Small Licence-Exempt Groundwater Sources

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BGS Technical Report WD/00/15

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This report provides information and guidance on the identification of small licence-exempt groundwater sources and explores the issues surrounding their protection.

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E-mail ngwclc@environment-agency.gov.uk

Environment Agency
General Enquiry Line
0645 333 111

Environment Agency Regional Offices and Environment Agency Wales

Anglian
Kingfisher House,
Goldhay Way, Orton Goldhay, Peterborough PE2 5ZR
Tel 01733 371811 Fax 01733 231840

Midlands
Sapphire East, 550 Streetsbrook Road, Solihull, West Midlands B91 1QT
Tel 0121 711 2324 Fax 0121 711 5824

North East
Rivers House, 21 Park Square, South Leeds LS1 2QG
Tel 0113 244 0191 Fax 0113 246 1889

North West
Richard Fairclough House, Knutsford Road, Warrington WA4 1HG
Tel 01925 653999 Fax 01925 415961

South West
Manley House, Kestrel Way, Exeter EX2 7LQ
Tel 01392 444000 Fax 01392 444238

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Tel 01903 832000 Fax 01903 821832

Thames
Kings Meadow House , Kings Meadow Road, Reading RG1 8DQ
Tel 0118 953 5000 Fax 0118 950 0388

Environment Agency Wales
Rivers House, St Mellons Business Park, St Mellons, Cardiff CF3 0LT
Tel 02920 770088 Fax 02920 798555

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Keyworth, Nottingham NG12 5GG
☎ 0115 936 3100 Telex 378173 BGSKEY G
Fax 0115 936 3200
E-mail: sales@bgs.ac.uk www.bgs.ac.uk

Murchison House, West Mains Road, Edinburgh, EH9 3LA
☎ 0131 667 1000 Telex 727343 SEISED G
Fax 0131 668 2683

London Information Office at the Natural History Museum, Earth Galleries, Exhibition Road, South Kensington, London, SW7 2DE
☎ 0207 589 4090 Fax 0207 584 8270
☎ 0207 938 9056/57

St Just, 30 Pennsylvania Road, Exeter EX4 6BX
☎ 01392 278312 Fax 01392 437505

Geological Survey of Northern Ireland, 20 College Gardens, Belfast BT9 6BS
☎ 01232 666595 Fax 01232 662835

Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB
☎ 01491 838800 Fax 01491 692345
email: hydro@bgs.ac.uk

Parent Body
Natural Environment Research Council
Polaris House, North Star Avenue, Swindon, Wiltshire SN2 1EU
☎ 01793 411500 Telex 444293 ENVRE G
Fax 01793 411501

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The Environment Agency has a general duty to protect water resources. It has a further, specific duty to protect all sources from derogation, and in some circumstances it needs to have particular regard to the presence of such sources to protect them from pollution. In addition, the Agency's 'Policy and Practice for the Protection of Groundwater' aims to protect (from pollution) all potable groundwater sources many of which are small, licence-exempt sources. However, under existing legislation and the current abstraction licensing system there is no established mechanism for identifying these sources in order that the Agency can adequately fulfil its responsibilities.

Whilst the Agency's primary interest is the identification and protection of Small Licence-Exempt Groundwater Sources ('SLEGS'), British Geological Survey's (BGS) interest in this area lies in enhancing and maintaining the National Well Record Archive. The archive is a unique store of more than 100,000 geologically classified records of wells, boreholes and springs within England and Wales, for which the main source of information is well logs from drilling companies.

This study describes and evaluates the various ways in which the Agency can identify SLEGS which, if taken to include springs, are believed to comprise the vast majority of small, exempt sources. The study draws on the experience and views of Agency staff across England and Wales. It reports on the relevant legislation, existing practices, data availability, and the lessons learnt from past initiatives by the Agency to identify these sources. The transfer of relevant information between the Agency and BGS' National Well Record Archive is also considered.

The study reveals that, as a consequence of past initiatives, the Agency has already established a large body of data pertaining to these sources. In some Agency regions, listings of SLEGS have been established by staff working in pollution prevention, whilst in other regions similar data have been compiled by abstraction licensing staff.

Consultations with Agency staff have highlighted a variety of existing methods of identifying SLEGS. These include use of:

- Ad-hoc water feature surveys;
- Local Authority Environmental Health Department records of private supplies;
- Water company records of water mains and connections;
- National Well Record Archive (British Geological Survey).

Lessons learnt from the application of the above methods in various regions are presented so that the collective experience of the Agency can be shared and used to help guide future initiatives in this field.

The above methods may be used in conjunction with, or independent to, the establishment of new local registers of licence-exempt sources (nominally <20m^3/d). For those parts of the country that adopt the new registration scheme, it is proposed (DETR 1999) that only those sources that voluntarily appear on the local register will be afforded protection from derogation. However, this report finds that the Agency will under some circumstances still need to have regard to SLEGS where they may be at risk from pollution. Furthermore, the

Agency's 'Policy and Practice for the Protection of Groundwater' aims to protect (from pollution) all potable groundwater sources, many of which are SLEGS. Beyond legal requirements and the needs of established policy, there may also be considerable additional benefit to the Agency and BGS from identifying SLEGS. This is due to their potential to yield valuable information about groundwater quality, yield capability and groundwater levels, all of which contribute to the effective management and protection of groundwater. As a consequence, even in areas that establish a registration scheme, methods of identifying SLEGS (beyond voluntary registration) are still likely to be required.

In general the study has found that the single most practical means of identifying the majority of SLEGS is by access to Environmental Health Department (EHD) records of private supplies. When EHD records are used in combination with other, complementary methods, Agency experience shows that reasonably accurate listings of SLEGS can be produced. This report presents guidance for the selection of the most appropriate combination of methods to meet local needs. In all cases, care must be taken to ensure that the Agency is compliant with the current data protection law (as recently updated).

As part of this study, new, tentative estimates of the number of SLEGS in England and Wales are derived. These figures are compared with an estimate of private water supplies (as opposed to sources) from a previous, unpublished study.

A number of recommendations are presented that are designed to regularise the Agency's approach towards SLEGS and to improve future access to information. Most notably, the Agency regards access to EHD records as a principal requirement to enable it to carry out its legal duties, whilst improvements in the numbers of well logs reported by drilling companies to BGS, would probably be the best means of enhancing the National Well Record Archive.

KEY WORDS:

Small sources, wells, boreholes, springs, licensing, groundwater protection, source protection.

GLOSSARY

DETR	DEPARTMENT OF ENVIRONMENT, TRANSPORT AND REGIONS
EHD	ENVIRONMENTAL HEALTH DEPARTMENT
EHO	ENVIRONMENTAL HEALTH OFFICER
SLEGS	SMALL LICENCE-EXEMPT GROUNDWATER SOURCES
NATIONAL WELL RECORD ARCHIVE	GEOLOGICALLY CLASSIFIED RECORDS OF WELLS, BOREHOLES AND SPRINGS WITHIN ENGLAND AND WALES
MAFF	MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

1. INTRODUCTION

1.1 Background

The role and significance of small private water supplies in England and Wales is poorly documented and generally underestimated. Returns to a 1994 Department of the Environment questionnaire suggested that countrywide these supplies, which are principally groundwater derived from dug wells, boreholes and springs, are the sole or principal source of water supply for an estimated 325,000 people.

As the majority of these supplies are unlicensed, they have traditionally been the concern of the Environmental Health Departments (EHDs) of the District Councils and Metropolitan Boroughs of England and Wales. EHDs are concerned primarily with the public health aspects of such supplies and their remit does not extend to the wider considerations of water policy, which is the province of the Environment Agency. Additionally, EHDs are concerned only with the quality of water at the point of delivery to a household and generally have only a secondary interest in the source of the supply (i.e. the borehole, well or spring). Indeed, one source might supply several households but this will not necessarily be known to the EHD or even, in some cases, to the householders themselves.

Because the majority of water sources providing these supplies are exempt from licensing (either by virtue of their small size and purpose of supply or because they are in licence-exempt areas), the Environment Agency has very little factual information on which to base its own operational and policy decisions or its advice to Government on a range of national or EC Directive-related issues.

The British Geological Survey (BGS) has responsibility for maintaining the National Well Record Archive, a unique store of fundamental hydrogeological information consisting of more than 100,000 geologically classified records of wells, boreholes and springs within England and Wales. This major archive relies largely upon the drilling industry to supply new data, there being a statutory obligation to provide BGS with information on wells and boreholes of 15 metres or more in depth. In the past BGS has carried out some well-siting surveys to augment coverage of the National Well Record Archive for a few selected geological map sheets. However, there remains a recognised lack of data on dug wells and shallow boreholes. This deficit has been highlighted by the current co-funded Environment Agency/BGS minor aquifer physical properties programme which has revealed a significant number of aquifers which are quite productive and in daily use but are practically undocumented in terms of yield potential.

This study was co-funded equally by the British Geological Survey and the Environment Agency with the objective of evaluating the various ways that the Agency can identify SLEGS to suit its current and anticipated requirements (with respect to the DETR Abstraction licence review, the Groundwater Regulations and the proposed Water Framework Directive). In brief, these requirements which are discussed below are related to water resource management, the protection of sources from pollution and protection from derogation by other groundwater abstractions or local developments, all of which rely upon the identification of private water sources. This report deals with groundwater sources only, which are the joint domain of the BGS and the Agency, and if taken to include springs probably represent the vast majority of small, licence-exempt sources. The BGS has supported this study as part of its on-going programme to improve understanding of the scope and limitations of the historical data within the National Well Record Archive, and to identify ways of improving coverage.

The recent review of the water abstraction licensing system in England & Wales (DETR 1999) includes proposals that in future would allow the Agency to apply for an Order to establish a formal, local register of small licence-exempt water sources (nominally <20m^3/day) for a defined area. For those areas that remain without an Order, the Agency will continue to make alternative arrangements for identifying small, licence-exempt sources in order carry out its duties. The Draft Water Framework Directive has a similar requirement for the identification of groundwater utilisation in order to help define 'groundwater bodies', and both the Groundwater Regulations 1998 and the Environmental Protection Act 1990 (Part IIA) contain specific requirements for the consideration of threat of pollution to individual water sources.

Hence there exists a clear requirement for, and mounting pressure to, address this gap in the Agency's knowledge. At present the Agency generally fulfils its obligation to protect small unlicensed sources by carrying out 'ad hoc' surveys (water feature surveys) in response to specific development proposals (proposed new abstractions or civil works). Some Agency Regions have also established local listings of unlicensed groundwater sources, having first identified these sources by a variety of means. Therefore there already exists within the Agency considerable knowledge of the possibilities and practical constraints of establishing records of unlicensed sources by various means. Methods currently employed to identify licence-exempt supplies or sources include: the identification of properties that are not served by a water company; reference to the National Well Record Archive and use of Environmental Health Department (EHD) Records of private supplies.

1.2 Project objectives

The overall aim of the project was to review the ways in which the Agency currently identifies SLEGS, and from this body of experience to highlight the lessons learnt from these various initiatives, the pit-falls, level of effort involved and the effectiveness of the various methods. The methods identified in this study can either be used in conjunction with a registration exercise as set out in the DETR review of abstraction licensing (DETR 1999), or in the absence of a local register as is currently the case. Consideration is given to how these methods can best be employed to meet the present and future requirements under the new abstraction licensing system described in the DETR review. A recommended approach is presented that should aid future initiatives in this field.

The projects specific objectives, as defined in the Project Memorandum were as follows:

1. To produce a summary of the legal background to and the current approaches used by the various Regions of the Agency to identify small, unlicensed, groundwater sources. To explore the implications to the Agency of the proposed changes in abstraction licensing and the registration of unlicensed sources (DETR Review of Abstraction Licensing and the proposed Water Framework Directive). The summary of the legal background will include the role and duties of Local Authority Environmental Health Departments in England & Wales and the Agency's rights of access to the records compiled by these Departments.

2. To identify and evaluate the various means of identifying small, licence-exempt sources in order to determine which approach will best satisfy the Agency's requirements with respect to water resource management and the protection of small groundwater sources from derogation or pollution. Specific consideration will need to be given to the proposed changes to the abstraction licensing system which will allow formal registers to be established of all groundwater sources that abstract less than 20m^3/d (DETR review of the abstraction licensing system). The evaluation will involve small scale testing of the feasibility and limitations of each approach. The

evaluation will be presented in a clear framework within which the relative feasibility, advantages and limitations of each approach are addressed. The evaluation will thus aid the future selection of the best way forward for the Agency to fulfil its duties and will provide an audit trial for that selection.

3. A further objective of transferring the 1994 DoE survey data of private water supplies from SPANS-GIS to ARCVIEW-GIS has been amended to a recommendation for further work, to be carried out by the Agency when resources permit this work to proceed. This is essentially a 'tidying up' exercise from earlier work undertaken by the Agency, the output from which is featured in this report.

2. LEGAL BACKGROUND

This section sets out the legal background to:

- Current and proposed definitions of SLEGS. (Section 2.1)
- The legal duty of the Agency to identify and protect SLEGS from derogation and pollution, and the duty of local authorities to identify and sample private supplies. (Section 2.2)
- Rights of access to and use of data on SLEGS. (Section 2.3)

Section 2.4 presents a concise summary and discussion of the legal background to the identification and protection of SLEGS.

2.1 The defining of Small Licence-Exempt Sources

(i) Water Resources Acts 1963 & 1991 and the Environment Act 1995

The present system for authorising abstractions originated in the Water Resources Act 1963. This Act laid the foundation for modern water resources management and superseded the previous system which involved riparian rights for surface water, general freedom to abstract groundwater with selected licensing in some areas, and intervention by Parliament to alter these rights where it considered it necessary.

The 1963 Act came into force in 1965 and made provision for granting of Licences of Right in circumstances where abstractors were already entitled to abstract under a statutory provision or where they had abstracted from a source of supply during the previous five years. There have been a number of modifications to the 1963 Act but these legislative changes have not fundamentally altered the structure of the original Act. The number of Licences of Right decreased significantly when abstraction charging was introduced in 1969. The Water Resources Act of 1991 consolidated amendments to the legislation up to that date and the Environment Act 1995 incorporated further amendments to the 1991 Act.

Under the current legislation certain types of abstractions (both surface and groundwater) can take place without a licence; for Agency staff, details are given in Volume 020A of the Environment Agency's Licensing Manual. For groundwater the exemptions are as follows:

1 Abstractions from underground strata for the abstractor's domestic purposes only, of not more than $20m^3$/day.
2 With the Environment Agency's consent, abstraction for groundwater investigation.
3 Abstractions for dewatering.
4 Abstractions for fire fighting.
5 Abstractions for irrigation other than spray irrigation.
6 Areas of England and Wales which have been exempted by Statutory Instrument and where sources of supply exempted from control by order by the Secretary of State under s.33 of the Water Resources Act 1963.

Groundwater abstractions within the categories of exemptions 2, 3, and 4 are all temporary in nature and not relevant to this study, whilst categories 1 and 6 above may contain SLEGS that are defined by the existing legislation.

The areas of England and Wales that have been exempted by Statutory Instruments and where identified (as far as was possible) by a survey carried out as part of this study are summarised in Section 3.2, Findings of Agency Survey.

According to the Agency's licensing manual, it is the responsibility of the person relying on the exemption from licensing to prove that the abstraction meets the exemption criteria; the default position is for a licence to be required.

(ii) The Review of Water Abstraction Licensing System in England and Wales (DETR 1999)

The DETR consultation document suggested that the current situation (March 2000) (as described above) is unsatisfactory on two counts. Firstly that there are no water resources management reasons for some users below the threshold to have a licence whilst others do not, and secondly that a single threshold applying nationally does not reflect the varying availability of water in different parts of the country.

It proposed that a more pragmatic alternative would be to set a normal threshold for all purposes, thus simplifying the definition of SLEGS in England and Wales. However, in order to ensure that the Agency is able to protect the environment adequately, it was proposed to allow local variation in the exemption threshold appropriate to the water resources position. The exemption will normally only be available once to any occupier of land (or with rights of access) at the point of abstraction to avoid aggregation of different abstraction points. However, for domestic use there will be no land occupation restriction.

Thus the current DETR proposal (DETR 1999) is to retain the current threshold of $20m^3$/day, but apply it to all uses, with local variation allowed depending on pressure on the resources. Thus SLEGS will be re-defined under this proposal and many small, licensed, groundwater abstractions will no longer require abstraction licences under the proposed system. Furthermore, if the DETR 'threshold proposal' is implemented, the Agency would be given powers to apply for an Order to establish local registers of small, licence-exempt sources which could then receive appropriate protection from derogation by other abstractors. Unregistered sources will not be afforded this protection.

2.2 Duty to identify and protect groundwater sources

The duty of the Agency to identify and protect SLEGS from derogation and pollution arises from a range of legislation. Most notably, the Water Resources Act 1991, the Groundwater Regulations 1998 and the Environmental Protection Act 1990. Also of significance to the Agency are the proposals arising from the review of the water abstraction licensing system in England & Wales (DETR 1999) and the proposed Water Framework Directive. (In addition, the Agency's current 'Policy and Practice for the Protection of Groundwater' aims to protect all potable sources of groundwater, many of which are SLEGS.

Also relevant to this project, Local Authorities have a duty to identify and sample private water supplies under the Water Industry Act 1991 and the Private Water Supply Regulations 1991. A summary of salient points are presented below:

(i) The Water Resources Act 1991 (abstraction issues)

All licence-exempt abstractions must be protected from derogation in accordance with Sections 39(3), 27(6), and 48(1) of the Water Resources Act 1991.

(ii) The Groundwater Regulations (1998)

The Groundwater Regulations deal exclusively with quality rather than quantity issues and may be a significant driver for the identification of SLEGS. For example, under Regulation 9, Terms of authorisation of discharge of substances in list I or II Regulation 2(c) states:

"In a case where this regulation applies the authorisation shall specify in particular the essential precautions which must be taken, paying particular attention to the nature and concentration of any substance in LIST I or II present in the effluent, the characteristics of the receiving environment and the proximity of water catchment areas, in particular those for ***drinking, thermal and mineral water;"***

Clearly it would not be possible to take into account a drinking water catchment area of a small, unlicensed source if the regulator did not know the location of that source.

Similar regard must be paid to the presence of SLEGS with respect to Regulation 2 (1) part (b) which sets out the Exclusions from the Groundwater Regulations:

*"**Nothing in the Regulations shall apply in relation to-***
(a)....
(b) any discharge of domestic effluent from an isolated dwelling which is not connected to a sewerage system and which is situated outside any area protected for the abstraction of water for human consumption;"

Draft DETR guidance on this item to the Agency indicates that the Agency has determined that the protected area should be taken to be the Zone 1 protection area for the domestic source, which is commonly a SLEGS.

Similarly, regard must be paid to SLEGS under the Regulation's measures to prevent the introduction of list I substances, Regulation 4, which states:

"4. (1) An authorisation shall not be granted if it would permit the direct discharge of any substance in list 1.
4. (5) However, a discharge of any substance in list 1 into groundwater may be authorised after prior investigation if:-

(a) the investigation reveals that the groundwater is permanently unsuitable for other uses (especially domestic or agricultural uses), presence of that substance does not impede exploitation of groundwater resources and conditions are imposed which require that all technical precautions are observed to prevent that substance from reaching other aquatic systems or harming other ecosystems..."

Thus the presence of SLEGS might be useful in determining whether or not the groundwater is unsuitable for domestic or agricultural uses and hence the acceptability of discharging list 1 substances into the groundwater. It should also be noted that similar considerations apply to the Waste Management Licensing Regulations (1994).

The Groundwater Regulations however, merely augment existing legislation in the form of the Water Resources Act 1991 and only deal with List I & List II substances (defined under the EC

Groundwater Directive). Although the Water Resources Act 1991 does not specifically cite sources of supply for special consideration it does seek to protect 'controlled waters' from pollution, and in practice surveys may be carried out to identify SLEGS that may be considered at risk from pollution.

(iii) Environmental Protection Act 1990

Part IIA of the Act introduced from 1 April 2000 a new regime for the identification and remediation of contaminated land. Land which is subject to contamination may be classified as Contaminated Land if it poses a significant risk of significant harm or pollution of controlled waters, as defined by the Act. Certain Contaminated Land may further be classified as a Special Site on the basis of the seriousness of pollution of controlled waters.

One criterion for classification of special sites relates to pollution of water abstracted for potable supply. The Contaminated Land (England) Regulations 2000, Regulation 3(a) state that contaminated land shall be designated a special site if:

> *"Controlled waters which are, or are intended to be, used for the supply of drinking water for human consumption are being affected by the land and, as a result, require a treatment process or a change in such a treatment process to be applied to those waters before use, so as to be regarded as wholesome within the meaning of Part III of the Water Industry Act 1991 (water supply)"*

In order to designate a Special Site on this basis, it is essential that the Local Authorities and the Agency are aware of the pressures of both licensed potable abstraction and sources that are exempt from licensing, but are nevertheless used for potable supply.

(iv) The DETR review of the abstraction licensing system (DETR 1999).

Where the Agency is granted an Order from the Secretary of State to establish a local register of small, exempt abstractions, it is proposed that the Agency will have a duty to protect (from derogation by other abstractions) only those abstractions that appear on the register. In those areas where the Agency does not establish a local register, the Agency will retain the duty to protect the rights of all licence-exempt abstractions. Transitional procedures will be put in place for those entering or leaving the Register due to future changes in the local volume threshold for authorisations.

(v) The Private Water Supply Regulations 1991

The Private Water Supply Regulations 1991 define 'private water supplies' as any supplies of water provided otherwise than by a statutorily appointed water utility. Thus the sources that provide the supply may include licensed as well as unlicensed sources (depending upon the type of source (well, borehole, spring or stream), the volume abstracted, and for what purpose the water is used). As noted in the introduction, small private water supplies have traditionally been the concern of Environmental Health Departments of England and Wales, the point of contact being the local Environmental Health Officers (EHOs).

Private water supplies are tested by local authorities under the Private Water Supplies Regulations, 1991. Among other things these rules set out how often samples must be collected from private water supplies and what tests must be carried out.

Under section 77 of the Water Industry Act 1991, local authorities have to check the quality of all water supplies in their areas. Water companies test their water supply regularly to check that it meets the quality standards. Information about the results of these tests is given to local authorities and is available on public registers kept by water companies. Hence, local authorities usually only do very limited testing of public water supplies. Private water supplies are tested by local authorities under the controls provided by the Private Water Supplies Regulations 1991. This clearly involves the local authority in identifying the locations of private supplies.

The Private Water Supply Regulations 1991 categorise private water supplies according to use and classify them according to size as shown in Table 2.1; the frequency of sampling and testing of any given supply by EHDs is dependant upon its category and class. However, it is important to emphasise that these are supplies at point of delivery (the tap) and not the supplies at source (the well, borehole, spring or stream) and it is possible that one source will provide several points of supply at some distance from the source. Conversely, in some cases, several sources can jointly constitute a single supply. This is an important point for this study where identification of individual sources and not individual users /supplies is the objective.

Table 2.1 Classes of private supplies.

SUPPLY CATEGORIES

Category one supplies

Class	*Number of people normally served by the supply*	*Cubic metres of water used from the supply each day*
A	More than 5000	More than 1000
B	501 – 5000	101 – 1000
C	101 – 500	21 – 100
D	25 – 100	5 – 20
E	Less than 25 (except supplies in F)	Less than 5
F	People living in a single dwelling	

Category two supplies

Class	*Cubic metres of water used from the supply each day*
1	More than 1,000
2	101 – 1000
3	21 – 100
4	2 – 20
5	Less than 2

Category one supplies are those only used for drinking, washing and cooking by people who live in the properties supplied. Category two supplies are those used to make food or drink that will be sold, or used in properties which provide accommodation on a commercial basis.

It is therefore apparent that the definition of private supplies differs significantly from the current definition of SLEGS. As such Local Authorities' records of private supplies can only assist in the identification of SLEGS. This will remain so even when the $20m^3/d$ licensing threshold is established re-defining SLEGS to closer approximate with DETR supply classes that share the same threshold of $20m^3/d$ i.e. single source supplies in category one, class D, E, & F and category two, class 4 & 5. Nevertheless, access to the EHD records is very important to the Agency as a starting point to identify SLEGS, with the former providing a ready means of identifying the latter.

(vi) The European Union's Water Framework Directive proposal

Under proposals for the Water Framework Directive, Member States will be required to identify all bodies of water used for the abstraction of water intended for human consumption providing more than $10m^3$/day as an average or serving more than 50 persons.

2.3 Rights of access to and use of data on small, licence-exempt, groundwater sources

The Agency can request information directly or from third parties either via its statutory powers or via the Environmental Information Regulations 1992. Both of these are subject to various restrictions. Moreover there are further restrictions imposed by the Data Protection Acts1984 & 1998. Key points from the legislation are presented below.

(i) Environmental Information Regulations 1992 as amended by Environmental Information Regulations 1998.

These Regulations apply to any information which relate to the environment and is held by a relevant person in an accessible form. Information regarding private water supplies and their state would come within this definition. Local authorities are relevant persons for the purposes of the Regulations. Relevant persons are obliged to make information available to every person who requests it. The exceptions to the provision of information are contained in Regulation 4(3) which states that information must be treated as confidential if:

(a) ....
(b) It is personal information contained in records held in relation to an individual who has not consented to its disclosure:
(c) It is information which is held by a relevant person in consequence of having been supplied by a person who was not under, and could not have been under any legal obligation to supply it to the relevant person, did not supply it in circumstances such that the relevant person is entitled apart from the Regulations to disclose it and has not consented to its disclosure.

The Regulations therefore exempt the disclosure of personal information without the consent of the individual. Personal information would include the name and address of the private water supply but not descriptions of the source or supply. If the private water supplier provides information to the local authority, the local authority can only disclose it to the Agency if the owners of the private water supplies have consented to the disclosure.

If a company is involved in providing private supplies then Regulation 4(3) will prevent disclosure unless there is consent. Since there are no public register requirements with regard to private water supplies, there is no statutory requirement to make these details public therefore the Agency has to rely on the Environmental Information Regulations and in the case of personal information on the consent of the individual.

(ii) The Data Protection Acts 1984 & 1998

The new Data Protection Act of 1998 restricts further the disclosure of personal information without the knowledge and consent of the individual concerned. It therefore follows that local authorities should obtain the consent of individuals before releasing data on private supplies where those records might incorporate personal information. Similarly, the Agency would need to contact the owners of private supplies and obtain their consent for using information (including personal information) on their water supplies in order to ensure compliance with data protection law. The Agency would need the consent of the individual before releasing data obtained from local authorities on that individual but could use that information for internal purposes only.

There are therefore limited circumstances in which the Agency can obtain information about private water supplies. Should the Agency or BGS require improved access rights to such information, new specific powers to require this information would be needed, for example in the new legislation arising out of the DETR licensing review.

Transfer of information between the local authorities, the Agency and BGS could then be carried out in accordance with a future Memoranda of Understanding between local authorities and the Agency and between BGS and the Agency.

2.4 Summary and discussion

- The result of the government's review of the abstraction licensing system (DETR 1999) will simplify the definition of SLEGS, establishing a normal threshold of $20m^3/d$ for all abstractions above which an abstraction licence will be required. In future the Agency will be able to apply for Orders to set up local registration schemes for sources yielding $<20m^3/d$.

- The Agency has a legal duty under a range of legislation to protect SLEGS from derogation by other abstractors, and in some circumstances needs to be able to identify sources that may be at risk from pollution. (In addition to the Agency's duties to protect groundwater 'per-se'.) Local Authorities have complementary duties, monitoring the quality of water supplies of a consumptive nature. Both organisations must therefore be able to identify small sources and supplies respectively in order to perform their duties.

- In areas where local registration schemes are to be established it is proposed that sources that are not on the register will no longer be afforded protection from derogation by other abstractors. However, this would not diminish the Agency's responsibilities with respect to the need to be able to identify sources at risk from pollution. It therefore follows that some means of identifying SLEGS that are not on the register would still be required.

- It is anticipated that there will be a need under the Water Framework Directive to identify SLEGS in order for the Agency to be able to identify all bodies of groundwater used for the abstraction of water for human consumption.

- The Agency can request information (about private supplies or SLEGS) directly or from third parties via its statutory powers or via the Environmental Information Regulations 1992. Both of these are subject to various restrictions. Moreover there are further restrictions imposed by the Data Protection Acts 1984 & 1998. In the case of EHD records of private supplies that contain personal information (e.g. name or address of household supplied) the Agency must ensure that it

has the expressed permission of the person served by the supply prior to accessing the record. Gaining the required approval is likely to be a major factor governing the effectiveness of any scheme that seeks to produce listings of these sources. New powers would be required to significantly improve access to this important data.

3. EXISTING ENVIRONMENT AGENCY PRACTICES AND VIEWS

3.1 Agency survey

A major component of this project was a survey of Agency practices and ideas with respect to the identification and protection of SLEGS. The main aims of the survey were to determine how the Agency currently identifies these sources and to draw out ideas that might benefit future initiatives in this field.

Each Region of the Agency and Environment Agency Wales was invited to participate in the survey. A questionnaire was used to help ensure consistency of approach and for ease of collating and analysing responses. The method of survey included consultation meetings, telephone interviews and the dissemination and return of the questionnaire by E-mail and post. The survey was carried out by the National Groundwater and Contaminated Land Centre (NGWCLC) between September 1998 and February 1999 during which time 18 completed questionnaires were received. Many of the questionnaires incorporated responses from two or more Agency staff. The response to the survey was very good, with all Regions of the Agency and Environment Agency Wales providing a large amount of information and contributing valuable ideas to the project. Responses were received from water resources, abstraction licensing and water quality staff.

The questions posed in the questionnaire can be summarised as follows:

1. *When/why would you seek to identify the occurrence of small unlicensed sources?*
2. *How do you identify their occurrence?*
3. *Do you have any licence-exempt areas in your Region/Area?*
4. *Please give your views on how a register of unlicensed sources could be established?*
5. *Do you have an estimate of the total number of private (unlicensed) sources in your Area/Region?*

A summary of the findings of the survey is presented in Sections 3.2 Findings of Agency Survey. For quick reference the reader is referred to Table 3.1 and Table 3.2 for a summary of approaches to identifying SLEGS as identified by the survey. A full record of responses is contained within the Project Record for this project. The contributions of everyone who took part in the Agency survey are gratefully acknowledged.

3.2 Findings of Agency survey

The following is a summary of the responses to the questions posed in the survey questionnaire and key points from discussions around the issues raised.

(1) When/why would you seek to identify the occurrence of small unlicensed sources?

Agency staff identified a wide range of circumstances that would require them to seek information about the existence of SLEGS, for example in response to a proposed landfill site or proposed new groundwater abstraction. However, all of these circumstances can be placed within one or more of the following categories:

1. To protect SLEGS from derogation by proposed water abstractions or from developments such as excavations, de-watering and other potentially disruptive engineering activities.

- To protect SLEGS from contamination from potentially polluting activities such as effluent from soakaways and landfills, and leakage from storage of contaminating substances.
- Some Agency staff also considered that these sources should be accounted in their water resources assessment calculations to achieve more accurate assessments.

In addition, it was generally recognised that the adoption of a common (variable) licensing threshold of $20m^3/d$ and the power to establish a register of licence-exempt sources, as proposed under the DETR Abstraction licence review, would likely prompt a review of the Agency's current practices. It was broadly acknowledged that this document should prove useful as it explores the various means by which SLEGS can be identified and sets out a framework to assist this process.

(2) How do you identify their occurrence?

The Agency survey revealed several different ways of identifying SLEGS currently used by the Agency. The overall approach was found to vary significantly between, and sometimes within, Regions and the Environment Agency Wales. A summary of the approaches currently used within each Region and Area (where identified as different) is presented in Table 3.1, 'Current means of identifying Small Licence-Exempt Groundwater Sources'.

Table 3.1 Current means of identifying Small Licence-exempt Groundwater Sources

Region	Area	Means of identifying Small Licence-Exempt Groundwater Sources
North West	Across Region	EHD records sought for entire Region, followed up with mailshots with maps and questions to occupants seeking info. on nature of sources. On-going exchange of records on boreholes & groundwater sources between Agency & BGS. Ad hoc water feature surveys as necessary to supplement the above.
South West	Old Devon & Cornwall Area	From 1990 to 1998 Water Co. and Postal records used to identify properties dependant upon private supplies. Supplemented, where necessary, by ad-hoc water feature surveys and requests to BGS & EHD for additional site specific data. For Licence Excluded Areas early correspondence files and records are also used as indicators.
	Old Wessex Region Area	Listings from EHDs for several districts – not comprehensive and now redundant system. Now use ad hoc water feature surveys & site specific requests to EHDs.
Thames	Across Region	Private sources are included on maps (in all Area offices) based on the Region's card system built up largely from Nat. Well Archive records & supplemented by listings from EHDs. Some 'supply records' have benefited from investigations related to the Region's water quality monitoring network. Water feature surveys are used in many cases.
Midlands	Lower Trent Area	Listings from EHDs
	Upper Severn Trent	Ad hoc water feature surveys, EHD listings, Nat. Well Archive records, Water Co. records, Market research, Media appeals
	Lower Severn Area	Ad hoc water feature surveys are used as necessary
Southern	Across Region	Annual updates of EHD records (records kept on data-base). Ad-hoc water feature surveys are used as necessary
North East	Northumbrian Area	NWAA 1981 established area exempt and a voluntary public register. Ad-hoc water feature surveys are routinely used for sect. 32 consents.
	Dales Area	Ad-hoc Water Feature Surveys plus original exempt declarations of 1963-5.
	Ridings	Ad-hoc Water Feature Surveys plus original exempt declarations of 1963-5 plus EHD listings for E.Yorks Chalk.
Anglian	Northern	Existing records and EHD listings, supplemented, where necessary, by ad-hoc water feature surveys.
	Central	EHD listings, drillers' records, Nat. Well Archive and ad-hoc water feature surveys as necessary.
	Eastern	Ad-hoc water feature surveys are routinely used, Nat. Well Archive, old well surveys, EHD records, old OS maps and contamination incidents.
Environment Agency Wales	Across Region	Ad-hoc water feature surveys and site specific requests to EHDs are routinely used to identify private supplies or sources.

Table 3.2 Summary of current approaches

	Ad-hoc 'water feature' Surveys	EHD Records	Nat.Well Record Archive (BGS)	Water Company Records	Statutory Voluntary Register	Other
North West	✓	✓	✓			*Postal surveys used as follow up toEHD responses*
South West	✓	✓	✓	✓*		
Thames	✓	✓	✓			
Midlands	✓	✓	✓	✓		*Market research and media appeals for information*
Southern	✓	✓				
North East	✓	✓			✓+	
Anglian	✓	✓				*Old OS maps and groundwater contamination incidents*
Env. Agency Wales	✓	✓				

✓* Use of water company records ceased in 1998.
✓+ Northumbrian Water Authority Act 1981 established a voluntary registration scheme for licence-exempt area

Note 1: This table does not differentiate between small and large-scale use of any one source of information. Nor is the method necessarily in use across the whole Region.
Note 2: For further details refer to Table 3.1.
Although the overall approach (i.e. combination of methods) differs across England & Wales, each Region nevertheless relies to varying degrees upon one or more of the five main sources of information (although this information is often supplemented by a variety of less significant sources of information).

The five main sources of information that have been identified are as follows:

(i) Ad-hoc water feature surveys

(ii) Use of local authority environmental health records of private supplies (EHD records)

(iii) National Well Record Archive Records (maintained by the British Geological Survey)

(iv) Water company records of properties supplied by mains water, and reference to postal records to deduce by difference those served by a private supply.

(v) A voluntary public register was established by the Northumbrian Water Authority Act of 1981. The register was populated by abstractors voluntarily registering details of their abstractions. The registration scheme was promoted in the local press.

Other sources of information used to augment the above but considered to be less significant with respect to current practice due to their limited application are:

- Advertisement/public campaigns for information;
- Field surveys carried out for research projects;
- Market research surveys/postal surveys;
- Historic archive material including: War pamphlets, 1965 abstraction notifications, and a variety of miscellaneous local historic records compiled for a variety of purposes.

The different uses of the various sources of information are illustrated in summary form in Table 3.2, 'Summary of current approaches'.

Tables 3.1 and 3.2 reveal that the use of ad-hoc water feature surveys is common to all Regions, and that reference to EHD records and the National Well Record Archive respectively are the next most commonly used sources of information.

Only in part of the South West Region (Old Devon & Cornwall Area) and Midlands Region (Upper Severn Trent) were water company records used to help identify private supplies, although this practice has recently ceased in South West Region. The (NE Region) Northumbrian Area alone has an existing register of licence-exempt sources as established by statutory instrument (Northumbrian Water Authority Act, 1981), although this is only a voluntary registration scheme. Midlands Region, Upper Severn Trent Area is the only Area to report the use of media appeals and market

research surveys to identify the existence of SLEGS. This is understood to be a relatively recent innovation applied to a licence-exempt area.

Box 3.1
North West Region. Summary of findings of Agency survey

The NW Region has many thousands of small-unlicensed sources in upland areas remote from the public supply mains system. The importance of identifying all private supplies to enable their protection has long been recognised. The fundamental difficulty is locating and classifying these small sources.

The majority of these upland domestic sources are springs – which in the NW Region were previously regarded as surface sources and therefore exempt from licensing.

It was felt that the only way of identifying all classes of sources was to carry out a comprehensive water features survey.

NW Region's approach adopted between 1989 and 1992 was as follows:

All EHDs in the Region were contacted, to establish the form and availability of information they held. This coincided with the EHDs being required to establish registers to conform with the Private Water Supply Regulations 1991. Not all EHDs were willing or able to provide information; due to sensitivity over access to data and lack of resources to respond to the then NRA's request for information. Certain EHD's held excellent records of individual source locations, albeit often in paper form which was not easily accessible. Others only had addresses of properties served by private supplies. Where necessary NRA staff visited EHD offices to discuss and collect source/supply details. For those EHDs that were most helpful, maximum information and understanding was gained by spending a significant amount of time in the respective offices of the EHDs'.

For those EHDs where only names/addresses of properties served where available, the NRA sent out a questionnaire (and map) to the property served with a prepaid envelope to reply. The questionnaire was designed to gather information about the source of supply to the property. The data was requested on the understanding that it would be used by the then NRA for the specific purpose of ensuring its future protection. The return rate for the questionnaire was approximately 30%. Of those returning information many people did not know the exact location of the source of their water supply. In addition there was some confusion about what constituted a spring or groundwater source. It was felt that many people did not provide information about the source of their water for fear of it being condemned, that they would require a licence and/or be charged.

It was estimated that the exercise took approximately 2 man years and to date (July 1998) has resulted in 1285 records of private water sources. It is estimated that approximately 9000 further small unlicensed sources exist in the Region for which the Environment Agency has no record. Whilst contacts with EHDs are being maintained, given the degree of effort expended and limited success of this initiative, NW have no plans to repeat the postal survey at this stage. (No aquifer properties were collected, nor is it felt would have been available via this route).

NW updated its 'white card' information system with the details of these unlicensed sources gathered during the exercise. The white card system contains information on all licensed and unlicensed sources for which the Environment Agency has information. This includes information on site investigation boreholes and those that have been tested as a source of water, but not necessarily

brought into supply. All information on the Region's 'white card' system has been passed to BGS Wallingford; this includes information on unlicensed springs. The Environment Agency-NW has established a database listing the sites on the white card system. This is used to search for sites of concern e.g. in response to a planning application involving a septic tank, in conjunction with other databases to check for private water supplies when responding to statutory consultations and groundwater protection issues.

(3) Do you have any licence-exempt areas in your Region/Area?

A number of Regions and the Environment Agency Wales, contain areas within their administrative boundaries that are currently exempt from various forms of abstraction licensing. These areas were established by various Acts of Parliament over the last 100 years. The nature of the licence-exemptions vary considerably between these areas. This project however relates only to groundwater sources, for which there are considerably fewer exemption areas.

The survey revealed the following Regions as currently having licence-exempt areas with respect to groundwater sources as established by various statutory instruments (Table 3.3).

Under the proposed changes to the abstraction licensing system (DETR 1999) the various Acts establishing licence-exempt areas will be repealed and those areas will be subject to the same rules as the rest of England & Wales with respect to abstraction licensing and registration. (Section 2)

Table 3.3 Licence-exempt areas for groundwater sources

Region	Area containing some form of licence-exemptions for groundwater abstractions	Statutory Instrument
North West	Cheshire Brine-fields (specifically extraction of brine)	Cheshire Brine-field Exemption Order
North East	Environment Agency – Northumbrian Area and the Tees catchment in the Dales Area	- Northumbrian Water Authority Act 1981
South West	Not identified by this study	- Devon River Authority (Exemptions from Control) Order 1970 - The Somerset River Authority (Exemptions from Control) Order 1970
Midlands	Much of Mid Wales & S Shropshire, part of Herefordshire and Worcestershire	- Severn River Authority (Exemptions from Control) Order 1967 No. 1971
Environment Agency Wales	All exempt from groundwater abstractions with the exception of areas of specific geology.	Not identified by this study

The above represents the findings of the Agency Survey only, and as such it is possible that other licence-exempt areas with respect to groundwater sources may exist but have not been identified by the survey. Additional research as part of this project has revealed that the Agency does not centrally hold a definitive listing of Areas exempt from abstraction licensing. As a consequence it has not been possible, within the scope and time scale of this project to verify the completeness of the above listing.

Box 3.2.
North East Region - Northumbrian Area. Summary of findings of Agency survey

The Northumbrian Water Authority Act 1981 exempted all abstractions from licensing that are less than 1 million gallons per year (4,546m3/year) with a maximum of 50,000 gallons per day (227m3/day). The Act required that a public register of exempt abstractions be kept for newly exempted abstractions under the NWA Act and other exempt abstractions under the Water Resources Act 1963.

When seeking to locate small licence-exempt sources the register is the first point of reference. However because it is not compulsory to register abstractions under the NW Act 1991, the register is thought to only include a proportion of the abstractions exempt under the Water Resources Act 1963 and 1991. Furthermore, there is no mechanism to keep the register up to date.

Local Authority (Environmental Health) records are not used because they only relate to the supply as opposed to the source and do not cover non-potable protected sources.

As a consequence, the Agency generally relies on ad-hoc water feature surveys as the most reliable means of identifying these sources, the results of which are partly dependant upon the quality of the survey.

It is estimated that there are approximately 10,000 protected sources, mostly springs within the licence-exempt area. Of these about 3000 are believed to be potable supplies and the remainder mostly agricultural.

It is felt that if a national, public register is to be established, no protection should be provided unless the abstraction is registered with the Agency. A mechanism for periodically updating the records will be required.

(4) Please give your views on how a register of unlicensed sources could be established

Views on how small licence-exempt sources can best be identified (and records maintained) under the proposed registration system (DETR 1999) are presented below in summary in Table 3.4 and the accompanying discussion:

Table 3.4. Ideas on establishing a register of unlicensed sources - summary

Agency Region	Comments and suggestions
North West	If a formal register, it would be logical to require source owners to register and not to use existing records. Difficult to ensure comprehensive take up. Once established, could require drillers to notify Agency of all new boreholes drilled. Major problem with on-going maintenance – should be linked to property purchase. Could mailshot all properties with Local Authority Council Tax demands or electoral role.
South West	Registers should be nationally consistent. Recommend linking registers with Land Registry system – will help keep records up to date. Law Society should make the identification of water sources a requirement of the Search process when purchasing a property. Electoral role could be used as a means of contacting people and encouraging registration or at least use Local Authority mailing lists. Free transfer of info with the Agency would be required. Must have mechanism to keep record up to date. Option of assuming that all properties have private supplies and then de-populate would be a preferred approach. Register should only be used as a scoping tool. Ad hoc water feature surveys will still be required.
Thames	EHDs have obtained information from advertising free water quality sampling – this seems to have been effective. Main shortcomings of Agency's current listings are that there is no mechanism to keep them up to date. Even with a register there would still be a need for ad-hoc water feature surveys eg to ensure protection of unregistered supplies from say a proposed landfill. Also because EHDs do not claim to have 100% coverage despite best efforts. Recommend establishing more formal lines of communications with EHDs to ensure sharing of information. Also could consider extending register idea to say that anyone not registering must move to a mains water supply. Alternatively, carry out desk study based upon EDH, Water Company and Well Archive records – then alert EHDs to potential private supplies, which they may then investigate.
Midlands	Recommends establishing register from all of the following sources of information: Well Archive records, EHD records, existing Water Feature Survey records, Water Co/Electoral role comparison, Advertisements in local media, market research survey, as recently done in Upper Severn Trent licence-exempt area. Voluntary registers with the aid of EHD's distributing information-encouraging registration. Could link with community charge applications or make part of next national census. Perhaps better if Parish Councils held records. Register only – no registration, no protection.

Table 3.4 continued	
Agency Region	**Comments and suggestions**
Southern	Maintain database of EHD records and voluntary registration. Add to this any sources discovered as part of water feature surveys.
North East	Creating would be relatively easy given possible means of identifying sources (could do on contract) compared with problem of keeping records up to date. Recognised Data Protection issues and hence need to contact all abstractors identified. Would always need to carry out water feature surveys for some instances. Problem with registers is keeping them up to date.
Anglian	Register favoured but difficulties anticipated in getting the message across and administering the scheme. Register is vital, EHD records will play a role, NGRs must be identified for sources otherwise records are too ambiguous. Favour a well-publicised campaign to register – this exercise will require adequate funding if it is to succeed. Current records are imperfect. Records must be on GIS; Well archive & EHO records miss existing sources. Considerable difficulties envisaged in keeping records up to date.
Environment Agency Wales	Register could benefit from adding question on private sources to national census. Tiered approach recommended dwellings without mains supplies targeted for follow up surveys. Springs not identified to BGS by Environment Agency Wales. Could try EHD records and water company records in combination. A number of methods such as EHD & Water Co. records would provide a broad-brush assessment and present the opportunity for targeted water feature surveys as necessary.

The Agency survey revealed a wide variety of views on how best to identify small, licence-exempt, groundwater abstractions especially in light of the proposed local registers of exempt sources. The following discussion reflects some of the favoured approaches.

Some Agency staff favour the establishment of local registers populated solely by responses to advertising/public information campaigns and thereafter only those sources on the register will be protected from derogation.

Other Agency staff argue that even with a local register they would still feel compelled to ask for ad-hoc water feature surveys to be carried out in response to proposals for new abstractions (and proposed civil engineering projects) to ensure that no sources would be overlooked (even if not registered). A similar view was also expressed by staff concerned with the protection of sources from pollution, especially given that the new Groundwater Regulations require due regard to be given to the existence of private sources, and for which ad-hoc water feature surveys would still likely be required.

A middle view is that reference to a local register should be used as a 'guide' to whether or not a water feature survey should be required for a proposed development/abstraction. This reflects the current use of existing listings of exempt sources in some Agency areas.

Box 3.3
South West Region. Summary of findings of Agency survey

Locations of small licence-exempt sources required both for abstraction licensing and pollution prevention. Survey requirements for abstraction licensing and development control are essentially the same. A wide range of methods for identifying small, licence-exempt, groundwater sources has been used in the South West.

Old Wessex Area :
In addition to ad-hoc water feature surveys listings of private water supplies from EHDs in 1994 – found to be patchy and listing is no longer used. Ad-hoc enquiries to Wessex Water have been used to help identify the existence of private supplies in an area.
Old Devon & Cornwall Area:
High emphasis is placed upon good quality, detailed, water feature surveys. Use of a range of other sources of information may however obviate the need for some water feature surveys in some cases. This information includes occasional use of a variety of historic information held by the Agency, EHD or National Well Archive records. However, the main source of information on private supplies has been use of water company records of mains connections and addresses via South West Water's GIS system. This has been a very powerful aid in identifying likely private supplies. Access to South West Water's records ceased in March 1998.

Arguably, even if a comprehensive listing of exempt sources were available, water feature surveys would still be required to identify other water features such as bogs.

In conclusion, ad-hoc water feature surveys are felt to be about 90% accurate, whilst all other sources of information may act as filters to help decide is a survey is actually necessary.

If registers are to be established for small licence-exempt sources then it is recommended that these records are linked to Land Registry records as a means of ensuring that records are kept up to date. Further that the Law Society should include enquiries about private sources of supplies. Use of the electoral role form to request information on private supplies should be considered (or at least use of these mailing lists for a separate survey). Other sources of information might include MAFF agricultural census/surveys.

A register is probably best used as a scoping reference only, with ad-hoc water feature surveys still being required. This is especially true with respect to Agency responses to potential sources of groundwater

pollution that may threaten small groundwater sources. 'No registration – no protection' proposal also has implications for other development proposals e.g. road works which could also impact small sources.

An alternative approach might be to assume that all properties have private supplies unless advised otherwise; a database could be set up and de-populated on this basis.

(5) Do you have an estimate of the total number of private sources in your Area/Region?

Table 3.5 Summary of estimates of private supplies or small, exempt sources.

Region	Area	Estimates from Regional and Area staff
North West	Across Region	11,000 small unlicensed sources (includes surface water sources)
South West	Across Region	30,000 to 40,000 licence-exempt sources. Ratio of 3:1of exempt to licensed concluded from small area investigations.
Thames	Across Region	2,400 private water supplies (licensed & unlicensed)
Midlands	Across Region	No estimate provided
Southern	Across Region	No estimate provided
North East	Northumbrian Area	10,000 'protected sources'
	Dales Area	7,000 small licence-exempt sources
	Ridings	No estimate provided
Anglian	Northern	1050 private water supplies
	Central	550 to 1100 private water supplies
	Eastern	2000 to 4000 private water supplies
	Regional Estimate	Could be 100,000 to 150,000
Environment Agency Wales	Across Region	10,000 to 10s of 1000s

Respondents' estimates presented in Table 3.5 refer either to small licence-exempt source or private supplies as shown. This reflects the various approaches and different types of data held across the Agency. There is also a wide range in the level of confidence placed in the estimates for each Area or Region by the respective respondents.

An interesting rule of thumb to emerge from the survey is that in the south west of England small, unlicensed sources tend to outnumber licensed sources by a ratio of 3:1. If this rule is applied to the 48,000 abstraction licences that exist throughout England and Wales (DETR 1998), this would produce an estimated 144,000 small, licence-exempt sources, the vast majority of which are expected to be groundwater sources (including springs). In the event of a future abstraction licence/registration threshold of $20m^3$/day being established, this figure is expected to increase, as many small sources that are currently licensed will fall below the threshold. However because such sources are currently known they can potentially be transferred to a register or listing of SLEGS.

The ratio derived for the south west of England may provide a reasonable estimate for other similar rural areas with a predominance of areas of livestock uphill farming but may reflect a proportionally greater reliance on small, licence-exempt sources than elsewhere. Hence this figure is likely to be too high for lowland areas of England and Wales. Balancing such areas against areas with relatively low numbers of SLEGS such as the South East and Central England, is likely to result in the selection of a lower ratio of exempt to licensed sources that could be applied across England & Wales.

In an attempt to produced a nationally representative ratio, a small follow-up survey was carried out by the NGWCLC asking selected Agency staff to produce an estimated ratio (of licensed/exempt sources) for their own Area or Region. However, this exercise did not produce any estimates for Regions other than for South West. The above estimate of 144,000 small, exempt sources in England & Wales must therefore be regarded as highly tentative and conflicts with the findings of the DOE 1994 exercise (see Section 4.1) that identified c50,000 supplies in Category 1, Classes D, E and F and Category 2, Classes 4 and 5.

3.3 Overview comments on Agency survey

The survey revealed a widely perceived need to identify sources to protect them from derogation, pollution and to aid water resource assessments. Several Regions had made substantial efforts to ensure SLEGS are or can be identified within their natural boundaries.

The survey found a variety of means of identifying SLEGS. Different means are employed between Regions and sometimes between areas within the same Region. In some cases the lead role in establishing a system of identifying and recording data on SLEGS had been taken by water resources / abstraction licensing staff whilst in others the initiative has been taken by water quality staff concerned with groundwater protection. The different approaches revealed by the survey are believed to have arisen from a number of factors, many of them historic; these include:

- Absence of specific national guidance on the need for and methods of identifying SLEGS;
- Differences in the availability of information from each of the candidate sources between Areas and Regions;
- Differences in the scale of the problem between Areas and Regions, relating to the number of licence-exempt groundwater sources, their vulnerability and the perceived level of threat to these sources (by pollution or derogation by abstraction);

- Differences in staff resource allocation, experience and skills and competing priorities for these resources.

Some Regions previously classed springs as surface water sources, whilst others consider them groundwater sources. This resulted in some spring sources that were locally classed as surface water sources not having an abstraction licence whilst another Region may have classed a similar source as groundwater that may require a licence, depending upon the use of the water supplied. The Agency's 'Abstraction Licensing Manual' has since regularized the classification of spring sources, and the proposed new abstraction licensing system will remove any historic inconsistencies this inconsistency by establishing a normal common threshold for all types of sources.

The survey revealed a broad recognition that the proposed new licensing threshold ($20m^3/d$) and the powers to establish local registers of exempt sources would likely prompt a review of current practices for identifying SLEGS.

If an assumed ratio (from part of SW Region) of exempt sources to licensed sources of 3:1 is applied to the 48,000 licensed sources in England & Wales this produces a corresponding estimate of some 144,000 small licence-exempt sources; the vast majority of which are believed to be groundwater sources (taken to include springs). However, this estimate conflicts with the findings of the DOE 1994 survey (see Section 4.1) for the total of Category 1, Classes D, E and F and Category 2, Classes 4 and 5, i.e. c 50,000. Indeed it might be lower than this figure as Category 2 sources will invariably be licensed and some of Category 1, D and E may be. Also, many Category 1, Class F supplies are currently licensed for general agricultural use and only included in F if they are also used for domestic supply.
A detailed description and a discussion of the various sources of information identified in this chapter are presented in the following chapter.

4. POTENTIAL SOURCES OF INFORMATION

4.1 Department of the Environment survey, 1994

In 1994 the National Rivers Authority (NRA) was requested by the Department of the Environment to prepare information on the number of private water supplies in England and Wales. The resultant synoptic maps (Appendix 1) were based on Local Authority returns to a DoE questionnaire. Environmental Health Officers of 402 Local Authorities were circulated and a 96% response rate achieved. Some 51,000 supplies (this includes 50,096 supplies in category 1 classes D, E & F and category 2 classes 4 & 5 (Table 2.1)) were found to be serving a population of around 325,000. At an estimated 200 l/day nominal per capita consumption this population figure represented a groundwater utilisation rate of 23,725 Ml/a (65Ml/d). It was felt at the time that these statistics underestimated the number and importance of private supplies.

The maps as sent to the DoE (Appendix 3.1) showed: the number of private water supplies; the estimated population served; and estimated abstraction from private water supplies. Each of these maps showed the information on a Local Authority area basis; thus a bias was introduced into the maps. Subsequently the maps were normalised and maps were produced of: number of private water supplies per square kilometre; Population served by private water supplies per square kilometre, and estimated abstraction for private water supplies per square kilometre of area (Appendix 3.2).

As has been noted previously, it is important to recognise that in the context of this DoE survey, "supplies" means supplies at point of delivery (the tap) and not the source (the well, borehole or spring). It is possible that one source will provide several points of supply, possibly at some distance from the source and conversely, though probably less frequently, several sources could constitute a single supply. Furthermore, the records will include surface water sources but will exclude all small sources that are used for purposes other than domestic supplies or the production of food.

Whilst these maps did not differentiate between categories 1 and 2 (classes D, E, F and 4, 5 respectively) (see Table 2.1), the basic data used to produce the synoptic maps did provide differentiation. These data indicated that approximately two thirds of private supplies recorded by the EHDs relate to supplies serving single dwellings (33,815 supplies), and that about one third of these supplies (11,101) are in Wales.

4.2 Local Authority Environmental Health Officers

Whilst the 1994 survey (section 4.1 above) achieved a very high response rate (96%) from the Local Authorities, it is felt that this was due to the fact that it was instigated by the Department of the Environment. Section 4 has indicated the problems the Agency sometimes experiences when trying to obtain the same information today from the EHDs. Nevertheless, many Areas do have good access to EHD records and where used they are a valuable source of information. During discussions with some of the EHDs selected as a random sample for this study, it was generally felt that the numbers of private supplies had remained fairly constant since the 1994 survey; the few being "lost" each year due to the availability of mains supply being balanced by those being "gained" either as newly developed sources or older existing sources not previously disclosed.

Some of the drawbacks of using this source of data to identify SLEGS have been described in Section 2 Legal Summary. In brief the data collected by EHDs relate primarily to water supplies (taps) and often do not record the locations of sources (wells, springs, boreholes, streams) and hence can often only indirectly lead to the identification and location of sources. The other main limitation of this data is that the EHD records do not distinguish between licensed and licence-exempt sources. This

makes our search for small, licence-exempt sources more difficult than it would otherwise be. However, under the proposed changes to the abstraction licensing system (DETR, 1999), all future exempt sources (under the proposed normal threshold of $20m^3$/day) will closely relate to single source supplies in category one, class D, E, & F and category two, class 4 & 5 (DETR formerly DoE categorisation of private supplies).

As is common with all data sets identified in this study, the records are not thought to provide 100% coverage of private supplies i.e. not all supplies will be known to the EHDs. This is thought to be especially so in rural areas with large numbers of private supplies. Nevertheless these records do provide an indication of areas where private sources are likely to be found and do offer a means of following up with enquiries to the properties about their source/s of supply. (See North West Region case example Box 3.1). In several areas EHDs estimate their coverage of domestic sources as approximately 90%.

4.3 Environment Agency water feature surveys

The Agency commonly requires water feature surveys to be carried out in response to applications for developments such as proposed groundwater abstractions, landfills, or civil engineering projects that might entail a degree of risk of groundwater pollution or derogation.

The water feature surveys would normally entail a field survey of properties to ascertain from the occupants if the property is served by a licence-exempt source. If a source were found, an assessment would normally be made as to the potential risk from the development to the source. This might involve monitoring water levels or water quality as part of a test period or longer term monitoring. Hence these surveys are a targeted response to the potential impacts of proposed developments. The surveys aim to identify sources that the Agency would not otherwise be aware of and to protect these sources (and other water features) from the adverse effects of proposed developments.

The scale and nature of the survey depends upon the scale and nature of the potential impact of the proposed development. A high quality survey requires considerable effort but is capable of providing accurate, up to date information on the status of any sources located in the search area. The quality of survey will vary according to the personnel undertaking the survey; the resources allocated and site specific considerations. The main drawback of water feature surveys is the cost of carrying out a high quality survey, however this is usually borne by the applicant.

4.4 BGS National Well Record Archive

The National Well Record Archive has already been described in section 1.1. These records form a unique store of fundamental hydrogeological information. The BGS relies largely upon the drilling industry to supply new data for its archives in the form of records for the wells and boreholes that are constructed, as required by Section 7 of the Water Act, 1945. However, there are other sources of data for the National Archive. For example, both Thames and North West Regions of the Environment Agency use the same well/borehole numbering system as the British Geological Survey and, should they locate unregistered wells/boreholes in their Regions, they inform the BGS records staff; the supply of data from other Agency Regions tends to be sporadic. The archived data holdings are also augmented by voluntary deposition of data from contractors, consultants and the water industry.

The British Geological Survey has also taken proactive measures from time to time to update and increase the coverage of the National Well Record Archive. A particular example of this was the

One of the most recent of these well-siting surveys was that for sheet 182 Droitwich (Chatfield V A, 1981). For that particular survey over 600 individual wells, boreholes and shafts on the then current register were checked. Of those, 63 (12%) were mineral shafts and boreholes yielding no hydrogeological data. A total of 102 sources were recorded as being in use and 248 were disused at the time of the survey; 83 new sites were added to the archive.

The National Well Record Archive is being transferred from a paper to an electronic database called WellMaster. All the boreholes and dug wells from the paper archive have been indexed within the system. The archive has some 100,000 sites at index level and is designed to hold data on well location, construction, yield and water quality, although population of some of these fields is still at an early stage. Data can be extracted from WellMaster and transferred to other data management systems as required, and data can be visualised against a GIS representation of lithostratigraphic units, drainage and other layers. The ability to manage data within a GIS would permit analysis of hydrological, hydrogeological and socio-economic controls on the distribution of small private water supplies. The PC-based ArcView system which is employed means output could easily be transferred to more sophisticated Environment Agency systems in the future, if so required.

There exist a number of limitations associated with using the National Well Record Archive for the identification of SLEGS; the main two are as follows. Firstly BGS will not necessarily have been advised of the construction of all sources. Records may be especially lacking with respect to springs, which may comprise a large proportion of licence-exempt sources in some areas. Secondly, some boreholes recorded on the archive may not ever have been commissioned as sources of water supply or may now be disused, abandoned or infilled. If BGS has not been advised of such events, the record will not necessarily have been amended. Postal addresses of owners or operators of the sources may not be recorded on the National Well Record Archive, or have changed with time making follow up enquiries about the status of the source very difficult.

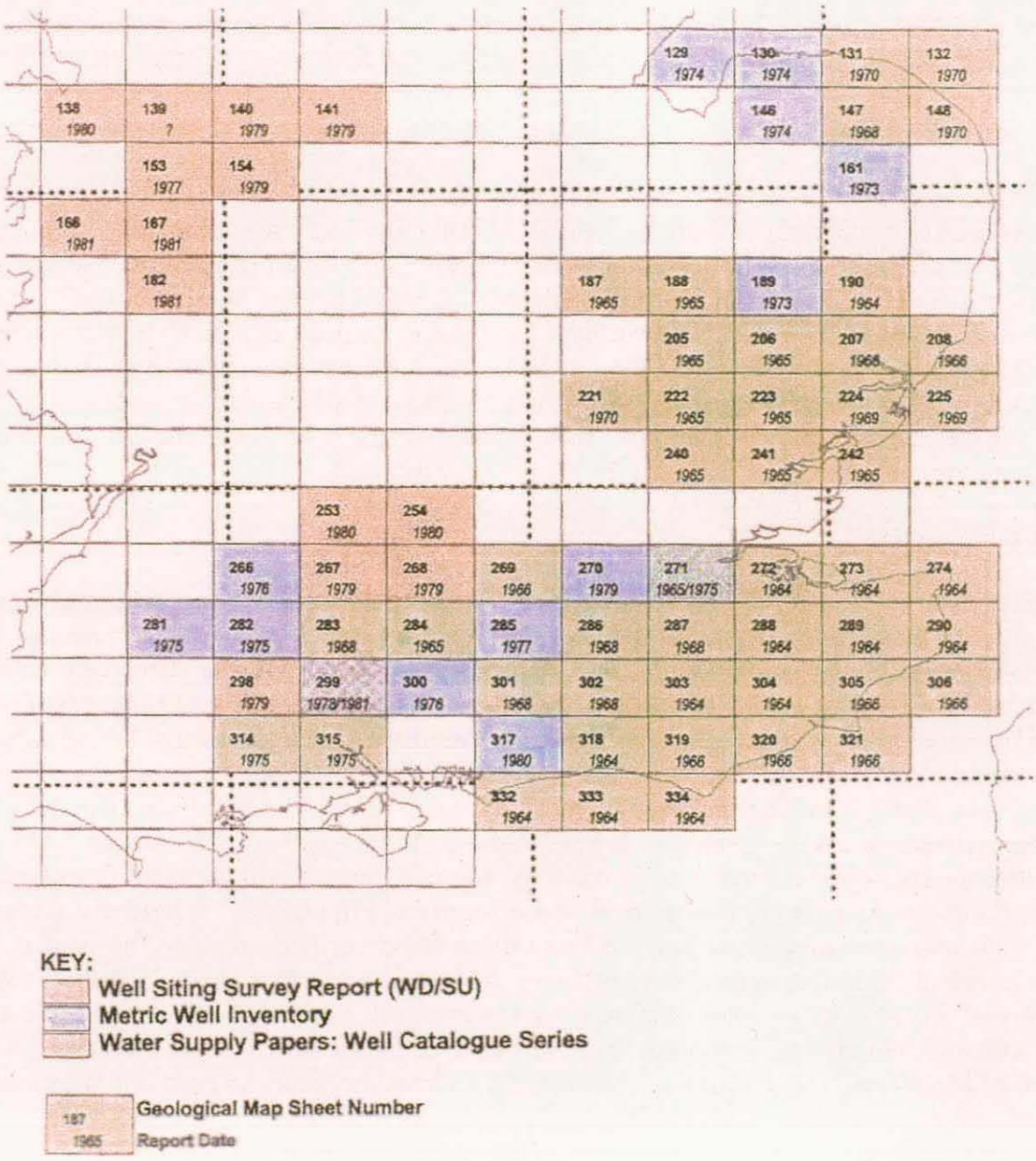
4.5 Water companies

It was felt that a potentially important source of primary data for the task of identifying unlicensed groundwater supplies would be the mains distribution networks of the various water companies. By comparing mains supply maps with Ordnance Survey maps and/or Water Company billing information with the Post Office's Gazetteer of addresses, it was hoped that it would be possible to identify those households not connected to mains supply. Whilst it is recognised that households on mains supply could also have a private supply, it was hoped that this approach would identify the majority of private supplies in England and Wales – although it would not differentiate between surface and groundwater sources. Equally it is recognised that this source of information will only identify localities having supplies other than provided by mains supply, it will not identify sources of supply (wells, boreholes or springs) remote from those localities. In addition, it has been reported that although new addresses are included on the Post Office Gazetteer fairly rapidly, the same is not true of addresses which no longer exist (for example due to demolition). This factor is likely to result in "false positives" in some cases when obtaining addresses which have no Water Company mains supply. Nevertheless, identifying properties that are likely to be served by a private supply does provide a way of identifying areas where licence-exempt sources are likely to exist and a means of obtaining information on the latter if additional enquiries were to be made.

Several Water Companies were approached for information on their mains supply and billing systems. The results of this survey indicate that the data required for the purposes of this study are not generally available in a readily usable form (Appendix II). It is however felt that most companies should be able to provide hard copy maps showing the location and extent of their water

well-siting surveys of the 1970s and early from the late 1960s to the early 80s, the British Geological Survey (then the Institute of Geological Sciences - IGS) carried out a number of well-siting surveys with a view to augmenting the National Groundwater Archive set. These surveys were based on separate one inch geological map sheets and published as internal IGS reports, commonly as a precursor to the publication of one of the IGS metric well inventories. These would involve a door to door survey noting the then current status of any recorded wells (i.e. in use, abandoned etc); evidently the status of these wells might well have changed in the time between the survey and the present day. Figure 4.1 shows the land surface area covered by these surveys.

Figure 4.1 BGS well siting survey coverage of England



KEY:

- Well Siting Survey Report (WD/SU)
- Metric Well Inventory
- Water Supply Papers: Well Catalogue Series

187 — Geological Map Sheet Number

1965 — Report Date

mains, although the existence of connections to individual properties is probably only rarely indicated. Where the Agency has used this source of data (South West Region and Midlands) it has proved to be very useful.

4.6 Other possible sources of information

- Advertisements/public campaigns – most likely to form basis of establishment of local registers as proposed under DETR licensing review 1998. Experience of voluntary registration scheme eg Northumbria has not been encouraging with only a proportion of abstractors registering their sources. Similarly the response to North West Region's follow up questionnaire to properties with private water supplies only had a 30% response rate. A compulsory registration scheme is likely to have more success but will depend primarily upon the message presented and the effectiveness of the advertisements and public campaign.
- Field surveys for research projects, for example PhD theses, similar in nature to ad-hoc water feature surveys as described above.
- Historic archive material, for example Civil Defence Archive of water sources to be used in event of Regional/national disaster.
- Market research surveys – broadly similar to water feature surveys
- In future could ask for relevant information to be included in National Census or with electoral role.
- Authorisation survey relating to Groundwater Regulations. MAFF have sent out some 20,000 letters to sheep farmers asking for information on their means of disposing of sheep dip. Within this survey the farmers are required to provide information of any water supplies within the vicinity of the disposal area – this is therefore a potentially useful source of additional data on private supplies although the area may be relatively small and will by no means be totally inclusive for any one farm. These surveys are not water feature surveys as described above but might still represent a useful source of information that should be collated and processed.
- Consultation of local drilling companies' records – to supplement existing records.
- Local knowledge e.g. via Parish Councils and residents – probably the most time consuming exercise but occasionally incorporated in high quality water feature surveys, as described above.

5. PILOT STUDY

5.1 Introduction

The purpose of this project is to develop a methodology to identify currently unlicensed abstractions without the need for a full survey of England and Wales. In proposing a methodology that does not include such a field survey, a pilot test would have been desirable in restricted areas where a field survey could be used to validate the approach proposed. Unfortunately the budget and time-scale of this project preclude such verification. Therefore, in order to provide some ground-truth, it was necessary to select pilot areas where a detailed survey had been carried out in the past. The water feature surveys carried out by the Agency to assess the impact of proposed new abstraction boreholes have been mentioned in section 4. Thus the availability of other sources of "ground truth data" effectively decided the area chosen to pilot test the methodology.

5.2 Objectives

- To evaluate, on a limited scale, the various means of identifying small licence-exempt groundwater sources
- to determine the feasibility and limitations of each approach

5.3 Approach

An outline of the approach used to carry out the Pilot Study is as follows;

1. Select study area

2. Establish ground truth from previous detailed ground surveys (to help assess the effectiveness of the methods used in the Pilot Study as part of item 6 below)

3. Obtain data sets from the following sources

    - Water Company
    - Environment Agency (Abstraction Licences and Water Feature Surveys)
    - BGS National Well Record Archive
    - Environmental Health Department (EHD)

4. Cross Correlate Data Sets

    - identify SLEGS, currently and formerly licensed sources.
    - correlate SLEGS and other sources identified against ground truth data.
    - plot maps showing SLEGS and other sources identified from individual data sets.
    - compare source location maps with maps of water main locations to identify properties without an obvious source of supply.

5. If EHD data on locations of individual groundwater sources is **not** available, determine the total number of sources and their Class/Category known to the EHD.

6. Data Assessment :

- compare and contrast the relative value of the various data sets and methods employed to assess their effectiveness in identifying SLEGS.
- if EHD data for individual supplies are **not** available, determine the number of SLEGS sources known to the EHD and compare with the number identified from the available data.
- highlight benefits/limitations of using each source of data and method

7. Produce conclusions and recommendations.

5.4 Selection of the pilot area

5.4.1 Considerations

As indicated earlier in this report, the primary consideration for the selection of a pilot area was the ready availability of high quality, ground truth information for the groundwater source locations. In order that the methods of identifying SLEGS can be properly assessed, it is important that the data used for ground truth testing has not previously been used to produce or upgrade any of the source data sets. Ground truth data in the form of historic detailed ground surveys are available for only approximately 15% of the area of England and Wales.

Access to Water Company information concerning properties not connected to the water mains (if available) was considered desirable for the pilot study. Responses to the telephone survey indicated that few Water Companies would be capable of providing information of this type. Even those that were capable of providing the required information generally consider such data to be confidential. As a minimum it was essential that detailed maps showing the positions of water mains and locations of properties likely to be served by the mains be available from the local water company. It would also be desirable to have access to the local Environmental Health Officer records for the sources that they monitor although, again such information may be regarded as confidential. Access to the BGS National Well Record Archive is available for any selected area of England and Wales. Agency abstraction licensing records are available for all areas except those currently designated as licence-exempt under various Acts of Parliament.

5.4.2 The selection process

It was considered that an area containing 50 to 60 groundwater sources would be required to act as the pilot study area. Three areas were initially identified as being potentially suitable. Areas in the Midlands and northern Thames valley had been subject to BGS field surveys in the late 1970's and beginning of the 1980's to identify borehole and well locations, in support of the production of Metric Well Inventories. Similar information was available for a considerable section of southern and eastern England but was invariably from older surveys that would impose additional limitations on the utility of the data. The third area covered central and east Devonshire and was surveyed in about 1980 by J Davey as part of a PhD thesis on the hydrogeology of the Permian sandstones (1981). All three sets of data were considered sufficiently detailed for the requirements of the pilot study and all were of a similar vintage. It would have been preferable to have access to a more modern field survey for use as the ground truth. Apart from the Agency's water feature surveys carried out as part of abstraction licence applications, which commonly contain only a few sources and cover areas a few kilometres in diameter, such surveys appear to be rare.

A close examination of all relevant factors indicated that an area located in the Crediton area of East Devon would be the most suitable Pilot Study area. High quality GIS maps showing water main and property locations were likely to be available from the water company. The BGS, Agency and EHD data had remained as essentially separate entities, although it is recognised that some Agency data

were used in the establishment of the original EHD list of monitored sources. In this respect the available information is likely to be a good reflection of similar data sets available over much of England and Wales. In the Midlands, potential problems existed with regard to securing sufficiently detailed water company maps and in both the Midlands and Thames Areas, field survey data had been used to up grade some data sets, potentially creating difficulties in defining how much data would have been available from individual data sources.

5.4.3 The pilot study area

The area covered by the PhD field survey covered the whole of central and east Devon and contained in excess of 600 groundwater sources. A block containing about 60 sources was selected to act as the pilot study area. The location of the block, positioned to the west of Crediton and extending 10 km from east to west and between 4 and 5 km from north to south, is shown in Figure 5.1. The selected area forms part of the Crediton Trough, underlain by Permian sandstones, breccias and conglomerates that constitute the most important aquifer in south west England. The boundary between these strata and the underlying Carboniferous Culm Measures form the northern and southern limits of the study area.

5.5 Information sources

5.5.1 Introduction

The methodology by which the data obtained from the various sources was classified and cross correlated to identify SLEGS, is presented as a flow diagram in Figure 5.2, reference to which will be of considerable assistance when reading the rest of this Section. The ground truth data (from Davey's PhD Thesis) and individual sources of data are discussed in some detail below, as are the means by which SLEGS were identified.

5.5.2 Davey PhD thesis source survey (ground truth)

A total of 58 groundwater sources were found to be in use (or usable) during the field survey carried out by Davey in about 1980. These source locations are used as the ground truth against which all other data sets are correlated in order to assess the most effective means for identifying small licence-exempt sources. The well catalogue numbers allocated to each of these sources by Davey are listed in Appendix II, together with the source type, grid references and status at the time of the survey. The source locations and their status at the time of the field survey are indicated in Appendix I. A considerable number of other former sources which were abandoned or thought to exist but which could not be located by Davey were also listed in his PhD thesis but have not been included in the subset used for this study.

Unfortunately the listing produced by Davey does not indicate the use to which the water was put but it is considered that where an abstraction licence was also quoted it is unlikely that the use was solely domestic. Conversely where a source was in use but no abstraction licence was quoted, it is probable that the use was domestic. Obviously the main drawback of using this data for ground truth is that no account can be taken of any new sources which came into use after the date of the survey. It is however anticipated that the majority of new sources are unlikely to be used solely for domestic supply, unless as a replacement for an existing source, and are likely therefore to require an abstraction licence. In principal, it would be possible to augment the ground truth data by including sources identified from Water Feature Surveys available from Agency abstraction licensing records, such as those carried out for Coleford and Knowle public supply boreholes. However these surveys

Figure 5.1 Map of Pilot Study Area

Figure 2. Map of the Pilot Study Area

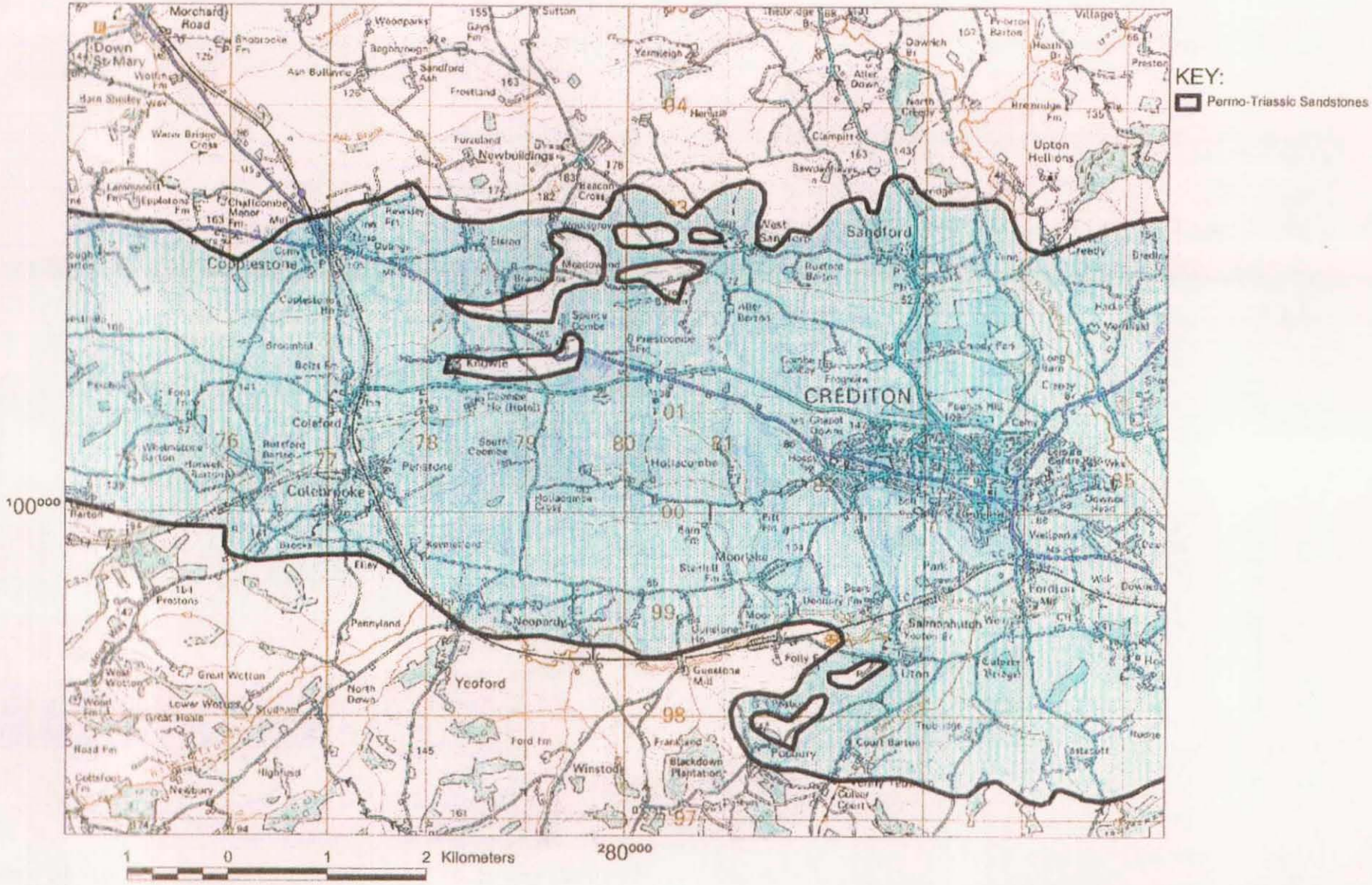
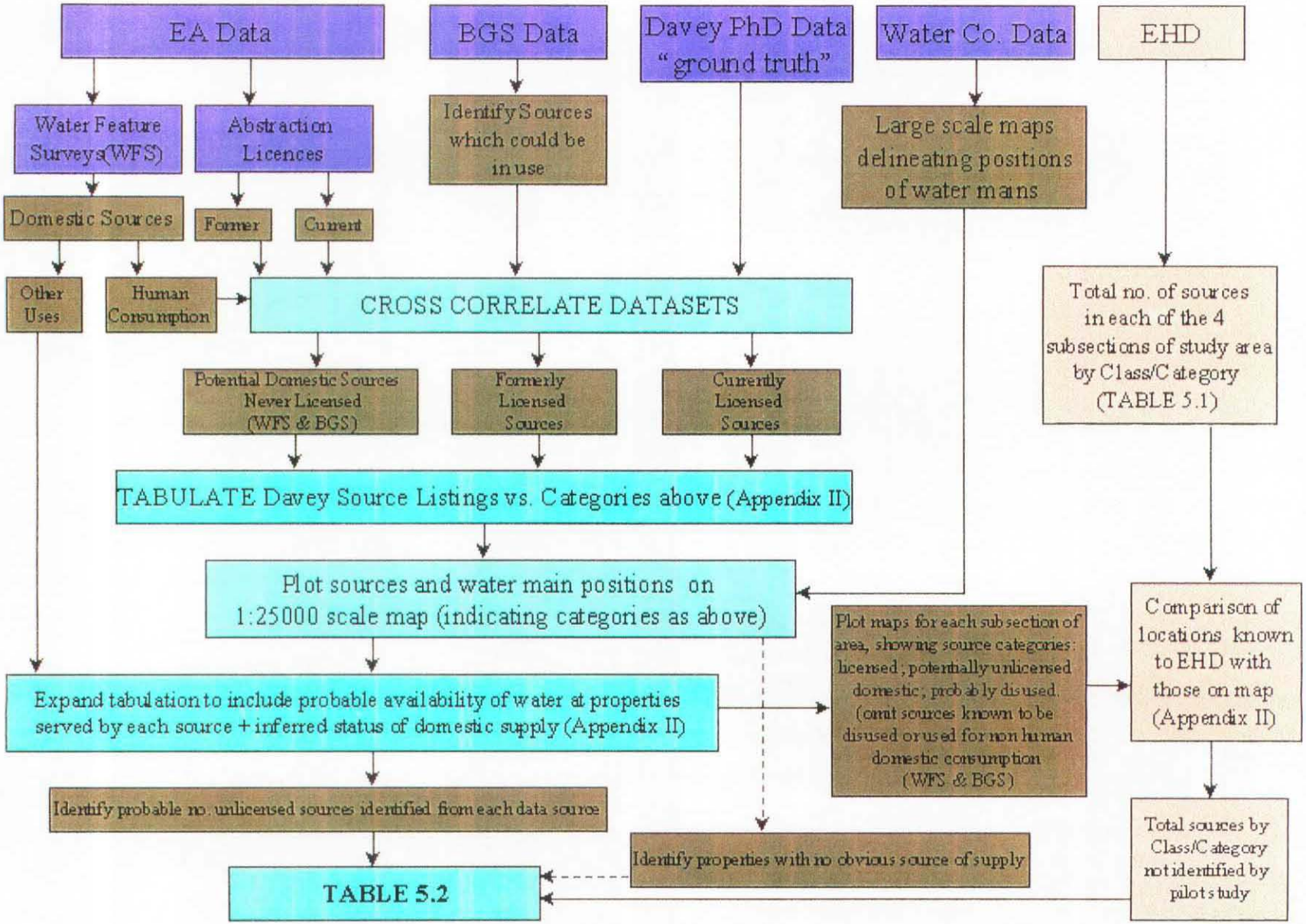


Figure 5.2 Pilot Study Flow Diagram



in themselves constitute an important source of data on SLEGS and, in consequence, have not been used in this manner for the purpose of the Pilot Study.

5.5.3 South West Water (GIS water mains records)

A series of highly detailed maps (at a scale of 1: 2500), printed from a GIS system, showing the extent of South West Water's mains distribution system in the area of interest was provided. These maps also included properties and roads located near the water mains but did not indicate actual mains connections to properties. A further request for information on properties known to have connections to the water mains was refused since this type of information (customer names or addresses) was considered to be of a confidential nature. This information, having been replotted together with potential groundwater source locations, was used to determine the probability of any given property having access to mains water in order to assess if any given source was likely to provide a domestic supply. Given the nature of the information available, it was only possible to carry out this assessment in terms of "Probable, Maybe and Unlikely" connection to the mains water supply. This assessment for each location known to have a potential groundwater source is included in Appendix II and in some cases has been used to indicate if an unlicensed source is likely to be used as a domestic supply.

5.5.4 Environment Agency, South West Region

5.5.4.1 Abstraction licence data

Data was provided for all licensed groundwater abstractions from Permian strata within all four ten-kilometre grid squares, which the pilot study area straddles. From this larger data set, a study area sub-set of relevant licence data set was abstracted. It is essential that the list of licensed sources be cross correlated against all other source listings, in order that actual and potential SLEGS can be properly identified. It is also necessary to take licensed sources into account, when using the positions of water mains to identify properties that have no obvious water supply. The locations of all currently licensed groundwater sources and their use are indicated on Appendix 1.2.

The study area data set was correlated against the locations found in the field by Davey (Appendix II), in order to define which sources were not licensed and may therefore be in use solely as domestic supplies. Davey did however include abstraction licence numbers where applicable and it was noted that a total of 12 sources which were licensed at the time of the field survey, were no longer currently licensed. It is possible that these sources are now disused or could possibly still be used as a small domestic supply, which would not require a licence. There is also a possibility that even if not currently in use, such sources could be brought back into use at some time in the future unless their condition (eg. filled in or built over) precludes this. Sources in this category are indicated as formerly being licensed on Appendix II and their locations and probable current status are indicated on Appendix 1.3

Of the 58 groundwater sources located by Davey (Appendix 1.1), 39 are subject to current abstraction licenses and a further 12 were formerly licensed. The latter were in fact identified from the Davey data set but the information for these revoked or lapsed licenses could as easily have been obtained from the Agency. The use of groundwater from licensed sources was predominantly for agricultural use, with only three being for joint general agriculture/domestic use. One licence was for spray irrigation, another for spray irrigation and private supply use. Individual licenses also existed for a statutory water-undertaking source (public supply) and one for an industrial process supply (which consists of three borehole sources). Only 6 sources in Davey's listing appear to have never been

licensed for abstraction. The distribution of sources in this category and their probable current status are shown in Appendix 1.4.

The data set also included a further 10 licensed sources which were additional to those identified by Davey. Six of these are boreholes drilled in the period since the Davey survey was carried out. Two are licensed as public supply sources, three as private water supplies (one jointly for spray irrigation) and one for general agricultural use. There are also one well and three springs, all of which undoubtedly existed at the time of the Davey survey but which were not identified, probably due to the fact that they were not in use at that time. All of these sources are licensed for general agricultural use. The locations of all of these additional licensed sources are also included in Appendix 1.5.

5.5.4.2 Water feature surveys

Water Feature Surveys for two public supply boreholes (Coleford and Knowle), identified numerous licensed sources but provided information on only three unlicensed sources (2 wells and a spring) used for domestic supply. Surveys for other recently drilled boreholes provided information for a further 2 disused wells and a well and adit which are unlicensed but are used for domestic purposes, namely gardening. These latter sources are of particular interest since their domestic use does not include water for human consumption. The EHD will not therefore monitor or register these two sources but their presence is of interest to both the Agency and BGS.

It should be noted that these surveys were carried out in the late 1980's and, although it is probable that most (if not all) of the identified sources are still in domestic use, it is possible that some sources have been replaced by mains water supplies. It is not however possible, from the information available, to determine if this applies to any of the sources listed in Appendix II. The locations, probable current status and use of the SLEGS identified from Water Feature Surveys are indicated in Appendix 1.5.

5.5.5 BGS National Well Record Archive

The Archive contained records for only 15 locations within the study area, for wells and boreholes that penetrate the Permian sandstones, with three boreholes being located in close proximity at one site. Of the total of 17 boreholes and wells, 6 were known to be disused or abandoned some considerable time ago, leaving only 11 sources that could potentially be in use. It was possible to cross correlate 7 boreholes with sources that are subject to abstraction licenses. It is considered that only three boreholes contained in the Archive could still be used for domestic supplies but even this is unlikely, due to the close proximity of water mains. The locations of the three potential sources are indicated in Appendix 1.5.

A close examination of available records, show that few new records have been added to the Archive since the 1960's. Since Agency abstraction licence records show that new sources have come into use during that period, it would seem that local drilling contractors have not been satisfying their statutory obligations in providing borehole records to BGS. Unfortunately this would also seem to be indicative of little (if any) communication between BGS and local Agency licensing staff. Action has already been instigated to recover information for boreholes identified as absent from the Archive during this study. Further steps will be taken to contact drilling contractors active in south west England in order to gain information on these and other boreholes drilled in the area in recent years.

It is considered that the poor level of information available from the BGS Archive for the study area is somewhat anomalous (although not unique) when considering England and Wales as a whole.

Certainly, the amount of information available in areas where field surveys have been conducted in the past (Figure 4.1) will be considerably more comprehensive. These areas cover extensive sections of Anglian, Southern, Thames and part of Midlands Agency Regions. Also in many other areas, contact between BGS and drilling contractors has been better maintained with time, ensuring that information on many new boreholes drilled are deposited in the Archive. Experience from this pilot study has however indicated that the subject of obtaining drilling data from contractors needs to be more actively pursued. Also better contacts need to be forged, in some cases, between BGS and Agency Regional licensing to ensure that the maximum amount for data possible is captured by the Archive. Improved communications can only be to the mutual benefit to both organisations and ultimately to drilling contractors, as all require access to accurate, comprehensive geological and hydrogeological information.

5.5.6 Environmental Health, Mid Devon District Council

A formal request for information regarding locations and types of groundwater sources was made following informal telephone discussions with the Environmental Health Officer (EHO). Unfortunately, the Council regarded even these rather limited items of information as confidential because they would involve the identification of specific properties. The general impression gained whilst conducting the telephone survey of local Authorities was that such a situation is likely to be fairly common when dealing with Councils in predominantly rural areas. Unfortunately these are the very Councils which are likely to have the greatest numbers of SLEGS. There was however a willingness to discuss the situation and to assist in any way possible within the limitations imposed by the need to maintain confidentiality.

Following further discussion, the EHO agreed that it would be possible to maintain confidentiality by providing information on the number of sources in each EHD Class/Category for each of the four 5 x 5 km blocks (SO70SE, SO80SW, SX79NE and SX89NW) which constitute the study area (Figure 5.1). Only those sections of each of the four blocks underlain by Permian sandstones were to be considered. The information provided is presented in Table 5.1.

Table 5.1. EHD water source data for the pilot study area.

	Class 1		Class 2		
Map Area	**Category E**	**Category F**	**Category 4**	**Category 5**	**Totals**
SS 70 SE	6	10	1	1	18
SS 80 SW	3	9	2	4	18
SX 79 NE	-	3	-	1	4
SX 89 NW	4	7	-	2	13
Totals	13	29	3	8	53

Unfortunately no direct correlation exists between the Class/Categories used by the EHD's and the Agency water use types. Of the above, the Class 2 supplies will equate to the Agency licence categories for industrial process and general agricultural uses which are involved directly with the production of food or drink. In the study area the predominant use is likely to be in dairy farming and possibly the washing of vegetables. Class 1 supplies are for domestic use, specifically for human consumption but will not include sources used solely for other domestic usage such as watering gardens.

A source licensed by the Agency for general agricultural use is of no interest to the EHD, if that use does not involve the preparation of food or drink. If some part of the supply is known to be used for human consumption, for example in the farmhouse, the source would be allocated to Class 1, F if for a single dwelling and D or E for several dwellings. Class/Category 1F does not require an abstraction licence if used solely for domestic purposes, whilst 1E and 1D could require an abstraction licence depending on the scale of the supply. No Class 1, Category D supplies were however identified within the study area. Although all private water supplies used for human consumption are monitored by the EHD, water sources used to provide public water supplies are not monitored or included in their classification.

5.6 Data assessment

In order to achieve the basic objectives of this pilot study it is necessary to ignore any potential domestic sources that are identifiable using the ground truth data set although this information does fortuitously provide a means of assessing the effectiveness of field surveys.

A number of private domestic water supplies were identified which are currently licensed for abstraction and which will in consequence be included in the total number provided by the EHO. Although there are many sources licensed by the Agency for general agricultural use, it is probable in many cases that some domestic usage occurs. In such cases only the domestic usage would be of interest to the EHD and sources would accordingly be allocated to Class 1. This renders cross correlation between the two data sets almost impossible except in terms of total numbers, although even this approach requires a considerable degree of supposition.

Correlation between the locations of currently licensed agricultural sources, formerly licensed sources and potential SLEGS and the locations of water mains, can be used to indicate the possible use of any given source as a domestic source. In many cases, the absence of a water main or any other obvious source of supply, in reasonable proximity to a property, may indicate that a SLEGS, currently or formerly licensed source is likely to serve as a domestic supply, unless the property is no longer used for habitation. As the latter factor cannot be determined from the data sets currently available, it was necessary, for the purposes of this study, to assume that all properties indicated on the maps of the area are in fact inhabited and therefore require a domestic supply of water. It must also be recognised that additional properties, which are not easily identified from available maps, may exist in the area. It is also possible that some properties could be supplied from licence-exempt surface water sources but it would only be possible to determine the source of supply during a detailed field survey.

All available data sets were cross-correlated (Appendix II) and groundwater source locations plotted on a map. The local EHO agreed to cross correlate this information against known locations of monitored groundwater sources, to provide numbers of sources (by Class/Category for each area sub-division) which had still not been identified from any of the data sets during the pilot study, including the data used as ground truth.

Application of the above assumptions to the data contained in Appendix II, provided estimates of the total numbers of SLEGS domestic supplies which could be identified using each of the data sets both individually and by cross-correlating information for each of the four sub-sections of the study area. These numbers are presented in Table 5.2 (column 3), together with the EHD information on the total number of sources registered in each Class/Category (column 1) and residual number of sources in each Class/Category not identified (column 5). The locations of the potential SLEGS (column 3) are

shown on Appendix 1.5. The origin of the data from which each was identified and their probable current status are also indicated.

Table 5.2. Cross correlation of numbers of licensed and unlicensed sources in the pilot study area.

Column No.	1					2		3			4	5		
	All EHD sources (by Class/Category)					**Agency licensed sources**		**Potential SLEGS**			**Properties with no apparent supply**	**EHD sources not identified by other means**		
Map Area	1E	1F	2/4	2/5	Total	Dom./PWS	All	EA	Davey	Tot.		1E	1F	Total.
SS70SE	6	10	1	1	18	1	16	3	3	6	6	0	4	4
SS80SW	3	9	2	4	18	2	23	2	1	3	6	0	5	5
SX79NE	-	3	-	1	4	0	1	0	0	0	1	0	1	1
SX89NW	4	7	-	2	13	3	9	2	0	2	5	3	3	6
Totals	13	29	3	8	53	6	49	7	4	11	18	3	13	16

A comparison of the figures contained in Table 5.2 (columns 1 and 2) indicates that there must be a considerable degree of correlation between those sources known to the EHD and those licensed for abstraction by the Agency. As discussed above many, (but by no means all), of the sources with abstraction licenses for general agricultural use are likely to also provide some element of domestic supply.

The numbers of sources listed for each block of the area in the sub-column headed "EA" (column 3) were predominantly derived from formerly licensed sources which were considered likely to still be providing a domestic supply in the absence of any other obvious source. The total for SX89NW also includes the single unlicensed domestic supply source identified by one of the Agency Water Feature Surveys but not the two sources used only for gardening, as these would not be included in the EHD totals. Unlicensed sources found by Davey during the field survey were also included in column 3 for comparative purposes. The three possible SLEGS identified from the BGS archive have not been included, since it seems more probable that mains water would be in use at those properties.

The map showing the positions of probable SLEGS (Appendix 1.6) can be used in conjunction with that showing the locations of water mains to identify properties which have no apparent source of supply. Assuming that all of the properties are inhabited and are supplied from groundwater sources, (which may not in fact be correct), a listing of properties can be drawn up to provide the basis for a limited selective field verification survey. The total number of such properties identified for each sub-section of the Pilot area is included in Table 5.2 (column 4). It is notable that the total number of properties (column 4) and the total number of EHD supplies not identified (column 5) are remarkably similar, although the degree of real correlation between the two totals remains uncertain. The possibility that one or more, of the three sources identified from the BGS archive is in fact in domestic use, despite the close proximity of mains supplies, must also be recognised.

It is considered highly significant that despite having access to data sets which are as good as is likely to be found elsewhere in the country, in addition to the information collected during a comprehensive field survey, the local EHO was still able to identify a total of 16 Class 1 sources used for domestic

supplies, which had not been identified by this pilot study. As may have been anticipated EHD Class 2 sources, which in any case should all be subject to abstraction licenses were at least successfully identified, even if confidentiality considerations prevents direct correlation of sources.

The availability of a good field survey data set also, if rather fortuitously, provides the opportunity to assess the probable level of success which may be achieved from a field survey to identify small licence-exempt sources. The information contained in Table 5.2 (columns 3 and 4) suggests that even a comprehensive field survey is likely to fail to identify a significant number of sources which are currently in use to provide domestic supplies for human consumption, let alone supplies used, perhaps sporadically, for other domestic requirements. Many owners/users are secretive even about the existence of a source, being unwilling to divulge information in case some sort of limitation or future charge is imposed on the use of the supply. It is interesting to note that although the EHD records are considered to be as comprehensive as possible, the local EHO thought that there may be 5 to 10% more unlicensed domestic sources in use over the County as a whole, than are currently registered by the EHD. The figures contained in Table 5.2 do however indicate that the best means of identifying SLEGS is undoubtedly the EHD register, if this data source is available. The register is to be preferred even over a field survey if such were available, since the register is derived from a wealth of local knowledge, the collection of data from many sources and inevitably some degree of field surveying.

5.7 Conclusions

This pilot study has successfully provided an improved understanding of the various methods that may be employed to identify SLEGS and the results that they can feasibly yield. Cross correlation of sources which were formerly licensed by the Agency with the locations of water mains (provided by South West Water) were, in the absence of EHD records, the most successful means of identifying SLEGS (Appendix 1.4). The successful use of BGS archive records was very limited due to the paucity of data for the area but it is anticipated that results would be considerably improved elsewhere in England and Wales, particularly in areas where field surveys have been carried out in the past.

A significant number of SLEGS were identified by examination of Water Feature Surveys (Appendix 1.4). These surveys were of particular value in identifying sources used for domestic purposes other than human consumption. Although the coverage of any given area by such surveys is likely to be limited, there appears to be little other means of identifying such sources except possibly via BGS records, given that properties with a mains supply may also retain the use of this type of SLEGS.

The most important finding of the pilot survey is undoubtedly that access to EHD records is the most effective means (used in conjunction with Agency licensing records) of identifying of the maximum number of SLEGS. There appears to be no other data set available that can adequately replicate that held by EHDs. The main limitation is that EHD records often identify supplies rather than sources and it would be highly beneficial if it were possible to expand the information held to include details on the sources, (where this is not already the case).

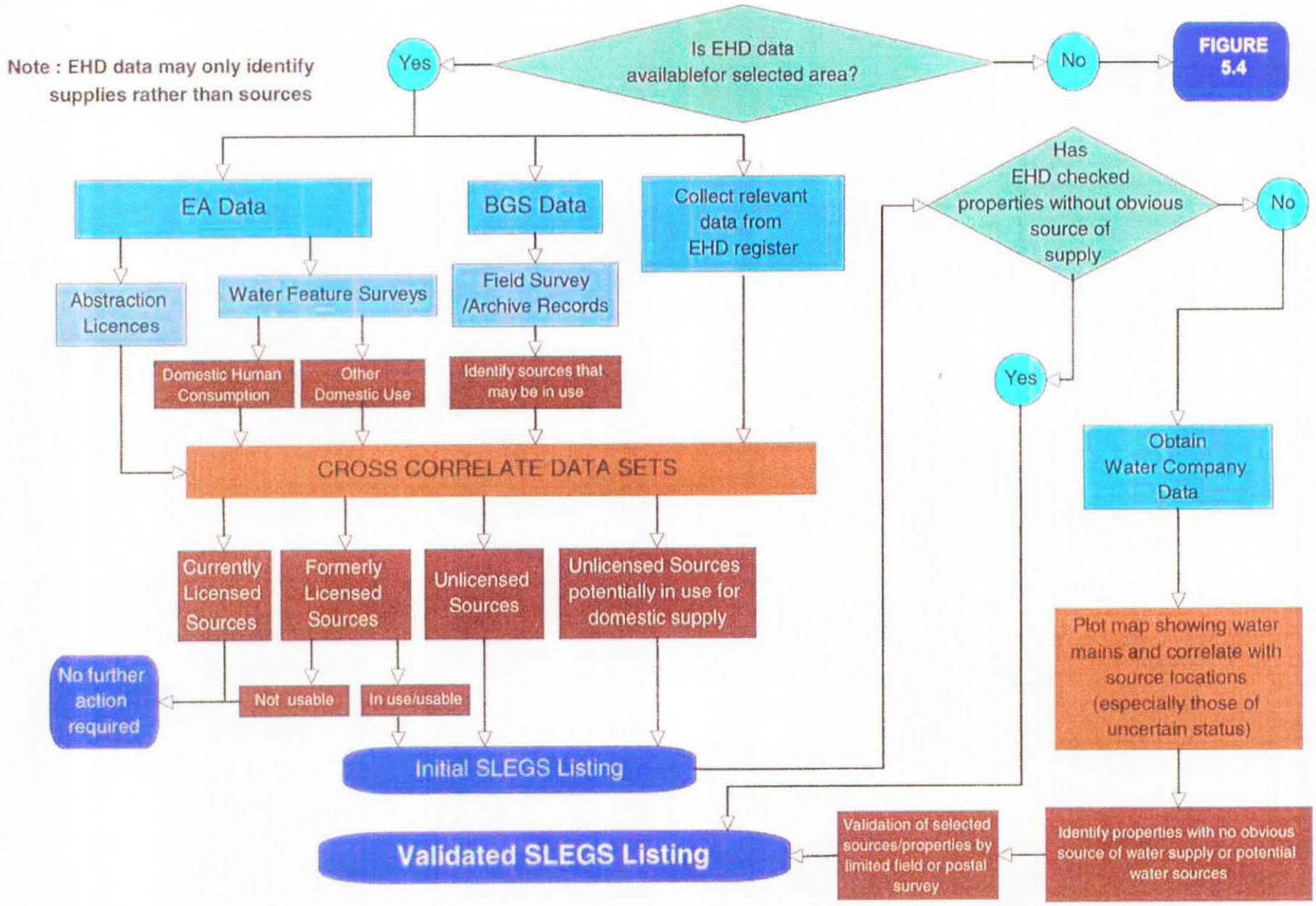
Every effort should therefore be made to gain access to this information, unless close co-operation already exists between local EHOs and the Agency Region that has resulted in a large degree of duplication between the two sets of information. Where data is considered to be confidential by the EHD only legal changes are likely to result in proper access to the information. Lacking access, some form of compromise arrangement may be made, such as that employed in the pilot study, which at least assists in determining the number of sources still to be identified. This in itself could be used to conduct a limited field survey of specific properties and sources of uncertain status, to identify the

remaining sources. Even if the EHD records are available, it must be recognised that a significant number of sources may remain unidentified, particularly those not used for domestic consumption.

Although the feasibility of the various methods and relative value of different sources of information have been assessed for the study area, the levels of success (or failure) are unlikely to be replicated in other areas of England and Wales and the relative importance of the methods and data sets is likely to vary considerably.

Experience gained whilst carrying out this Pilot Study has demonstrated that the overall approach required for the identification of SLEGS in any given area, will be largely dependant on the availability of data from the local EHDs. Two procedures for the identification of SLEGS, one for use where EHD data **is** available and the other where such data **is not** available, have therefore been developed and are presented as flow diagrams in Figures 5.3 and 5.4. Whilst these flow diagrams show the basic procedures to be used, they represent a simplification of a more complex methodology and cannot therefore cover every eventuality which may arise (e.g. the availability of an additional local data source). In consequence the procedures should be used as a guide to be adapted as common sense demands to suite local circumstances.

Figure 5.3 Flow diagram for use in identifying SLEGS where EHD data is available



6. DISCUSSION

There is a clear need and duty for the Agency to have knowledge about SLEGS, both under the current legislation and anticipated new legislation likely to result from the recent review of the abstraction licensing system of England and Wales (DETR, March 1999) and the EU Water Framework Directive. These needs extend to the identification of sources that might be at risk from pollution and are not limited solely to concerns about derogation. Furthermore SLEGS are a valuable source of information on water quality, groundwater levels and yield potential which would not otherwise be attainable. Indeed some Regions actively seek to incorporate SLEGS into their groundwater-monitoring network.

This study has revealed that there is a wealth of experience and a large body of data already within the Agency pertaining to SLEGS. However, this knowledge is not spread evenly across the Agency.

Whilst a variety of methods have proved to be effective at identifying SLEGS, the most commonly used method involves EHD records as a means of identifying properties that have a private water supply. Other methods include the use of the National Well Record Archive listings of boreholes, Water Company water distribution systems to identify properties not served by a mains water supply, and ad-hoc water feature surveys (usually carried out in response to proposed developments that might derogate existing supplies). Generally speaking, only the National Well Record Archive and the latter method are normally able to identify the source of supply (our main objective), the others identify or indicate properties that are or may be served by a private water supply.

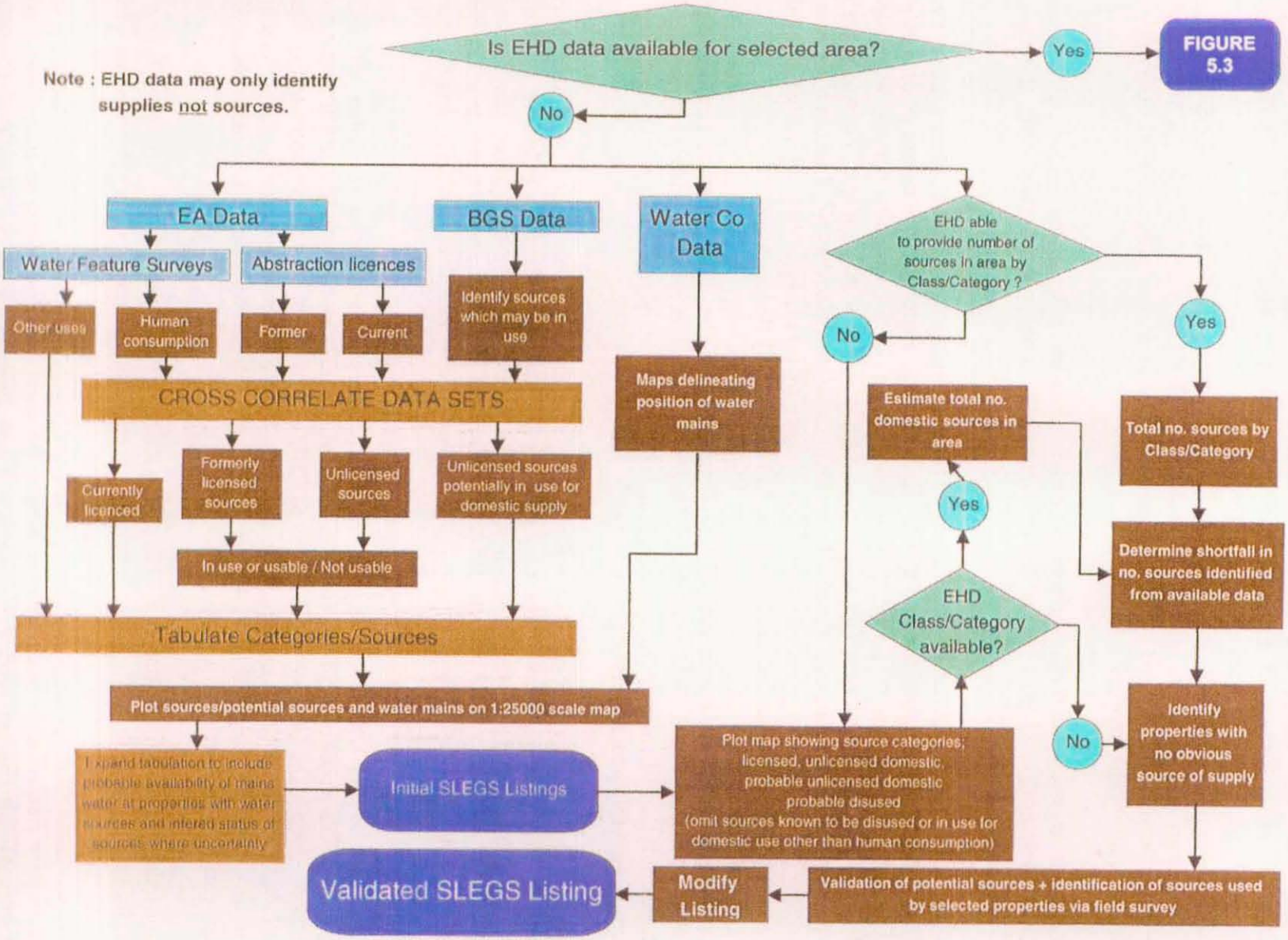
Nevertheless, despite their limitations, EHD records remain the most practical single means of identifying the majority of SLEGS, albeit often by proxy (i.e. by identifying private supplies used for domestic supply). When used in combination with other methods this approach is capable of producing reasonably accurate listings of SLEGS.

However, some Local Authorities have refused access to their valuable data sets of small private supplies. On investigation, such refusal may be well founded, as no legislation has been unearthed by this study that would entitle the Agency or BGS access to these data given the over-riding requirements of the Data Protection Act (1984 and 1998) to restrict access to these data. However, this restriction need not apply where permission of the owners/occupiers has been obtained for the transfer and use of this data.

Without access to EHD data, the Agency must rely more heavily upon the other methods of identifying SLEGS as set out in this report. These are generally not as reliable or efficient as using EHD records. Hence the legality of the access to EHD records must be a key concern to the Agency and BGS, both to ensure that they avoid breach of the Data Protection Act and to ensure continued access to this valuable source of data. Access to EHD records are considered as a principal need for the Agency in order to carry out its legal duties.

The proposed changes to the abstraction licensing system (DETR, March 1999) will result in changes to the definition of SLEGS, with many previously licensable sources of $<20m^3/d$ becoming exempt from licensing, and will allow for the establishment of statutory local registers of exempt source (normally all abstractions of less than $20m^3/d$). An Order for a specific area must be applied for and registration may not be commonly adopted across the Agency. The status of previously licence-exempt areas will also be removed. Where local registers are established, only registered abstractions will continue to receive protection from derogation. However, not all areas need necessarily establish such registers and in those areas that do not, all exempt sources will (as at present) require

Figure 5.4 Flow diagram for use in identifying SLEGS where EHD data is not available.



statutory protection from derogation. Furthermore, whilst the exclusion of a source from a local register would remove the Agency's duty to protect the source from derogation, it would not remove the need in some circumstances for the Agency to identify SLEGS that might be at risk from pollution in order to protect that source. This is an important feature that the Agency will need to address. Furthermore there are other reasons why the Agency should have knowledge of SLEGS. Those identified in this study are:

(i) To be able to operate the Agency's 'Policy and Practice for the Protection of Groundwater' which aims to protect all potable groundwater sources, many of which are SLEGS.

(ii) To be able to consider incorporating selected SLEGS in the Agency's water level and water quality monitoring network.

(iii) To be able to identify groundwater bodies in accordance with the groundwater yield threshold of the proposed Water Framework Directive

(iv) To incorporate the yield potential of various strata in resource studies and for water resource planning.

It therefore follows that the Agency's existing listings of SLEGS (at Regional or Area level) and its current methods of identifying exempt sources will continue to be important to its operational activities subsequent to any expected changes in abstraction licensing legislation. The development of the following recommended approach to identify SLEGS is cognisant of the likely changes to the abstraction licensing system, the Groundwater Regulations 1998, and the issue of data protection especially with respect to the Agency's use of EHD records.

7. RECOMMENDED APPROACH

7.1 Development of the recommended approach

The methods identified in this study can either be used in conjunction with a registration exercise, which it is presumed will be based upon an advertising/public information campaign, or independent of a registration exercise, as is presently the case for most of the country. The methods may be applied under the current or proposed abstraction licensing system. However, for the purpose of producing a recommended approach it has been assumed that the proposed licensing system is in place (which allows for both registration and non-registration schemes to exist).

7.2 Evaluation of individual methods

In producing a recommended approach, the various methods must first be evaluated in terms of their effectiveness and level of effort required, and any pit falls must be clearly identified. This section presents a summary of these factors based upon lessons learnt from the Agency survey (section 4) critical consideration of the potential sources of information for each method (section 5) and results of the pilot study (section 6). The evaluation presented in Table 7.1 is therefore a subjective assessment that represents a synthesis of findings of this study.

Table 7.1 Evaluation of methods

Method	Value in identifying SLEG sources	Effort/cost	Comments
New field survey of water sources	***(**)	£££(£)	Effectiveness & cost will depend upon the rigour of the survey. Prohibitive cost for large areas
Advertisements & Public campaign	**(**)	££(£)	Effectiveness and cost will depend largely on the nature of the campaign.
EHD records	***(*)	£	Can be highly effective at identifying majority of small supplies. Data often easy to obtain. Usually requires follow up to identify sources of supply. Issues arise with regard to data protection.
National Well Record Archive (BGS)	*(**)	£	Level of coverage varies widely across England & Wales. Requires follow up to identify current status
Water Company mains records	**(*)	£	Can be highly effective at identifying properties that are not served by a mains supply. May have difficulty in obtaining information from water companies. Requires follow up to identify sources of supply
Existing Agency records (may incorp. findings of any of the above).	*(****)	£	Variable knowledge base between Agency Areas and Regions.

*Note: **(**) depicts normal range and (possible increase in range)*

7.3 Combining methods

Consideration is now given to how the various methods may be used in combination with each other. The views expressed in the Agency survey (section 4) guide this discussion. A recommended approach to identifying SLEGS under the new abstraction licensing system is then presented.

The methods in Table 7.1 of identifying SLEGS have been used in a variety of combinations across the Agency in an attempt to produce a comprehensive list (as far as is achievable) of these exempt sources. The Agency survey revealed a diversity of views on how these methods could be used in the future, especially in light of the anticipated changes to the abstraction licensing system. The following discussion reflects some of the favoured approaches.

Some Agency staff favour the establishment of local registers populated solely by responses to advertising/public information campaigns and thereafter only those sources on the register will be protected from derogation.

Other Agency staff argue that even with an established listing of SLEGS or a formal local register they would still feel compelled to ask for ad-hoc water feature surveys to be carried out in response to proposals for new abstractions (and proposed civil engineering projects) to ensure that no sources would be overlooked (even if not registered). A similar view was expressed by staff concerned with pollution prevention. Consequently, ad-hoc water feature surveys may still be required to identify sources that might be at risk from pollution even if not required to protect them from derogation. This is not surprising since the registration proposals were not drawn up with groundwater source protection in mind.

A middle view is that reference to an existing listing of SLEGS or a local register should be used as a 'guide' to whether or not a water feature survey should be required for a proposed development/abstraction. This reflects current use of existing listings of exempt sources in some Agency Areas. However, in practice an ad-hoc survey is almost always requested even in those areas with relatively good records of exempt sources, and is usually paid for by the licence applicant.

Given that some Areas and Regions have invested considerable effort in establishing listings of SLEGS it would seem sensible to capitalise on this body of knowledge when establishing a local register. Hence the existing data may be used to help populate the local registers. Similarly, Agency Areas/Regions might chose to acquire records from EHDs, water companies or BGS (National Well Record Archive) where they have not already done so to help the process of building up a comprehensive listing or to establish a register. In almost all cases follow-up enquiries would need to be made to obtain data on the source and its current status, to ensure compliance with current data protection requirements and any particular requirements to enable sharing of databases with BGS.

7.4 Selecting an approach to identifying Small, Licence-Exempt Groundwater Sources

Due to the different needs and views of each Area/Region, a flexible framework has been developed to help identify the best approach that is appropriate to any study area. The framework sets out a variety of ways in which the various methods can be used to identify SLEGS, and guides the selection of a particular approach (combination of methods) based upon local requirements, resources and accessibility to data. In all cases care needs to be exercised to ensure compliance with current data protection law.

Box 7.1.
Selecting an approach to identifying Small, Licence-Exempt Groundwater Sources

1 Determine objectives of identifying SLEGS
i.e. for the purpose of protecting against derogation (abstractions or other developments), or pollution, or for water resource assessments. All should be considered.

2 Determine budget/resources required to carry out the project

3 Estimate the amount and quality of data likely attainable by each method (will vary by area)

4 Decide on an optimum approach (combination of methods) most likely to meet the above objectives at an acceptable cost.

Methods

- Advertisement/public campaign/postal survey
- Use existing data held by Agency
- Access EHD records
- Access Water Company & property records
- Access National Well Record Archive (BGS)
- Specially designed field survey
- Ad-hoc water feature surveys
- Other eg drillers records, War Pamphlets

A key factor in deriving an optimum approach is the accessibility of EHD data. Figures 5.3 & 5.4 present two suggested procedures for the systematic identification of SLEGS that incorporates all of the commonly adopted approaches in a combined approach. The first procedure (Figure 5.3) can be applied where EHD are accessible and the second procedure (Figure 5.4) where they are not.

In all cases care must be taken to ensure that the Agency and BGS is compliant with The Data Protection Act of 1984 and 1998. Gaining the required approval to hold data on small, licence-exempt, sources from individuals who receive their water supplies from these sources is likely to be a major factor governing the effectiveness of any scheme that seeks to produce listings of these sources. Requests for the necessary consents can of course be incorporated in the procedures used as part of any exercise to produce a listing of SLEGS including the establishment of a local register under the proposed new abstraction licensing system. However, it should be noted that collecting the data for source protection purposes and subsequently providing data to BGS may compromise the data protection law unless BGS' use of the data has also been consented.

8. NATIONAL ESTIMATES

8.1 Current national estimates

Prior to this study the Agency produced in 1994, an estimate of the number of small, <20m^3/d, private water supplies in England and Wales, based upon data supplied to DoE from Local Authorities in 1994 (correspondence Agency to DoE 1994). Section 4.1 describes the data set and the synoptic maps that were produced at the time (Appendix III). The estimate produced in 1994 was of c51,000 private supplies. At the time this figure was thought to be an underestimate because it is unlikely that the Local Authorities had indeed identified all the private sources nor did all of the Local Authorities return estimates. Moreover, this figure excludes water used for any purpose other than domestic and food production, but includes surface water abstractions. Under the present licensing regime a considerable number of the sources identified will be licensed (but in future will be exempt) i.e. those used for general agriculture commonly have a component of domestic use and would be included in Category 1, Classes D, E and F. Hence this estimate has to be treated with caution and cannot be considered an accurate estimate of SLEGS.

This study has sought to provide an alternative estimate using two different means. However, both have their limitations:

The first estimate is a collation of estimates returned by Agency staff as part of the questionnaire exercise. However, because not all areas returned estimates it has been necessary to make pro-rata adjustments based upon the figures returned from the other Areas and Regions. By this process it has been possible to produce new estimates of the number or SLEGS nationally. These estimates range from 105,000 to 150,000 SLEGS in England and Wales. However, the figures returned are a mixture of estimates of sources and supplies, some of which include surface water abstractions. An additional point to note is that once the licence threshold of 20m^3/d is established, the number of SLEGS will increase as many abstractions will no longer require abstraction licences.

An alternative and pragmatic approach to estimating SLEGS arose from discussion with staff in SW Region, who from experience noted that in general water feature surveys found that for every licensed source, three licence-exempt sources were detected. Applying this ratio to the national number of abstraction licences in England & Wales, 48,000, (DETR, 1998) provides a national estimate of 144,000 small, licence-exempt sources (including surface water sources). However, attempts to obtain similar ratios estimates from other Agency Regions has not been fruitful and the national estimate thus derived remains highly tentative.

Clearly, all of the above estimates have serious limitations. Consequently, none are considered by the authors to be accurate estimates. Furthermore these estimates conflict with the 1994 DoE survey that reported the total number of Category 1, Classes D, E and F and Category 2, Classes 4 and 5 (see Table 2.1) supplies was approximately 50,000. Of these all Category 2 supplies and those of Category 1, Classes D, E and F, which are also used for agricultural supply, will be licensed under the existing regulations. This would indicate that the current total of SLEGS is probably less than 50,000.

8.2 Future estimates

It is recommended that future estimates for the number of SLEGS should be derived in accordance with the approach advocated in this report, with each Region applying a selection of methods to

produce or improve their listings of SLEGS. These Regional estimates should then be collated to produce a total figure for England & Wales.

A less accurate estimate could be obtained by 'sampling' selected areas in each Region to determine the typical ratio of licensed to exempt sources. Using the licensing data-base each Region could then estimate by extrapolation the number of SLEGS in its Region. Existing records from water feature surveys could be used as the source of data for this method, although it is possible that they will not supply sufficient continuous cover to be sure of a complete picture.

9. SPECIAL RECOMMENDATIONS

This section contains recommendations that are designed to regularise the Agency's approach towards SLEGS and improve future access to information that is relevant to the duties of the Agency and BGS. For clarification, the Agency's primary interest is the identification and protection of SLEGS, whilst BGS's interest lies in enhancing and maintaining the National Well Records Archive.

1. The Agency should update and re-issue its 'Policy and Practice for the Protection of Groundwater' to incorporate detailed guidance on the protection of SLEGS, both from derogation and pollution. The policy should benefit from the findings of this study, and should make reference to the recommended procedures to identify SLEGS that feature in this report.

2. The Agency should actively seek an agreed means of improving access to data on small licence-exempt sources held by Local Authorities that are relevant to the Agency's duties. This item alone would result in a very significant improvement in the ability of the Agency to identify SLEGS. Clearly, careful consideration will need to be given to ensure compliance with data protection law. The opportunity should also be taken to ask EHO's if they would, in future, request information on the type of source (eg spring or well) and its location. In the first instance the Groundwater Resources Group and the Groundwater Quality Group should consider this recommendation and determine an appropriate course of action.

3. BGS should review its recommended depth criteria of 15m as the depth beyond which drilling companies are legally obliged (Section 7 of the Water Act 1945.) to provide drilling logs to the BGS that are then entered on the National Well Record Archive. This would help to address the lack of data on shallow wells held on the National Well Records Archive.

4. BGS should contact relevant drilling companies to 'remind' them of their legal obligation to supply drilling logs for all excavations >15m deep or a revised criteria as set out in point 3 above. Indeed this is the primary source of geological data for BGS, and improvements to the numbers of well logs reported by drilling companies to BGS, would probably be the best means of enhancing the National Well Record Archive.

5. The Agency's national review of groundwater monitoring (March 2000) should include in its brief, consideration of the potential role of SLEGS to augment the existing monitoring network with respect to groundwater quality and groundwater levels. This is already established practice in some Regions.

6. The Agency should consider a common medium and format for the storage of data on SLEGS. The BGS and the Agency should seek to ensure an effective and frequent means of transferring data on SLEGS that are relevant to their respective duties. It is important that careful consideration is given to the implications of data protection law to ensure lawful access to the required data.

7. Agency & DETR should consider the possible role of the Land Registry in keeping records of private sources associated with property and access rights. This is a possible mechanism to ensure that the existence and details of private sources are identified and that these records are kept up-to-date.

10. REFERENCES

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Water Act 1945
Groundwater Regulations 1998
Private Water Supply Regulations 1991
Waste Management Licensing Regulations 1994
Contaminated Land (England) Regulations 2000
Environmental Information Regulations 1992

APPENDICES

APPENDIX I - LOCATION OF SOURCES

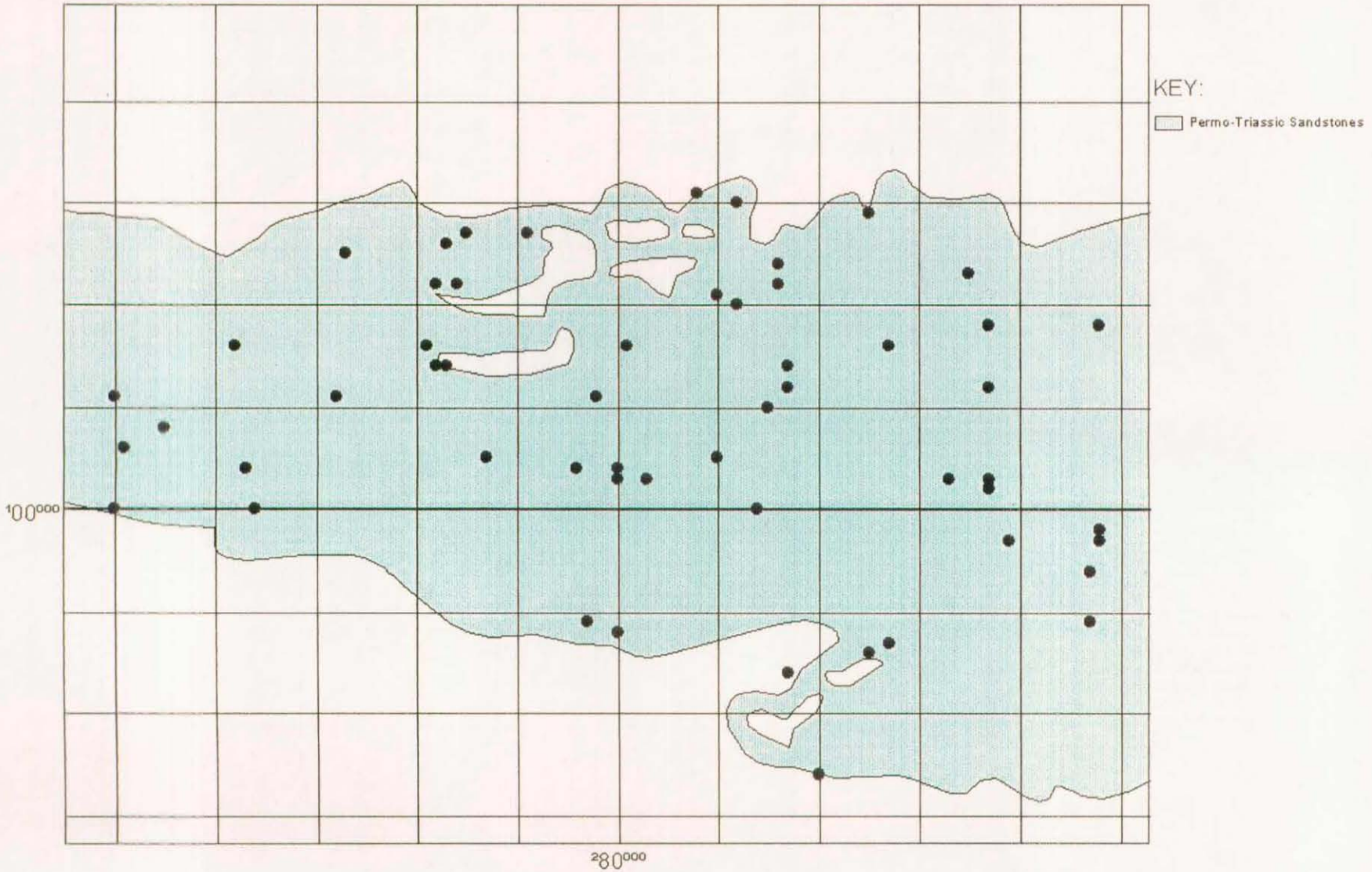
APPENDIX II - CROSS CORRELATION OF WATER SOURCE INFORMATION

APPENDIX III - RESULTS OF DOE SURVEY OF PRIVATE SUPPLIES 1994

APPENDIX I
LOCATION OF SOURCES

Appendix 1.1	**Location of Sources identified by the Davey Field Survey**
Appendix 1.2	**Location of Currently Licensed Sources**
Appendix 1.3	**Location of Formerly Licensed Sources**
Appendix 1.4	**Location of Unlicensed Sources identified only from J Davey's Field Survey**
Appendix 1.5	**Location of Sources identified from the BGS Archive and Environment Agency Water Feature Surveys**
Appendix 1.6	**Location of Small Licence-Exempt Groundwater Sources and Potential small Licence-Exempt Groundwater Sources identified by the Pilot Study**

Appendix 1.1 Locations of Sources Identified By The Davey Field Survey



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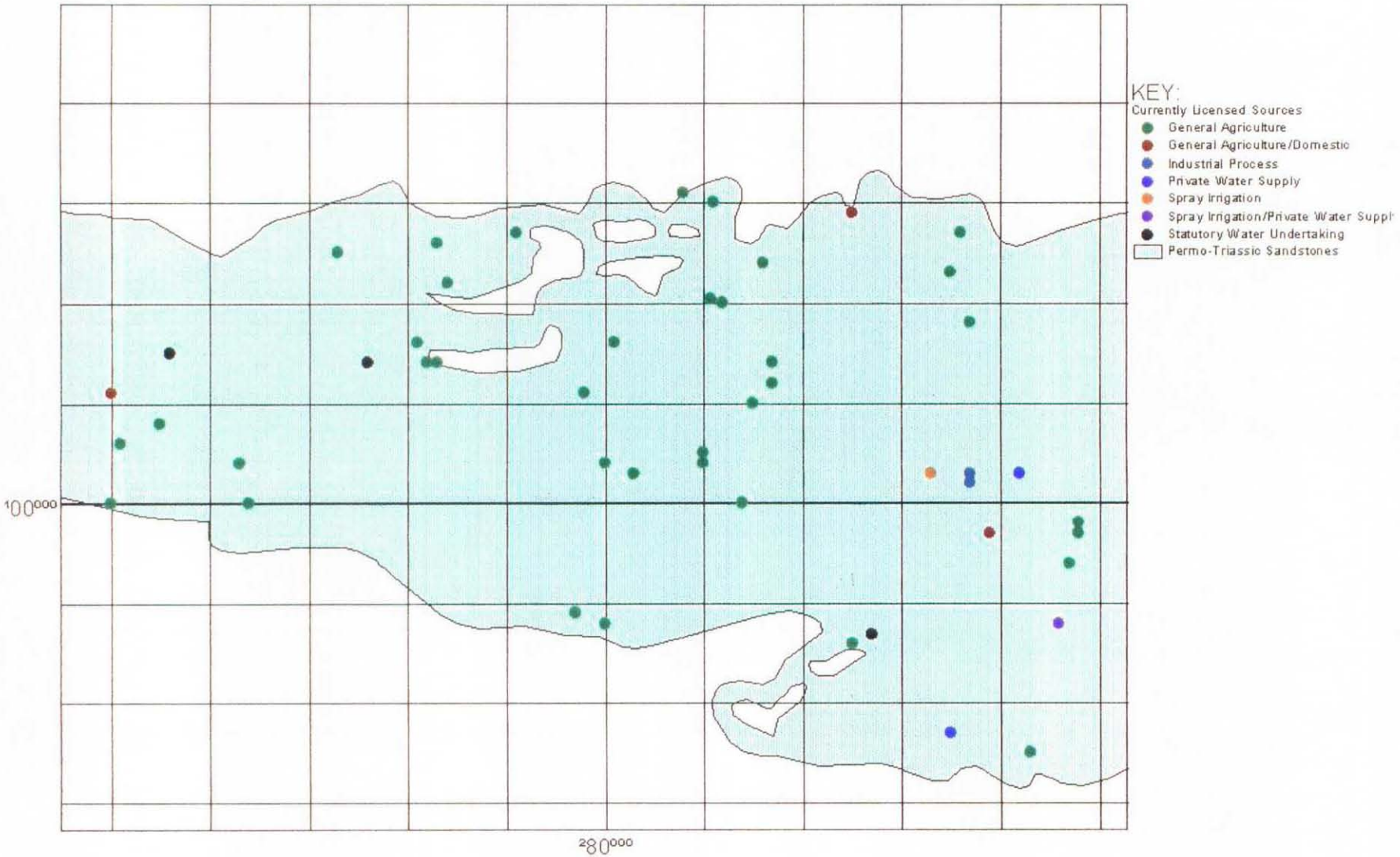
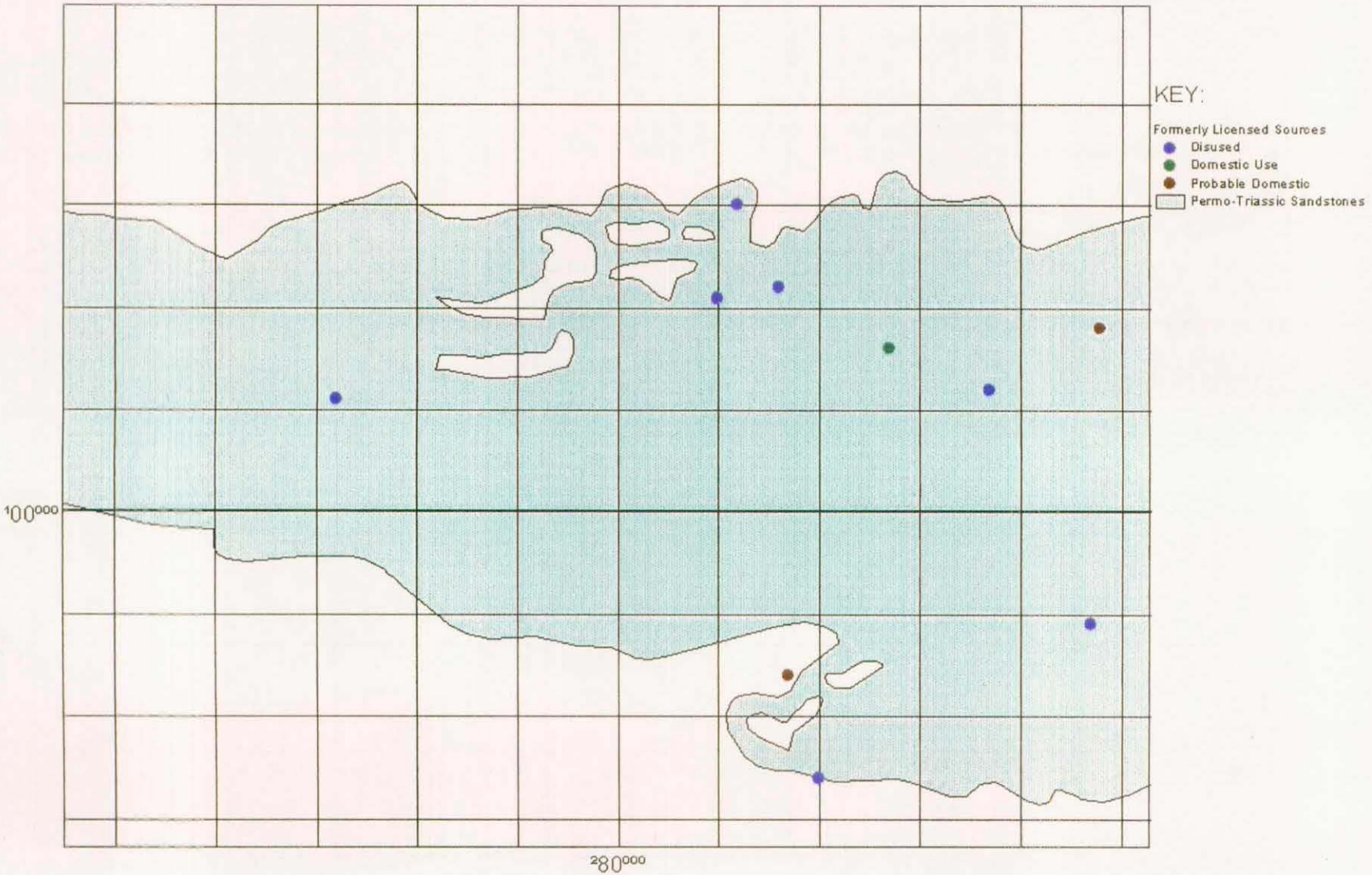
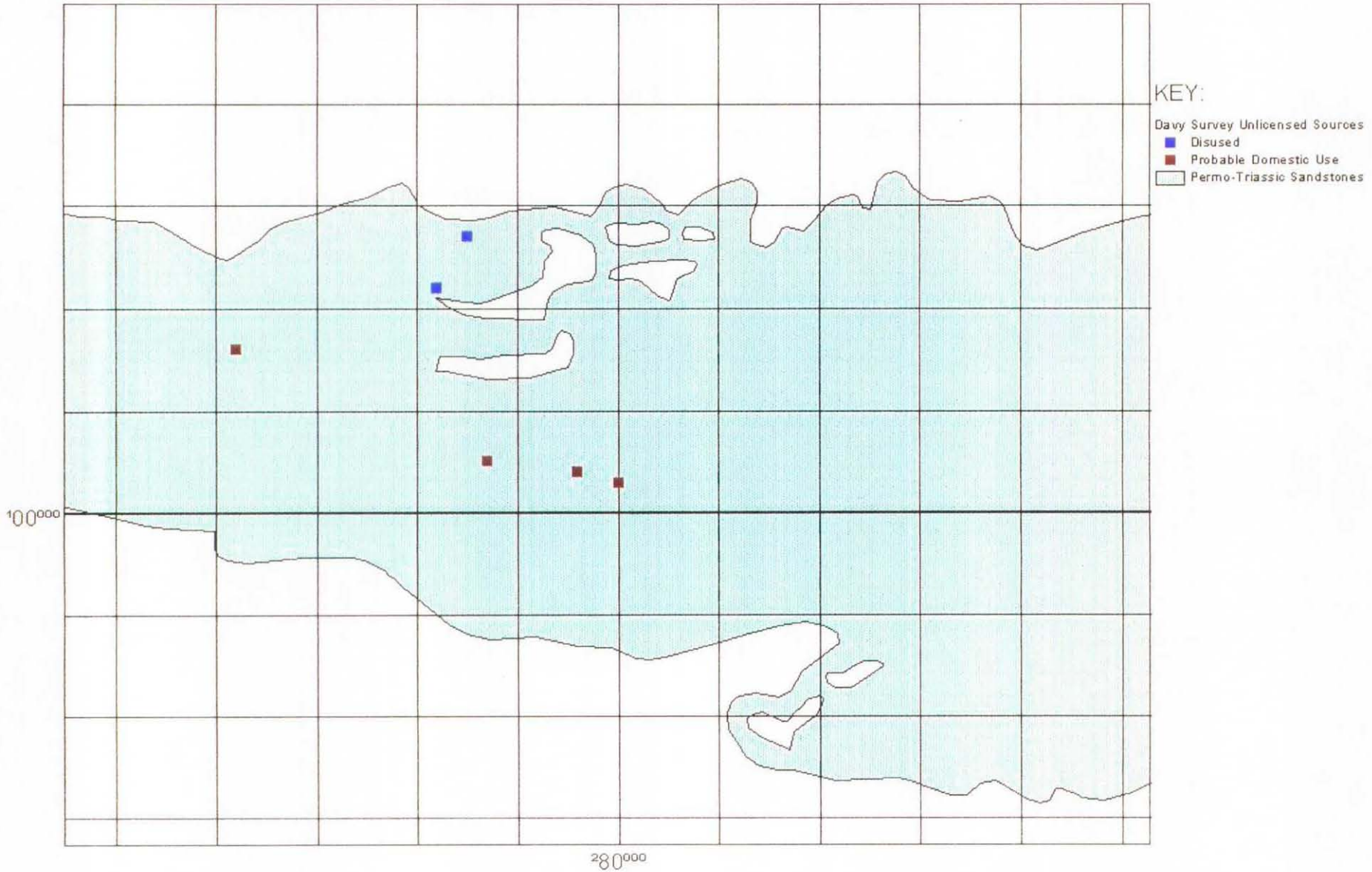
Appendix 1.2 Location of Currently Licensed Sources



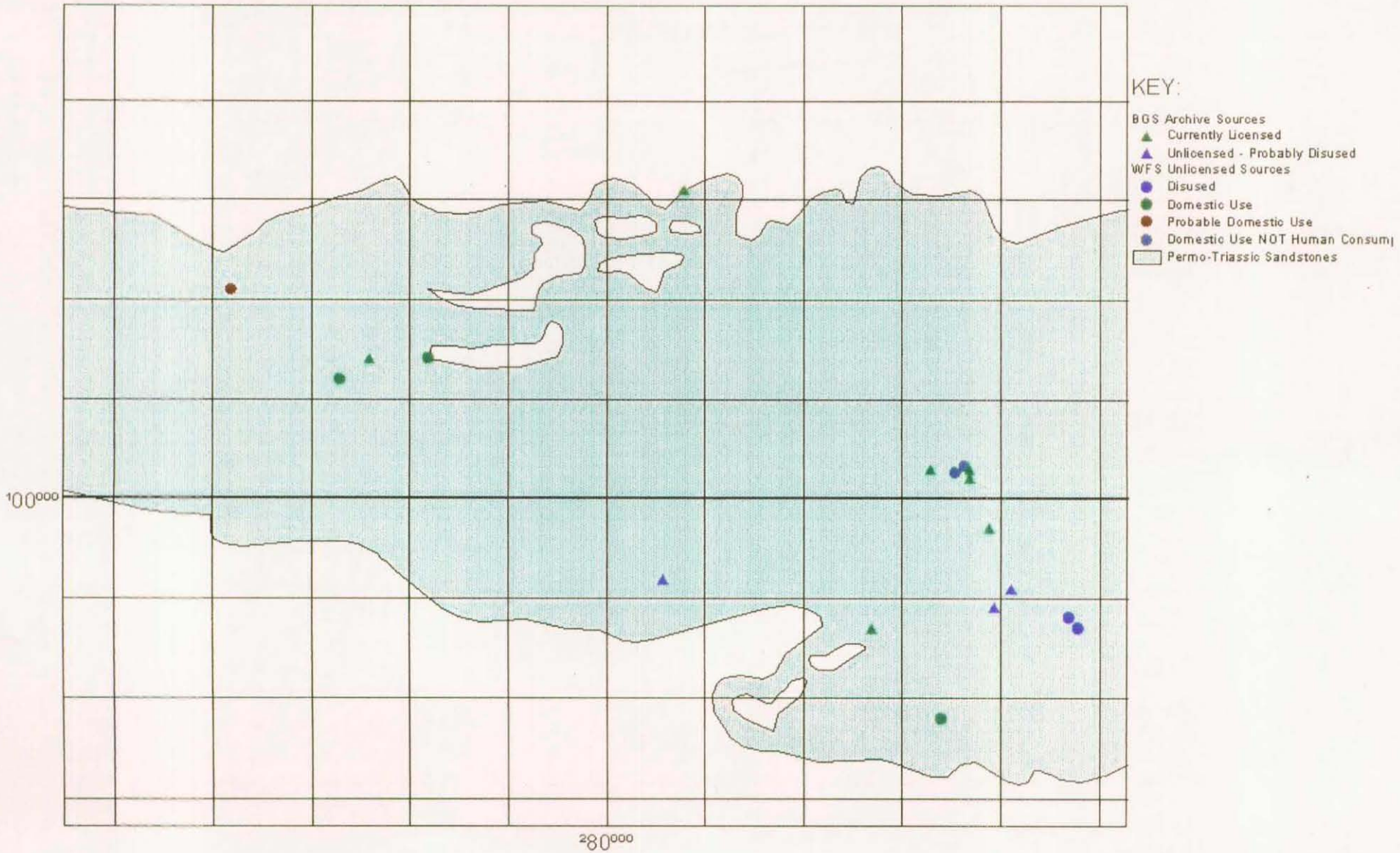
Appendix 1.3 Location of Formerly Licensed Sources



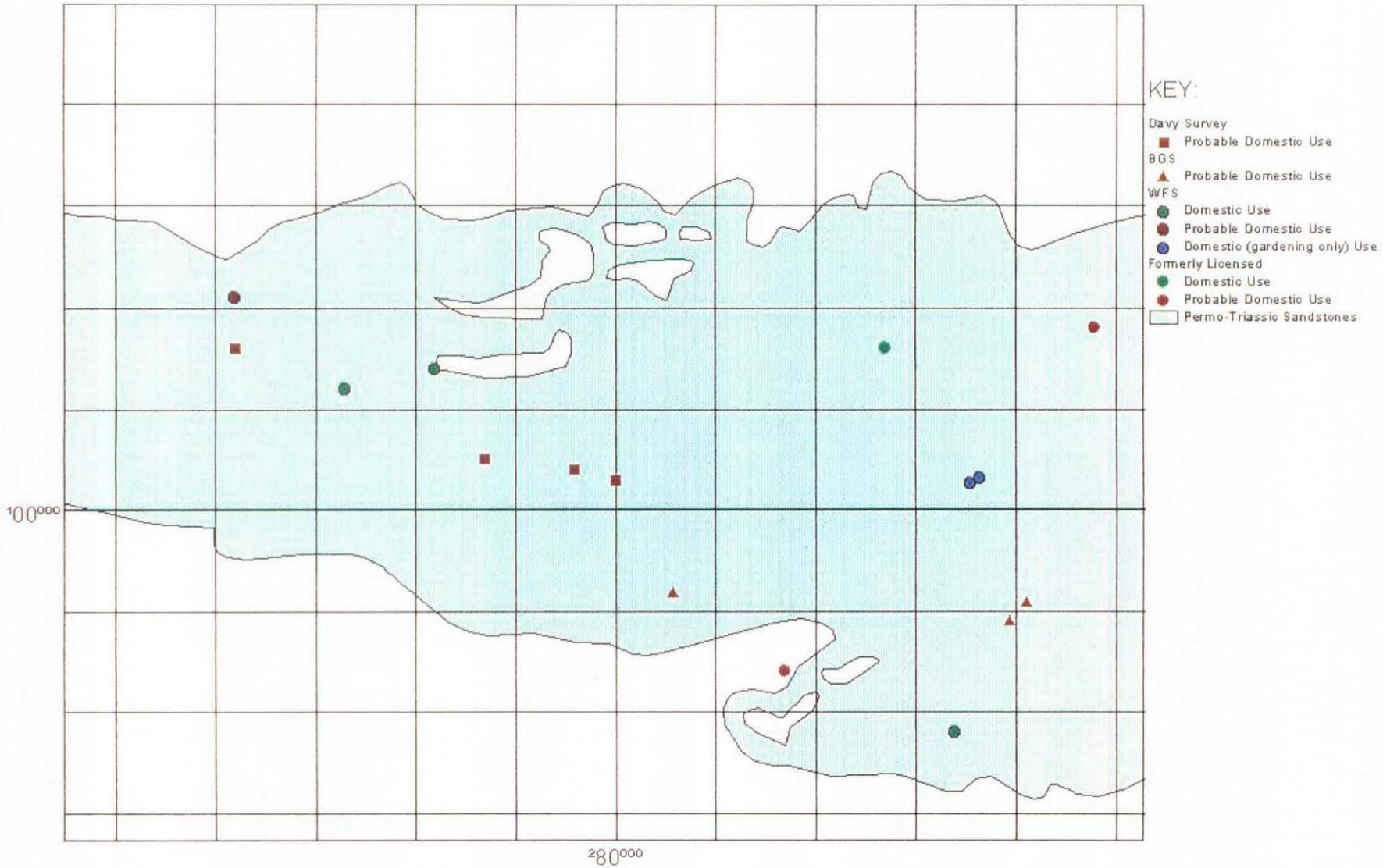
Appendix 1.4 Location of Unlicensed Sources identified only from J Davey's Field Survey



Appendix 1.5 Location of Sources identified from the BGS Archive and Environment Agency Water Feature Surveys



Appendix 1.6 Location of SLEGS and Potential SLEGS identified by the Pilot Study



APPENDIX II
CROSS CORRELATION OF WATER SOURCE INFORMATION

Cross Correlation of Water Source Information

Well No.	Status (c.1980)	Type	NGR	Abstraction Licence	Use	Current Status	Mains water available?	BGS No.	Comments
62	U	S/C	SS 750 000	C	AG	Used	M		
63	U	B	SS 751 006	C	AG	Used	U		Possible domestic use
64	U	S/C	SS 750 011	C	AG/D	Used	U		Domestic use
65	D	W	SS 755 008	C	AG	Used	M		
67	U	W	SS 762 016	N	D?	Used?	U?		Possible domestic use
68	U	W	SS 763 004	C	AG	Used	P		
69	U	W	SS 764 000	C	AG	Used	U		Possible domestic use
70	D	W	SS 772 011	F	-	Disused?	P		
72	U	W	SS 773 025	C	AG	Used	P		
74	D	W	SS 783 026	C	AG	Used	P		
75	U	S/C	SS 785 027	N	-	Disused?	P		
76	U	S/C	SS 791 027	C	AG	Used	U		Possible domestic use
77	U	W	SS 782 022	N	-	Disused?	P		
78	U	W	SS 784 022	C	AG	Used	P		
79	U	W	SS 781 016	C	AG	Used	U		Possible domestic use
80	U	S/C	SS 783 014	C	AG	Used	U		Possible domestic use
81	U	S/C	SS 782 014	C	AG	Used	U		Possible domestic use
83	U	W	SS 787 005	N	D?	Used?	U		Possible domestic use
85	U	W	SS 796 004	N	D?	Used?	U		Possible domestic use
86	D	B	SS 798 011	C	AG	Used	M		
87	U	S	SS 801 016	C	AG	Used	U?		Possible domestic use
88	U	W	SS 803 003	C	AG	Used	U		Possible domestic use
89	U	S/C	SS 800 004	C	AG	Used	U		Possible domestic use
90	U	W	SS 800 003	N	D?	Used?	U		Possible domestic use
91	U	S	SX 797 989	C	AG	Used	M		
92	U	S	SX 800 988	C	AG	Used	M?		
96	U	S/C	SX 817 984	F	D?	Used?	U		Possible domestic use
97	U	S	SX 820 974	F	-	Disused?	P		
100	U	B	SX 827 987	C	SWU	Used	N/A	SX89/14	
101	U	S	SX 825 986	C	AG	Used	P		
102	U	W	SS 814 000	C	AG	Used	U		Possible domestic use
103	U	W	SS 810 005	C	AG	Used	U		Possible domestic use
105	U	S	SS 815 101	C	AG	Used	?		
106	U	S	SS 817 012	C	AG	Used	U		Possible domestic use
107	U	S	SS 817 014	C	AG	Used	U		Possible domestic use
108	U	S	SS 812 020	C	AG	Used	P		
109	U	W	SS 810 021	F	-	Disused?	P		
110	U	S/C	SS 816 022	F	-	Disused?	M		
111	U	W	SS 816 024	C	AG	Used	M		
112	D	B	SS 808 031	C	AG	Used	P	SS80/4	
113	U	S	SS 812 030	F	-	Disused?	P		
114	U	S	SS 825 029	C	AG/D	Used	P		Domestic use
118	U	S	SS 827 016	F	D	Used	U		Probable domestic use
119	U	S	SS 835 023	C	AG	Used	P		
120	U	S	SS 837 018	C	AG	Used	P		
125	U	S/C	SS 848 018	F	D?	Used?	U		Possible domestic use
127	U	S	SS 837 012	F	-	Disused?	P		
128	D	B	SS 833 003	C	SI	Used	P	SS80/7	
129A	U	B	SS 837 003	C	IP	Used	P	SS80/9c	
129B	U	B	SS 837 002	C	IP	Used	P	SS80/9A	
129C	D	B	SS 837 002	C	IP	Used	P		
132	U	S/C	SX 848 998	C	AG	Used	U		Alternate source in domestic use
133	U	S/C	SX 848 997	C	AG	Used	U		Alternate source in domestic use
134	U	S/C	SX 847 994	C	AG	Used	U		Alternate source in domestic use
135	U	B	SX 839 997	C	AG/D	Used	U	SX89/11	Domestic use
139	U	W	SX 847 989	F	-	Disused	U		Alternative source in use
140	U	W	SX 847 989	F	-	Disused	U		Alternative source in use
A	-	B	SS 756 015	C	SWU	Used (from 15.6.90)	N/A		
B	-	B	SS 776 014	C	SWU	Used (from 11.2.91)	N/A	SS70/11	
C	-	S	SS 810 004	C	AG	Used (from 23.9.96)	U		
D	-	B	SS 8108 0204	C	AG	Used (from 9.9.98)	M		
E	-	S	SS 811 030	C	AG	Used (from 13.1.82)	P		
F	-	S	SS 836 027	C	AG	Used (from 5.12.85)	M		
G	-	B	SS 842 003	C	PWS	Used (from 12.11.98)	P		Private Supply
H	-	B	SX 835 977	C	PWS	Used (from 26.8.92)	U		Private Supply
I	-	W	SX 843 975	C	AG	Used (from 27.1.67)	U		
J	-	B	SX 846 988	C	SI/PWS	Used (from 19.1.96)	M		Private Supply
K	-	W	SX 834 978	N	D	Used (as at 18.3.92)	U		Info. from water interest survey
L	-	W	SX 848 987	N	Not used	Disused	P		Info. from water interest survey
M	-	W	SX 847 988	N	Not used	Disused	P		Info. from water interest survey
N	-	W	SS 8364 0032	N	Garden	Used	P		Info. from water interest survey
O	-	Adit	SS 8355 0026	N	Garden	Used	P		Info. from water interest survey
P	-	B	SX 8395 9890	N	-	Disused?	P	SX89/1	BGS archive - in use c.1965
Q	-	B	SX 8059 9918	N	-	Disused?	P	SX89/10	BGS archive - in use 1949
R	-	B	SX 8412 9909	N	-	Disused?	P	SX89/12	BGS archive - in use 1950's?

KEY

Source Type
B = Borehole
W = Well
S = Spring
S/C= Spring with catchpit

Abstraction Licence
C = Current
N = No
F = Formerly

Use
AG = General Agriculture
SI = Spray Irrigation
D = Domestic
PWS = Private Water Supply
SWU = Statutory Water Undertaking
IP = Industrial Process

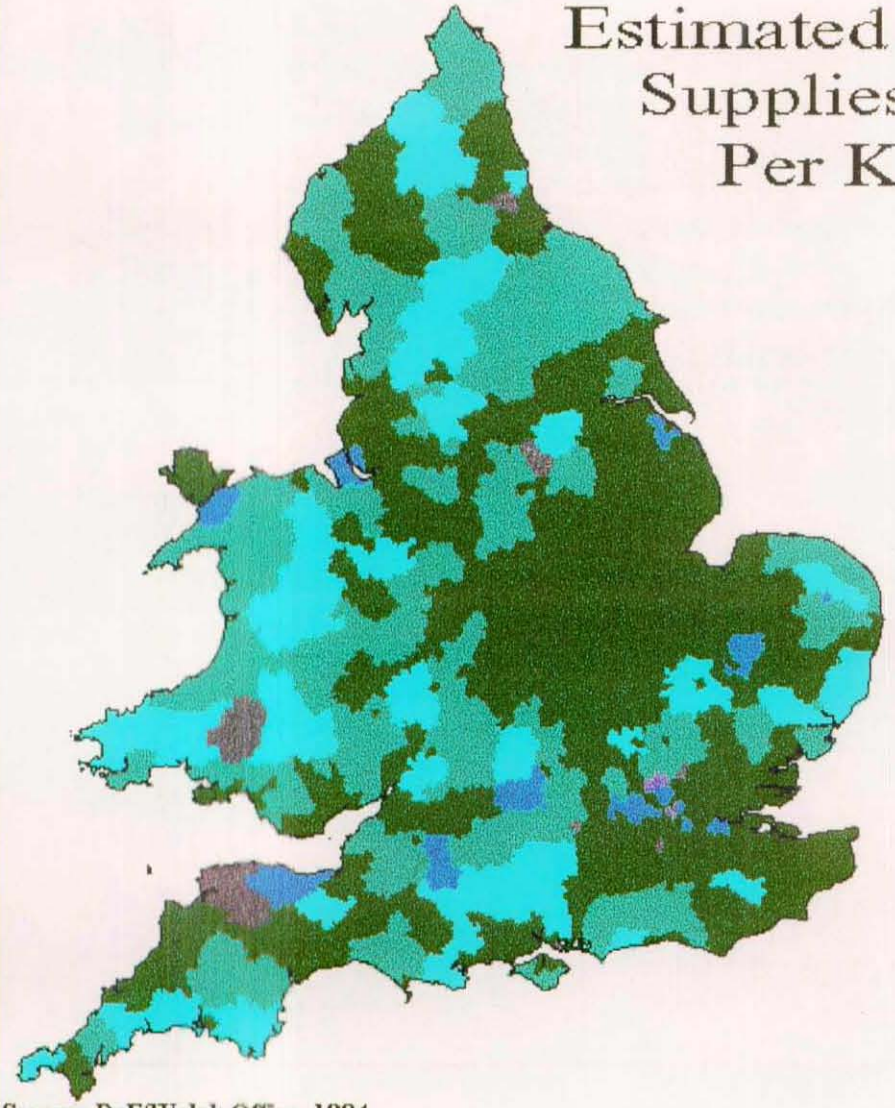
Mains Water
M = Maybe
P = Probable
U = Unlikely
N/A = Not Applicable

APPENDIX III
RESULTS OF DOE SURVEY OF PRIVATE SUPPLIES 1994

DOE SYNOPTIC MAPS 1994

Appendix 3.1	-	Estimated abstraction for private water supplies in England and Wales 1994 per kilometre square of area.
Appendix 3.2	-	Estimated number of private water supplies based on Local Authority areas of England and Wales 1994.
Appendix 3.3	-	Population served by private water supplies per kilometre squared of area.
Appendix 3.4	-	Number of private water supplies per kilometre squared of area.
Appendix 3.5	-	Estimated population served by private water supplies in England and Wales, 1994.

Estimated Abstraction For Private Water Supplies In England & Wales, 1994 Per Kilometre Squared Of Area



Approx Abstraction m3/Km2/Annum

- No Data
- 0.0 to 73.7
- 73.71 to 219.7
- 219.71 to 730.7
- 730.71 to 3650.0
- > 3650.0

N
W E
S

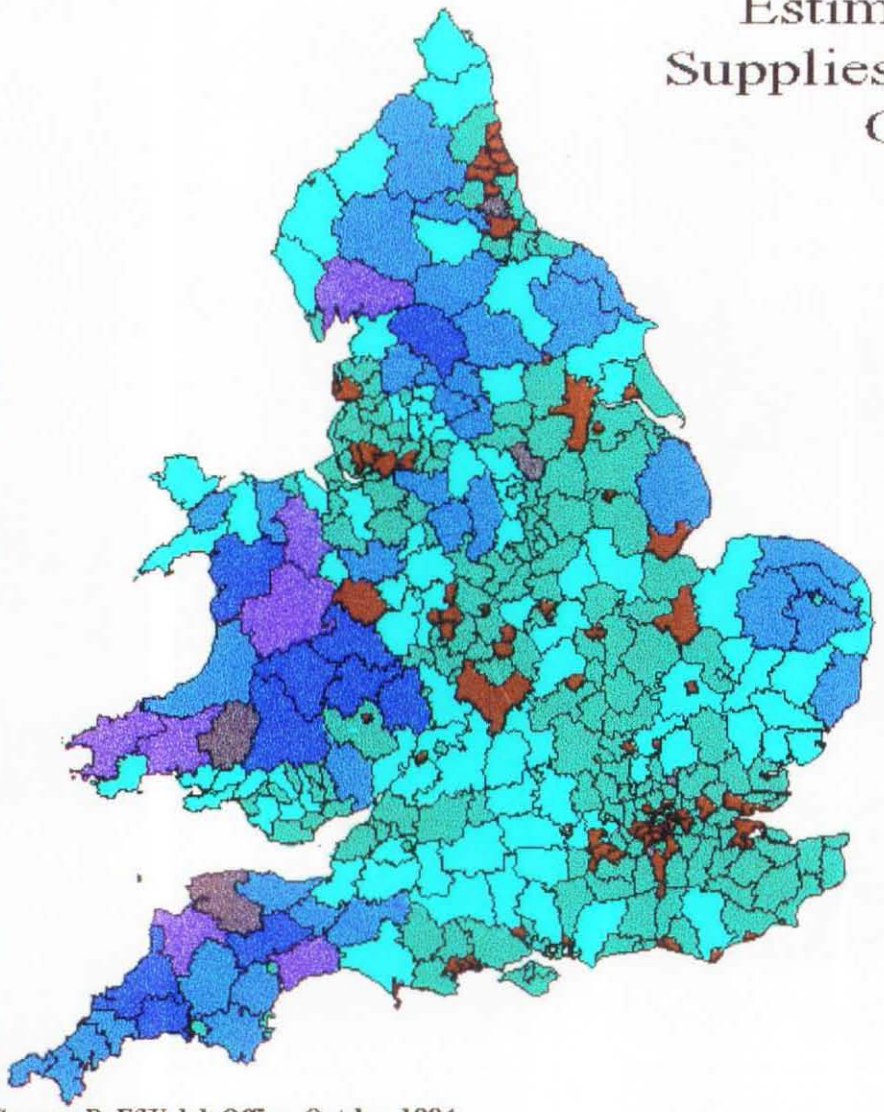
Note: Estimate includes categories 1 & 2, Classes A-F & 1-5.
Volume abstracted based on population served at 200 l/p/d.

-25 0 250 km

Source: DoE/Welsh Office, 1994

NRA
National Groundwater Centre

Estimated Number Of Private Water Supplies Based On Local Authority Areas Of England & Wales 1994



No. Of Supplies Per Local Authority

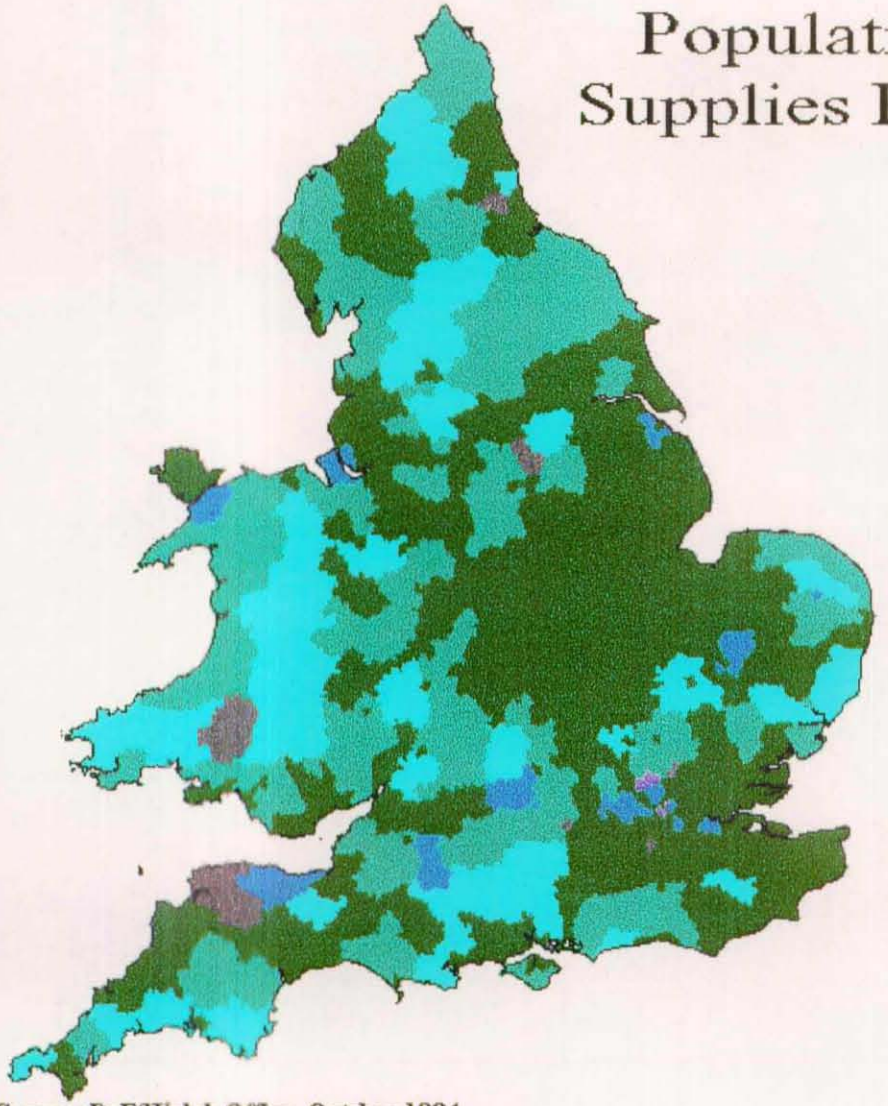
- No Data
- No Private Supplies
- 1 to 50
- 51 to 250
- 251 to 750
- 750 to 1500
- > 1500

Note: Estimate includes categories 1 & 2, Classes A-F & 1-5.

NRA
National Groundwater Centre

Source: DoE/Welsh Office, October 1994

Population Served By Private Water Supplies Per Kilometre Squared Of Area



Population Served Per Km2

- No Data
- 0.00 to 1.00
- 1.01 to 3.00
- 3.01 to 10.00
- 10.01 to 50.00
- > 50

N
W
E
S

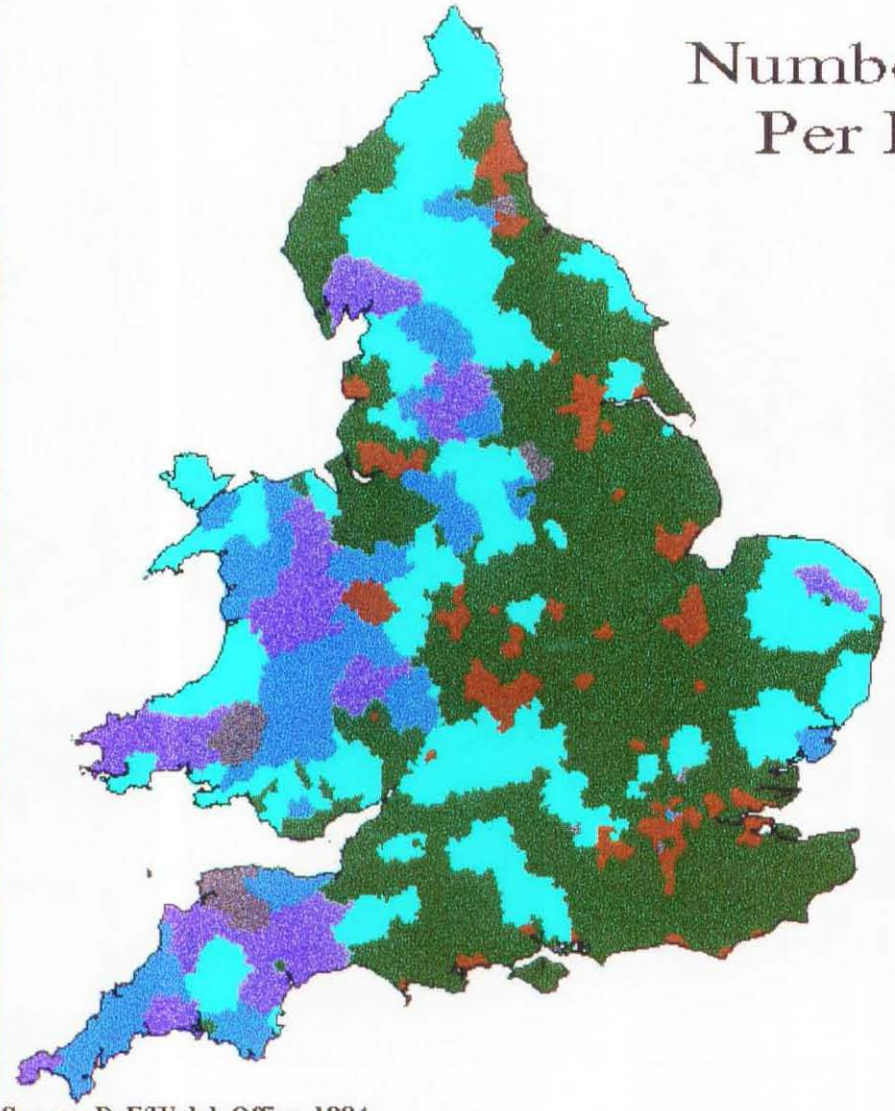
Note: Estimate includes categories 1 & 2, Classes A-F & 1-5.

-25 0 250 km

Source: DoE/Welsh Office, October 1994

NRA
National Groundwater Centre

Number Of Private Water Supplies Per Kilometre Squared Of Area



Number Of Supplies Per Km2

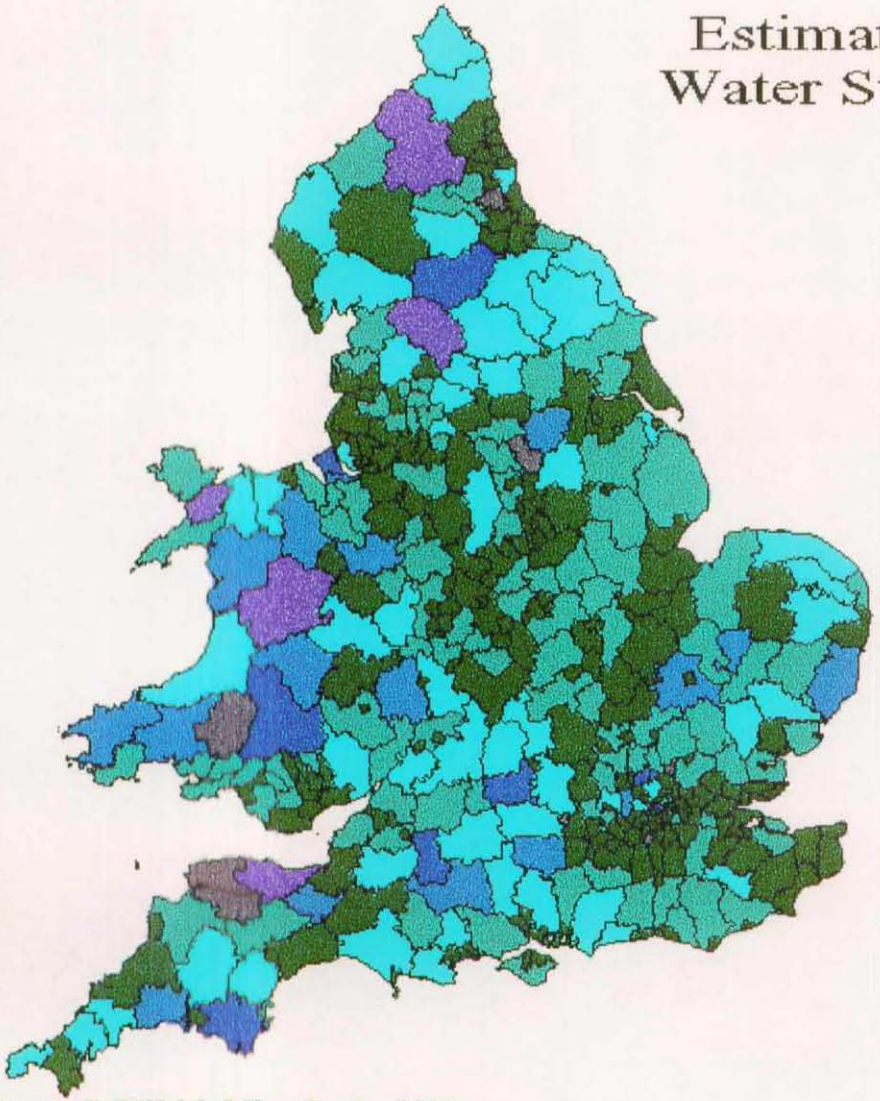
- No Data
- No Private Supplies
- 0.0001 to 0.2
- 0.2001 to 0.5
- 0.5001 to 1.0
- 1.0001 to 5.0

Note: Estimate includes categories 1 & 2, Classes A-F & 1-5.

Source: DoE/Welsh Office, 1994

NRA
National Groundwater Centre

Estimated Population Served By Private Water Supplies In England & Wales, 1994



Population Served Per Local Authority

- No Data
- 0 to 100
- 101 to 1000
- 1001 to 3000
- 3001 to 5000
- 5001 to 7500
- > 7500

Note: Estimate includes categories 1& 2, Classes A-F & 1-5.

Source: DoE/Welsh Office, October 1994

NRA
National Groundwater Centre