph and Ordnance Survey six-inch map, although occasionally the geological map is also required. The quarry appears as a small "hole" in the land surface, rarely exceeds one quarter of a hectare in area, and is often well vegetated with scrub or trees. The nearby presence of a lime kiln, often marked on the O.S. map, indicates the past activity associated with the quarry (i.e. lime burning) and consequently the fact that limestone had once been extracted.

The development of the iron industry during the latter eighteenth and early nineteenth centuries led to an increase in the production of limestone for flux in the iron smelting process, and quarries became larger and more numerous. The later expansion in coal mining and the consequent increase in building resulted in a further demand for limestone although the quarries supplying this were only medium sized.

Since 1900 the market for all forms of limestone has undergone several fluctuations such that many quarries have become derelict. Photographs AP9 and Fig. 7.10 show a group of quarries which are in such a condition near Rhoose and Porthkerry in the Vale of Glamorgan. The quarries are clearly visible as are associated buildings and kilns (at 1), and the site of the link connecting the nearby railway to the site is also visible (at 2). This last feature and the absence of any plant or vehicles, together with the ruined state of the buildings and the well vegetated nature of the site, are a strong indication of its disused status.

A contrasting situation can be seen on AP10 which shows an active quarry near East Aberthaw. Apart from the presence of plant (at 1), certain rock faces show signs of recent working (at 2), and there is an obvious route connecting the site to the nearby Aberthaw cement works (3). Since this cement works (which can only be seen on one of the photographs) is in close proximity to the quarry, it is possible to fully identify the latter feature without consulting a geological map.

The Aberthaw quarry is perhaps the largest in the County but those other quarries extracting limestones for cement are not much smaller. The remaining active quarries are medium sized and produce stone for roadstone, ballast, and aggregate for constructional work, and for flux in the iron and steel industry. The latter also includes dolomite which is found within the Carboniferous Limestone outcrop on the southern edge of the coalfield near Taff's Well. As well as having a use as flux, this particular form of limestone is important in the production of refractory bricks and cement.

Sandstone quarries

The quarrying of sandstone, and in particular the Pennant Sandstone, began in the same fashion as limestone extraction for local building purposes, but has not seen as great an expansion in development. Consequently most quarries are small and derelict, exhibiting similar characteristics to those where limestone was formerly extracted (although, of course, the location is quite different). On of these quarries can be seen at 10 on photograph AP2.

The few active quarries which are found extract sandstone for roadstone, walling and other general and specialised building purposes. In appearance on the aerial photograph they closely resemble active limestone quarries with mobile plant, screeners and crushers, offices, etc., and in fact are often distinguished only by reference to a geological map.

Brick clay and fire clay extraction

Brick clay pits contribute little to the spoiled landscape of Glamorgan since their number is small and their extent is limited. Apart from a few pits which extracted Keuper Marl near Cardiff and Penarth, most have been concentrated in the shales of the Coal Measures. Since these features are similar to other quarries, such pits are rarely identified directly from the aerial photograph, except where a brick-works is or has been present. In addition, some material from deep mines has been extracted directly at colliery pit heads so that there are no excavations in virgin ground. A similar situation exists with fire clays, used for refractory purposes, which are closely associated with particular coal seams.

Sand and gravel extraction

Of all the extractive industries found in Glamorgan, the removal of sand or gravels has contributed least to the spoiled landscape. The major areas involved are Merthyr Mawr Warren, between Porthcawl and the Ogmore estuary, and Margam Burrows, below Port Talbot. These two coastal areas are active, and represented on the aerial photograph simply by excavated areas within the sand dunes, and by vehicles and plant used for transporting the material within and from the sites.

7.6(vi) Reworking of colliery spoil heaps

One industrial practice which has become increasingly significant in recent years is the reworking of colliery spoil heaps for coal or shale. Since the latter aspect of reworking is difficult to distinguish from restoration work when observed on the aerial photograph, however, (this is also discussed in Chapter 8), it will not be further considered here.

The reworking of spoil heaps for coal is easily observed, however, as can be seen in photograph AP6. The basic premise behind this practice of reworking is that many old spoil heaps contain a high proportion of coal. This is due to the less efficient methods of washing that removed much of the finer particles of coal and dust, which became waste. There was also an economic basis behind the method in that since coal was in plentiful supply, the smaller particles were not needed. With the advent of pit closures, however, and the demand for small coal by electricity generating stations, this component of the spoil heaps became valuable. The easiest method of removing such coal is to rewash the heaps, hence the commonly applied term of "rewashing" to the modern practice.

The plant found at these rewashing sites is simple and usually consists of covered conveyor belts which are used to transport coal and the associated waste (see 8 on AP6) to the washing plant (9), and the secondary waste to a fresh spoil heap (10). Offices are also to be found (11) in addition to vehicles used for removing the newly won coal from the site. Figure 7.11 illustrates a ground view of a rewashing site although it is not that shown on AP6.

The whole site is usually dark in tone due to the inherent presence of water, while the fresh spoil heaps are finer textured and unvegetated when compared to their unworked counterparts.

7.7 Interpretation of other industries and utilities

A description of all those industries which have contributed to the spoiled landscape would probably occupy more space than is justified when considering the total situation in Glamorgan. In addition, since the Welsh Office were not interested in industrial spoilation to the level of individual industrial practices (see Chapters 6 and 8), it appeared a little irrelevant to examine the problem at such a level.

As a result of this it was decided to pay most attention to those industries which have contributed more to spoiling the landscape than the average manufacturing or processing industries. Such industries are those which generally produce a great deal of waste (as in steel production or power generation), those closely associated with mineral

Fig. 7.11 Rewashing

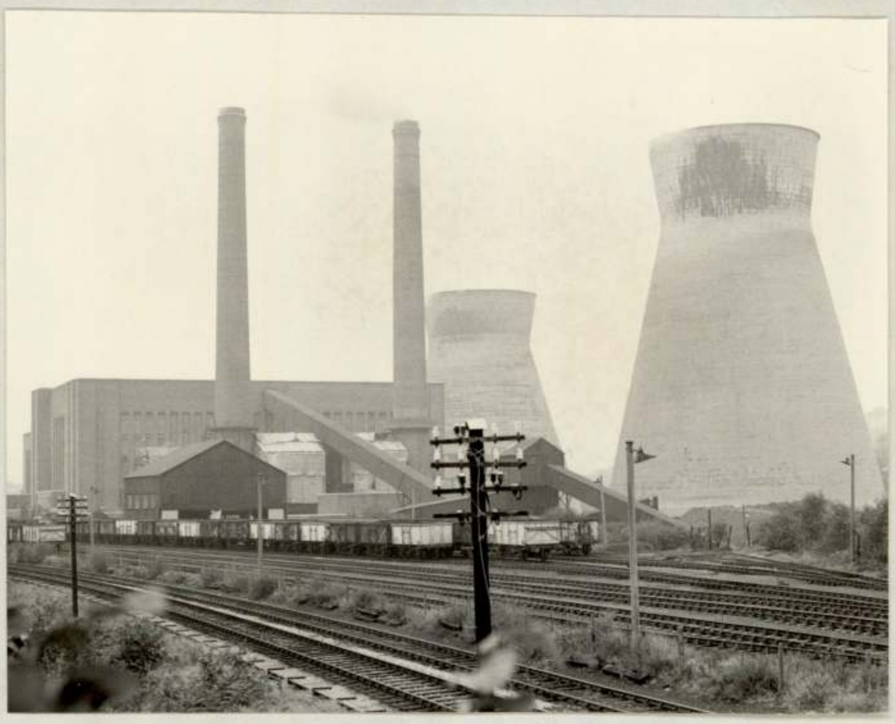


Fig. 7.12 Llynfi power station

extraction (coke works, lime kilns, etc.), or those which have appeared quite commonly in the spoiled landscape survey (for example sewage works).

Any other forms of spoilation will usually be insignificant on a County level (for example, refuse and waste from a small manufacturing industry) or not identifiable (as in the case of a derelict factory which has an unknown form/function relationship).

7.7(i) Industries producing large amounts of waste

In general, the industries which have produced the greatest amounts of waste, and consequently presented the greatest environmental problems, have been the metal smelting industries and the power stations.

The majority of derelict smelting works have been those connected with copper, lead, zinc and iron but since these have often fallen outside the administrative County of Glamorgan they are not considered in detail here(many of the non ferrous smelters were concentrated in the lower Swansea valley while many of the early iron smelters were grouped around Merthyr Tydfil.) One site, however, which was significant at the time of the survey (i.e. it appeared on the aerial photographs), but which has subsequently been cleared during motorway construction, was the derelict smelting works near Neath Abbey. The appearance of the site on the aerial photographs gave little indication of the industry which had formerly existed there, since all that remained were buildings in an advanced state of ruin and numerous heaps which were well vegetated. The heaps in some parts did exhibit characteristics of slag, however, in that the spoil material was heterogenous in tone ranging from black to white. In this particular case the use of additional data sources proved to be an advantage in suggesting a tentative interpretation, since George Borrow in his book

"Wild Wales" refers to "immense stacks of chimneys surrounded by grimy diabolical-looking buildings, in the neighbourhood of which were huge heaps of cinders and black rubbish" close to Neath Abbey, (Borrow, 1862). The exact geographical location of the site which Borrow described is difficult to ascertain from his account but it would seem likely to be the site observed on the photographs. In addition, a field visit showed the presence of slag blocks on the site and the use of lumps of slag in the construction of garden walls of nearby houses.

In the case of modern smelting works, principally in the production of steel, correct identification from aerial photographs is more straightforward. Photographs AP11, for example, show part of the Briton Ferry steelworks near the Neath Estuary. The buildings themselves are shown, in part, in area 1 while piles of slag can be seen in area 2. In addition, scrap iron can be seen at 3 and steel ingots at 4. From the presence of smoke issuing from the chimney stacks at 5, and the numerous railway wagons located all over the site (for example at 6), the works are obviously active.

This site, together with the major steelworks at Port Talbot, have produced large amounts of waste, but an equal amount has probably been produced by the more numerous power stations found through the County. Power station waste (pulverised fuel ash or, more commonly, PFA) is fairly homogenous in nature and consequently has little tonal variation on the aerial photograph.

Photographs AP12 and Fig. 7.12 show the Llynfi Power Station which is situated approximately mid-way between Maesteg and Bridgend. The station is easily observable with the generating house at 1 and the cooling towers at 2, while the coal stockpiles are situated at 3 (not in stereo) and the coal wagons can be seen at 4. The slurry lagoons into which the water/cooled ash is pumped are at 5, and at 6 it is possible to see the small reservoirs into which the recycled water is returned.

At this particular site, much of the ash waste has been used to fill in small valleys which fed into the Llynfi valley. Area 7, in fact, is part of one un-filled valley although there is a second not shown on this stereo pair. Some waste also appears to have been deposited in area 8 since the photographic tone (mid-grey) bears some similarity to the materials found near the slurry lagoons (5), and there is obvious access from the main depositional area.

Although a large amount of ash has been produced by this particular power station (but not as much as the one near the Thaw estuary at West Aberthaw), other stations may exhibit less where the ash has been used for constructional purposes.

7.7(ii) Industries closely associated with mineral extraction

Industries in this class produce very little waste but can contribute greatly to the spoiled landscape especially when active. They are closely associated with the extractive industries in using the extracted mineral as a raw material, and are also commonly located in close proximity to the site of the mineral extraction.

A prime example is the coke and by product plant adjacent to Cwm colliery (area 15 on AP3). The industry is characterised by the transportation of coal (11), in this case directly from the washing and preparation plant of the colliery, to a series of coking ovens (16). Here the coal is converted to coke, removed and cooled before being graded (at 17). Gases which were generated during coking are also removed to other parts of the site (at 18) where they are condensed, washed and purified to produce a variety of by-products (usually tar, ammonium sulphate, sulphur, napthalene and benzole products).

Another industry which is located adjacent to the extraction of its raw material is that producing cement. The left hand photograph of the stereo pair AP10 shows the cement works at Aberthaw, although the works cannot be seen in stereo. However, assuming that the interpreter has a knowledge of the processes which take place during the manufacture of cement it is possible to identify the industry from the major part of the works seen on the photo. The limestone is brought to the site by rail (4) and enters the plant at 5. It is then crushed and mixed with clay and water to form a slurry which is stored in large tanks at 6. While in storage the slurry is continuously agitated until it is transferred to long revolving kilns situated in the building at 7. Since four chimneys can be seen to the north of this building, there are probably four kilns present.

After passing along the length of the kiln, the slurry becomes a hard clinker which, after cooling, is crushed into powder. Before or during this grinding, specific amounts of calcium sulphate (gypsum) are added and the final product is stored in silos (8), or removed by road and rail in bulk.

A second industry (that of lime production), which utilizes limestone has already been referred to in Section 7.6(v) under limestone quarrying, and since the example of lime kilns (at 1 on AP9) has also been given no further discussion will be made here. The site is referred to, however, in order to illustrate one aspect of air photo interpretation not previously discussed at length.

In all the examples quoted in this section, the industry concerned has been interpreted in conjunction with the extractive industry with which it is associated. The advantages of this are that the reliability of the interpretation is increased for the extractive industry and its associate, and that since the associated industry indicates the exact nature of the extractive industry the use of the geological map is of minor importance. In fact, in situations such as this, the nature of the extractive industry can be stated without any reference to the geological map. The sole use of the aerial photograph as a prime data source, therefore, will obviously quicken the overall survey method.

7.7(iii) Miscellaneous industries

Two examples are given in this category to illustrate how industries and utilities can spoil the landscape although they neither produce large amounts of waste nor are they associated with extractive industries.

The first relates to scrap metal merchants who act as the link between those bodies to whom scrap metal (in any form) is waste, and those bodies who can use it as a raw material. The appearance of scrap steel on the aerial photograph has already been referred to in connection with the Briton Ferry steelworks (AP11) under section 7.7(i), but the example considered here concerns area 1 on AP13. Within this area, situated close to Barry docks, it is possible to see significant amounts of scrap material composed largely of cars and other vehicles. The features which distinguish such a site from, say, a car park devoid of any markings, are that firstly, the vehicles are often stacked one on top of another as at 2, and secondly that individual vehicles may be found lying on one of their sides or even their roof, as near 3. These latter positions make it more difficult to recognise the vehicles, since in the case of the side elevation visible when the vehicle is on its side, the observed area is smaller than the usual plan view. Where the vehicles are resting on their roofs, the exposed undersides exhibit very little variation in photographic tone and consequently tend to merge together. In addition, since the undersides have little difference in their apparent relief (particularly when the tyres have been removed), the three dimensional image is insufficient to suggest the true nature of the observed object. The successful interpretation of such sites therefore requires very careful observation and analysis of the image.

Scrap yards are invariably active due to the inherent value of the materials contained within them and as such can only spoil the landscape in an aesthetic sense. The second example considered here, however, relates to a derelict feature which spoils the landscape through being an unutilized resource.

This feature is a disused sewage works, an example of which is found in area 1 on AP14. In this area it is easy to see two circular settling tanks at 2 and a series of rectangular tanks where sewage was broken down by anaerobic bacteria (at 3). The derelict nature of the site is indicated by the ruined state of the containing walls of the settling tanks (2), the absence of any rotary scrapers in these tanks, and the presence of vegetation in the sludge plant (3).

Scrap yards and sewage works are only two out of dozens of miscellaneous industries which contribute to the spoiled landscape, but they have been discussed in preference to others since they represent different facets of that landscape and are also found quite frequently.

7.8 Interpretation of miscellaneous tipping practices

Sections 7.6 and 7.7(i) above have discussed those activities, i.e. mining, smelting, power generation, which produce large amounts of waste. This section is concerned with practices which are non-industrial in nature and produce smaller quantities of waste, and those activities (and consequently any related tipping) whose exact nature cannot be ascertained.

The most important of these groups is the tipping of household or domestic refuse. The location of sites where this takes place is quite variable ranging from disused excavations (in many cases the ideal situation) to flat low lying areas. The basic method of tipping involved is to deposit the refuse, compact it in order to exclude as much air as possible (thus reducing the likelihood of spontaneous combustion and/or inhibiting the growth of harmful aerobic bacteria), and then cover it with soil. This process continues until the capacity of the site is reached, when full restoration can take place.

AP15 and Fig.7.13 show aspects of this process on a flat low lying site near Rhiwbrwdw. Recently deposited heaps of refuse can be seen at 1 and are characterised by coarse texture and varied photographic tones. Areas where the refuse has been compacted are found at 2, while soil dumps and areas covered by soil are visible at 3 and 4 respectively. Area 5 on the left hand side of the road is an area of former tipping.

An unusual aspect of this particular site is the complete absence of any earth moving plant or waste disposal vehicles. The "freshness" of features 1-4, however, indicate that the site is active and a subsequent field visit has confirmed this.

In the case of sites where tipping is observed but where the nature and source of the tipped material cannot be ascertained, little more can be said. One example is shown on AP16 where material has been tipped into the disused Penarth Dock. Discounting the debris floating

Fig. 7.13 Domestic refuse tip

Fig. 7.14 Residual open space (waste ground)

on the surface of the water, the material in area 1 appears to be inorganic and resembles sub-soil or overburden. In contrast to this, area 2 exhibits more heterogeneity which is characteristic of refuse. Since the tipping is taking place in water, however, the material is unlikely to be domestic refuse since for health reasons such material is usually tipped in dry areas.

Having established all that is possible about the nature of the material further information may be given by establishing the origin of it. In this particular example there would appear to be no connection between the material and its surroundings (even outside of this particular stereo-pair) and must therefore be concluded that the origin is unknown.

Consequently, these sites were designated as "unknown tipping practices" during the survey although a later field visit showed the material to consist of a mixture of rubble, various forms of refuse and earth. Its origin, however, still remains unknown.

7.9 Interpretation of intra-urban residential uses

The types of spoiled landscape which have been discussed so far have resulted, or are resulting, from industrial activities. Now attention will be paid to those activities which although equally spoiling the landscape, are non-industrial in nature.

The categories which comprise "intra-urban residential uses" have been mentioned in previous chapters but not described in depth. The first category, that of "abandoned allotments" is easily understood, although the appearance of such sites on the aerial photograph is less easily comprehended. The major problem that occurs is in deciding whether an overgrown and unmanaged allotment is truly abandoned, i.e.

derelict, or just temporarily neglected. A solution, however, was found by using the "minimum area of 0.25 hectare rule" mentioned in Section 6.3(ii). By using this rule, single allotments which appeared abandoned but which could have easily been neglected for a season would not be included, since they would rarely approach 0.25 ha in area. On the other hand, a series of allotments which were overgrown suggested complete abandonment, and assuming it was at least equal to the minimum size would be included.

Area 3 on AP16 shows allotment gardens which have been abandoned for some time. This site is so overgrown in fact, that its original use might easily be overlooked if it were not for the site being marked on the Ordnance Survey six-inch map, and for the presence of the boundaries which existed between individual allotments, and which can still be seen at 4. This particular area can be contrasted with the active allotments in area 5, and another series of abandoned allotments on AP13 (area 4). This latter site has been cleared of much vegetation, but again, it is still possible to see the original boundaries between plots at 5.

A more difficult problem of interpretation occurs in the second category of intra-urban residential uses, that of "residual open spaces (waste grounds)". As stated in Section 5.4(ii), this class " was designed to include those areas generally superfluous to development or resulting from irregularly shaped gardens and housing plots, and having no apparent use". During the survey, however, it became apparent that the author's notion of "residual open space" did not appear to be generally understood by other members of the survey team. As a result, the following characteristics had to be added to those originally stated:

a) that "residual open spaces" were usually well vegetated,

b) that there was no sign of any land management, i.e. unlike official open spaces (e.g. parks) or road-side verges, any vegetation growth was unchecked,

c) that the average area of such sites rarely exceeded 0.25 - 0.50 ha,

d) that if any use took place in such areas, then it was usually to take "short-cut" routes through the site.

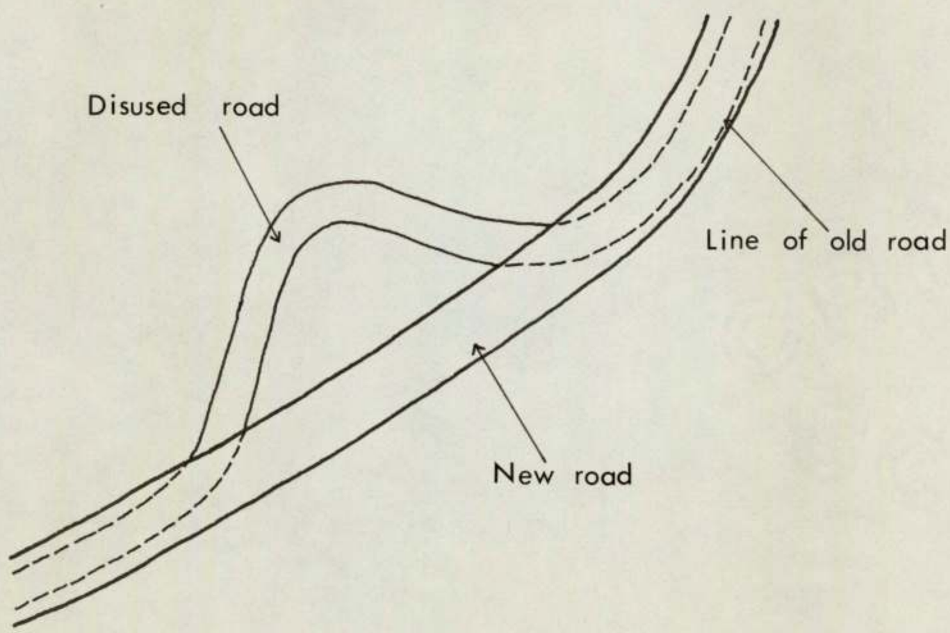
The ground view in Fig. 7.14 gives an indication of how "residual open space" usually appears in the urban environment. Although no true areas of residual open space are represented on the aerial photographs examined in this chapter, an indication of their aerial photographic image can be gained by considering area 6 on AP13. Here is a site which is obviously in an intra-urban situation, is very well vegetated and unmanaged (unlike the open space just to the south-east), and which appears not to be used except for a path connecting two adjacent roads.

7.10 Interpretation of transportation networks

Transportation networks are among the easiest features to identify from aerial photographs although it may be difficult to decide whether such features are active or derelict. For the purpose of this survey only derelict features have been examined, however, since active networks are not regarded as contributing to the spoiled landscape. The most common networks have been railways and tramways, with canals taking secondary importance, although other features associated with water transport (docks, landing stages, etc.) have not been insignificant. In contrast to these groups disused roads have occurred rarely.

7.10(i) Disused roads

Since there could be great difficulty in differentiating between active and disused roads where they are infrequently used (particularly in rural areas), only those roads having a high probability of being disused have been surveyed. Generally such roads are found where road improvements have made certain parts of the road obsolete, as in schemes for road straightening. Fig. 7.15 below, for example, shows where a bend in an old road has been cut off by improvements to the route.



(Fig. 7.15 Example of a disused road)

Such examples are rare, and because of this no example is given on an aerial photograph.

7.10(ii) Disused railways

Chapter 4 indicated that derelict railways exist in various forms although there were two basic types of railways with track still present, and with the track removed.

The greatest problem arises in interpreting derelict railways with the track present since they obviously could be active. There are, however, several characteristics which may be seen and which should provide reasonably valid evidence in order to assume that the line is disused. Firstly, lengths of disused track will usually be quite short since their inherent value (particularly as scrap) will make it uneconomic to leave them down for very long. Situations where, perhaps, the track is left, generally occur where the line is in any case short, as in small branch lines or sidings. An indication of dereliction in these cases is provided by the presence of vegetation growing around and in between the sleepers supporting the rails.

In the case of track terminating, although the line of the original route still continues, an indication of use will be given by the presence of buffers (or occasionally sets of sleepers) fixed to the end of the line. In this situation, however, it is also advisable to trace the extent of the line in the opposite direction in order to ensure there are no further breaks, since a length of disused track may sometimes be isolated from any other active routes.

Identifying disused railways where the track has been removed is usually an easier task. The location of an old railway will be indicated symbolically on the Ordnance Survey map, while the straight runs and smooth curves of its route will be evident on the photograph. In addition, the stereo image provided by the aerial photographs will exhibit the cuttings, embankments, bridges and tunnels necessary for maintaining a gentle gradient and for avoiding roads, rivers and other landscape features.

Most of the aerial photographs so far illustrated, contain examples of disused railways with track removed, AP2, for instance, shows a railway (9) which passed close to Bryn colliery, and which is embanked for most of this particular stretch. There is no indication of any track or track bed (ballast), although the latter is often found in other areas. In area 7 on AP13, for example, it is possible to see the positions of old sleepers in the ballast, although all the track has been removed. This area may be contrasted with neighbouring ones where track is still in use. A similar contrast can be seen in Fig. 7.16 which shows a disused railway with track present and absent, and an active route.

In addition to the railway networks which are disused, there are also disused buildings and installations such as bridges, viaducts, engine sheds and stations. The first two of this group are quite common although the state in which they are to be found can vary, such that in many cases only the bridge piers remain. AP17 shows a bridge (at 1) which is still intact although others can be seen on many of the other photographs. It is possible to see also two remaining station platforms, at 2 on AP17, but this is a very rare occurrence since all traces of stations are usually removed, even on disused lines.

Finally some attention must be given to the numerous tramways which are to be found throughout the coalfield area of the County. All discussion about disused railways so far, has related to the single or multiple track rail routes of standard gauge, since these have been a significant part of the derelict landscape. There exists, however, an extensive network of short length, single track, narrow gauge tram routes which, although small in total area, have also contributed significantly to the spoiled landscape. These routes are usually distinguished only by the fact that they are straight, and that they once connected mine workings or quarries to spoil heaps or disposal points for the relevant minerals. An example of an active tramway system was given earlier (Section 7.6(ii)) where it is employed at the private mine at area 2 on AP2. These same photographs, however, also illustrate disused tramways as at 12, where minerals were brought down the valley. It will be noticed that, in addition to the straight delineation of the route mentioned above, the gradient is much steeper than that of a standard gauge track route, but this is commonly found with most tramways.

7.10(ii) Disused waterways

The last major category of transportation networks, that of disused waterways, not only includes the more common features of canals and docks, but also isolated features associated with marine transportation, such as landing stages, slipways, and in one instance a lighthouse.

The most common feature of the group was the disused canal, recognised on the aerial photographs largely by the regular plan shape, although in some cases locks could be seen. Derelict status was assumed from the presence of vegetation growth along the canal banks and in the main water body since this phenomenon is consistent with a lack of any moving traffic. This is assuming of course that the canal is disused only as a transport network even though recreational activities may be taking place. The point is discussed more fully in Chapter 8, since it is more relevant to the problems of interpreting the Welsh Office Derelict Land Classification.

Since most of the Glamorganshire canals generally pre-dated the "railway age", few have survived to the present, such that in many cases only isolated stretches can be interpreted from the aerial photographs. It is only in situations such as these that the derelict status of the canal can be ascertained with a high degree of probability.

Fig 7.16 Active and derelict railway routes

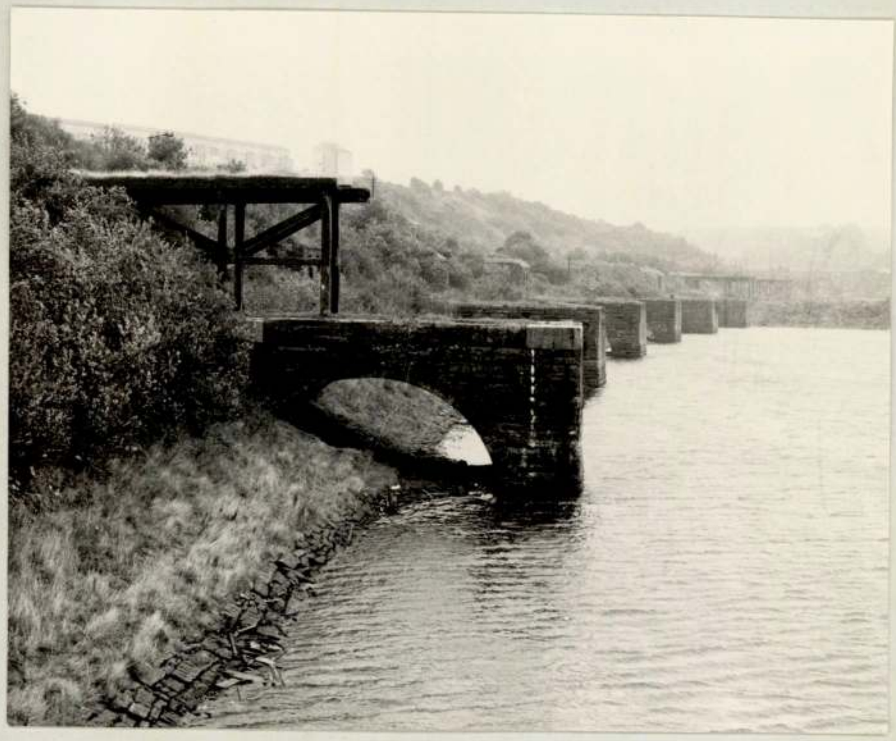


Fig. 7.17 Derelict staithes at Penarth Dock

The active or derelict nature of docks, on the other hand, is much more easily discovered. AP13, for example, show part of Barry Docks where there is evidence of activity in the presence of moored vessels, and from the well maintained appearance of those docks which are visible. In addition, the photographs covering the area outside of that shown indicate easy and well maintained access to the sea. Further evidence of activity is presented by the occurrence of loading/unloading cranes at 8 and coal drops at 9. These latter features are used for transferring coal (brought to the drop by rail along the coal staithes at 10) to coal carrying vessels (as at 11). During the port's hey-day when coal exports were at their greatest, the staithes and coal drops were much more numerous, but today most of them are derelict.

In the majority of cases only the foundations of the coal drops remain as at 12, but most of the staithes still remain as at 13. The appearance of these latter features is quite distinctive consisting of an almost parallel series of curved embankments leading from the nearby marshalling yards (14). Other examples can be seen on AP16, leading to Penarth Dock, although in this case the actual staithes (6) are shorter (Fig. 7.17) while the approach to them is more oblique (7).

For reasons explained fully in the following chapter, all of these derelict features are regarded as part of the dock system rather than being associated with disused railways.

If attention is now paid to Penarth (AP16), it will be seen that the main dock is entirely disused. The dock has been divided into two parts by the tipping which has occurred at area 1, while access to and from the sea has been stopped by a further area of tipping at 8. In addition, most of the northern side of the dock has been obscured by further tipping (as in area 2), and much debris can be seen floating on the water surface at the landward end. It is interesting to note, however, that the water within the dock is still much deeper than that outside, since the photographic tone is much darker (being almost black as opposed to a light or mid-grey).

AP16 also illustrates some of the minor disused features associated with waterways that were referred to at the beginning of this section. At 9, for example, there is a disused landing stage, while a derelict slipway can be seen, partially covered by silt, at 10. Both features are indicated on the Ordnance Survey 6-inch map but they are obviously derelict since nothing remains but the supporting vertical piers.

7.11 Interpretation of Ministry of Defence landscapes

The landscape which resulted from British wartime defence operations is, perhaps, the sole derelict one so far considered which is interpreted mainly from the physical form (i.e. size and shape). The reason for this is that the form of the landscape, which consists mostly of buildings and installations, closely reflects its function.

In the case of Ministry of Defence (M.O.D.) camps for example, as shown at 4 on AP14, the roads are set out formally on a grid pattern, while buildings (now represented by their foundations only) follow a similar pattern. Although the site was closely associated with the adjacent airfield, shown on the rest of this stereo pair and AP18, the presence of numerous air-raid shelters (e.g. at 5) suggests a high concentration of military personnel, and for this reason the area is effectively termed "a camp".

The airfield itself (near Llanmighangel in the Vale of Glamorgan) is better represented by AP18 which show the main runways (at 1) and several of the hangers (2). Many of these features are now used for other purposes, as shown by their well maintained state and the presence of vehicles (at 3, for example), and are excluded from the survey. Other areas are excluded where they have been reclaimed as at 4, or are undergoing restoration as the runways are removed (5). Thus the only parts which are derelict are those small areas such as dispersal bays which are still surfaced but which have become partially vegetated (as at 6), those buildings which are ruined (7), and obsolete features such as shelters and bunkers.

Other features may be found in strategic positions on coastlines as AP17 show. Observation posts and gun emplacements are clearly visible at 3 (see Fig. 7.18) and 4, although the function of 3 is not really discernible from the aerial photographs alone. Remnants of other gun emplacements can be seen at 5 but since these have now been absorbed into a caravan and chalet camp they would be regarded as active installations and excluded from the survey.

The latter point raises a problem which exists in interpreting ex-defence installations as derelict when they are located in rural areas. It is not uncommon for shelters, bunkers and other buildings to be used by local farmers for storage purposes or even the sheltering of livestock, while surfaced roadways are also used. In situations such as this it is virtually impossible to suggest guidelines that will lead to a successful interpretation. Rather, it is a case of the interpreter utilising the finer aspects of his skills in making a decision which may be correct only some of the time.

7.12 Summary and Conclusions

This chapter has attempted to outline the general principles of aerial photographic interpretation with special reference to

Fig. 7.18 Derelict coastal defence installations

interpreting the spoiled landscape. Although in many cases it is possible to achieve this interpretation with the sole use of aerial photographs, it is clear that the use of additional sources of data is desirable in several instances, and of absolute necessity in others.

The list of activities which have contributed to the spoiled landscape is not exhaustive, particularly in the case of many industries, since the main aim of the above discussion has been to illustrate the involved nature of the interpretation process, to indicate those aspects of the process which are most problematic, and to suggest how those problems may be solved. Additionally, the activities which have been described, are those which have occurred most commonly during the survey, and which generally have had the greatest influence in spoiling the landscape.

Several references have been made to "successful interpretations" and to those having a "high probability" of being correct. These phrases introduce the concept of accuracy in the interpretation but since any assessments of accuracy forms part of the survey results, the question will be considered in Chapter 9.

Having dealt, therefore, with the first process of the total survey method (item 1 in Section 6.4), it is now appropriate to consider the remaining processes of mapping, checking and the compilation of the transparencies for the Welsh Office Survey. These processes are discussed in Chapter 8.

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CHAPTER 8

Mapping the spoiled landscape data and the compilation of the Welsh Office transparency

"While the task of clearing dereliction has been getting under way there has been an increasing awareness of the need for more accurate information on the total amount of derelict land in Wales. The last annual return in Wales at the end of 1969 ...... is now believed to be an under-estimate ....."

(Welsh Office, 1972)

8.1 Introduction

Having discussed in detail the interpretation of the spoiled landscape data from all available sources, it is now possible to describe the remaining processes of the survey which were listed in Chapter 6.

Although these processes are mainly concerned with mapping the spoiled landscape data and compiling the Welsh Office Transparencies for the Welsh Office Survey, there are several important, if small, tasks which require description. The first of these is:

8.2 The compilation of the transparent overlays

Before the interpretation of a six-inch scale map sheet was attempted transparent acetate rolls were cut into overlays which measured approximately 23 x 23 cm. square ($9\frac{1}{4}$ x $9\frac{1}{4}$ in.). These were placed over alternate aerial photographs during the interpretation process and the outlines of spoiled features were delimited. The code relating to the particular form of spoilation was then entered as close to the feature as possible so as to reduce any problems of confusion at the mapping stage.

It was found that the best medium for recording this information was either black draughting ink (used with a Rotring type pen), or black felt-tip marking pens (other coloured inks did not appear to adhere to the acetate surface).

This particular method was used, as opposed to marking the photographs directly with a china-graph pencil, since the photographs were the property of Glamorgan County Council. If china-graph had been used as a draughting medium, the photography would have had to be cleaned before it was returned to the County Council and this would have been too time consuming. There is also the problem that the use of the china-graph pencil sometimes produces "furrows" in the surface of the print where too great a pressure has been exerted. These indentations distort the image represented on the photograph and also tend to shorten the working life of the print.

Despite the fact that these problems were prevented from arising, the use of overlays meant that they had to accompany the photographs at the mapping stage. Originally locational features (roads, railways, etc.) were marked on the overlays so that the spoiled landscape features could be located on the dyeline base map. It later became obvious that this was a laborious and time consuming task, as well as being difficult where locational features were infrequent or non-existent. Consequently, the details on the photographs were used as a means of locating the spoiled landscape.

8.3 Transferring the data to the base map

After the data had been recorded on the transparent overlay, they were transferred to a six-inch scale dyeline base map. As the detail on this map was in black on a white background, a coloured ink (purple) was used to make the spoiled landscape features more obvious.

Provided that the overlays were used in conjunction with photographs this process presented few problems, although in some areas where there were no locational features difficulty was encountered. One such area can be found on map sheet SN 80 NE where an opencast coal site occupies about 18% of the total map area of 25 Km^2 (see Figure 8.1). This particular site is covered by about 10 photographs most of which contain only parts of the site. As a result, it is difficult to plot the internal boundaries between, for example, the opencast pit and the neighbouring heaps of overburden. Since, however, the state of an

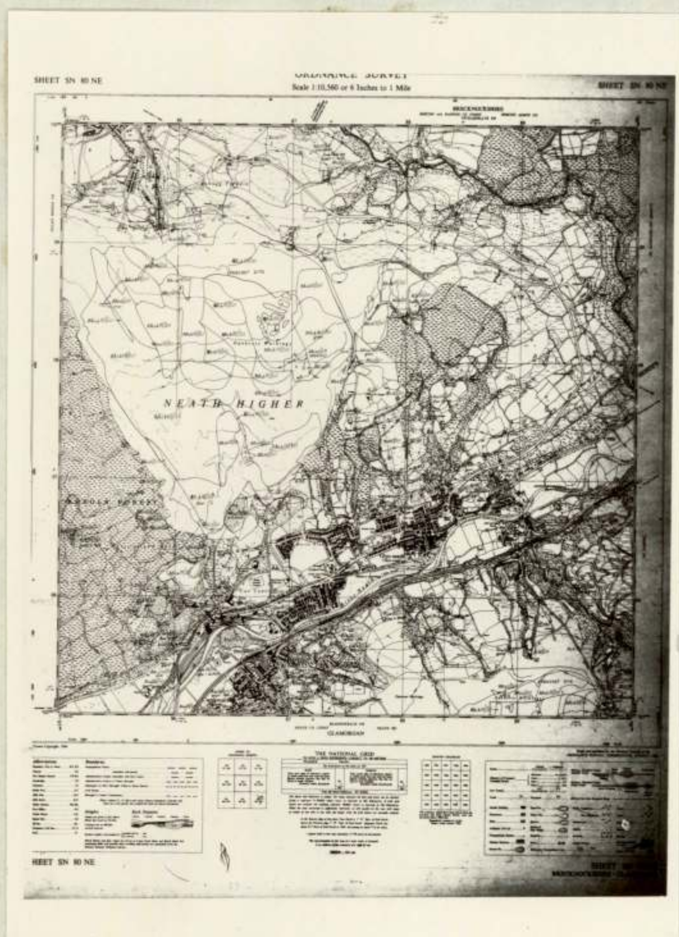

Fig. 8.1 Active opencast site on SN 80 NE.

opencast site is continually changing, this may not be of much significance. Because of this it was eventually decided that it would be sufficient to map sites as accurately as possible, and that most attention would be paid to the outer limits of such sites.

The only major problems encountered were in the mapping of buildings and installations. Generally, these features were mapped only where they were derelict, but with reference to the Welsh Office Survey (described below) there was sometimes a necessity to map buildings and installations which were not "minor". This term was used, but not defined, by the Welsh Office in their notes on conducting the Derelict Land Survey for Wales (Welsh Office, 1971). The lack of definition, therefore, resulted in the problem of interpreting the term although the difficulty was finally resolved as will be shown below.

A less important problem was that it was often difficult to map small buildings or installations accurately. If they were drawn to scale they would sometimes be "lost" amongst the base map detail, so that it was decided to slightly exaggerate their plan dimensions, as are road and rail networks on Ordnance Survey maps of 1:63,360 scale. The location of such features with reference to the National Grid, however, was always as accurate as possible.

During the interpretation process it had been found that some sites were covered by photographs of differing dates, usually 1971 and 1972. Where this occurred, the date nearest to 1971 had been adopted as the optimum since the majority of the photography was taken during 1971. If, however, a particular map sheet was covered by photography of greatly differing times, as in the case of the Gower Peninsula where some areas were interpreted from photography dated 1969, a small key was included on the map indicating which photography had been used in the interpretation. This could then be used in the same way as the Ordnance Survey revision and/or survey dates to ascertain the dates for which the mapping was effective.

The final problem of transferring the data to the base map concerns "edge effects". During the surveying of a particular six-inch map sheet, it was found that the aerial photographic coverage of that map usually overlapped with neighbouring sheets. Consequently, care had to be taken in ensuring that the spoiled landscapes of the sheet under study and of the fringe areas of adjacent ones were identified from the photographs. This phenomenon is also applicable to mapping, where the features on one transparent overlay may belong to two or more adjacent sheets. It was found that the best way to overcome this inconvenience was to map one sheet and then map the adjacent sheets (or as many as possible) almost immediately. In cases where this could not be done due to the non-availability of photographs for interpretation, any errors of omission were usually discovered during the next process of the survey procedure.

8.4 Checking the air-photo interpretation and mapping processes

It has already been mentioned that the checking of the original air-photo interpretation and of the mapping was conducted by an independent observer. This had the advantage of reducing subjectivity within the total survey and restricting the likelihood of any errors occurring. Unfortunately, however, it also meant that the checking process was almost as long as the original interpretation and mapping since the survey was effectively being repeated. In spite of this, it was ultimately thought to be worthwhile as the following types of error could be detected and corrected:

1. omission, where sites had been overlooked in

the original interpretation, or in transferring the data to the map

2. mistaken identity, where sites had been incorrectly interpretated, or transferring the code from the overlay to the map had resulted in the use of incorrect nomenclature

3. displaced boundaries, where sites were incorrectly placed

4. edge effects, where the errors of 1 and 3 are more likely to occur, particularly where a site is located on the boundary between two maps

8.5 Correcting the spoiled landscape map

Once the checking process had been completed the spoiled landscape maps were corrected where appropriate. At this stage it was found that the practice of inking in the data during the original mapping produced a problem, since the original boundaries and/or mapping codes had to be carefully erased before the corrected data were inserted. This tended to take some time and in a few cases it was realised that it was quicker to completely redraught the map rather than laboriously make corrections to the original. Rather than disrupt the survey procedure, however, it was decided to continue with the original processes since there were very few maps containing gross errors.

The fault of the method was, nonetheless, noted and an improved scheme is discussed in PART FOUR.

8.6 Insertion of geological data

The problems of the geological map coverage of Glamorgan, and the process of obtaining geological data for the County, have already been raised and will not be further discussed. The use of such data, however, requires additional comment.

The major use was in confirming the original interpretation of extractive industries, or in supplying information to complete those interpretations. For example, the identification of deep coal mines could be made solely from the aerial photographs and the geological data could add information only about the name of the colliery or pit within the site. In the case of quarries (in its widest sense), however, where perhaps it was not obvious whether sandstone, limestone or brick clay had been extracted, the geological map usually indicated the main rock extracted. This was done through the conventional mapping nomenclature, or by the description of a geological section within the site.

In some areas, however, neither sorts of data were of value where, for example, cropworkings could have referred to coal or ironstone extraction (as in the north of the County). In areas such as these the most likely extractive industry was regarded as that where the amount of ore or mineral was greatest in thickness.

A similar problem occurs in some parts of the Vale of Glamorgan near the edge of the coalfield where it is not certain whether dereliction has occurred as a result of lead or limestone extraction (the former mineral, usually in the form of galena, being found in latter).

The most interesting observation, however, was that in some cases the interpretation for the spoiled landscape survey tended to confirm the geological data! This was most obvious in the case of cropworkings where a line of coalworkings on the spoiled land map coincided partly with known seams of coal, and partly with the supposed outcrop of coal.

As mentioned at the beginning of this section, the geological map was mainly of use in connection with the extractive industries. In spite of this, it gradually became clear that the maps were also providing information of a general industrial nature. The reason for this lay in the fact that most of the geological maps consulted were of the six-inch County series. The majority of those held in London are original hand-coloured sheets dating back to the late nineteenth - early twentieth century with contemporary Ordnance Survey base details. This detail is more comprehensive than equivalent modern maps, such that whereas the latter will just indicate, perhaps, "factory" the earlier editions will state exactly what that factory was.

It might be argued that this information is superfluous since the classification used in the survey requires only an interpretation of "other industrial workings". If, however, one discovers that an excavation is adjacent to buildings called "brick-works" on the geolological map, then it would not be unreasonable to assume that the excavation was used or is still used for the extraction of brick earth.

The insertion of the geological data ensured that the maps had been completed, and that the final process of the survey could commence.

8.7 Compilation of the Welsh Office Transparencies

The manner in which the Welsh Office Transparencies (WOTs) were compiled was briefly outlined in Chapter 2 but is now considered more fully.

A comparison between the information recorded using the survey classification (Table 6.1) and the data required by the Welsh Office (Figure 2.2) shows that the two sets of information are not directly linked. Rather, it is the case that the Welsh Office data needs to be interpreted from the spoiled land survey data.

As an example, consider an area of active colliery tipping with adjacent colliery buildings. The County Survey data will be in the form of an outline of the tip on the base map, together with a code such as AAiia(1)/I(i) (single active colliery tip devoid of any vegetation), and the outline of the buildings and installations with the code AA(i)/I(i) (active colliery buildings and installations). In terms of the Welsh Office classification, this will translate as "Active areas - colliery tipping. Buildings and installations associated with above". Similarly, an ash tip from a power station would be recorded as say AAiia(1)/II (single active tip associated with industry and devoid of vegetation) on the spoiled land maps, and translated as "Active areas - Industrial waste" for the purposes of the WOT.

The first step, therefore, was to examine a site on the spoiled landscape survey map and re-interpret it in terms of the Welsh Office classification. When this had been done, and assuming there were no problems of the type described below, the outline of the site was traced on to the WOT and the appropriate parts of the classification marked. The following information was also indicated:

1. the grid reference of the centroid of the site, found from the base map.

2. area of the site, found by the use of a "Square counting" grid or planimeter.

3. the date of the survey, related to the date of the aerial photography.

Certain information was not included since it concerned aspects of planning. The letters "A and B" relating to the "Active areas" and "disused spoil heaps being reworked" referred for example, to the presence or absence of planning permission, while the last two categories of the WOT concerned the reclamation and after use of the site. These categories were completed by the Planning department of Glamorgan County Council after the WOTs had been sent to them.

Two limitations were placed on the WOT compilation by the Welsh Office, the first of these having been already mentioned:

1. "Disused dwellings and minor buildings are not to be included"

2. "Generally the most appropriate scale for the transparency is 1:10,560 (6 inches to the mile); occasionally a scale of 1:25,000 ($2\frac{1}{2}$ inches to the mile) may be justified". (Welsh Office, 1971).

These will be referred to in more detail in the discussion which follows.

8.8 <u>The use of the Welsh Office Survey classification</u>

8.8(i) <u>The problem of degraded land at ground level</u>

The division of the spoiled landscape into spoil heaps, excavations, degraded land at ground level and buildings and installations, has already been discussed with reference to the survey classification (Chapters 5 and 6). An hypothetical profile of a spoiled landscape containing all four of these categories might, therefore, be as shown in Figure 8.2.

For the county's purposes all four types of feature have been surveyed and recorded on the base maps, but when these have been transferred to the Welsh Office Transparency only the areas of spoil heaps, excavations, and buildings and installations have been mapped, i.e. in Figure 8.2, those areas between A/B, C/D, and between E/F. The degraded land at ground level (B/C, D/E), although a part of the total spoiled landscape has been omitted for several reasons:

(a) There is no apparent provision made for it in the Welsh Office classification; terms such as "colliery <u>tipping</u>", "<u>quarry</u> working", "disused spoil <u>heaps</u>" or "disused mineral <u>excavations</u>" have been interpreted in this study as referring to the actual feature (tip or quarry, spoil heap or excavation) and <u>not</u> to the associated ground level land which surrounds or adjoins that feature.

(b) Attempting to include degraded land at ground level which surrounds, say, a spoil heap or quarry, with that feature would produce problems, particularly where an area at ground level is bounded by a spoil heap on one side and a quarry on the other, i.e. it is really common to both.

(c) Inclusion of degraded land at ground level with spoil heaps or excavations would distort the areal extent of heaps and excavations in the County (and ultimately the whole of Wales).

These points were raised with the Welsh Office (via Glamorgan County Council) who stated that the problem "has been raised elsewhere but has not been reported as substantial" (Pryce, 1973). But as was further pointed out, this "may well be because no separate classification was included and those compiling the returns made a

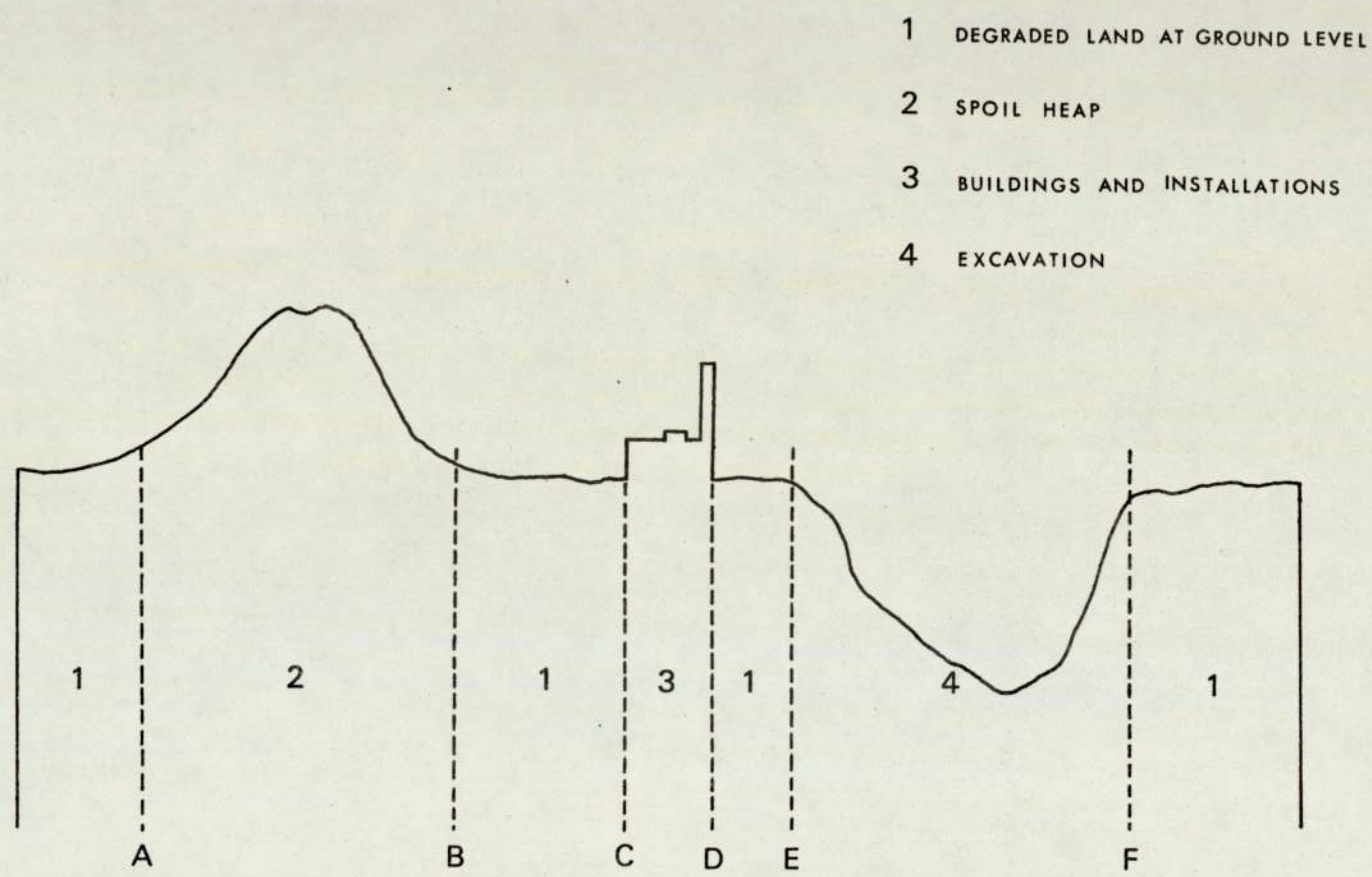

Fig. 8.2 Hypothetical profile of a spoiled landscape.

subjective judgement to include degraded land with adjoining forms of dereliction or to exclude it altogether" (Pryce, 1973). Thus it would appear that the exclusion of a category of dereliction at ground level from the Welsh Office classification has already left the survey open to a free interpretation - the very thing that the new survey had attempted to avoid (as was discussed in Chapter 2).

It is true that in some places it is not easy to say where ground level is, as has been accepted previously, but in a survey such as this the use of aerial photography does alleviate the problem, since due to the inherent vertical exaggeration of the stereo image, breaks in slope and levels in the ground surface are easily differentiated, even where such changes are subtle when viewed on the ground.

The question now arises as to how the category of "degraded land at ground level" can be included if significant areas of dereliction are not to be missed". A suggestion attributed to the Welsh Office was that such areas should be entered on the survey returns as "disused buildings and installations associated with ...." the relevant activity. The precedent for this was said to be disused airfields which are obviously at ground level and which have been included in the survey (Glamorgan County Council, 1973a). However, as far as Glamorgan is concerned, the only areas of old airfields included have been the runways where they are still present. The fabric of these is obviously akin to that of all other buildings and installations and consequently the problems of reclamation are as similar. The areas of grass between runways need little attention particularly as many of them are given over to agricultural uses such as sheep grazing. But the most serious implication of classifying degraded land as buildings and installations is that it would be impossible to distinguish the two groups without seeing the actual site shape and pattern. Logically, then, as well as practically, the suggestion seems quite unsound.

Taking all the above points into consideration, it seems that the only way to solve the problem would be to add a further category of "degraded land at ground level associated with ....." and used in the same way as "disused buildings and installations associated with .....". This, if adopted, would make comparison between the 1971 and future surveys difficult, but no more difficult than comparing two counties in the 1971 survey where perhaps one has excluded ground level dereliction altogether and another has included it with heaps or excavations. In any case, local government re-organisation of 1974 has already made any comparison, whether between counties, or between years, far more difficult.

8.8(ii) The problem of active areas

This section of the WOT seemed to present most of the problems of applicability as the following two cases show. If reference is made to the WOT shown in Fig. 8.3, it will be seen that an activity will usually be indicated by marking one of the first seven boxes. If there are buildings or installations associated with it then the eighth box is marked. If, however, a situation exists where there are active buildings or installations but no associated tipping or quarrying or opencast working, then these installations cannot logically be entered since there is nothing to say to which activity they belong. This situation can be seen in Fig. 8.4. Although it is rare it can occur where there are installations associated with coal mining, e.g. a shaft used for pumping water or for emergency access, but with which there is no associated tipping. As a result of the problem, sites of this type were originally excluded but on the advice of the Welsh Office (Glamorgan County Council, 1973a) were later included by marking the site on the WOT, indicating the presence of buildings and installations, and adding the words "spoil from this mine tipped elsewhere" (see Fig. 8.5).

A problem related to that above concerns the case of private mines whose buildings qualified for inclusion in the survey but whose tips were excluded under the minimum area ruling given below. These sites were included by marking the site of the buildings (and occasionally the tip) and indicating that there was "colliery tipping" and "buildings and installations associated with ......" it, and adding the words "private mine" (see Fig. 8.6).

No indication was found of those characteristics distinguishing "industrial waste" from "refuse", but the following guideline was drawn up and adopted in the work carried out. "Industrial waste" was taken to mean those areas containing large amounts of material which resulted from, and were superfluous to, certain industrial activities. These were found to be almost exclusively the steel industry (slag) and power stations (ash). "Refuse" was regarded as referring to those areas containing small amounts of material, usually mixed in composition, associated with, but not necessarily resulting from, an activity. Again these materials are superfluous to the activity. The largest example in the group is domestic refuse whose disposal was the responsibility of the individual local authority, prior to local government reorganisation. Factories, however, were also included where they were disposing of small amounts of waste whose composition bears some similarity to domestic refuse.

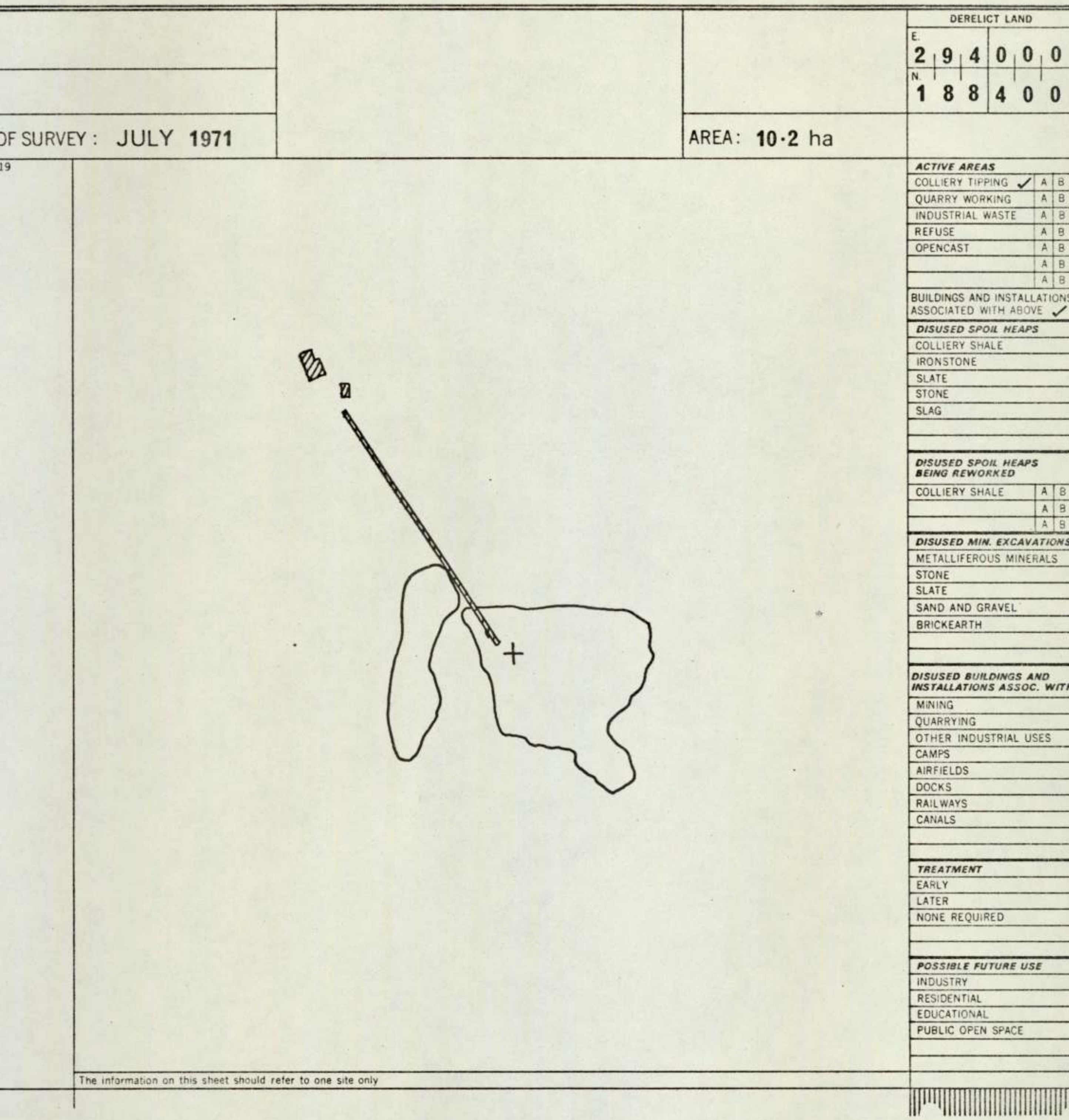

Fig. 8.3 WOT showing active area and associated buildings

OF SURVEY : JULY 1971

AREA: 0·2 ha

DERELICT LAND

E. 2 6 7 9 0 0

N. 2 0 2 8 7 0

19

ACTIVE AREAS

COLLIERY TIPPING	A	B
QUARRY WORKING	A	B
INDUSTRIAL WASTE	A	B
REFUSE	A	B
OPENCAST	A	B
	A	B
	A	B

This has no significance ---→ on its own.

BUILDINGS AND INSTALLATION ASSOCIATED WITH ABOVE ✓

DISUSED SPOIL HEAPS

COLLIERY SHALE
IRONSTONE
SLATE
STONE
SLAG

DISUSED SPOIL HEAPS BEING REWORKED

COLLIERY SHALE	A	B
	A	B
	A	B

DISUSED MIN. EXCAVATION

METALLIFEROUS MINERALS
STONE
SLATE
SAND AND GRAVEL
BRICKEARTH

DISUSED BUILDINGS AND INSTALLATIONS ASSOC. WIT

MINING
QUARRYING
OTHER INDUSTRIAL USES
CAMPS
AIRFIELDS
DOCKS
RAILWAYS
CANALS

TREATMENT

EARLY
LATER
NONE REQUIRED

POSSIBLE FUTURE USE

INDUSTRY
RESIDENTIAL
EDUCATIONAL
PUBLIC OPEN SPACE

The information on this sheet should refer to one site only

Fig. 8.4 WOT showing active buildings

OF SURVEY : JULY 1971

AREA: 0·2 ha

DERELICT LAND

E. 2 6 7 9 0 0

N. 2 0 2 8 7 0

19

Spoil from this mine
tipped elsewhere.

The information on this sheet should refer to one site only

ACTIVE AREAS
- COLLIERY TIPPING ✓ A
- QUARRY WORKING A
- INDUSTRIAL WASTE A
- REFUSE A
- OPENCAST A

BUILDINGS AND INSTALLATIO
ASSOCIATED WITH ABOVE ✓

DISUSED SPOIL HEAPS
- COLLIERY SHALE
- IRONSTONE
- SLATE
- STONE
- SLAG

DISUSED SPOIL HEAPS BEING REWORKED
- COLLIERY SHALE A

DISUSED MIN. EXCAVATION
- METALLIFEROUS MINERALS
- STONE
- SLATE
- SAND AND GRAVEL
- BRICKEARTH

DISUSED BUILDINGS AND INSTALLATIONS ASSOC. WI
- MINING
- QUARRYING
- OTHER INDUSTRIAL USES
- CAMPS
- AIRFIELDS
- DOCKS
- RAILWAYS
- CANALS

TREATMENT
- EARLY
- LATER
- NONE REQUIRED

POSSIBLE FUTURE USE
- INDUSTRY
- RESIDENTIAL
- EDUCATIONAL
- PUBLIC OPEN SPACE

Fig. 8.5 WOT showing "spoil from this mine tipped elsewhere"

			DERELICT LAND
			E. 2 8 5 7 0 0
			N. 2 0 6 6 0 0
OF SURVEY : SEPT. 1972		AREA: 0·5 ha	

19

The information on this sheet should refer to one site only

ACTIVE AREAS	
COLLIERY TIPPING ✓	A B
QUARRY WORKING	A B
INDUSTRIAL WASTE	A B
REFUSE	A B
OPENCAST	A B
	A B
	A B
BUILDINGS AND INSTALLATIONS ASSOCIATED WITH ABOVE ✓	
DISUSED SPOIL HEAPS	
COLLIERY SHALE	
IRONSTONE	
SLATE	
STONE	
SLAG	
DISUSED SPOIL HEAPS BEING REWORKED	
COLLIERY SHALE	A B
	A B
	A B
DISUSED MIN. EXCAVATIONS	
METALLIFEROUS MINERALS	
STONE	
SLATE	
SAND AND GRAVEL	
BRICKEARTH	
DISUSED BUILDINGS AND INSTALLATIONS ASSOC. WITH	
MINING	
QUARRYING	
OTHER INDUSTRIAL USES	
CAMPS	
AIRFIELDS	
DOCKS	
RAILWAYS	
CANALS	
TREATMENT	
EARLY	
LATER	
NONE REQUIRED	
POSSIBLE FUTURE USE	
INDUSTRY	
RESIDENTIAL	
EDUCATIONAL	
PUBLIC OPEN SPACE	

Fig. 8.6 WOT showing "private mine"

8.8(iii) Disused spoil heaps/Disused mineral excavations

These groups can be conveniently considered together since there are some similarities in interpretation. The word "stone" for example, occurs in both but is not further defined. Consequently all forms of stone (usually limestones and sandstones) have been included, irrespective of the uses to which they might be put.

The other area of similarity between the two groups occurred in the few cases of disused "opencast" workings. This term (i.e. "opencast") had to be added to the Welsh Office classification, which, understandably, had not originally included it. The occasions are rare where modern opencast schemes become disused with none of the inherent reclamation work being carried out, and it takes exceptional circumstances for such a situation to arise. (In one of the examples found the geology had proved more difficult than anticipated and the contractor had become bankrupt). There were, however, several examples found in Glamorgan and the additional item had to be inserted since the nature of the dereliction was too distinctive for the sites to be included under "disused spoil heaps - colliery shale".

The Welsh Office memorandum of 1971, to which reference has already been made, stated that "disused spoil heaps - colliery shale and ironstone" should include "patchworking", an early method of mining which approximated to a shallow form of opencast working. This is a reasonable way of classifying such workings since although they take the form of numerous heaps and depressions, the spoil heaps are the predominant features. The main difficulty arises in that coal and ironstone extraction by patchworking were very closely associated with one another, as mentioned previously, such that even on the ground it is difficult to say, except by careful analysis of the spoil material, whether a spoil heap has resulted from one or the other. Thus, although geological data was used to the full, in some cases certain areas of patchworking may have been misclassified as, for example, "colliery shale" when it may be "ironstone". Although this would slightly distort the returns for these two classes, the margin of error is regarded to be almost negligible, particularly when it is considered that by far the greatest area of disused colliery shale is attributable to deep mining activities, where there is not this element of doubt.

The criterion which has been put forward for including patchworking, as mentioned above, was also applied (by the author, and accepted by the Welsh Office (Pryce, 1973)) to "cropworking" and "bell-pits" where again spoil heaps are closely associated with, but dominant over, shallow excavations. Little evidence was found in fact for the classical use of "bell-pits" for coal extraction, but cropworkings for both coal and ironstone are very common. Unlike patchworking, however, the distinction between coal and ironstone cropworkings is very clear when the 1:10,560 scale geological maps are examined, since the cropworkings follow the outcrop at the surface of either coal seams or ironstone bands.

A second addition which had to be made to the "disused mineral excavations" was "lead". In the northern part of the Vale of Glamorgan there are areas of shallow excavations and mounds associated with very old lead workings. Since the general impression of such areas is one of excavations, they were placed in the disused excavations group, rather than that of disused spoilheaps. The separate category of "lead" was used in preference to the existing "metalliferous minerals", since this was the only such mineral excavated in this manner in Glamorgan.

8.8(iv) Disused spoil heaps being reworked - colliery shale

There were originally two problems associated with this group although each was eventually half-solved. It was first thought that it would not be possible to distinguish from the aerial photograph between those spoil heaps which were being specifically reworked and those which were being reclaimed. Later, however, it became clear as to which heaps were being reworked, at least for coal, since the plant used in such an operation and the characteristic appearance of the resulting secondary spoil heaps were, after all, quite distinctive. There was then the problem, however, of whether the disused spoil heaps being reworked should also include those heaps which were being reworked for the shale itself (particularly burnt shale), since this is known to be a valuable fill material for civil engineering projects. It was finally decided that in any case this latter form of reworking would not be distinguishable from general reclamation work since the plant used and the manner of working are too similar.

In view of these points, therefore, heaps being reworked for coal have been included in the survey, but if any others have been reworked for shale these will have been considered as part of reclamation schemes and consequently excluded. It might be worth considering whether, because of this latter point, some provision should be made for including, in future surveys, a category of areas undergoing reclamation.

8.8(v) Disused buildings and installations associated with .....

The major problems in this group related to military activities and transportation systems. In the case of the former, "camps" and "airfields" as set out in the classification were quite satisfactory. It was felt, however, that a further category of "other M. o D. uses" should have been inserted since there were numerous examples of other types of military dereliction. These included air-raid shelters, gun emplacements and rifle ranges, and less commonly, features such as concrete tank traps. It is certainly true that, in areal extent, these installations were less significant than the greater expanse of airfields or camps. On the other hand, however, they tend to be generally more intrusive on the visual environment and in this respect can be equally, if not more, important (see PART THREE for example).

The transportation systems in this group ("docks", railways", and "canals") presented three problems. The first was that the author did not see how the "railway" category could include the largest amount of railway dereliction - that of disused track bed. This is more strictly <u>land</u> and not an <u>installation</u> since usually not even the ballast which supported the railway track is present. This question was raised with Glamorgan County Council which decided that the category ought to include disused trackway (Glamorgan County Council, 1973b). It was, therefore, included as such for the survey under discussion but it is suggested that for future work a separate group of transportation dereliction be separated out from the present group and entitled "disused land, buildings and installations associated with transportation systems."

Incidentally the problem of "degraded land at ground level" discussed above (Section 8.8(i)) was not regarded as being applicable to railways since, as discussed on several occasions, the term "ground level" has little significance. As a result, all forms of railway land have been included in the survey.

A further problem with railways also concerned the category of "docks". In most of the disused docks in Glamorgan are found remains of coal staithes and the embankments leading to them (both having been used when the docks were active, for transporting coal by rail to the edge of the dock and thence for loading). The problem arises in deciding whether these should be regarded as associated with "railways" or "docks" since they are a link between both systems. It was eventually decided that where the main through rail routes branched into approach routes to staithes then those branch lines were regarded, with the staithes, as belonging to the dock system and included as such. Where branch lines could have been operationally independent of the docks, then these were classed as "railways". All through rail routes adjacent to docks were also classed as "railways".

The last problem of the group was associated with canals, where it was not clear whether the canal should be regarded as disused for transportation purposes only. In other words, if a canal was being used as a water resource of any type, but was not used as a transport system, should it be included as disused? Since it would be impossible, from an aerial survey, to surmise about the use of canals as a resource except in the case of recreational use, it was decided to adopt the criterion of "use as a transport system". Thus, of the few canals which remain in Glamorgan all those showing no use as a routeway were included as disused.

8.9 Site particulars required in the survey

8.9(i) Interpretation of site for mapping purposes

The WOT (Fig. 2.2) states that "the information on this sheet should refer to one site only". It was presumed that this meant that only one parcel of land should be put on each transparency, and in cases where the parcel was large and distinct enough this guide was adhered to. In many cases, however, it seemed more sensible to map several parcels as one site since they were identical to each other in terms of the Derelict Land Classification and also formed a distinct group.

When it came to include buildings or installations there occurred two other problems with the interpretation of site. Although there was provision made for the inclusion of buildings in the classification, it was not made clear whether these should be mapped on the transparencies. Buildings were in fact mapped and shaded to distinguish them from the areas of dereliction such as spoil heaps or quarries.

Also, despite the fact that "minor buildings" were to be excluded along with dwellings (see Section 8.7), no guide was given as to the meaning of "minor". This problem was solved in the following way: where a site contained several buildings, the smallest of these were classed as minor if their interpreted use was seen to be insignificant when compared to the activity as a whole. If a site contained just one or two buildings, then these were usually included irrespective of their size, as to the site they were "major" buildings.

8.9(ii) Map reference

A suggestion stated earlier (Section 8.7) said that sites would be best mapped at a scale of 1:10,560. This means that a unique grid reference can be read to only 10 figures, i.e. to the nearest ten metres in each direction along the grid axes, and not to 12 figures as set out on the WOT. If the information on the WOT is to be matched up to additional information where the site is identified by a 12 figure reference, then it is no great task to complete the 10 figure reference with two zeros (one each for the northing and easting references). If, however, no such information linkage is envisaged, it would seem that the two zeros are superfluous and that the WOT should be designed to show just ten figures.

8.9(iii) Area of site

No information concerning the minimum area to be considered was originally given, but it was thought that at the national level on which the Welsh Office survey was operating, an area of one hectare (1 ha.) was the smallest of any significance. As with the limit imposed on the County Survey, however, the majority of buildings and installations would be excluded on this basis. No restriction was imposed, therefore, on these features other than one of being able to physically map them, and provided they were not classed as "minor" (Section 8.9(i)). Thus, only areas of land of less than 1 ha. were excluded.

8.10 Scale of mapping

Generally speaking the guideline referring to scale (Section 8.7) was found to be satisfactory. In some cases, however, where sites were very large (because of opencast working), they could not be mapped on one WOT at 1:10,560. In these instances care was taken to show that the site continued on other transparencies. This was done by marking on each of the transparencies covering the site, the grid references of all adjacent transparencies. Although this meant that transparencies were consistently at the same scale, it also resulted in the sites having several grid references to locate them. The disadvantages of this latter point, if any, are yet to become apparent so that it is difficult to know whether a reduction in the scale of mapping is a more preferable alternative.

The only major deviation of scale occurred where transportation networks were mapped at 1:63,360. This meant that the area covered by a normal 1:10,560 Ordnance Survey map could just be fitted onto one WOT, greatly simplifying an otherwise difficult mapping task. Related to this was the fact that the normal grid referencing system (Section 8.9(ii)) was not really applicable as so many linear networks usually appeared on one transparency. Thus the grid reference given in these cases refers to the centre of the total area covered, i.e. to the centre of a 1:10,560 map.

8.11 Summary and Conclusions

This chapter has concentrated on most of the processes used in the survey procedure, particularly those involved with mapping the Spoiled Landscape data and compiling the Welsh Office Survey Transparency. Each process has been described, the problems which arose have been discussed, and in some cases solutions have been suggested.

It is concluded, however, that the survey procedure in general requires improvement as will be described in PART FOUR.

Having examined the manner in which the Survey was completed, it is now possible to discuss the results which have been achieved before studying the uses to which the derived spoiled land data can be applied.

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CHAPTER 9

The results of the Glamorgan Survey

"It will be necessary to review existing information sources and add to these as necessary; they include the air photo survey material, records of tip and shaft locations, existing District and County proposals for reclamation and the Aston University derelict land material."

(Land Reclamation Project Group, 1974)

9.1 Introduction

It will be apparent from the preceding chapters that the data obtained during the Spoiled Landscape Survey of Glamorgan are to be found in two forms, firstly as a set of maps showing all sites whose area is not less than 0.25 ha, and secondly as a set of Welsh Office Transparencies showing selected sites whose area is not less than one hectare. Taking each of these in turn, it is possible to re-state the nature of the results obtained and to consider their analysis.

9.2 The Spoiled Landscape data maps

Taking into consideration those maps covering areas which have no spoiled landscape, approximately 100 Ordnance Survey 6-inch base maps were produced showing the nature and extent of the spoiled landscape in Glamorgan. Since this research has been mostly concerned with the methodological problems of arriving at that situation, however, it is inappropriate to reproduce all of those maps here. Instead, two sheets are illustrated (Figs. 9.1 and 9.2) to indicate the amount of detail present and show how various forms of spoilation appear in their mapped form. The types of spoiled landscape shown are commonly found in the area of the main coalfield (from which these maps are taken) but it would be unwise to regard them as "typical", either in respect of the nature of the spoiled areas or with regard to the size, number and distribution of sites concerned. Some sheets, for example, contain numerous small sites each no larger than one hectare in size, while others contain fewer but larger parcels. One map in particular contained a few small sites and one opencast site which was equivalent to about a fifth

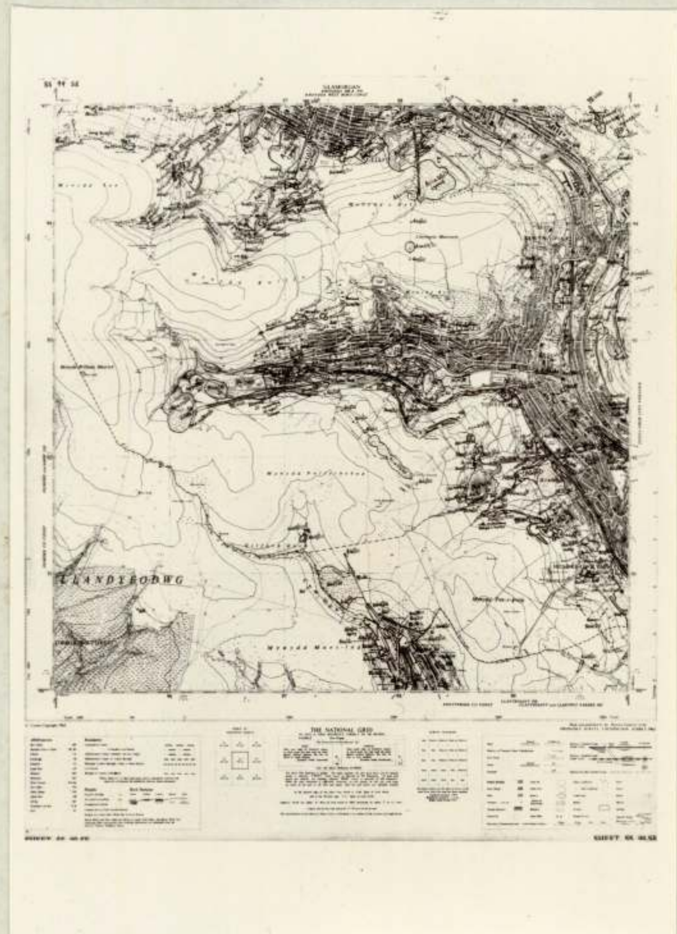

Fig. 9.1 Example of the Spoiled Landscape data maps.

of the area covered by the whole sheet, i.e. $5km^2$ or 500 ha. (Figure 8.1)

Variations such as these, therefore, make a detailed analysis of the set of maps difficult, while any generalised examination would be reduced to stating the obvious (e.g. derelict collieries are found in the coalfield), as well as negating the whole purpose of conducting a detailed survey.

9.3 The Welsh Office Transparencies

By the end of the survey the number of Welsh Office Transparencies (WOTs) had greatly exceeded the number of maps produced. This was hardly surprising when for every map containing spoiled land there were up to about 50 individual WOTs.

In view of this it would, again, be inappropriate to show all those WOTs which were produced; the examples given in Chapter 8 being sufficient to illustrate their appearance.

The WOTs are in a form more amenable to analysis than the maps are, since information relates only to one site which is uniquely identified by its grid reference. Even where sites are to be considered on a sheet-by-sheet basis, it is a simple task to group those sites falling within the co-ordinates which delimit each sheet. Similarly, if sites are to be examined on the basis of whether they are active or derelict, or on the individual types of spoilation, they can be grouped accordingly and classified. It is assumed that the Welsh Office will probably analyse the data in this way, although since the initial data is less detailed than that of the Spoiled Landscape Data maps any final conclusions that they reach will also be of a general nature.

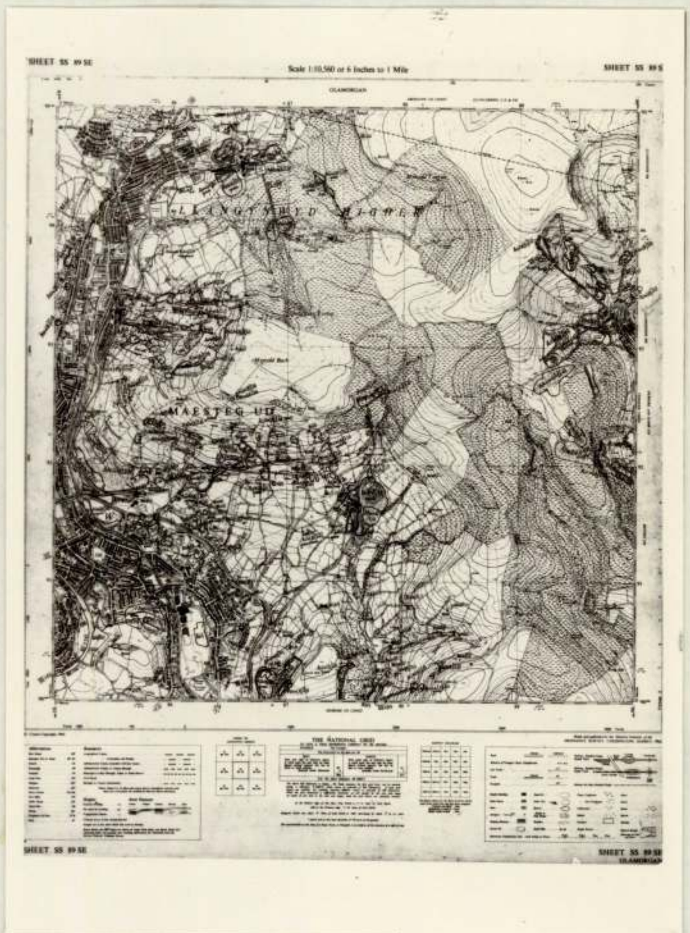

Fig. 9.2 Example of the Spoiled Landscape data maps.

9.4 Analysis of the spoiled landscape situation in Glamorgan

A very general analysis of the data has also been carried out in the present study using the WOTs. It has already been mentioned that analysis of the spoiled landscape maps is difficult and that too great a generalisation would defeat the original objective of the survey. Consequently it was decided to examine the WOTs in order to ascertain the total amounts of derelict and actively disfigured landscapes and to see how these were distributed.

The analysis was carried out on the basis of the Ordnance Survey six-inch sheets since the data were easier to handle in this fashion. All the WOTs pertaining to each sheet were examined and divided into "active" or "derelict" classes. The areas of sites within each class were summed giving two totals, which when added together give the total area of the spoiled landscape for that sheet. Thus, for each map sheet there were three values:

1. Total area of the derelict landscape (ha)
2. Total area of the actively disfigured landscape (ha)
3. Total area of the spoiled landscape (1+2) (ha)

These values are represented in a simplified form in Figures 9.3, 9.4 and 9.5 where they have been divided into class intervals and mapped, but before looking at each map there are several general points which need to be raised. Some of the data relates to only parts of Ordnance Survey sheets since the survey has been concerned with the administrative County of Glamorgan and has excluded Cardiff, Merthyr Tydfil and Swansea. This means that sheets which fall on the boundaries between the County and County Boroughs give a slightly misleading picture.

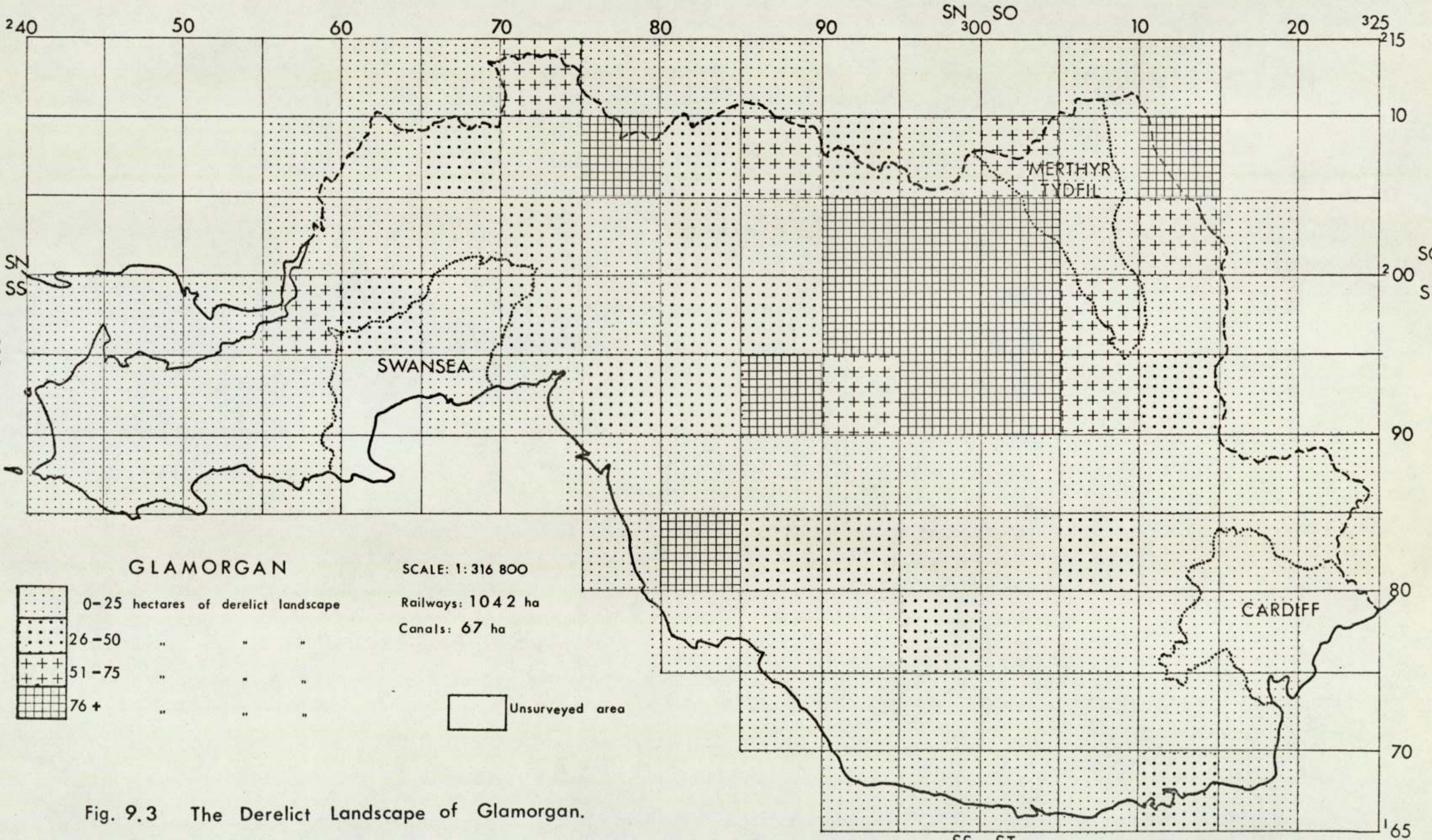

Fig. 9.3 The Derelict Landscape of Glamorgan.

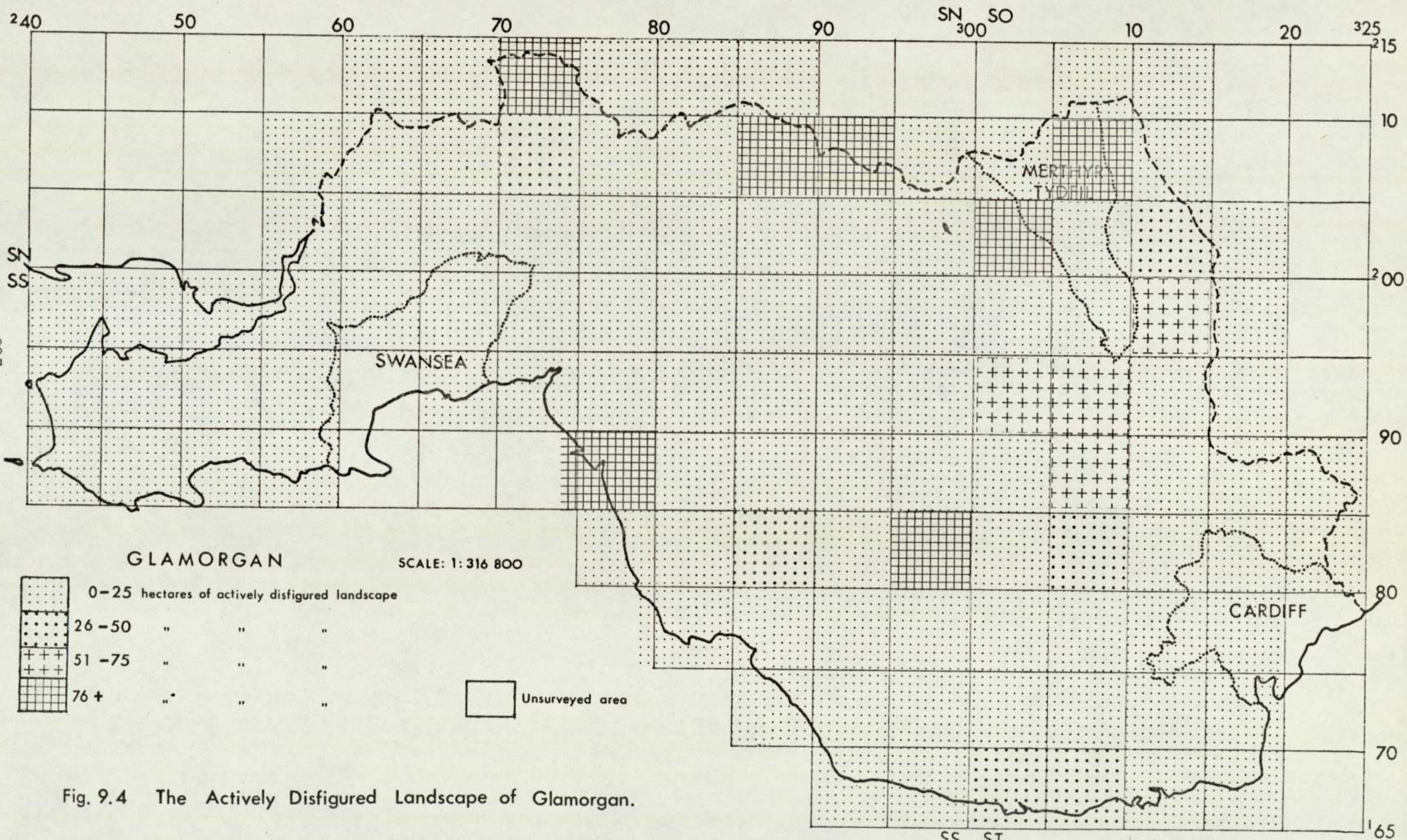

Fig. 9.4 The Actively Disfigured Landscape of Glamorgan.

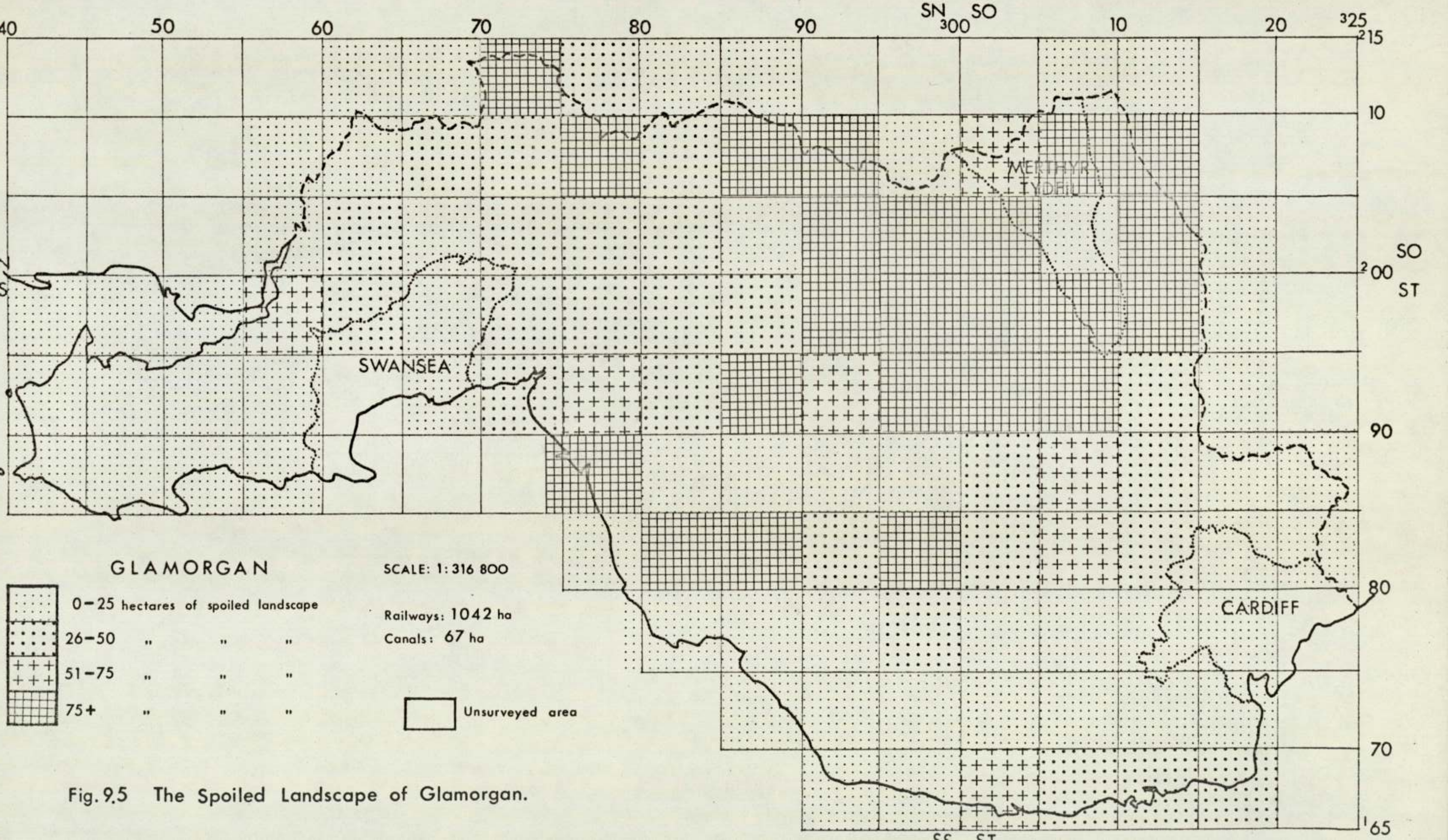

Fig. 9.5 The Spoiled Landscape of Glamorgan.

For example, SS 69 NW and SS 69 SW show no spoiled landscape at all on Figs. 9.3, 9.4 and 9.5 but this is only as far as the County is concerned, for if Swansea had been surveyed it is likely that some spoiled landscape would have been recorded.

A second point to note is that the data do not include areal measurements for canals and railways since these had been entered on separate WOTs. The total figures for these derelict features are given, however, on Figs. 9.3 and 9.5.

Lastly, but not least, it must be remembered that the data collected for the Welsh Office are just part of the total information gathered during the survey. In addition to the WOTs showing only sites whose area is not less than 1 ha, some types of spoilation are completely excluded as is the category of "degraded land at general ground level" (see Chapter 8). Thus the data shown in Figures 9.3, 9.4 and 9.5, and the areas which are discussed below, are not entirely comprehensive and must be regarded as an approximation to the real situation. The visual impression gained from examining the total number of spoiled landscape maps, indicates that if all the excluded categories were taken into consideration, the final values might be increased by as much as 30%, although it would require careful analysis of the original spoiled landscape maps to obtain a more exact correction factor.

In the Gower (SS 40's and 50's), for example, there is hardly any actively disfigured landscape (Fig. 9.4) as most of the spoiled landscape (Fig. 9.5) is made up of derelict coal mining in the north east of the peninsula, a few quarries, and ex-Ministry of Defence installations. On the other hand much of the spoiled landscape of SS 78 NE or ST 06 NW/NE is active, the former containing the Port Talbot steelworks and the latter sheets containing the large power station and limestone quarries at Aberthaw/Rhoose. Most other isolated areas having a large area of actively disfigured landscape, such as SN 71 SW, SS 98 SE and SN 80 NE, are often found where large opencast coal sites are present.

In the central part of the coalfield there is no obvious relationship between the amount and cause of the derelict and actively disfigured landscapes. This is because most of the total spoiled landscape is related to coal mining, and the relationship between the derelict and active areas depends only upon those collieries which have closed or are still open. By taking the spoiled landscape values upon which Figs. 9.3, 9.4 and 9.5 are based and considering the administrative County as a whole, the total area of the spoiled landscape of Glamorgan was calculated. Since the date of the survey is regarded as being 1971, the resulting figures, which are shown in Table 9.1, are applicable for that year.

Table 9.1

Spoiled Landscape in Glamorgan, 1971

Total area of all derelict sites	4,176 ha
Total area of all actively disfigured sites	2,299 ha
Total area of spoiled landscape	6,475 ha

The last available statistics for 1969 (Welsh Office, 1970), when only hard core dereliction was surveyed, indicate a total area of 2,914 ha, a difference of 3,561 ha. The increase in the 1971 situation is difficult to explain, but is probably accounted for more by the inclusion of additional types of dereliction and sites previously unsurveyed, rather than a significant increase in the number of sites becoming derelict.

A survey carried out by Thomas in 1964 indicated a total area of dereliction within South Wales of 6,800 ha (Thomas, 1966). Comparisons are difficult again, however, since Thomas used a broader definition of derelict land than that adopted here (see Chapter 1), and his study area was much larger since it included the three County Boroughs as well as parts of Breconshire, Monmouthshire and Carmarthenshire. There is no doubt, however, that he included more dereliction than was recorded for national government, since the official returns for 1964 show a total of 5,676 ha for the whole of Wales, i.e. 1,124 ha less than Thomas' figure for part of the country.

In conclusion, it is worthwhile to consider the percentage area of the Administrative County which is spoiled, since, for example, 10 ha of spoiled landscape in 10 ha of land are going to be more significant than 10 ha of spoiled landscape in 1000 ha of land. These percentages are shown in Table 9.2 where it can be seen that the percentage total of the County which is spoiled is quite significant.

Table 9.2

Percentage of Glamorgan which is spoiled, 1971

Percentage of administrative County which is derelict	2.2%
Percentage of administrative County actively disfigured	1.2%
Percentage of administrative County spoiled	3.4%

(based on area of County quoted in Municipal Year Book (1972)).

9.5 Survey accuracy

In providing the background to the recent survey of spoiled landscape in Glamorgan (Chapter 4), attention was paid to the studies carried out by Collins and Bush (1969b; 1971) and James (1970). These works show that the use of aerial photography in surveying the spoiled landscape results in a high degree of accuracy with only a few errors of ommission or misinterpretation. As this level of success has been accepted and is assumed to apply equally to similar surveys, no formal assessment of accuracy has been made in this current research. There were, however, several queries raised by the Glamorgan Planning Department which seemed to question the validity of certain interpretations in the Glamorgan survey, and because of this a cursory examination of accuracy has been undertaken.

The concept of an "accurate survey" is, in any case, a complex one to discuss since tests of accuracy can be applied to most processes of the survey method (e.g. accuracy of mapping, and of measuring areas). If, however, it is assumed that any survey processes employing instrumentation or general cartographic techniques are as accurate as that instrumentation or those techniques will allow, then the only remaining question is whether the air photo interpretation has been accurate. In other words, whether the situation on the ground agrees with that as interpreted on the aerial photograph.

There are two ways in which this can be done. In the first case a knowledge of the ground truth situation is compared with the results of the aerial survey. This is the method which was used by the Planning Authority for checking the accuracy of the WOTs, but there are several points which tend to cast doubt on its validity. In the current survey the extent of the ground truth is unlikely to be entirely comprehensive, for if it were there would be little point in conducting an aerial survey. If this is the case then the method of checking breaks down when a site appears on the aerial survey but is not found to exist from the field record. A second problem arises if there is a significant difference between the terminology and classification of the aerial survey and of the ground truth. This latter situation accounted for most of the queries raised by the Glamorgan Planning Department where they thought sites or parts of sites had been omitted from the WOTs. In fact, of the 17 queries raised, a re-examination of the sites on the aerial photographs and maps showed that only 2, or 12% of the sites had been subject to error and consisted of omitting sites rather than misinterpreting their previous function. Assuming that the Planning Department conducted a thorough check on all the survey results submitted to them, and taking into account that the total number of sites within the County is greatly in excess of the number of queries raised, the total percentage error will probably be much lower.

The second method of testing accuracy involves taking the results of the aerial survey and verifying them by field checking. This will overcome the problems, not least that of incompatible classifications, which were raised above. The method was used during a field visit to the County when about 55 different sites were examined, of which only one indicated any error in interpretation. The remains of the site concerned showed numerous but small heaps of slag, but for reasons as yet unknown they had been identified from the aerial photograph as colliery spoil. One possible explanation is that although nearby colliery dereliction had been observed, there was no further evidence suggesting the previous existence of smelting activities.

Although the number of sites visited might seem small, between them they accounted for all the forms of spoiled landscape encountered in the survey, and were distributed over most of the County. In spite of this, however, the apparent success of the interpreted spoilation can be regarded only as a guide, since no formal statistical principles were applied to the checking procedure carried out during the field visit.

As a further test it was decided to approach the County Planning Department and ask for their comments on the success of the whole survey, as opposed to the few queries raised on the WOTs, but although this request was made in July 1974 no reply has been given to date. It can only be assumed that since there has been no comment, adverse or otherwise, and that no further queries were raised, that the interpretation was satisfactory.

9.6 Time taken to complete the Survey

Excluding the Feasibility Study (Chapter 5), some record of the time taken to complete the survey has been kept. The survey team operated between October 1972 and March 1974, i.e. over a period of about 18 months, although the number of man-hours involved was 1,767 hours, or just under one man-year (in fact 49 man-weeks).

The contribution of the author was not, unfortunately, recorded since he was also involved with the pure research aspects of the work, but some estimate of the time spent can be made. Since the period taken during the survey is fixed at about 18 months, the maximum contribution would have been 75 man-weeks or 3,000 man-hours. This would result in a total of 4,767 man-hours, or about 47 hours spent on each of the 100 maps covering the County. Because of the considerable time element involved with the research, however, the true contribution probably equates with that of the rest of the survey team, i.e. about 1,800 man-hours. This makes a grand total of approximately 3,500 man-hours or 35 hours per map. As this includes all the survey processes outlined in Chapter 6 and a significant part of the survey management, the figure ought to compare favourably with the time taken had the survey been conducted to the same level of detail on the ground. Comparative studies of aerial and ground survey methods are rare in this particular field, but an indication of the temporal advantage of aerial surveys can be obtained from work in the photogrammetric field (Section 4.1(ii)).

It should be stressed that the total of 35 man-hours per map still involves a fair amount of research time and time used up due to inadequacies of the survey method. In the light of experience, therefore, and utilising a different survey procedure, it is quite probable that the survey time could be considerably reduced, as is discussed in PART FOUR.

9.7 Summary and Conclusions

The output of the Spoiled Landscape Survey of Glamorgan is in two forms, that of a set of six-inch maps and an accompanying set of Welsh Office Transparencies. Since different types of data are shown on each of these, the problems and methods of analysis of the survey results also differ. A brief analysis of the WOTs, however, indicates that there are 6,475 ha of spoiled landscape in Glamorgan, or 3.4% of the area of the administrative County. Of this 4,176 ha (or 2.2% of the County) are derelict and the remaining 2,299 ha (1.2%) are actively disfigured. These figures are greatly in excess of those indicated by previous surveys, but this is probably due to the present survey being more comprehensive rather than to a real increase in the amount of spoiled landscape.

The accuracy of the results is difficult to ascertain for the reasons outlined above, but there is every indication from available sources that about 88% - 98% of the interpretations were correct. It would be interesting to see, however, how these percentages might be altered if a more rigorous examination of the results was carried out.

Approximately 35 man-hours were spent on completing each of the maps covering the County, and their associated WOTs, but changes in the survey procedure and the present level of experience could considerably reduce this. The changes which are required are simple, but effective, and will be considered in more detail in PART FOUR.

Having acquired the spoiled landscape data using the current survey procedure, however, it is now appropriate to examine the manner in which those data can and might be used.

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PART THREE

USE OF THE SPOILED LANDSCAPE DATA

Introduction

PART TWO presented the reasons behind the Survey of the Spoiled Landscape in Glamorgan, the methods and problems arising from the collection of such information, and the manner in which the data have been presented. It is now possible to consider the uses to which these data may be put. Logically, the use of the data should determine how and in what form they should be collected, so that once the data are obtained their use is obvious. This point will be discussed more fully in the appraisal of the current work in PART FOUR, but for the moment it will be assumed that the data exist as data *per se*; and that they need to be used in the best possible way. In this respect Chapter 10 discusses the likely and potential use of such data, and Chapter 11 outlines a small project in which the data have been utilized.

CHAPTER 10

The probable and potential use of the spoiled landscape data

"Local planning authorities .... should be required by the (Clean Land) act accurately to survey all.... dereliction within their boundaries .... Secondly the act should require local planning authorities to produce - on the basis of those surveys - detailed blueprints for reclamation within the context of their overall development plans."

(Barr, 1969)

10.1 Introduction

Mention was made in Chapter 3, of the difficulty of obtaining direct information about the strategy behind the reclamation of spoiled land, and of the need to infer such information from literature on the subject. A similar problem is encountered in attempting to assess how spoiled land data are going to be used in general. As far as National Government returns are concerned it would appear logical to assume that the data are being used primarily to indicate the extent of the problem in the country (in terms of area), and to determine the probable cost of reclamation. At a local or regional level, however, the uses to which these data are being put, or will be put, are less evident. In spite of this, it is possible to distinguish between the probable use of data as indicated by, for example, planning department of local authorities, and the potential use of data which covers a field larger than that of planning.

10.2 Probable use of spoiled landscape data

The uses referred to in this section are those which are likely to occur and which have been discussed in conversation or correspondence with officers in the planning field.

The most obvious application relates to land reclamation which was discussed in Chapter 3. A discussion paper on Land Reclamation in West Glamorgan, for example, states that:

> "The first priority in establishing a long term approach to the question of land reclamation must be to compile an inventory of all existing problem areas. It is necessary to identify the range of problems requiring attention, the scale

of the problem, and its geographical distribution. This would need to be monitored on a continuous basis to ensure a continually up-to-date assessment in order to reconsider priorities to evaluate the success of completed schemes." (Land Reclamation Project Group, 1974)

The type of survey described in PART TWO will provide the inventory of problem areas as mentioned here and having achieved this data base, subsequent re-surveys will provide for monitoring on a continuous basis. The uses quoted above were also behind the reasoning for carrying out the survey as proposed by the old County of Glamorgan, and since most of the planning officers of that County are now with the newer one of Mid-Glamorgan it is not unreasonable to assume that the original ideas will be carried out.

It has also been suggested that spoiled landscape information will be useful for work on Structure Plans (West Glamorgan County Council, 1975), although the exact usage has not been given. The data will, however, probably be used in assessing those areas which are suitable for redevelopment as industrial or residential zones, or which could be utilized for recreational purposes (e.g. using disused railway routes for footpaths or nature trails).

More specific uses include the location of tipping sites using disused excavations or mine shafts for waste disposal, and the location of old spoil heaps suitable for use as a source of hardcore and fill material. While both these examples are relevant to planning departments, they can also be important to commercial enterprises such as those involved in waste disposal or civil engineering, and since local government and commercial bodies are often in competition with one another the spoiled land data can take on a very real economic value.

10.3 Potential use of spoiled landscape data

Whereas the probable use of spoiled landscape data is at present confined mainly to planning authorities the potential usage applies to a much wider range of disciplines. Experts within these various disciplines will probably see many more applications than are discussed here and the examples quoted below are therefore selective, relating to fields with which the author has some familiarity.

One significant application in an academic context, but having relevance to the applied discipline of planning, concerns an examination of the relationships between the spoiled landscape and the socio-economic environment. PART ONE examined some of these issues in considering how the spoiled landscape might be related to factors such as environmental perception, the outward migration of population and economic decline through the loss of industry. It is easy to establish hypotheses concerning the manner in which these factors are related, but difficult to verify them without a careful attempt to assess their degree of correlation. With regard to environmental perception, for example, Wallwork (1974) regards that studies do not as yet permit more than a simple analysis of attitudes. In addition, much of the literature relates to pilot surveys based largely on the responses of students who do not necessarily provide a representative opinion of the population at large.

It is also important to ensure that any data which are to be compared are compatible on a temporal and/or spatial basis. Indeed, it will be recalled that the spoiled landscape/socio-economic study which originally was to form part of this research had to be abandoned because of temporal incompatibility of the data (Chapter 5).

Assuming that problems of this type can be solved, however, there should be sufficient scope for a significant amount of research, particularly since the number of variables involved in socio-economic studies are many, and their relationships complex. Even where multivariate analyses such as multiple correlation techniques and principal components analysis are used, much work is involved in interpreting the treated data.

A second field of study where the spoiled landscape data might be utilised initially for academic purposes but with future practical applications is industrial archaeology. This is a subject which has gained increasing respectability in recent years (although not as yet being allowed to reach the academic status of traditional archaeology), and which has become important for recreational purposes as well as educating people about the industrial development and past technological innovations of Britain.

Data which have been collected in the current survey could be used for pinpointing sites worthy of archaeological field investigation and also suggest sites which could be preserved as industrial monuments. Although such work would be of a qualitative nature, it would be a simple task to re-examine relevant aerial photographs for quantitative data such as the dimensions of buildings and installations, and be considered more efficient than conducting field measurements. The use of both approaches, and the incorporation of historical data gained from archives and records pertaining to the Industrial Revolution, could lead to the compilation of an inventory of sites on a scale and systematic basis hitherto unknown.

The use of quantitative data might also be used in reclamation and landscape design. The existing data already show information about the nature of any vegetation existing on spoil heaps or within disused excavations, and this alone will give an indication of whether a derelict feature requires some form of reclamation. Moreover, where reclamation is desired, the data should help in making qualitative decisions concerning the mode of reclamation that is to be carried out, particularly where simple cosmetic treatment is to be employed.

As with the previous application, however, quantitative data can be obtained by further reference to the aerial photographs. Apart from linear and areal measurements, heights can also be obtained by the use of a parallax bar (or stereometer) and approximate volumes of heaps or excavations calculated. For more accurate height measurements, and indeed for general planimetric work necessary for detailed landscape design, photogrammetric plotters should be used.

The above type of work does not necessarily require data about the type or cause of the spoiled landscape; rather it is more concerned with the morphological characteristics of that landscape. The following chapter, however, considers an example of the use of spoiled landscape data in landscape studies where both the form and cause of the spoiled landscape are considered together. The type of example given, although again having relevance to the criteria of reclamation, is related to the correlation studies mentioned at the beginning of this section but the degree of sophistication of this work is of necessity less than that which would be required by a more rigorous study.

10.4 Summary

Although it is difficult to establish precisely how the recently collected spoiled landscape data is going to be used, it is possible to obtain an indication of the probable uses in the field of land reclamation, environmental monitoring, structure plan work, waste disposal site surveys and the location of fill materials. Potential uses are less orientated towards the wider discipline of planning, and may include correlation studies, the location of industrial monuments, and landscape design. An example of the use of the data for other landscape purposes is presented and discussed in Chapter 11.

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CHAPTER 11

An example of the use of the spoiled landscape data

"Sweet smiling village, lovliest of the lawn,
Thy sports are fled, and all thy charms withdrawn;
Amidst thy bowers the tyrant's hand is seen,
And desolation saddens all the green .....

Sunk are thy bowers, in shapeless ruin all,
And the long grass o'ertops the mouldering wall;
And trembling, shrinking from the spoilers hand,
Far, far away thy children leave the land."

(Goldsmith, 1770)

11.1 Introduction

The idea of carrying out the work described below originated after reading a document entitled "A Strategy for Gower" (Glamorgan County Council 1971/2). Part of this report mentioned a landscape evaluation which as well as having been conducted on the Gower peninsula, was also being undertaken in the rest of Glamorgan County. The manner in which the evaluation was conducted has been discussed in PART ONE, but further consideration will now be given to this survey.

11.2 The Glamorgan Landscape Evaluation

A later document (Glamorgan County Council, 1973) giving the background to the survey states that the landscape evaluation was conducted primarily for the purposes of the Structure Plan, and that it was concerned purely with the aesthetic value of the landscape. This value was quantified within a fairly arbitrary range of one to ten, although it was stated that "it proved easier to think" out of 10 "and decisions between values seem less critical than in a shorter scale." The numerical values could also be related to descriptive terms (Table 11.1), although it can be seen that a few numerical categories are grouped together for descriptive purposes.

In addition to the numerical categories, provision was made for classifying urban landscapes as "U", but since this designation gives no indication of landscape quality and cannot be related to the scale of 1-10, the class is omitted in most of the following analyses.

A landscape value was assigned to each quarter kilometre square within the County and a map was produced showing the value for each square. An examination of the map, part of which is shown in Fig. 11.1, shows that there are many areas classed as "substantially degraded landscapes". This suggests that these areas contain either a large amount of spoiled landscape or a particularly intrusive type of spoilation. Assuming this hypothesis to be correct, it would not be unreasonable to expect that it would be verified by the data collected during the spoiled land survey. More importantly, however, if the hypothesis could not be verified then it would be of significance to establish why this apparent anomaly should occur. Accordingly, a brief project was formulated to study this relationship, the method and results of which are given below.

Table 11.1 - Landscape values used by Glamorgan County Council

Value	Landscape type
10 9	Landscapes of national importance
8 7	Landscapes of regional importance
6	Landscape of local importance
5	Landscape with limited special character
4	Average landscape with no special character
3	Poor quality landscape with no special character
2 1	Substantially degraded landscapes

(Source: Glamorgan County Council, 1973)

11.3 Landscape evaluation - spoiled landscape comparison : pilot study

11.3(i) Data collection

Since the landscape evaluation data were related to quarter-kilometre squares, it was desirable that the spoiled landscape data should be on the same basis. In order to achieve this, a trial study was conducted in which several six inch map sheets showing the spoiled landscape data were divided into quarter-kilometre squares. The areal extent of spoiled land within each square was then measured using a "square-counting" method. A grid containing 25 cells per hectare, i.e. each cell covering an area of 0.4 ha, was placed over each quarter-kilometre square. The number of cells containing 50% or more spoiled landscape (n) was counted and the total area calculated from:

$$\text{Total spoiled landscape per } \tfrac{1}{4} \text{ km. square} = n \times 0.4 \text{ ha.}$$

This method of measurement was employed since it was simple to use, more accurate than some methods of areal measurement (Monkhouse and Wilkinson, 1967), and yet remained compatible with the level of generalisation obtained from the landscape evaluation. The areas of spoiled landscape were then expressed as percentages of the total area of a quarter-kilometre square (i.e. 25 hectares), in order that the extent of the spoiled landscape could be more easily visualized, and to facilitate easy comparison of data between squares.

The trial sheets chosen were from the Gower Peninsula since at that time it was the only area for which any landscape evaluation was available. It was realised that the area was not truly representative of the rest of Glamorgan (where the problems of

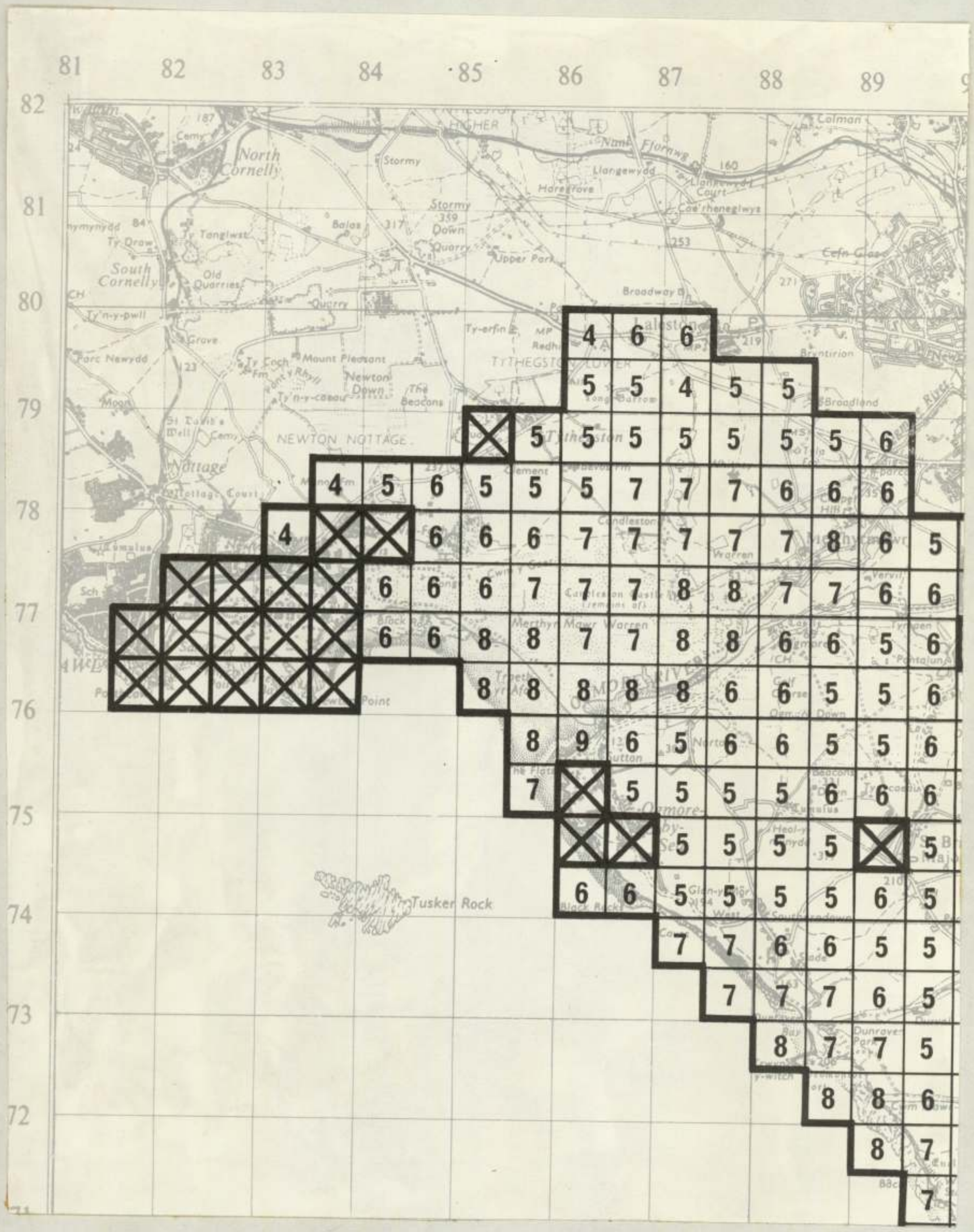

Fig. 7.1 Sample of landscape evaluation map.

spoiled land are greater), but two sheets were chosen, SS 59 SW and SS 59 SE, to contain the most significant amounts of spoiled landscape and to have the greatest variety of landscape, as expressed in the evaluation, as possible.

The location of the two areas in the County is shown in Figure 5.1, while a schematic representation of the landscape values and spoiled landscape percentages is shown in Figures 11.2 and 11.3. It will be noticed that no values are recorded for part of SS 59 SW since that part corresponds to a water-covered coastal zone. Similarly, no values are recorded for that part of SS 59 SE which falls within the old County Borough at Swansea, an area excluded from the Spoiled Land Survey. These restrictions on the number of observations within each sheet mean that SS 59 SW has only 94, and that SS 59 SE has only 90 observations, instead of a possible total of 100. Since the former total of observations exceeds the latter total by less than five per cent, no corrections have been made to individual observations in the following analysis.

11.3(ii) Analysis of data

For each map in turn, the data shown in Figures 11.2 and 11.3 were tabulated as follows. For each landscape value found on the map the number of occurrences of areas of spoiled land occupying 0-2%, 2-4%, 4-6%, etc., of the individual quarter-kilometre squares was recorded. These numbers of occurrence are shown for each map in Table 11.2.

An examination of the landscape values which appear on each map sheet shows that SS 59 SW has a greater variety of landscape types than its neighbouring sheet, SS 59 SE, and that it generally has a

Landscape value of 1/4 km square: 8

% of 1/4 km square which is spoiled landscape: 4

C	O A S	T A	L	4 / 2	U / 2	5 / 6	5 / 3	5 / 1	5 / 0
Z	O N E	4 / 0	4 / 0	5 / 8	5 / 2	5 / 11	5 / 0	5 / 8	5 / 0
5 / 0	5 / 1	4 / 0	5 / 0	5 / 0	5 / 0	5 / 0	4 / 0	5 / 0	5 / 0
5 / 0	5 / 0	5 / 0	5 / 0	5 / 0	4 / 0	4 / 1	4 / 0	5 / 0	5 / 2
5 / 0	5 / 0	5 / 0	5 / 0	5 / 0	4 / 0	5 / 0	5 / 0	5 / 0	5 / 0
6 / 0	5 / 0	5 / 0	5 / 0	6 / 0	6 / 0	6 / 0	6 / 0	6 / 0	6 / 0
5 / 0	5 / 0	5 / 0	5 / 0	5 / 0	6 / 0	6 / 0	5 / 0	5 / 0	5 / 0
7 / 0	6 / 0	5 / 0	7 / 0	5 / 0	6 / 0	5 / 0	5 / 0	5 / 0	6 / 0
7 / 0	7 / 0	7 / 0	7 / 0	6 / 0	6 / 0	6 / 0	5 / 0	5 / 0	6 / 0
8 / 0	7 / 0	7 / 0	7 / 0	7 / 0	6 / 0	6 / 0	5 / 1	5 / 2	6 / 1

Fig. 11.2 Landscape values and spoiled landscape percentages of O.S. sheet no. SS 59 SW.

Landscape value of 1/4 km square (top left of square, e.g. 8)

% of 1/4 km square which is spoiled landscape (bottom right of square, e.g. 4)

4 / 10	5 / 4	5 / 6	5 / 0	5 / 2	5 / 0	5 / 0	5 / 0	5 / 10
5 / 0	5 / 0	4 / 1	U / 0	U / 0	5 / 0	5 / 2	4 / 22	2 / 4
5 / 0	4 / 6	4 / 0	4 / 0	4 / 0	6 / 0	5 / 5	U / 1	U / 8
4 / 0	4 / 1	6 / 0	5 / 0	5 / 2	5 / 2	6 / 1	6 / 4	U / 2
5 / 0	6 / 0	6 / 0	4 / 0	5 / 0	5 / 0	4 / 2	5 / 4	6 / 4
6 / 0	6 / 0	5 / 0	5 / 2	2 / 3	6 / 2	4 / 0	U / 3	5 / 0
6 / 0	5 / 1	4 / 4	2 / 4	2 / 6	5 / 1	6 / 0	6 / 1	4 / 1
6 / 0	6 / 0	2 / 4	2 / 0	2 / 6	5 / 2	4 / 1	5 / 1	4 / 1
5 / 8	5 / 4	5 / 0	2 / 6	4 / 6	6 / 0	6 / 0	4 / 0	5 / 0
5 / 2	5 / 2	6 / 0	5 / 1	4 / 0	5 / 0	6 / 0	6 / 0	6 / 0

INCOMPLETE DATA: SWANSEA C.B.

Fig. 11.3 Landscape values and spoiled landscape percentages of O.S. sheet no. SS 59 SE.

Table 11.2 - Frequency of occurrence of certain amounts of spoiled landscape in areas of SS 59 SW and SE having a given landscape value

SHEET SS 59 SW

Landscape value	U	4	5	6	7	8	Totals
Amount of spoiled land (% of 25 ha. square)							
0-2	0	8	46	19	10	1	84
2-4	1	1	4	0	0	0	6
4-6	0	0	0	0	0	0	0
6-8	0	0	1	0	0	0	1
8-10	0	0	2	0	0	0	2
10-12	0	0	1	0	0	0	1
22-24	0	0	0	0	0	0	0
Totals	1	9	54	19	10	1	94

SHEET SS 59 SE

Landscape value	U	1/2	4	5	6	Totals
Amount of spoiled land (% of 25 ha. square)						
0-2	3	1	13	21	18	56
2-4	2	1	2	8	1	14
4-6	0	2	1	4	2	9
6-8	0	3	2	1	0	6
8-10	1	0	0	1	0	2
10-12	0	0	1	1	0	2
22-24	0	0	1	0	0	1
Totals	6	7	20	36	21	90

N.B. Classes for % spoiled land should strictly be 0-1.99, 2-3.99, etc., but have been expressed as above for convenience.

better landscape with 11 occurrences of "landscapes of regional importance" (values 7/8) and no "substantially degraded landscapes" (values 1/2). Sheet SS 59 SE on the other hand has a poorer landscape with 7 occurrences of "substantially degraded landscapes" and no "landscapes of regional importance". This major difference is partially reflected in the amount of spoiled landscape found within each map area, since about 1.9% of SS 59 SE is spoiled, whereas the corresponding value for SS 59 SW is only 0.5%.

Apart from these generalised observations, any detailed comparisons can most reasonably be made between the relative amounts of spoiled landscape occurring in the areas of each map having the same landscape value. In the case in question these values are 4, 5 and 6, ranging from average landscapes to those of local importance. In order that comparisons could be made easily, frequency distribution graphs were plotted for each map sheet, showing how often certain amounts of spoiled landscape occurred within areas of a given landscape value. The result of these plots is shown in Figures 11.4(a), (b) and (c).

The general form of these graphs is of a high peak in the 0-2% spoiled landscape class, and gradually declining towards a zero occurrence broken only by minor fluctuations in certain spoiled land classes. The high peaks, particularly in the case of SS 59 SW, are explained by the high proportion of quarter-kilometre squares having no spoiled landscape at all, as reference to Figures 11.2 and 11.3 shows. There is also some indication that the occurrences of little or no spoiled landscape (i.e. less than 2%) tend to increase with the general landscape quality. This is not seen if the absolute number of occurrences of areas having less than 2% spoiled landscape is

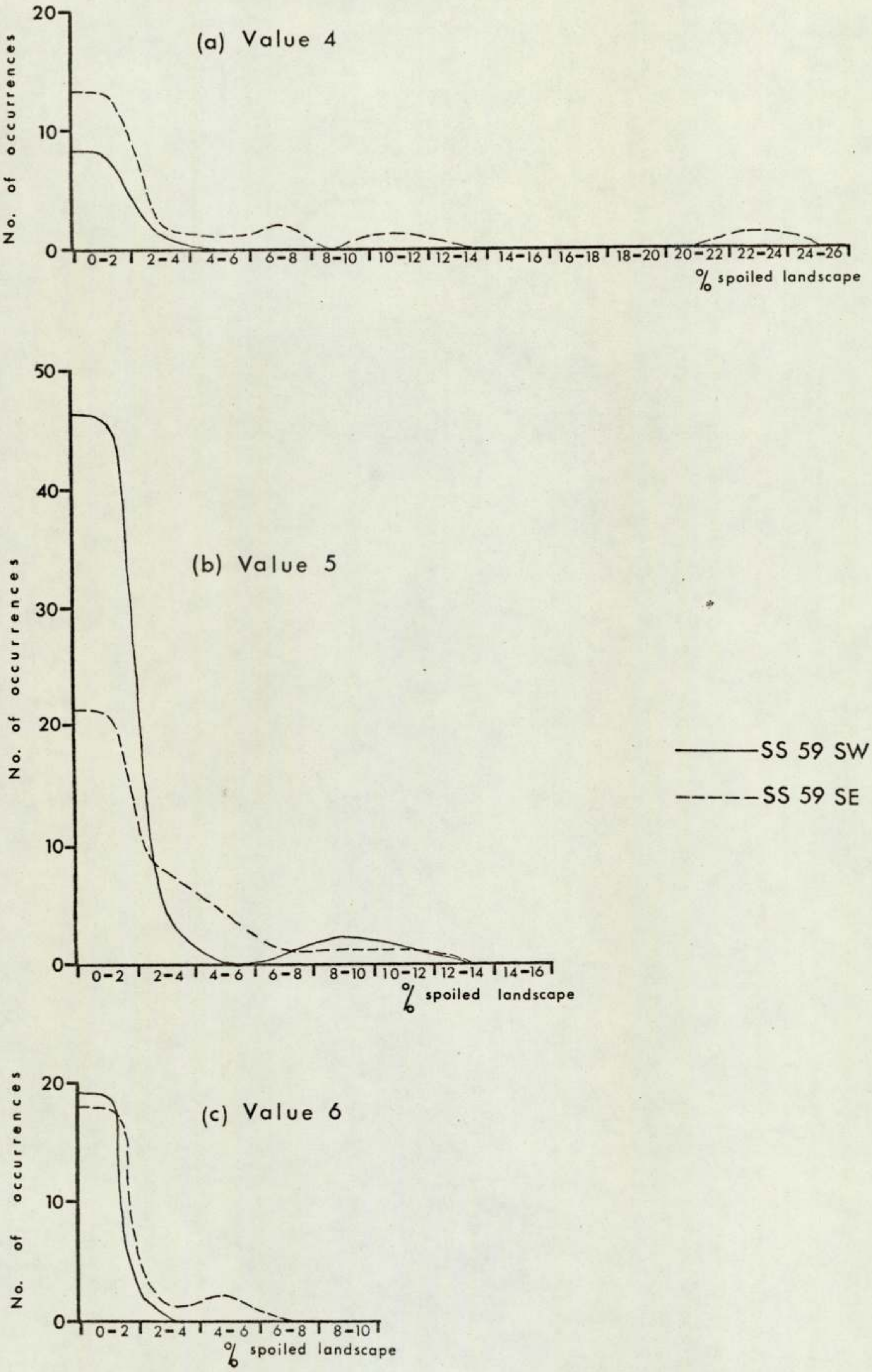

Fig. 11.4 Frequency of occurrence of spoiled landscape percentages for landscape values 4, 5 and 6.

examined but it becomes evident on considering the relative occurrences of this particular class. These relative values are expressed as those percentages of the total number of occurrences within each landscape value which fall within the 0-2% spoiled landscape class. For example, the total number of occurrences of areas having a landscape value of 7 on sheet SS 59 SW is 10 (Table 11.2). The number of occurrences within this landscape value of areas having less than 2% spoiled landscape is also 10. Thus the relative occurrence of areas within this spoiled landscape class is 100%. If similar percentages are calculated for the remaining landscape values in this sheet, and for the landscape values of SS 59 SE, the pattern shown in Table 11.3 will be found. Apart from the slight downward trend in the landscape value of 5, there is a general increase in the percentage of areas unspoiled as the landscape quality increases. In addition, the higher values for SS 59 SW indicate the generally better landscape of the whole area which was commented upon earlier.

Table 11.3 - Relative occurrences of areas of SS 59 SW and SE having less than 2% Spoiled Landscape

Landscape value	U	1/2	4	5	6	7	8
Sheet SS 59 SW	0%	-	88%	85%	100%	100%	100%
Sheet SS 59 SE	50%	14%	65%	54%	85%	-	-

- indicates that a particular landscape value is not represented on the map

11.3(iii) Conclusions of the pilot study

The major indication of the above analysis is that the SW sheet of SS 59 has a better landscape than that of the SE sheet. If they are considered together, however, most of the sheets have landscape values of 5 and above, i.e. the landscape quality is average and above. This is doubtless related to the fact that both sheets fall within the Gower peninsula, which is officially designated as an Area of Outstanding Natural Beauty (AONB).

Secondly, there is some indication that those areas of high landscape values tend to have fewer occurrences of spoiled landscape, although there are anomalies, as shown by the secondary peaks in Figures 11.4(b) and 11.4(c).

In spite of these encouraging observations, however, it is as well to restate an earlier comment that it is unlikely that the two sheets are typical of the rest of the County, partly because they exist within an AONB, and partly because they do not have the extent and type of spoiled landscape found elsewhere. In view of this, it was decided to extend the study to take into account these other types of area, and the results of this work are given below.

11.4 Landscape evaluation - Spoiled landscape comparison: extended study

11.4(i) Data collection

Data for the extended study, as well as including those which were collected earlier, were obtained from three additional six inch map sheets. Two of these, SS 99 NE and SE, cover part of the Rhondda valleys in the main area of the coalfield, while the other, ST 08 SW, covers part of the boundary between the southern edge of the coalfield and the Vale of Glamorgan.

Using the spoiled landscape information for the above sheets and a complete landscape evaluation map for the whole of the County (recently made available), data were measured and recorded as described previously (Section 11.3(i)). These data are shown for the three new map sheets in Figures 11.5, 11.6 and 11.7. Frequency tables were constructed (Tables 11.4, 11.5 and 11.6) to show the numbers of occurrences of squares having certain percentages of spoiled landscape within each landscape value. This information was plotted graphically in the manner described in 11.3(i) but all landscape values were considered since two of the three sheets, SS 99 NE and SE had common values ranging from 1/2 to 7. These graphs are shown in Figure 11.8.

11.4(ii) Analysis of the Data

The graphs in Figure 11.8 follow the trends indicated earlier in Figure 11.4, i.e. of high occurrences of squares having 0-2% spoiled land followed by low, spasmodic occurrences in other spoiled landscape classes. Secondly, there is the trend, more obviously seen on this occasion, of higher landscape values having fewer occurrences of squares containing high percentages of spoiled landscape.

A more detailed examination of these graphs and trends is made difficult by the large number of individual curves, particularly if the graphs of SS 59 SW and SE are also to be considered. In view of this it was decided to condense and generalise the data.

It will be remembered that the earlier sheets were incomplete for various reasons, and contained total occurrences of

Landscape value of 1/4 km square

8
4

% of 1/4 km square which is spoiled landscape

6 (0)	1/2 (0)	1/2 (26)	3 (8)	4 (0)	7 (0)	1/2 (28)	5 (17)	5 (17)	U (5)
5 (0)	3 (0)	3 (29)	1/2 (41)	1/2 (22)	3 (0)	7 (3)	5 (24)	5 (29)	5 (38)
5 (4)	3 (3)	1/2 (33)	3 (40)	U (19)	4 (3)	6 (0)	6 (0)	6 (0)	6 (0)
4 (18)	3 (31)	4 (0)	3 (2)	U (0)	U (2)	3 (0)	4 (0)	4 (1)	4 (6)
5 (1)	1/2 (46)	3 (41)	4 (0)	1/2 (0)	U (1)	U (14)	U (20)	5 (18)	U (9)
U (17)	U (12)	5 (1)	4 (3)	4 (0)	5 (0)	1/2 (0)	1/2 (2)	3 (10)	U (2)
5 (4)	U (0)	U (2)	1/2 (44)	4 (1)	5 (0)	5 (0)	4 (0)	5 (1)	U (0)
U (3)	U (4)	U (0)	U (11)	3 (7)	1/2 (26)	5 (0)	5 (1)	4 (0)	4 (4)
4 (36)	4 (2)	4 (0)	U (1)	U (35)	3 (17)	4 (25)	5 (2)	5 (0)	5 (1)
5 (2)	5 (0)	4 (0)	U (13)	U (11)	U (4)	U (20)	U (2)	4 (5)	5 (2)

Fig. 11.5 Landscape values and spoiled landscape percentages of O.S. sheet no. SS 99 NE.

Landscape value of 1/4 km square: 8

% of 1/4 km square which is spoiled landscape: 4

6 2	5 2	3 4	1/2 35	U 34	U 30	1/2 26	U 7	U 1	3 8
6 0	4 2	4 10	3 4	1/2 14	3 2	1/2 36	6 0	U 0	U 0
5 0	5 2	5 0	4 8	3 0	3 0	7 2	6 0	5 7	U 7
5 0	5 0	4 0	3 1	3 5	U 1	4 3	4 2	U 12	U 7
6 0	5 0	3 30	1/2 50	1/2 46	1/2 38	1/2 43	U 12	U 8	4 8
5 0	5 2	1/2 26	1/2 3	1/2 0	1/2 6	1/2 9	5 5	U 5	U 5
5 0	5 0	5 0	7 0	7 0	7 3	7 4	5 36	3 37	U 5
6 0	5 0	6 0	7 0	6 4	4 1	7 0	6 1	3 6	U 12
6 0	6 1	6 0	6 0	6 16	3 23	6 0	7 0	6 0	6 18
6 0	6 0	6 0	6 0	6 0	5 17	U 26	7 0	6 0	6 2

Fig. 11.6 Landscape values and spoiled landscape percentages of O.S. sheet no. SS 99 SE.

Landscape value of 1/4 km square: 8

% of 1/4 km square which is spoiled landscape: 4

5 0	5 0	7 0	7 0	7 0	6 3	5 12	U 15	5 9	5 2
5 14	5 1	6 0	6 0	7 0	7 0	5 15	4 0	5 0	5 3
5 6	6 0	6 0	7 0	7 0	7 0	6 11	6 0	5 0	U 0
U 2	5 0	6 0	6 0	7 0	6 0	6 0	5 0	U 0	U 0
4 1	6 0	6 0	6 0	6 0	4 0	U 0	U 0	4 0	4 0
4 3	4 4	5 1	5 0	5 0	U 6	U 14	U 0	4 0	5 0
4 24	4 42	5 30	5 0	5 0	5 1	U 5	U 0	4 0	4 0
4 4	4 1	4 0	5 0	5 1	4 5	4 1	U 0	5 0	5 8
4 7	4 1	4 9	4 15	4 4	4 0	4 0	5 12	5 5	U 0
4 2	U 0	U 7	5 12	4 0	4 0	5 0	4 0	5 0	5 0

Fig. 11.7 Landscape values and spoiled landscape percentages of O.S. sheet no. ST 08 SW.

Table 11.4 - Frequency of occurrence of certain amounts of spoiled landscape in areas of SS 99 NE having a given landscape value

% Spoiled landscape	Landscape value U	1/2	3	4	5	6	7	Totals
0-2	6	3	3	10	12	5	1	40
2-4	5	1	2	2	3		1	14
4-6	3			2	2			7
6-8			1	1				2
8-10	1	1						2
10-12	2		1					3
12-14	2			1				3
14-16	1							1
16-18	1		1		2			4
18-20	1			1	1			3
20-22	2			1				3
22-24		1						1
24-26				1	1			2
26-28		2						2
28-30		1	1		1			3
30-32			1					1
32-34		1						1
34-36		1		1				2
36-38								0
38-40					1			1
40-42		1	2					3
42-44		1						1
44-46		1						1
Totals	24	14	12	20	23	5	2	100

Blank areas of table indicate non-occurrence

Table 11.5 - Frequency of occurrence of certain amounts of spoiled landscape in areas of SS 99 SE having a given landscape value

% Spoiled landscape	Landscape value U	1/2	3	4	5	6	7	Totals
0-2	4	1	3	2	10	19	6	45
2-4		1	1	3	3	2	2	12
4-6	3		3		1	1	1	9
6-8	3	1	1		1			6
8-10	1	1	1	2				5
10-12				1				1
12-14	3							3
14-16		1						1
16-18					1	1		2
18-20						1		1
20-22								0
22-24			1					1
24-26								0
26-28	1	2						3
28-30								0
30-32	1		1					2
32-34								0
34-36	1	1						2
36-38		1	1		1			3
38-40		1						1
40-42								0
42-44		1						1
44-46								0
46-48		1						1
48-50								0
50-52		1						1
Totals	17	13	12	8	17	24	9	100

Blank areas of table indicate non-occurrence

Table 11.6 - Frequency of occurrence of certain amounts of spoiled landscape in areas of ST 08 SW having a given landscape value

% Spoiled landscape	Landscape value U	4	5	6	7	Totals
0-2	11	18	20	12	9	70
2-4		2	2	1		5
4-6	2	3	2			7
6-8	1	1				2
8-10		1	2			3
10-12				1		1
12-14	1		4			5
14-16	1	1	1			3
16-18						0
18-20						0
20-22						0
22-24						0
24-26		1				1
26-28						0
28-30						0
30-32			1			1
32-34						0
34-36						0
36-38						0
38-40						0
40-42		1				1
42-44		1				1
Totals	16	29	32	14	9	100

Blank areas of table indicate non-occurrence

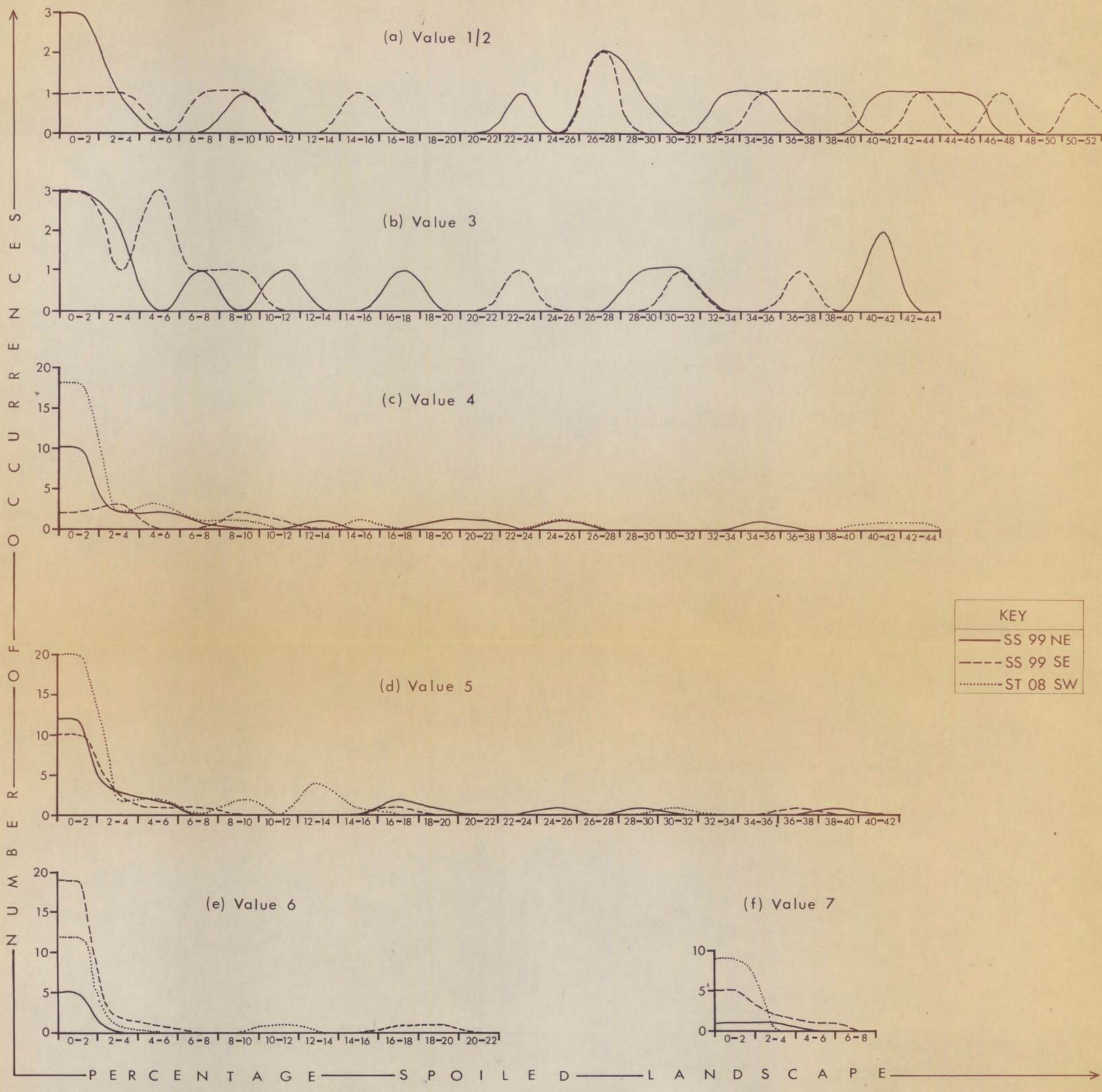

Fig. 11.8 Frequency of occurrence of spoiled landscape percentages within each landscape value.

90 and 94 quarter-kilometre squares instead of a possible 100. The sheets subsequently examined contained a full total of 100 occurrences, however, and it was thought that if the earlier maps were to be brought into the extended study then their data should be corrected to this total of 100. Applying correction factors of 1.06 and 1.11 to SS 59 SW and SE respectively, and taking the resulting values to the nearest whole number, new frequency tables were produced for these sheets (Table 11.7).

Each of the five new frequency tables and corresponding maps were then considered in turn. For every landscape value within each table, the average percentage of spoiled landscape was found by summing the individual amounts of spoiled landscape within the landscape value and dividing by the total number of occurrences of spoiled landscape having that value. Consider, for example, the data for SS 99 SE and in particular those for landscape value 7. The map shows that there are:

6	occurrences	of	squares	with	0%	spoiled	land	= 0%
1	occurrence	of	squares	with	2%	"	"	= 2%
1	"	"	"	"	3%	"	"	= 3%
1	"	"	"	"	4%	"	"	= 4%

The total percentage is 9%

Since this is over a total of 9 squares the average per square is 1.0% spoiled land.

This average, and the remaining ones calculated in the same manner, are shown in Table 11.8. This shows much more clearly the trends suggested by the individual graphs and frequency tables, since it effectively summarises them. There are, of course, some anomalies which become more prominent if the data are shown

Table 11.7 - Corrected data for SS 59 SW and SE
(original data as shown in Table 11.2)

SS 59 SW
(Correction factor 1.06)

Landscape value	U	4	5	6	7	8	Totals
% spoiled landscape							
0-2	0+	9	49	20	11	1	90
2-4	1	1	4				6
4-6			0				0
6-8			1				1
8-10			2				2
10-12			1				1
22-24			0				0
Totals	1	10	57	20	11	1	100

SS 59 SE
(Correction factor 1.11)

Landscape value	U	1/2	4	5	6	Totals
% spoiled landscape						
0-2	3	1	14	23	20	61
2-4	2	1	2	9	1	15
4-6		2	1	4	2	9
6-8		3	2	1		6
8-10	1			1		2
10-12			1	1		2
22-24			1			1
Totals	6	7	21	39	23	96*

* Even the corrected total does not become 100 since there are so many individual values of 1 which when corrected to 1.11 and rounded to the nearest whole number revert back to 1.

\+ Blank areas of table also indicate non-occurrence.

graphically (Figure 11.9).

Table 11.8 - The average percentage of each landscape value which contains spoiled landscape

	U	1/2	3	4	5	6	7	8
SS 59 SW	2.0	-	-	0.3	0.8	0.1	0.0	0.0
SS 59 SE	2.3	4.1	-	1.7	1.6	0.5	-	-
ST 08 SW	2.9	-	-	5.5	4.1	1.0	0.0	-
SS 99 NE	7.2	21.6	15.7	6.7	7.0	0.0	1.5	-
SS 99 SE	10.1	25.5	10.2	4.3	4.2	1.8	1.0	-

Generally, Figure 11.9 shows more strikingly the trend of increases in the landscape value corresponding to reductions in the percentage of spoiled landscape. The curve for SS 59 SW, however, does not suggest this since firstly it contains no areas of substantially degraded or poor quality landscapes (values 1/2 and 3 respectively) and secondly the total amounts of spoiled landscape are small. The peak in this curve in fact results from the occurrence of a railway cutting in an area designated as value 5 (i.e. having limited special character).

The curves for SS 59 SE and ST 08 SW show a more positive trend, although the latter has no landscapes of value 1/2, and neither have occurrences of value 3. The first peak of SS 59 SE is explained by the occurrence of small individual areas of a derelict military airfield. Each individual unit is small in areal extent but collectively they cover a large part of the landscape and greatly detract from the surrounding agricultural landscape. The second peak results from the occurrence of more areas of derelict airfield, of well vegetated spoil heaps and a railway cutting. The last two forms of dereliction also account for the spoiled landscape found in areas of SS 59 SE having landscape values of 5 and 6 (having limited special character and national importance respectively).

The curve of ST 08 SW shows a greater peak than those previously examined even though it occurs for the landscape value of 4. Active opencast coal workings account for most of this higher proportion of spoiled landscape although disused spoil heaps associated with deep coal and haematite mining are additional factors. The other percentages of spoiled landscape in areas of landscape values 5 and 6 are caused again by opencast mining in the former case, and by tree covered spoil heaps in both instances.

The most obvious trends can be seen in the curves for sheets SS 99 NE and SE. In both cases the high proportion of spoiled landscape in areas of values 1/2 and 3 are caused by large disused colliery spoil heaps, although the percentages for SS 99 SE also include a significant amount of spoilation associated with rewashing. The lower percentages associated with value 4 landscapes result from spoil heaps undergoing or having undergone reclamation in the case of the NE sheet, and from small heaps, a private mine site and old crop workings in the case of SS 99 SE.

There is a secondary peak for each curve associated with landscapes of limited special character (value 5). This is because of the occurrence of large areas of degraded land at ground level associated with coal mining, although some spoil heaps are also present. In the case of SS 99 NE there follows a sharp decrease to a level of zero, in the amount of spoiled landscape associated with value 6 landscapes, while the level for SS 99 SE falls less dramatically to 2%. This small percentage is accounted for by grassed spoil heaps, cropworkings and a private mine, all features being individually small in areal extent.

It is perhaps surprising that landscape value 7 (landscapes of regional importance) is associated with any spoiled landscape in sheets SS 99 NE and SE, since the other sheets under consideration have no occurrence. In the case of the NE sheet the spoiled landscape occurs since certain areas border the edge of rewashing or reclamation practices and have been designated as degraded land at ground level in the spoiled land survey. Similarly, all areas designated landscape value 7 on the SE sheet, border areas which are of value 1/2, but in addition contain small amounts of spoil.

Having examined the generalised curves in some detail in oorder to explain the occurrence of certain peaks within each curve, it is now possible to draw some conclusions further to those expressed earlier in the pilot study Section 11.3(iii)).

11.4(iii) Conclusions of the extended study

In terms of landscape quality the data shown in Table 11.8 and Figure 11.9 indicate that map sheets SS 59 SE and SW have better landscapes than those of SS 99 NE and SE, and that ST 08 SW occupies an intermediate position. On the other hand, however, the SS 99 sheets have a greater variety of landscape types and all values from 1/2 to 7 are represented. The former statement reflects the earlier choice of two maps (SS 99 NE and SE) from the heavily despoiled main coalfield area, one (ST 08 SW) from the southern coalfield edge with less spoilation, and the original two sheets from the Area of

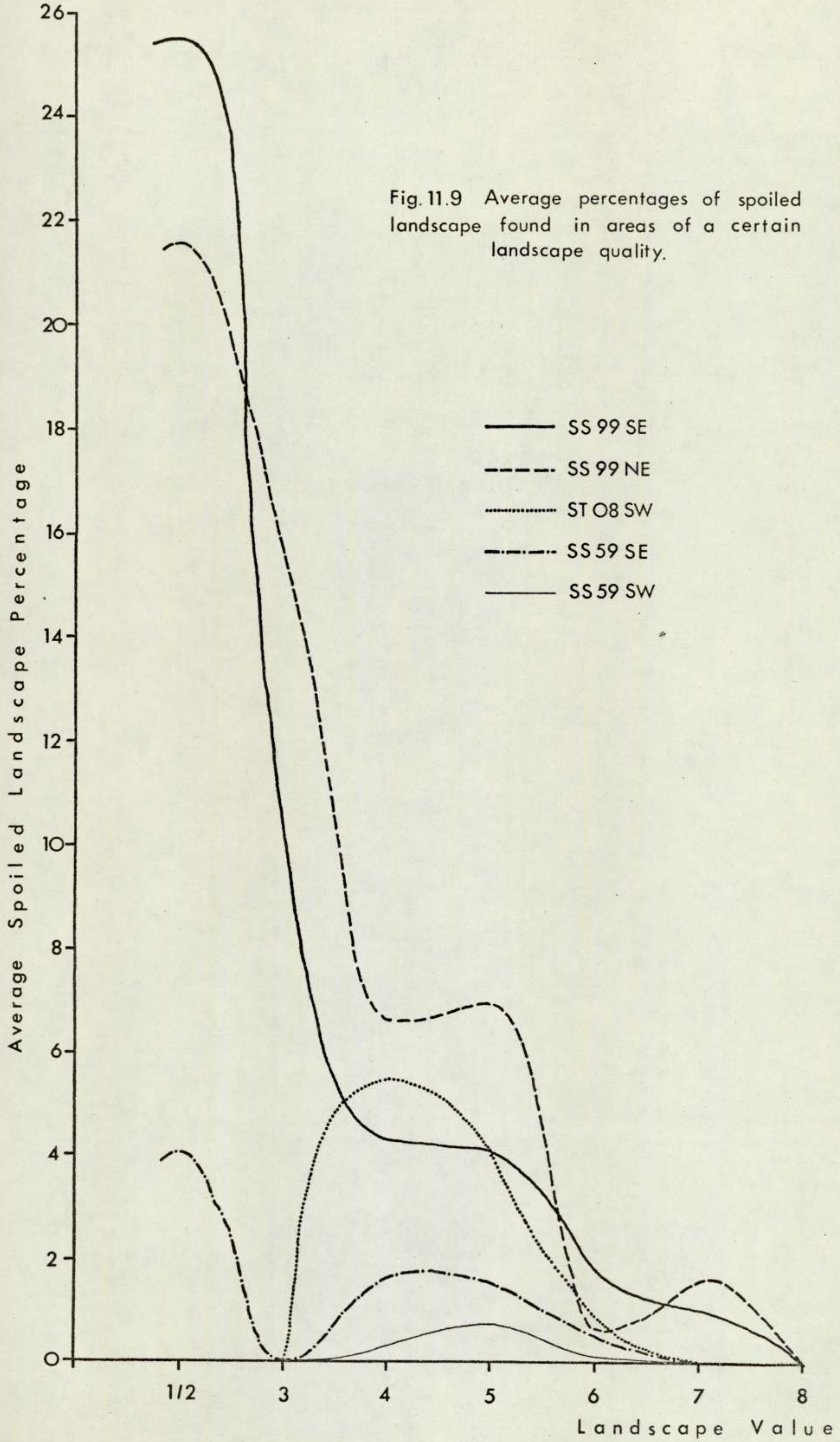

Fig. 11.9 Average percentages of spoiled landscape found in areas of a certain landscape quality.

Outstanding Natural Beauty (SS 59 SW and SE). It also suggests that sheets from similar areas will show similar characteristics, but this is obviously an aspect for further study.

With reference to specific landscape values, there seems to be an indication that certain forms of spoiled landscape are associated with certain values. The categories covering the worst landscapes (1/2 and 3), for example, appear to involve large individual sites such as spoil heaps or, in the case of SS 59 SE, an old airfield. The average landscape values of 4 and 5 seem to be more associated with smaller and more varied forms of spoilation, although where large sites do occur, as in the case of derelict railway cuttings, they are not obtrusive. Finally, the better landscape areas (6, 7 and 8) have the smallest forms of spoilation such as cropworkings or private mines, and where any significant spoil heaps are found, they tend to be heavily vegetated to the extent of merging with their surroundings.

11.5 Discussion of the landscape evaluation - spoiled landscape study

The work described in the above studies and the conclusions which have been drawn suggest that there is a significant inverse relationship between landscape quality and the amount of spoiled landscape within that landscape, as assessed from independent surveys. There is also an indication of a relationship between the type of spoiled landscape and its general landscape quality.

These findings, however, need to be treated with caution since, firstly, the restrictions on time have prevented the studying of other areas within the County. Secondly, no sophisticated techniques of sampling or analysis have been employed to see whether the observed differences between areas, or between landscape values, are statistically valid. Lastly, it has not been possible to establish the exact nature of the landscape evaluation, particularly with regard to the time of that survey. This latter point is important since many obvious anomalies could be explained by temporal variations - the agricultural area which has been excavated for opencast coal extraction, for example, or the reclamation of a previously derelict site.

A further ommission concerns the landscape designated as "urban" (U). It was stated previously that this value would be ignored in the analysis since the term implied no aspect of quality as found in values 1/2 to 10. Examination of Table 11.8, however, shows that there could be variations in quality <u>within</u> that category since, whereas on the Gower peninsual there would appear to be about 2% of the urban area spoiled, the corresponding figure for the valleys in the coalfield rises to 7% and 10%. This would perhaps be an important observation for the planners using the landscape evaluation, and indicate the rural bias of the landscape classification.

Accepting all of these limitations, however, it is hoped that the spoiled landscape data can be further applied to other more rigorous landscape studies.

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PART FOUR

CONCLUDING DISCUSSION

Introduction

Having dealt with all of the aspects of the present research programme, it is now appropriate to assemble the major findings of PARTS ONE, TWO and THREE. No formal summary is presented here since this is given at the beginning of the thesis, but the achievements and problems arising from each PART are reviewed, and recommendations for solving these problems are given and discussed. Finally an indication is given as to how the current research can be extended, and the future role of other forms of remote sensing is discussed with reference to spoiled landscape studies.

CHAPTER 12

Present conclusions and future possibilities

"Contract research may offer an opportunity to obtain data which are more satisfactory than those normally available, ... Secondly, such applied research may similarly provide opportunities to test ideas and concepts under demanding operational conditions and thereby to qualify and develop them in ways more appropriate to the observed reality .... Thirdly, such research provides an opportunity to devise and test new techniques of measurement .... Fourthly, research of this kind provides experience in the management of large scale projects, especially in handling data on a large scale ...."

(Coppock, 1974)

12.1 The meaning of Spoiled Landscape

Some of commonest definitions which have been used in studies of the spoiled landscape have been examined with reference to the derelict landscape. It was suggested that problems involved with interpreting and applying such definitions arise from confusion between the economic and aesthetic concepts of the terms "derelict" and "spoiled", and as a result that no definition could be sensibly applied to every situation. In order to provide a reasonably workable solution to the problem it was decided that the comprehensive class of "spoiled landscape" (defined in Section 1.3) should be divided into two components. The first of these, the "derelict landscape", would include all sites which were unutilized, while the second component of "actively disfigured landscapes" would embrace sites which were in use but which aesthetically detracted from the surrounding landscape.

The concepts of these terms have been briefly examined, and discussion has related mostly to attitudes of visual perception. No attempt has been made, for example, to discuss fully the socio-economic implications of spoiled landscapes although passing reference has been made to some case studies (the Lower Swansea Valley Project, and the Durham Motorway Corridor), and to the question of criteria used in planning reclamation. The omission is not to deny the importance of the spoiled landscape in affecting the economic and social well-being of an area, but it was felt that such an appraisal was outside the scope of the current research. An approach to the subject was to have been made in examining the relationship between socio-economic variables and temporal changes in the spoiled landscape in Glamorgan but this was abandoned on the advice of the County Planning Department. Further reference to work of this nature, however, is made in Section 12.5.

12.2 National surveys of Spoiled Landscapes

An assessment of the survey of spoiled landscapes has shown that National Government has become more liberal in including forms of spoilation hitherto ignored. In spite of new approaches to the type of data that are collected, however, it would appear that little progress is being made in revising the manner in which the data are gathered. Previous studies (Bush, 1970 and James, 1970) have shown the value of using aerial photography for spoiled land surveys, and Denton (1973) has pointed to such a use by local authorities but the full nature of the application remains unknown. In this context, two fields for future study might be to:

(a) conduct a survey among local authorities in order to establish how their returns for national Derelict Land Surveys are made, and

(b) question local authorities who have used aerial photography about the manner in which the photographs have been applied in Derelict Land Surveys.

In addition, it may be of value to communicate the findings of the present work to those local authorities who have no practical experience in using aerial survey methods, if only to indicate some of the possible applications.

12.3 The Spoiled Landscape survey of Glamorgan

Having assumed that the previous applications of aerial photography to spoiled land studies had been successful, and taking into account Glamorgan County Council's needs for a sound and comprehensive survey of spoiled landscape within the County, the recent survey was undertaken. The initial Feasibility study exposed some problems of classification, mapping and the use of the photographs but these were solved in the preparation for the Regional study at the County level. During the course of the latter study, however, there arose problems of a different nature, some of which having been already discussed. The most significant of these are given below.

12.3(i) Classification and mapping code

The classification and mapping code which was finally derived (Table 6.1) generally proved satisfactory, although Glamorgan County Council appeared not to fully understand the rationale behind the morphological class of "degraded land at general ground level". The major problem, however, was to adequately define the class of "residual open space (waste ground)", but this was eventually resolved.

One aspect of the classification which could not be dealt with during the survey was the associated code used to identify the mapped features of the landscape. The revised code used in the County Survey contained the remnants of that used in the Feasibility study (Table 5.1), but this ultimately led to some confusion and also proved cumbersome. In order to prevent this problem recurring should the code be used at a future date, a further revision is presented in Table 12.1

12.3(ii) Air-photo interpretation

Most aspects of interpreting the aerial photographs used

Table 12.1 - A revised mapping code

The code is used in the same manner as those presented earlier.

Morphology			Code
Buildings and installations			A
Buildings			Ai
Installations			Aii
Unrecognisable buildings or installations			Aiii
Heaps (Tips)			B
Single heaps	(1)	unvegetated	Bi
	(2)	sparsely vegetated	Bii
	(3)	well vegetated	Biii
Groups of heaps	(1)	unvegetated	Biv
	(2)	sparsely vegetated	Bv
	(3)	well vegetated	Bvi
Holes			C
Single holes	(1)	unvegetated	Ci
	(2)	sparsely vegetated	Cii
	(3)	well vegetated	Ciii
Groups of holes	(1)	unvegetated	Civ
	(2)	sparsely vegetated	Cv
	(3)	well vegetated	Cvi
Degraded land at general ground level			D
Special features			E
Sites or foundations of buildings or installations			Ei
Levels, adits or drift entrances to mines Mine shafts			Eii

In the case of heaps (B) and holes (C), the vegetation code refers to the amount of cover. An indication of the type of cover is given by a simple written description, e.g. "grass", "bushes".

Where holes are found to contain standing water those areas are indicated by the letter "W".

Activity	Code
Extractive industries	I
Coal-mining	Ia
Sandstone quarrying	Ib
Limestone quarrying	Ic
Lead	Ie
Iron (haematite and ironstone)	If
Sand and gravel	Ig
Brickearth	Ih
Other industries (including utilities)	II
Miscellaneous tipping	III
Source and composition of tipping material unknown	IIIa
Refuse (usually domestic)	IIIb
Intra-urban residential uses	IV
Abandoned allotments	IVa
Residual open spaces (waste ground)	IVb
Transportation networks	V
Disused roads	Va
Disused railways (a) track present	Vb
(b) track removed	Vc
Disused canals	Vd
Ministry of Defence	VI
Airfields	VIa
Camps	VIb
Others (e.g. rifle ranges, coastal defence works, etc.)	VIc

Some examples

Biii/Ia .... A disused colliery spoil heap well vegetated with grass.

Civ/Ib .... A group of disused and unvegetated sandstone quarries.

D/IVa .... Disused allotments.

Prefixes

The code may be prefixed by the letter "A" to indicate that an activity is currently in progress, e.g. AAi/Ib ... an active colliery building. The prefix "R" indicates that a derelict feature is being reworked or reclaimed, e.g. RCi/Ic ... a disused and unvegetated limestone quarry being reclaimed.

during the survey have been discussed at length and will not be repeated here. It is sufficient to state that there were few problems which could not be solved, particularly where other data sources were available.

One problem which has not been fully discussed, however, concerns the identification of disused buildings. Often the only factor which indicates whether or not a building is derelict is its external condition. Thus buildings showing an advanced state of ruination or disrepair can be assumed to be derelict with a reasonable degree of confidence. Where, however, a building is intact but derelict, it may be identified as being in use and consequently omitted. The problem is not so significant when dealing with industrial buildings since external factors may point to its status, but it is important when dealing with residential buildings. An example is shown at 11 on AP2 where a small terrace of houses appear to be in use, although a field visit shows most of them to be derelict (see Fig. 12.1). Unfortunately, there seems to be no solution to this problem and it must be accepted to be one of the few limitations of the aerial photograph.

A further question to be examined is whether the scale of photography used was adequate for the purpose of surveying the spoiled landscape. The scale used here, 1:5,000, presented no problems with regard to the process of interpretation, but it did mean that there were about 6,000 photographs covering the County. The total interpretation and mapping procedure was consequently lengthened by having to handle such a large amount of software. It is difficult to assess, however, whether a smaller scale of photography and a corresponding reduction in the number of photographs will reduce the survey time. Research into comparing different scales is currently

Fig. 12.1 Derelict terraced housing.

being undertaken in the context of another project and appears to indicate that the same amount of data could be extracted from 1:20,000 and 1:10,000 scale photos as from 1:5,000 scale, assuming that the same classification is used in each case. Although the time taken to handle the smaller scale photography is less than that of the larger scale, however, the interpretation would appear to take much more time, i.e. the time gained in handling small scale material is offset by spending more time in scanning it. It must be stressed though, that these conclusions are provisional and that any final decision is dependant upon further study.

12.3(iii) Mapping procedure

The mapping procedure gave rise to two significant problems which increased the amount of time spent on the survey. The first, to which reference has been made, concerns the use of a transparent overlay as an intermediate stage between the interpretation of the photograph and production of the spoiled landscape map. It became apparent that this stage was superfluous and that the marking of the information directly on to the aerial photograph could be more efficient. Secondly, the use of dyeline prints of Ordnance Survey base maps on which to plot the survey data, led to problems of reproduction, which could not be satisfactorily resolved even by photographic copying. It is suggested, therefore, that transparent draughting film be used for future mapping purposes. This will have the advantage of being suitable for dyeline copying and may be used in conjunction with Ordnance Survey maps. In addition, if the initial mapping is completed in blue pencil (which does not reproduce in the dyeline process), no erasures will be necessary after checking since the final mapping in ink can incorporate any necessary corrections.

12.3(iv) Survey management

Some aspects of the survey management have been mentioned above but there are problems of a more fundamental nature which have become apparent during the course of the survey.

The first relates to the poor flow of data source material. The unavailability of geological data and consequent visits to London were both time consuming and liable to result in error since the spoiled landscape maps were handled and re-examined several times thus increasing the chances of making omissions. Ideally the geological maps which form part of the initial data input, should be used in conjunction with the aerial photographs as shown in Figure 12.2.

The manner in which the photographs were used resulted in a similarly inefficient use of the survey software since there was a constant two-way flow of photographs between Birmingham and Cardiff. The sole solution to this problem is to have all the photographs at the place at which the survey is to be conducted, and indicates the advantage of local authorities possessing more than one set.

The major problem of management, however, concerned general communication with the local authority. The apparent misunderstanding over some items of the classification and the non-response to requests for information about survey accuracy have already been mentioned. Problems of this nature were aggravated by the fact that communication was made with up to six individuals within the local authority. It became increasingly obvious that internal communication between these individuals was far from satisfactory and misunderstandings arose concerning the aims of the survey, particularly with regard to the dual role of conducting the survey for the County's purposes (resulting in the six-inch scale maps) and for the Welsh Office survey (i.e. the Welsh Office Transparencies). The main conclusion to be drawn from this unfortunate situation is that the initial consultations with the authority did not involve all the interested parties of the planning and reclamation departments, and that those who were involved were uncertain as to the type of data required.

12.3(v) The Welsh Office Survey

A slightly different problem existed with the Welsh Office which apparently knew which data were required but had not sufficiently examined the practical problems of obtaining them. This is evident from the problems encountered with the Welsh Office Transparency, and the *ad hoc* fashion in which they had to be solved. It is suggested that future surveys take note of the questions raised in this study in order to prevent the problems recurring.

12.4 A revised procedure for spoiled landscape surveys

Taking into account the problems met during the survey in Glamorgan and noting the conclusions expressed in Section 12.3, a revised survey procedure is suggested as follows:

1. the interpretation of the aerial photographs in conjunction with all other data sources including the geological map.

2. the recording of the data on the photographs using the revised mapping code (Table 12.1).

3. the transference of the data to transparent draughting film.

4. the checking of processes 1-3 by an independant surveyor.

5. the final draughting of the map.

6. the compilation of the Welsh Office Transparency from the final map.

The procedure, which is shown schematically in Fig. 12.2, could reduce the survey time significantly, and where the level of expertise is sufficiently high in 1. above, could result in the current 35 hours per map being cut by approximately 30%. This can be seen by comparing columns A and B in Table 12.2. The first shows a breakdown of the time spent on each process involved in the production of one map and one set of Welsh Office Transparencies, and is based on an accurate record kept by one member of the research/survey team. Column B shows estimates derived from assessing the improvements made by using the revised survey procedure. For example, in the original procedure where geological data were collected in London, an average number of 10 spoiled landscape maps were completed on any trip. These maps took $12\frac{1}{2}$ hours to complete since travelling time (Birmingham to London return journey) occupied 5 hours, data insertion after examining the geological maps took 5 hours and final mapping required a further $2\frac{1}{2}$ hours. The average time per map was therefore 1.25 hours. In the revised procedure where geological data is collected at the same time as the aerial photographs are interpreted, no travelling time is involved. In addition, the combination of two original processes into one obviates the need to handle data sources and spoiled landscape maps more than is necessary. This should reduce the remaining time of $7\frac{1}{2}$ hours which was originally spent to about 5 hours. The new time spent

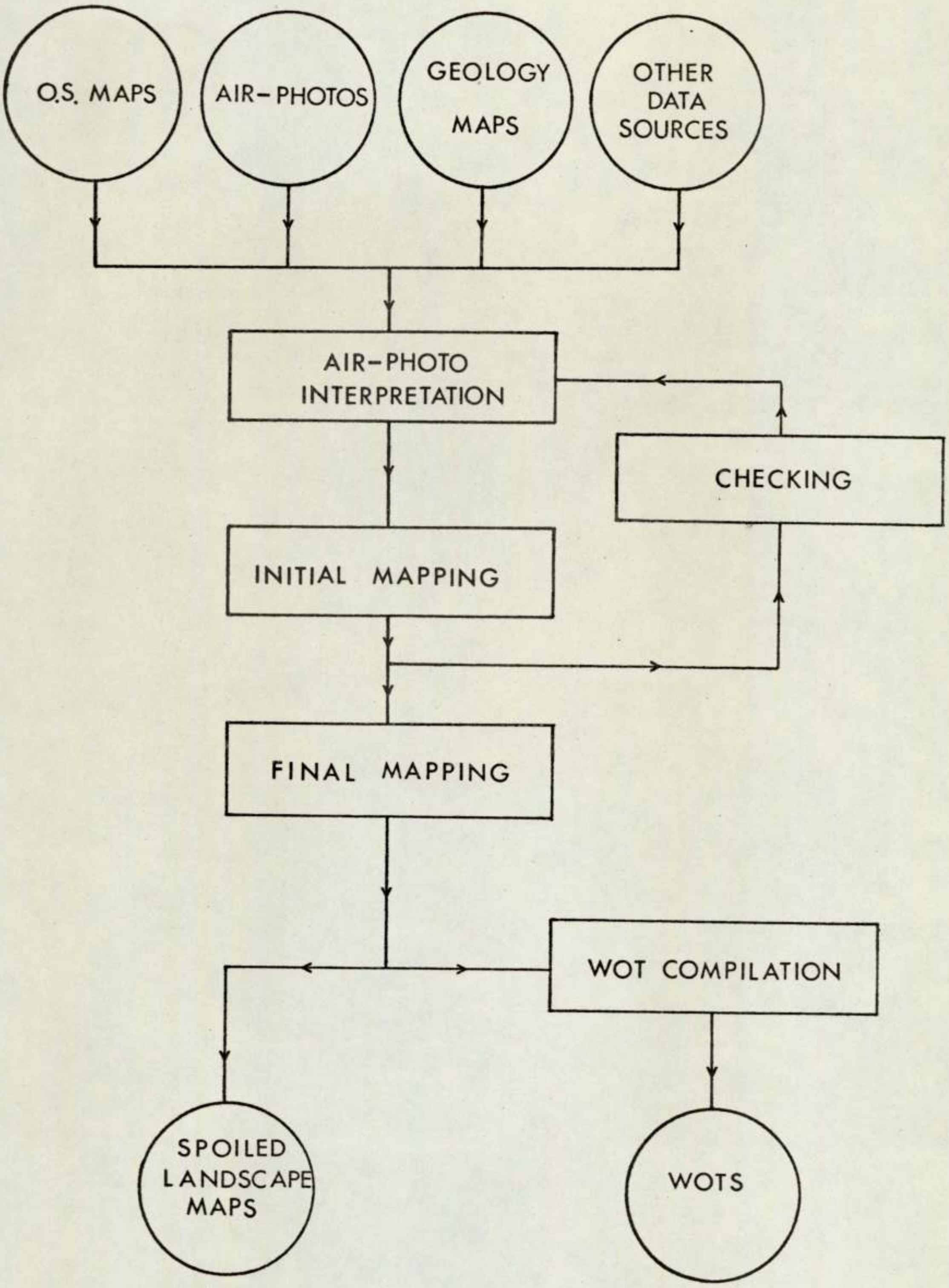

Fig. 12.2 A revised survey procedure.

Table 12.2 - Comparison of current and revised survey times

General process	Column A Time taken using current procedure	Column B Estimated time taken using revised procedure
Interpretation from photos and other sources	12.00 hours	7.50 hours
Mapping	3.75 hours	3.00 hours
Checking and final mapping	15.00 hours	9.00 hours
Insertion of geological data	1.25 hours	0.50 hours
Compilation of Welsh Office Transparency	3.00 hours	3.00 hours
Total time taken to complete one map	35.00 hours	23.00 hours

All times are averages for one map.

on each map is thus $\frac{1}{2}$ hour.

Although reductions in the time taken over other survey processes can be similarly estimated, the re-assessment does not apply to the compilation of the Welsh Office Transparencies since this process has not been revised. The time taken to complete these is therefore the same in columns A and B of Table 12.2.

Column B shows that the total estimated time for completing one map using the revised survey procedure is 23 hours, a reduction of 12 hours in, or 34% of, the original time. It must be stressed that this is an estimate and that any true value could only be derived from comparing the two approaches in a purely experimental situation. Since, however, the present research has been largely concerned with a "real-life" applied situation, any attempts to obtain such a true value must lie in future studies.

12.5 The reclamation of Spoiled Landscapes

The reclamation of spoiled landscapes has been considered in some detail, and mention has also been made of the potential role of aerial photography. The greatest contribution is probably in providing data relating to the reclamation criteria necessary to the compilation of a rational reclamation policy and programme. Some items of data such as information about vegetation cover, and photogrammetric values have been mentioned but others remain to be discussed. If, for example, reference is made to parts A and B of the reclamation criteria suggested by Glamorgan County Council - "danger to life and limb" and "threat of economic loss by physical damage" - it is possible to equate these to physical parameters obtainable from the aerial photographs. In the case of spoil heaps, A and B will be a function of, among other factors, the stability of the heap and distance between the heap and neighbouring built areas. As a crude indicator, therefore, such distances could be measured and scaled to suggest those areas which are at greatest risk. If such an indicator was combined with data pertaining to other reclamation criteria, it might be possible to obtain a priority listing of sites requiring reclamation, i.e. to establish a reasonably objective framework on which to build a reclamation policy. The question of how much data the aerial photograph can provide in this manner is obviously one which needs careful thought, but future research in this field would appear to be worth considering.

12.6 The use of spoiled landscape data

In introducing PART THREE of this thesis, it was stated that the use of the spoiled landscape data should determine how and in what form they should be collected. In the present study the purpose of the survey has been two fold, firstly to provide a general inventory of spoiled landscape for use by the local authority, and secondly to collect certain data required by the Welsh Office. These requirements have influenced the classification of spoiled landscape which has been used and thus dictated the type of data collected. In addition, the assumption by the author that the data are to be used as an input to reclamation planning has given rise to the collection of data relating to such planning. These data have largely concerned the nature and amounts of vegetation present on spoiled land sites.

Accepting these premises, it is felt that the present body of data is sufficient for the intended purposes. Examination of the potential uses of spoiled landscape data, however, shows that other purposes would require additional information particularly that derived from photogrammetric techniques. In traditional surveys, i.e. those conducted by field work, the need for additional data might require a total re-survey, with the danger that the new data might be temporally incompatible with those previously gathered. The use of the aerial photograph, however, dispenses with the problem as all data obtained from it are related to the same period in time. Thus it is a simple task to re-examine the photographs for information which was not required in the first instance.

Taking the data as they exist at present, there are several fields in which they can be used. In an academic context one of the most interesting applications is in determining the relationship between the spoiled landscape and socio-economic variables. The major problem will be to ensure that data are on an equal spatial basis, (i.e. at a County level), and where changes are to be studied, that the temporal basis is compatible. Assuming these difficulties can be overcome, there should be sufficient scope for examining whether population migration (internal and external), the quality of housing stock, the distribution of people in various socio-economic classes, and the location of industry are related to the type, amount and distribution of the spoiled landscape.

12.7 The future role of remote sensing in spoiled landscape studies

The present study has exclusively used black and white aerial photography for surveying the spoiled landscape, while all discussion has been confined to assessing this particular form of remote sensing. There exists, however, several other forms of photography and imagery which may prove of value in surveying certain aspects of the spoiled landscape, when their level of utilization is raised from the present one of experimentation to one of practical application.

The use of colour or false-colour photography may be of value in studying the vegetation cover of the spoiled landscape, although for surveys such as that carried out in Glamorgan where interpretation is based largely on the morphological characteristics of the landscape, colour photography may have little advantage over black and white photographs. This is not to deny the value of colour photography in other fields, however, (Jones, 1969).

The application of multi-spectral photography, which records reflected light of differing wavelengths, is also likely to have limited application though there are many differences of opinion with regard to its use in soil, vegetation and ecological surveys (National Environment Research Council, 1974). It might be of value, however, in specialised applications such as the location of old mine shafts, but this will be established only through an extensive research programme.

A more optimistic development could be the use of infra-red linescan imagery, although the application would again be of a specialist nature. Such imagery, which records emitted, i.e. thermal, infra-red radiation, has already been used for detecting "hot spots" in electricity transmission cables, for monitoring the origin and spread of forest fires, (Lawson, 1974), and detecting thermal water pollution. The technique might also prove of value in surveying burning tips, firstly by locating them and secondly in indicating those parts of the tip which offer the greatest hazard. Assuming that the resolution of the imagery is sufficiently good, it might also be possible to locate mine shafts since there will probably be a thermal gradient between the air space in the shaft and the surrounding land.

The use of satellite photography and imagery is probably the only aspect of remote sensing technology which is unlikely to provide any useful application in this country, although Skylab photography has been applied to studying surface mining activities in the United States (Brooks, 1973). The prevailing weather conditions over the United Kingdom are not conducive to the provision of extensive good quality imagery, and even where cover does exist the resolution is probably not sufficient to enable most elements of the spoiled landscape to be surveyed at the required level of detail.

12.8 Conclusion

This final chapter has attempted to bring together those elements of spoiled landscape research, survey and reclamation which are common to all chapters previously presented. The problems relating to this particular research have, it is hoped, been satisfactorily resolved such that future spoiled landscape surveys can be conducted more easily and quickly than has been possible to date. Although research into the application of aerial photography to such surveys can perhaps go no further, there are numerous other applications in the field of reclamation and landscape studies. In addition the body of data so far collected provides ample opportunity for analysis and research in the socio-economic field, which is ultimately the context in which the spoiled landscape must be taken.

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ADDITIONAL MATERIAL IN SUPPORT OF THE ATTACHED THESIS

The use of Aerial Photography for spoiled and Derelict Land Studies with special reference to Glamorgan.

LESLIE JAMES GIBSON Ph.D. 1976

List of Aerial Photographs

AP1a; AP1b to AP18a; AP18b (inclusive)


AP 9a
31


AP 9b
2
1


AP 10a
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7
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AP 10b


AP 11a


5
5
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AP 11b

AP 12b
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AP 12a


AP 7a
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AP 7b
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AP 8a
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AP 8b


AP 13a


AP 16b
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AP 17a


AP 17b
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AP 18a


AP 18b
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AP 13b
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AP 14a


AP 14b
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AP 15a

AP 15b
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AP 16a


AP 1b
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AP 2a


AP 2b
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2a
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AP 3a


AP 3b
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AP 4a

AP 4b
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AP 5a


AP 5b
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AP 6a


AP 6b
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