

RESTRICTED EXTERNALLY

**RIVER DEBEN (Suffolk)  
POLLUTION PREVENTION PROJECT  
2001/2**

The data on the compact disc with certain copies of this report and on G:\Env\_Protection\Deben collected during the project is restricted for Environment Agency staff and is not available for public consumption.



ENVIRONMENT AGENCY



124248

## SUMMARY

This project is based on the upper catchment of the River Deben, Suffolk.

With a downstream limit at Brandeston Bridge it covers approximately 100km<sup>2</sup> of predominantly arable and rural catchment.

The river is one of the top 40 low flow rivers in the country and has been the subject of significant agricultural and natural pollutions in the past. In 1997 it also suffered the devastating effect of a near zero % dissolved oxygen over a 15 km stretch for several weeks.

This project was designed to reduce the risk of pollution incidents, raise awareness in the community and provide a database to aid Environment Agency officers in future investigations.

An experienced external contractor was employed to provide the initial data from fieldwork. The data handling, letters and follow-up work was carried out internally.

Approximately 110 premises were investigated during the project. This covered all agriculture, industry and business in the catchment, excluding retail outlets in towns and villages and domestic properties.

A satisfactory standard of pollution prevention was found at only 24% of the premises inspected. 52% of the inspected sites were provided with advice to raise them to a satisfactory standard. Of the remaining 24% that required improvements 58% of these had requirements that were enforceable with legislation.

Discussion is provided on the methodology. The findings and potential impact of the project is discussed along with a comparison with past pollution incidents.

The project has provided a database on the catchment for internal use.

The information gathered during the period of this work will become inaccurate over time and addenda may be added to the report to reflect known changes.

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## 1 INTRODUCTION

The River Deben lies in Suffolk flowing to the east coast via an estuary at Woodbridge. The upper portion of the catchment drains a rural area of lowland England and is the subject of this project. The area is boulder clay covered chalk with the principle aquifer being gravels overlying the chalk. Some overlying valley deposits may also be found in the main river valley where gravels and chalk may also be revealed.

The river has been engineered in its middle and lower reaches with a number of gated mill pools and weirs however there are no major engineered in-river structures in the study area of approximately 100 km<sup>2</sup>. The downstream limit of the project area is at Brandeston Bridge TM238603. This catchment includes two of the more significant tributaries of the River Deben.

### 1.1 History

In 1990 the river was nationally designated one of the top 40 low flow rivers. This status was derived from an investigation of the relationship between the catchment hydrology and actual river discharge. The cause has been considered to be licensed spray irrigation abstraction in the lower reaches of the catchment (<sup>1</sup>National Rivers Authority 1993). This abstraction remains. Augmentation boreholes have however been established. Currently these are at Earl Soham (Environment Agency) and at Debenham sewage works (Anglian Water) and are available to augment river low river flows or to reduce any pollution impact on the river.

During the late 1990s the river suffered a number of pollution incidents resulting in fish deaths. Some of these were clearly of agricultural origin.

In 1997 a 15-kilometre stretch of the river in its middle reaches became de-oxygenation for a period of about two weeks. This caused the death of hundreds of fish and resulted in the growth, within the water mass, of sulphur bacteria derived from the sediment. The augmentation boreholes along with aerators were put into use during this event.

The event occurred in late August during a dry sunny period at low river flows. It was probably the result of the progressive lowering of dissolved oxygen levels caused by the still water at mill gates. This developed under a covering of *Lemna*, which prevented oxygen diffusing in from the atmosphere that might otherwise recover overnight oxygen lows. Once the water mass had taken on an anaerobic ecology it proved difficult to return to the aerobic state by human intervention. A report was produced on the incident (<sup>2</sup>Parr 1997). While the cause was probably natural and no specific polluting discharge could be found, diffuse pollution and eutrophication can not be eliminated from the equation and thus the project that is the subject of this report was spawned.

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<sup>1</sup> National Rivers Authority March 1993 LOW FLOWS AND WATER RESOURCES.  
IBSN1 87 3160 42 9

<sup>2</sup> Lynn Parr 1997 RIVER DEBEN DEOXYGENATION EVENT 1997 University of Essex

## **1.2 Aims**

The project aimed to:

- Reduce the risk of polluting discharges to the River Deben from its upper catchment by provision of pollution prevention advice.
- Raise awareness in the local population of pollution risks and the potential for harm to the river
- Provide an information database at a point in time for the catchment
- To assist in any future investigation of pollution incidents within the catchment

## **1.3 The Project**

Finance became available for the project and it was decided to offer the data collection part to an external contractor through competitive tendering in which both quality and price of the tenders was considered. R G Contracts was successful in the tendering.

The project was managed internally by C I McArthur. The day to day contact with the contractor, letter production, data handling, follow-up visits and enforcement were handled internally by R A Watson. Both staff were members of the Environment Protection team and based at the Ipswich office at the time.

Whilst it had been intended to complete the project within a year it suffered a number of delays. The outbreak of Foot and Mouth in Britain interrupted the project for a year. Following this it became more time consuming to arrange visits to agricultural sites owing to 1) operators concerns 2) the Agency's precautionary policy on bio-security. Shortly after the restart of the work legal difficulties of enforcing aspects of the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 arose. This presented problems where sites had been threatened with a SSAFO notice and delayed the sending of letters until the legal situation had been clarified further.

## **2 METHODS**

### **2.1 Contractors Work**

#### **2.1.1 Requirements**

R G Contracts was required to visit all agricultural and industrial premises in the catchment area delineated on a supplied map. The contractor was provided with a letter authorising the inspections on behalf of the Agency and a list detailing the topics applicable that the various inspection regimes.

Data was required for each discrete site along with a draft letter to be compiled from standard paragraphs. Regular meetings between the Agency and R G Contracts for discussion around particular sites or issues were necessary and successful.

An end of contract report in draft format was presented by R G Contracts and is included as file Contractrep.doc on the accompanying cd and in G:\Env\_Protection\Deben at Ipswich. Parts of the contractors draft report are included in this project report. The draft report also contains material not featured in this project report.

#### **2.1.2 Inspections**

The study area was covered progressively by dividing it into smaller areas that were completed before moving on. Site identification was initially carried out in the field and sites inspected by cold calling. Only one complaint was received as a consequence of this method of approach. Appointments were made when the first approach was not convenient. Following the Foot and Mouth outbreak pre-arrangements were made to ensure compliance with the Agency's bio-security policy and adjustment in working practices. Identification of sites and their owner's was then mainly achieved with assistance from neighbouring sites during inspections.

The most effective inspection method was to be shown around the entire site by the operator/owner. A site sketch could then be produced during the inspection, if not provided by the operator, onto which notes could be added. Questions covering the data requirements and to bring up relevant points could be made during and after the inspection. In the case of some industrial sites it was possible to follow the process from inputs through to product and wastes as the inspection progressed.

#### **2.1.3 The Data**

The data was provided electronically in a format determined by the contractor. The draft letters were in Microsoft Word. The data in Microsoft Word or Excel was routinely e-mailed from the contractor to increase efficiency and ensure letters sent by the Agency were received by the site operators/owners as soon as possible after the inspection.

Inspected sites were marked onto a map with the file name during Environment Agency / contractor liaison meetings. This connection between site and files is retained in this report, however file names are changed to a simple numbering system.

## **2.2 Environment Agency Work**

The raw data has been retained in the format presented by R G Contracts two examples of which are shown in appendix 1. Fictitious data has been used in these examples.

The data was viewed and any modification to the draft letter that had been e-mailed was made. In some cases requests for site meetings were made to discuss issues raised by the contractors inspection. Where appropriate, letters were accompanied by informative literature. This was mostly Environment Agency Pollution Prevention Guidance leaflets, CoGAPs and SSAFO Regs guidance to farmers.

Information was abstracted from the data to compile files relevant to the presentation of this report and to follow the progress of response to the letters sent to the site operators/owners.

Historic data on pollution incidents reported to the Environment Agency has also been used in this report. No third party data is incorporated into this report.

### 3 RESULTS

A compact disc, for internal use only, accompanies this report and is a copy of G:\Env\_Protection\Deben at Ipswich it contains the following:-

1. The data provided by R G Contracts, in the Data folder.
2. All letters sent that relate directly to this project, in the Data folder.
3. A map of the study area labelling all sites inspected, Debenmap.bmp
4. A skeleton map locating pig and cattle holdings Skeleton.jpg
5. The draft report submitted by R G Contracts, Contractrep.doc
6. The query list for coverage during inspection, Query list.doc
7. File assembled from the data for interpretation purposes, Check list.xls
8. File assembled for presentation of data, Pies.xls.
9. Access to Data and Map Guidance

#### 3.1 Access to Data and Map

This section applies to Environment Agency staff using the Computing Information System provided at the time of writing the report.

Documents in this work are best accessed via Windows Explorer, available via the start button, Programs or in Accessories under Programs else via the My Computer icon.

To view the data for a particular site its number within the Project must be found from the map. This can be done from one of the paper copies in the appendix 2 of this report, from the cd or from Ipswich G:\Env\_Protection\Deben.

In the case of the electronic version of the map 'Debenmap.bmp' this must be opened with Microsoft Photo Editor (available to EA users in 2003). Open the file from the cd or G drive using the 'open with' option on the right click drop down menu. Single click on the zoom icon (a magnifying glass). Position the cursor in the area you wish to enlarge and single click until the required magnification is achieved. Read the number/s from the map for the site/s of interest. You may move around the map at the magnification chosen or reduce the magnification by holding the shift key down whilst clicking.

The skeleton maps may be used to identify the sites with the specific stock type above a particular point on the river. Again the sites number should be noted.

To view the data and/or related letters, open up Windows Explorer from the Start button (Programs or Programs/Accessories) or the My Computer icon and find the source of the data you are using which will either be the cd drive or G:\Env\_Protection\Deben\Data. Find the file of interest and double click it to open.

The number files display all data obtained during the inspection and will usually supply a sketch of the site to aid any future visit.

The number files prefixed L are letters related to the site. Suffixes relate to additional letters such as reminders.

Some limited information on sites can also be obtained from the file Check list.xls. The sites of interest can be found in any one of the three sheets of that file by entering the number into the Find facility off the Edit button dropdown menu.



For example on 'Debenmap' at Dog Corner, Bedfield you will find a site numbered 106. In 'Data' you will find the file 106, this contains the data collected by the contractor and includes a sketch of the site. File L106 is the first letter sent to the owner of the site and file L106r is a reminder letter. In 'Check list' 106 can be found on the Sheet1 and Retailindustry sheets.

An agricultural and an industrial example of the data files are given in appendix 1.

## **3.2 Findings**

### **3.2.1 Introduction**

The study area is rural. The largest town is Debenham, with approximately 2,200 population.

The area is predominantly agricultural with mostly related light industry. The land is primarily arable however most farmsteads either house or have housed livestock at some time. The project area is following a national trend whereby smaller farms are being bought or contract farmed by larger enterprises. This process leaves farmsteads redundant or used for storage or light industry with the farmhouses often remaining as domestic residences.

The livestock sector in the area is currently in a period of decline. During the study period two enterprises (one with several units) ceased pig farming and a further multi-unitted pig enterprises significantly reduced its stock number.

### **3.2.2 Data Provided**

Aspects of the raw data in the Data folder have been presented in a tabulated format in the file Check list.xls, particularly in the sheets Retailindustry and Agricultural and as pie diagrams, file Pies.xls. The pies are printed in appendix 3 of this report.

The gross distribution of sites inspected between industry (25%) and agriculture (35% stock farms and 40% solely arable) is shown in the Upper River Deben Sites Visited, Nature of Business pie diagram.

Arable includes orchards, willow growing, parkland and a contract sprayer on an arable farm. It should be noted that many stock farms also have a considerable arable acreage as many will grow their own stock feed.

Industry in the area includes a micro-brewery, two local cyder and apple juice companies, plant nurseries, a fish farm, two agricultural engineers and a game dealer (venison) other industry includes furniture, windows and vehicle servicing.

Stock type breakdown, appendix 3b shows pigs to be the dominant stock type and whilst cattle appear as the second commonest this hides the high numbers of poultry in the area that are concentrated in four sites housing a total of 435,000 broilers. Three farms in the study area each keep in the order of 100 sheep. Minor stock sites are mostly horses with many at essentially domestic or hobby farm sites. There is no dairy in the area.

### **3.2.3 Response to Data**

Most inspected sites merited their own standard letter following the inspection. Exceptions to this included sites under a more extensive pollution prevention

review outside the remit of the project, sites very closely connected with a more major site and those just about to cease the operations inspected.

The Upper River Deben Pollution Prevention Needs pie, appendix 3c illustrates that only a quarter of all the sites visited were sufficiently risk free not to require any advice. The remainder have been divided into those where only advice was given with no follow up to ensure this was taken and those where the risk was sufficiently high that improvements had a legislative back up. Fourteen sites were issued with threats that notice would be served in the event that listed improvements were not complied with. To date, no notices have been issued although there are still some requirements outstanding. Difficulty arises where a SSAFO Regs notice has been threatened since this can no longer be enforced.

A gamekeeper's site that prepares venison was referred to the County Council Trading Standards department in respect of its obligations under the Animal By-Products (Amendment) Order 2001.

### **3.3 Pollutions and Risks Encountered**

#### **3.3.1 Pollutions**

Actual pollutions encountered during the inspections were fortunately few. The most serious encountered was a leaking effluent lagoon. This had probably been the cause of at least one prior pollution incident, the investigation into which had not successfully located the true source. A handful of smaller less significant watercourse pollutions were found at sites where structures had deteriorated through lack of maintenance or there was a failure to observe a 10 metre separation between clean and dirty areas.

#### **3.3.2 Risks**

The commonest risk at sites was found to be unbunded facilities, principally fuel tanks but this also included other oils, workshops, pesticide and other chemical storage. Notification of this risk was sent to 54 operators. Sheet 1 in the Check list file shows data on risks notified.

Twenty-one operators were notified of the risk in the failure to observe the 10-metre separation of clean and dirty water where there was a risk of pollution.

Four operators were notified of ineffective bunding owing to lack of maintenance. This was observed for both fuel and pesticide stores.

Eleven were notified on the risks associated with either liquid or solid fertiliser storage and three were informed they should contact the Environment Agency on particular issues relating to the Groundwater Regulations.

Two sites were assisted to reduce a significant risk associated with the preparation of liquid urea fertiliser from purchased solid.

One site retained a long out dated practice of a soak away to land from a pig housing effluent collection tank. The effluent is now diverted to lagoon containment on site.

## **4 DISCUSSION**

### **4.1 Methodology**

The contractor was generally well received by site operators and owners who were considered to feel easier providing information to a third party rather than an Environment Agency official. Being part of a catchment wide survey rather than being singled out for a visit, following a pollution incident for example, gave a fairer balance to the inspections.

The method of cold calling on sites initially used by the contractor was not possible following the Foot and Mouth outbreak. Other methods of site inspection are used by the Agency when information is available prior to an inspection allowing contact to be made for an appointment. Pollution prevention surveys however needs observation on site to identify sites that maps or publicly accessible lists cannot provide. Post Foot and Mouth the contractor picked up information to enable prior contact from neighbours though some sites still presented initial contact difficulties.

The contractor felt that, whilst the inspection was well received and advice listened to with feedback, operators with existing effective pollution prevention structures were unlikely to make any improvements unless required to do so by the Agency. With many this would simply be no gain for the cost of 'improvements'.

The project suffered a number of delays that could not have been foreseen at the start of the project. Additionally the actual workload on the project in house was significantly underestimated. The time taken reading the data, letters sent in by the contractor and the sending of modified letters was underestimated. Follow-ups as well as Agency inspections proved significant and more drawn out than originally envisaged. Data handling was very time consuming. This was a project planning failure. The contractor was allowed to present the information in whatever format they wished and it turned up in an electronically unwieldy form. A standard easy to handle format should have been provided before the fieldwork began. The use of an external contractor was an innovative approach as we could not afford the staff time in house. The contractors involvement was always in partnership with the project officer who carried out follow up visits.

### **4.2 Impact**

A number of sites have been required to take and taken remedial measures where statutory back up has been available. Significant risks have been reduced and pollution where found has ceased.

Progress towards a cleaner environment has therefore been achieved by the project in addition to the raising of awareness of all relevant inhabitants.

The raising of awareness by pollution prevention inspections cannot completely remove the risk of pollution. In part this is because much of the advice cannot be backed up by legislation but also that accidents can occur that do not have realistic preventative measures. These may include road traffic accidents, fires,

failure of apparently properly constructed lagoons and other containment structures and overflows caused by rainfall above required design capacities.

#### **4.3 Comparison with Past Incidents**

Recorded incidents within the catchment over the last ten years have been examined and presented as appendix 3d Incidents Source and 3e Incidents Pollutant.

Within the Incident Source data 'not identified or natural' will include the severe river death in 1997 as well as minor reports received by the Environment Agency. 'Water Industry and Private Dwellings' principally reflects sewer overflows and septic tank discharges that were not the subject of this project. The remaining sources reflect the agricultural nature of the catchment with the pig industry dominating. The project has picked up a number of high-risk situations within this sector such as the leaking lagoon. Together, this project and the decline in the agricultural sector, should significantly reduce the risk of pollution from such sources within the project area. The transport sector also includes agricultural related incidents such as spills of liquid nitrogen fertiliser during transport.

The Pollutants data reflects the source of the pollution. Fuels and oils are derived from all sectors of the community and at 11% of identified pollutants, ties in with the 54 operators notified of the risk of unbunded storage facilities during this work. In only a few cases was bunding required and completed during the project.

It should be noted that the 37% 'not specified' category does not necessarily reflect a failure to identify the pollutant but is in some measure a result of an inability to merge two older databases' information into a unified coding system for archiving.

From the inspection carried out during this project, we have the perception that none of the deficiencies found at establishments had the potential to cause an incident of the magnitude of the 1997 pollution or natural deoxygenation of the River Deben. It is however the case that by undertaking this survey we have been pro-active in managing this river catchment.

## **5 RECOMMENDATIONS**

- A project of this nature is appropriate for a river catchment with repeatedly failed RQOs or a similar situation where there may be a number of unconfirmed sources degrading the river quality.
- The division of labour with a none official contractor collecting data and an Environment Agency officer progressing the work is effective and manageable.
- A realistic time allocation for such a project must be approved prior to commencing. This time allocation must reflect the catchment size under investigation otherwise the efforts of a partial investigation will be seriously compromised.
- The electronic format of the contractor presented data must be established prior to the work. This should be in a format that can be readily manipulated for interpretation purposes.
- This and any such project only applies to the period of the work, whilst the raising of awareness and improvements carried out will have effect for some years a repeat of the work may be necessary if the river quality were to decline in future.
- Further work of a similar is needed in other parts of the River Deben catchment if pro-active management of the entire river catchment is to be achieved.

### **Circulation List**

Anglian Regional Library

Incident Room at Ipswich Office

Circulation copy for Suffolk Environment Management

Loan copy (with R A Watson)

The full report and data remains on the Ipswich server in G:\Env\_Protection\Deben.

## **6 APPENDIX**

- 1** Examples of Data provided by contractor.
  - a** Agricultural example.
  - b** Industry example
- 2** Debenmap and Skeleton map.
- 3** Pies
  - a** Nature of Business
  - b** Stock Type Breakdown
  - c** Pollution Prevention Needs
  - d** Incidents Source
  - e** Incidents Pollutants

## **EXAMPLES OF DATA SUPPLIED BY CONTRACTOR**

|   |  |  |
|---|--|--|
| Date of inspection: 01/01/00<br>Name: Mr Farmer   |  | Site Reference: PP010100<br>Contact: Radio 4 producers<br>Head Office? |
| Address: Farmer Farm, Ambridge,   |  | Tel. No. 0123 456789   |
|   |  | NGR: AB 123456   |
| Nature of Business<br>Pigs max 2000   |  | Owner / Tenant / Company / Other<br>Owner                              |
| Geology:  |  | Other Sites or Land<br>Farm in Borchester                              |
| Business Ethics:<br>Care of Env./Monitoring/Supermarket Scheme                          |  | B'hole Water Supplies+Water abstraction info                           |
| Pig Assurance scheme  |  |  |
| Materials In (Volumes):<br><br>Diesel max 600 gall<br>Pigs fattening 800<br>Weeners 750 |  | Product out (Volumes)<br><br>Pig                                       |
| Wastes In / Out (Volumes) Para 7/Reg.   |  | Drainage (Consents)  |
| Ongoing / Potential Sources of pollution<br><br>Fuel tank not banded                    |  |  |
| Contingency Plans for incidents:<br>NO  |  |  |
| Sprayer wash down N/A<br>Sprayer Wash out N/A   |  |  |



## NOTES:

Pigs, fattening up to 800 in yards on straw.

Weeners up to 750 all self contained

Weener pens all have own tanks to collect slurry, this is pumped out and discharged to lagoon.

600 gallon diesel tank bunded

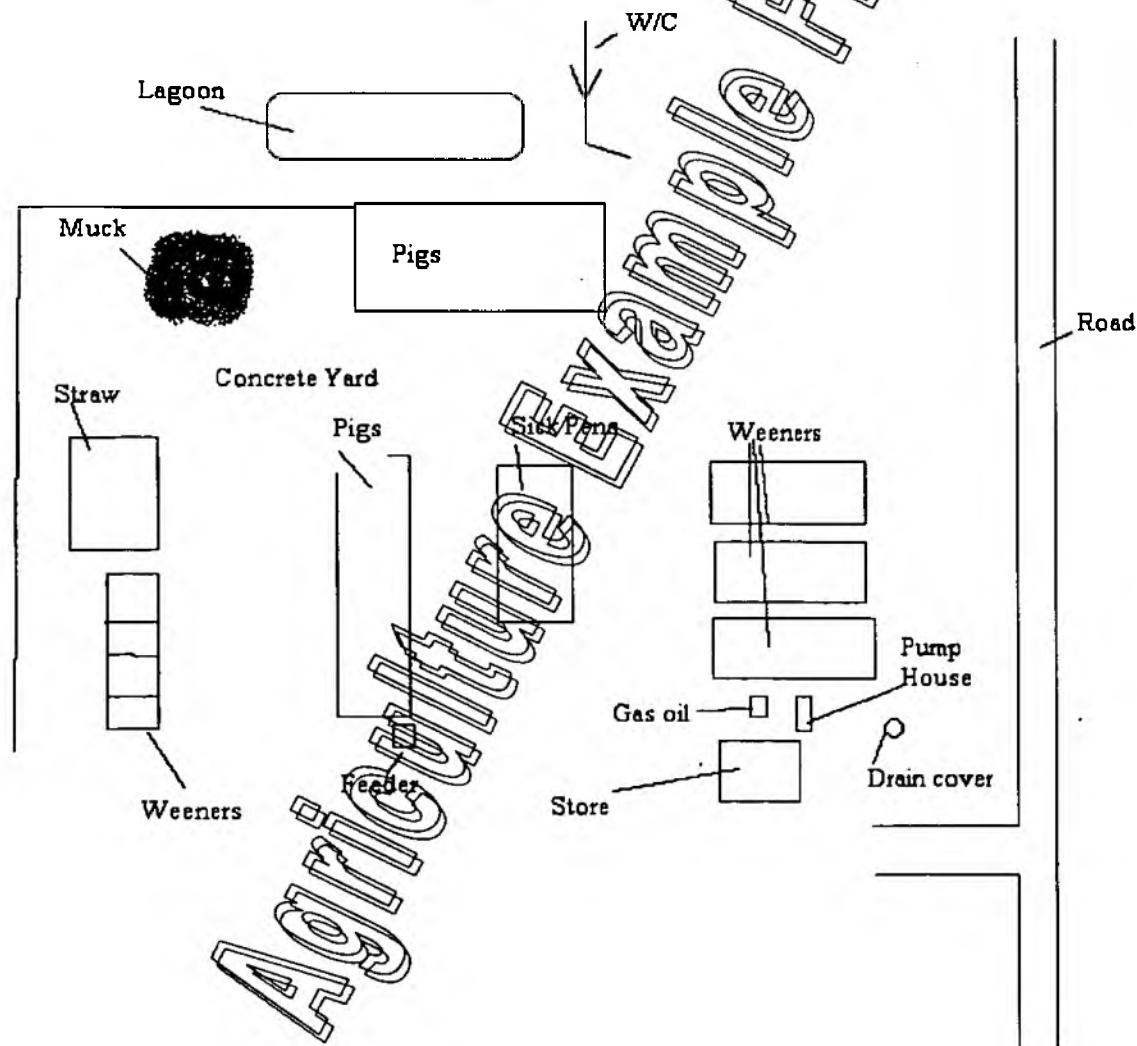
Virtually all yard including muck storage area drain to pump house and into lagoon.

Ditch comes in at top of yard and is piped through yard.

It has an inspection chamber near site entrance labelled drain cover on site plan

Inside sump drain is split in two one half is where clean water drains other is where dirty water is collected this goes on to pump house. If pump house fails and sump fills dirty water backs up in the inspection chamber there is a level alarm in this to warn operators of problem

Pump not on routine maintenance contract relies on workers keeping an eye on it.



|                                     |   |
|-------------------------------------|---|
| Name                                | Mr Engineer   |
| Site Address                        | Best Works in Ambridge  |
| Contact Name & Address if different |   |
| Telephone number                    | 01234 567890  |
| NGR                                 | AB 123 456  |
| Nature of Business                  | Agricultural Engineers  |
| Other Sites / Land                  | Meadow with Barn in Borchester.   |
| Owner / Tenant / Company            | Owner   |
| Borehole supplies                   | No  |
| Water Abstraction                   | NO  |
| Raw Materials                       | Lubricating oils 55 X 20 litre drums<br>4 X 45 gallon drums<br>Paints<br>Creosotes ~ 10 X 25 litre drums<br>Red diesel 1200 gallon tank<br>DERV 1250 gallon tank<br>Paraffin 80 gallon tank |
| Product                             | Well maintained equipment   |
| Waste                               | Waste oil kept in 45 gallon drums   |
| Drainage                            | Buildings on main sewer<br>Separate collection system for vehicle wash bay.   |
| Contingency Plans                   | No  |
| Awareness / Attitude                | Awareness fair to good<br>Attitude good   |
| Business Ethics                     | Meadows are organically kept  |
| Surrounding Geology                 | Very heavy  |

## NOTES

Service, hire and sell machinery and parts. Engineer / fabricate parts to order.

Site has wash bay, goes to two sealed tanks of 1.2 sq metres 2.5 metres deep have these pumped out.

Small amount of cutting oil used in workshop.

Waste oils stored in 3 X 45 gallon drums in workshop, solid floor no drains. Bunded. Waste oils usually go to local farmer with oil burner, when have large amounts from busy period licensed company is brought in to remove.

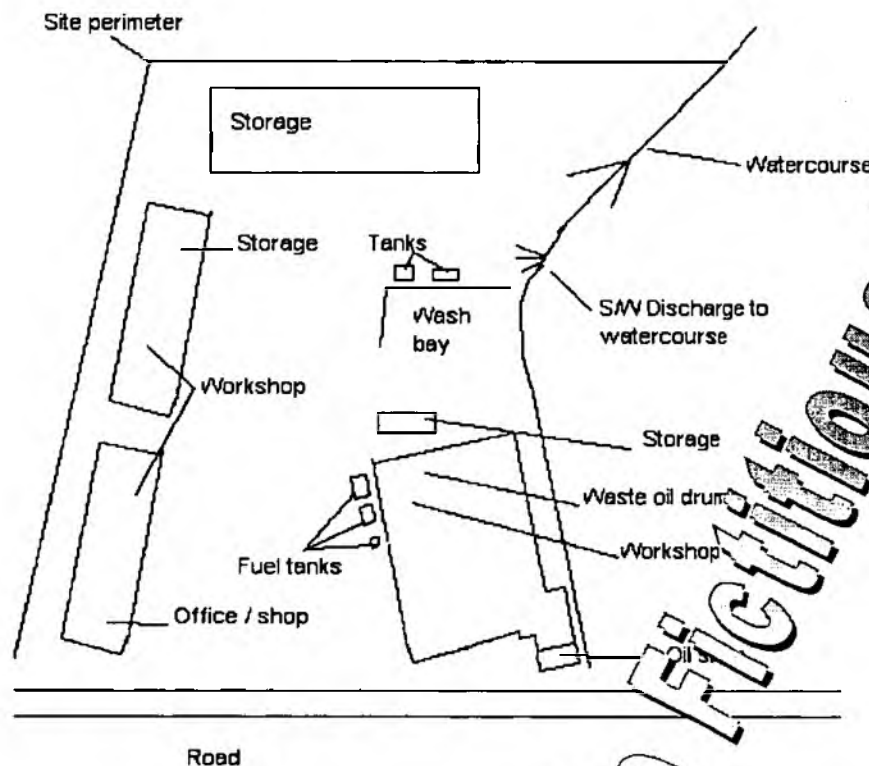
Fuel and paraffin tanks bunded, close to surface water drain.

Keep absorbent granules on site, have good store of them as also sells them.

Most new oils, the paints and creosote are kept in the oil store. Solid floor, doorway has a lip.

Keep a few meadows in Borchester. Have 1 crop of hay of meadows and bring sheep in to graze. Meadows are organically kept, no sprays.

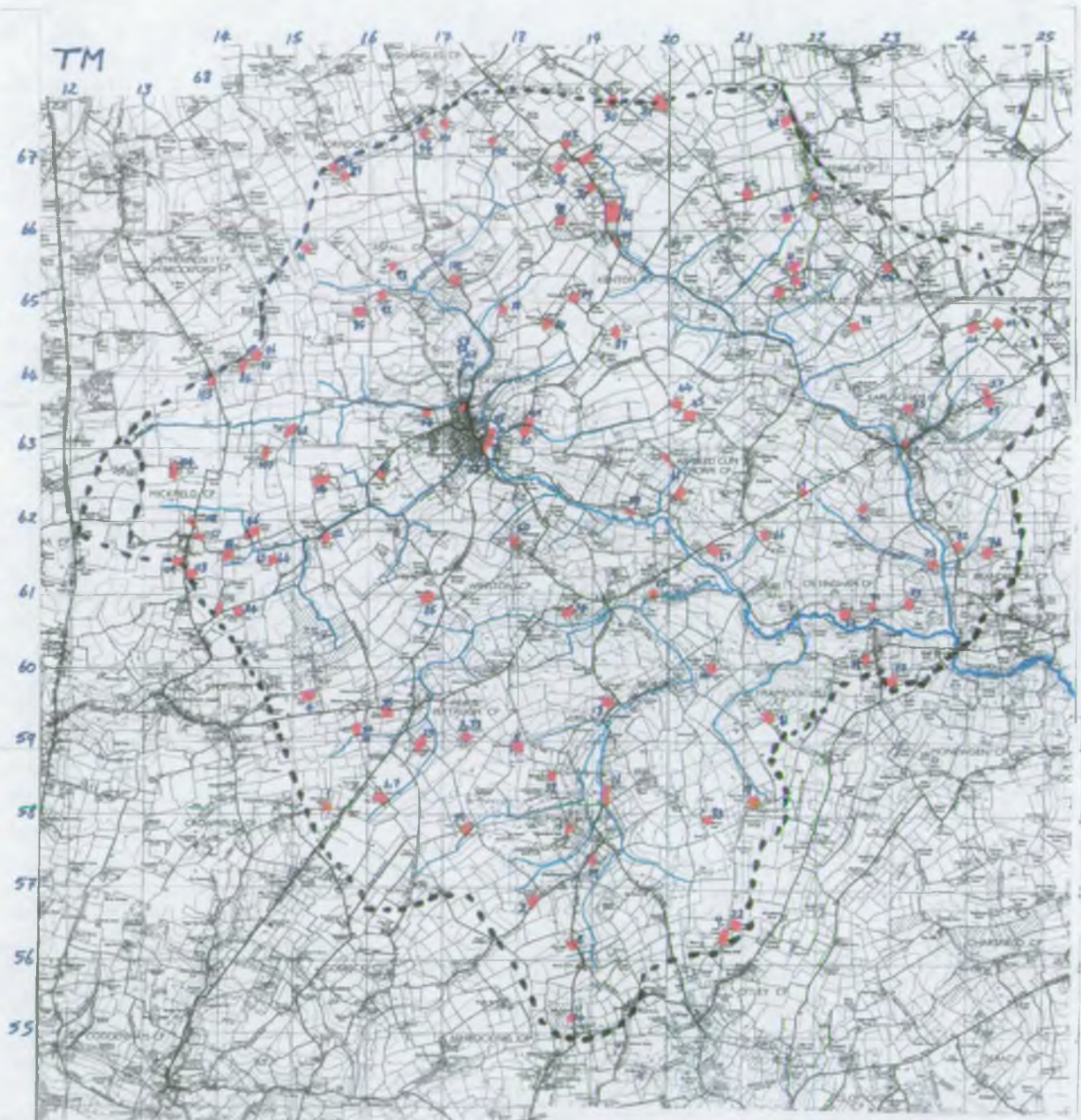
Barn on meadow is used to store machinery, machinery is all in open sided barn nothing else is stored there.



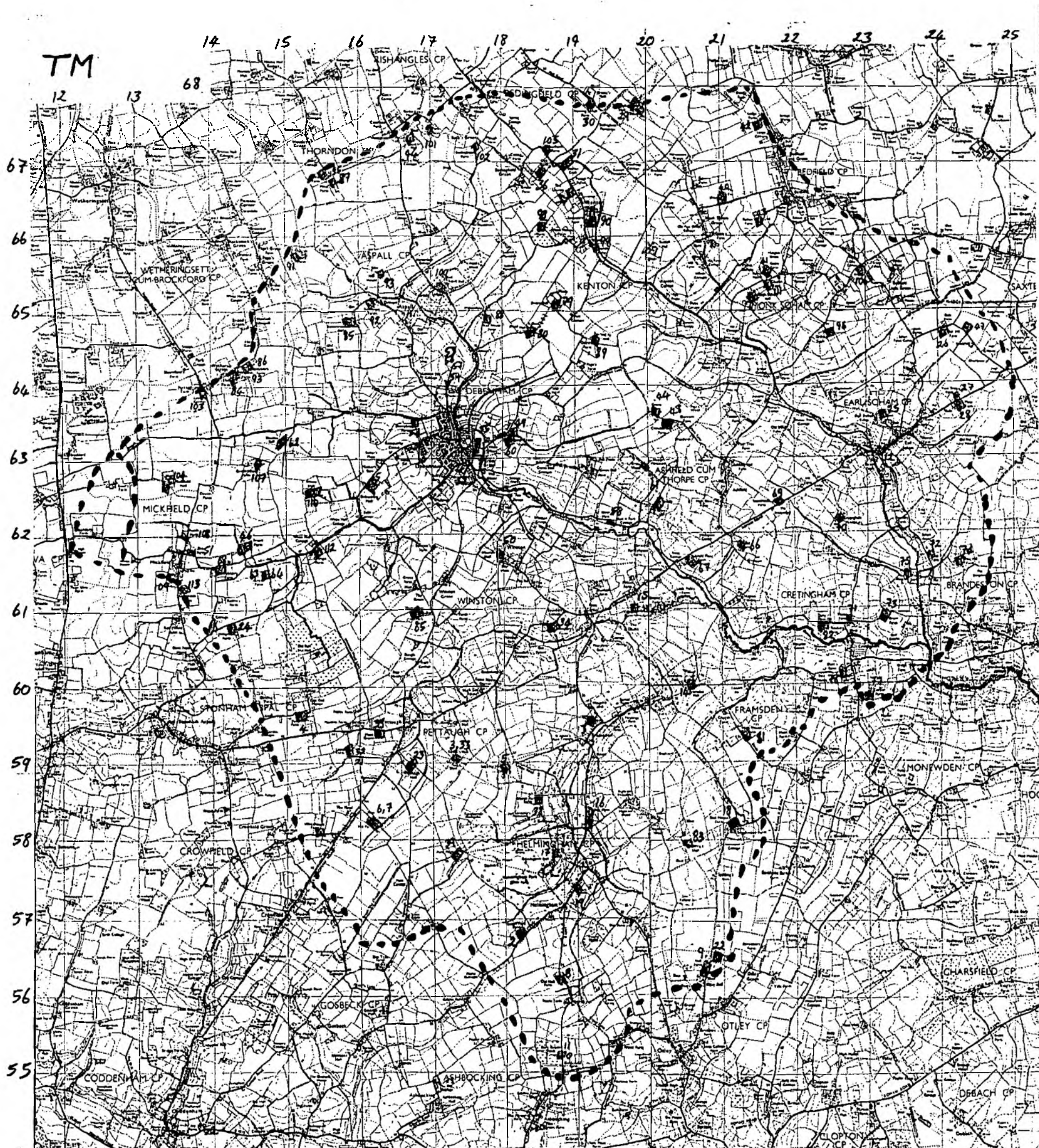
**DEBEN MAP AND SKELETON MAP**



# DEBEN MAP





**DEBEN MAP    Sites located with Project Identity Numbers**

This map is also available as 'Debenmap.bmp' from the cd or from Ipswich G:\Env\_Protection\Deben. As such it must be opened with Microsoft Photo Editor (available to EA users in 2003). In the editor single click on the zoom icon (a magnifying glass). Position the cursor in the area you wish to enlarge and single click until the required magnification is achieved.

Note the number/s of the site/s of interest.

To view the data and/or related letters, open up Windows explorer from the Start button and find the source of the data you are using, that will either be the cd or the Ipswich server G drive. Find the file of interest in the Data folder under Deben.

The number files display all data obtained during the inspection and will usually supply a sketch of the site to aid any future visit.

The number files prefixed L are letters related to the site. Suffixes relate to additional letters such as reminders.



# River Deben Project Skeleton Map

## Pig and Cattle Holdings



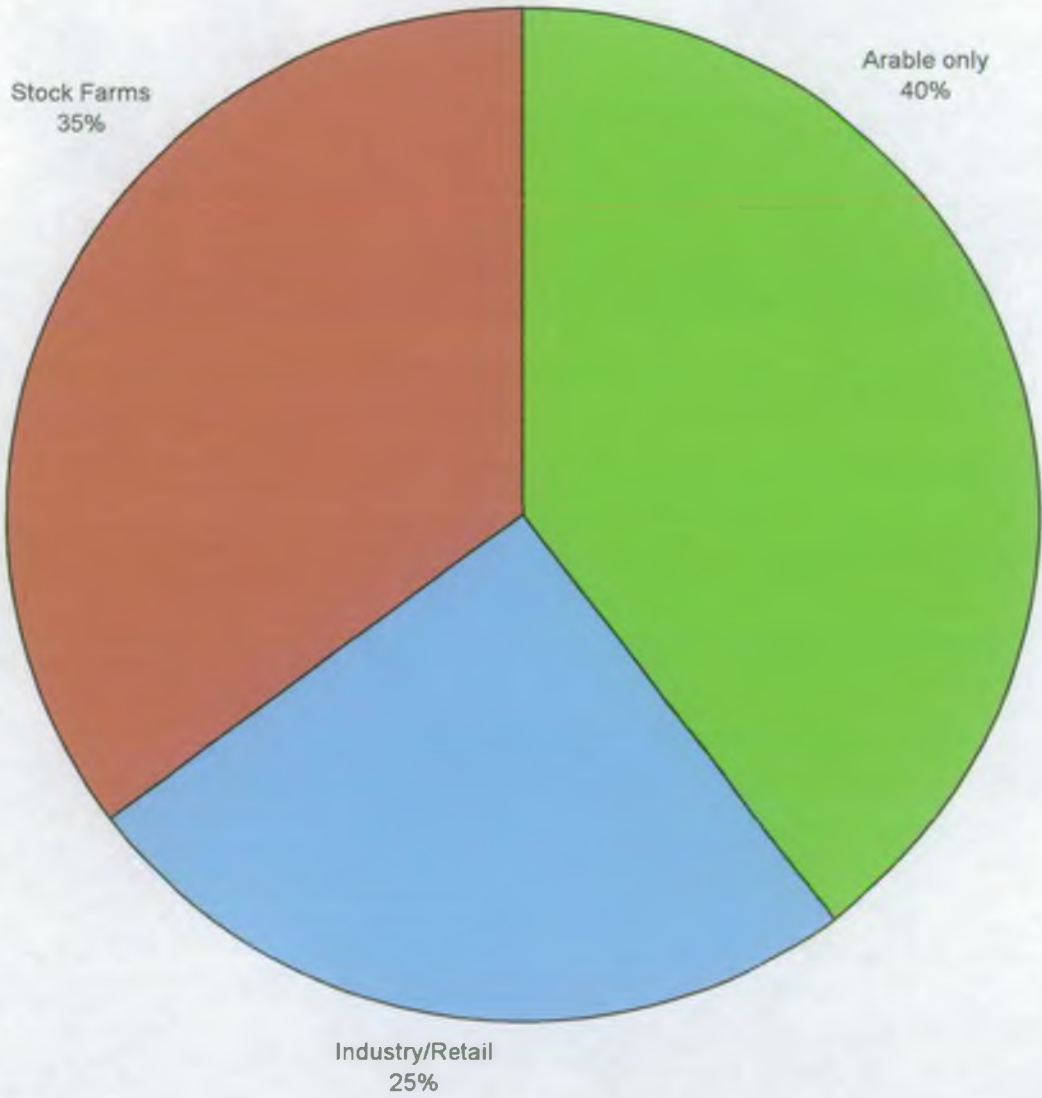
- Pig Holdings
- Cattle Holdings

## PIE DIAGRAMS



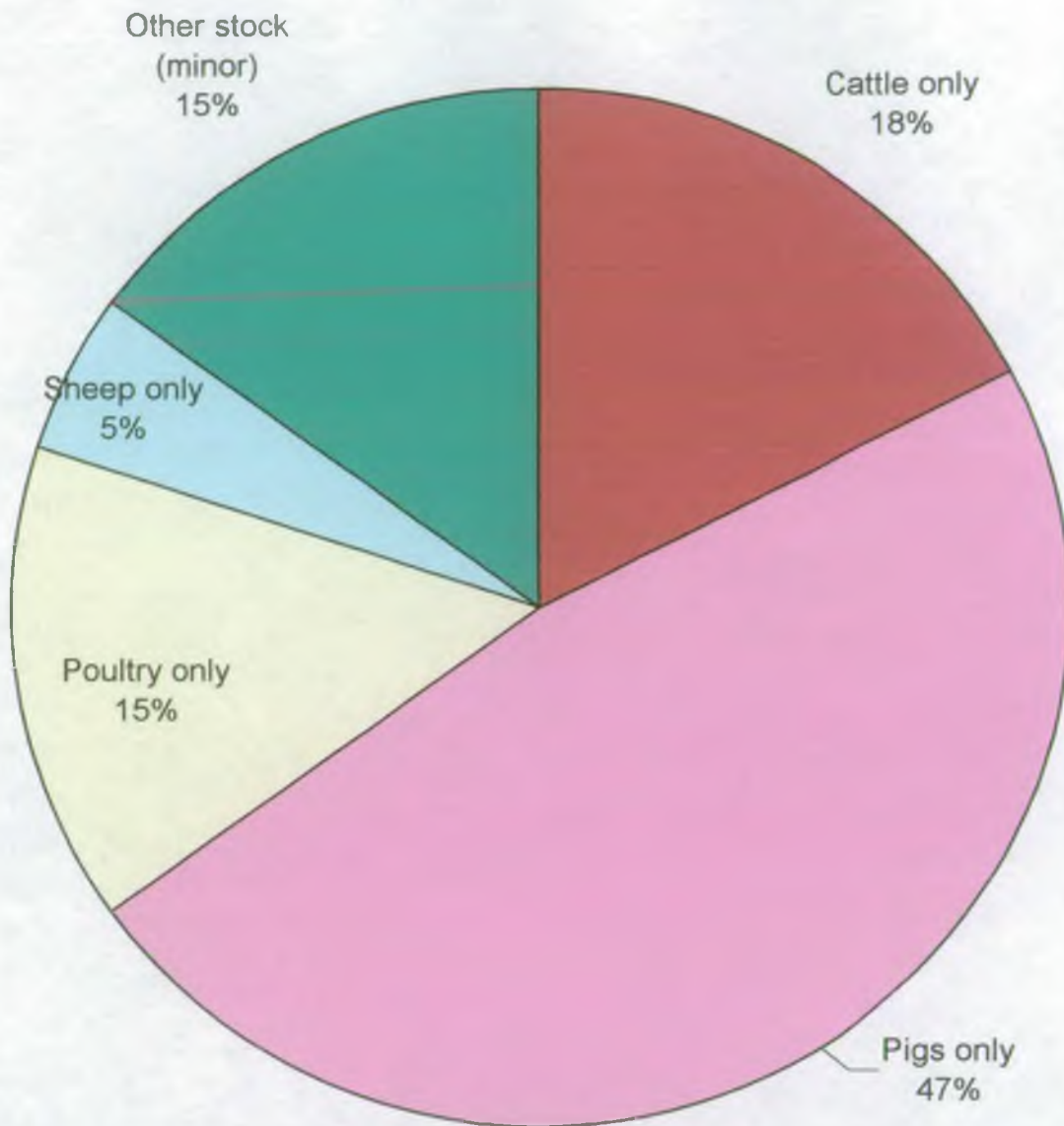
Upper River Deben Sites Visited  
Nature of Business

3a



Upper River Deben Stock Farms  
Stock Type Breakdown

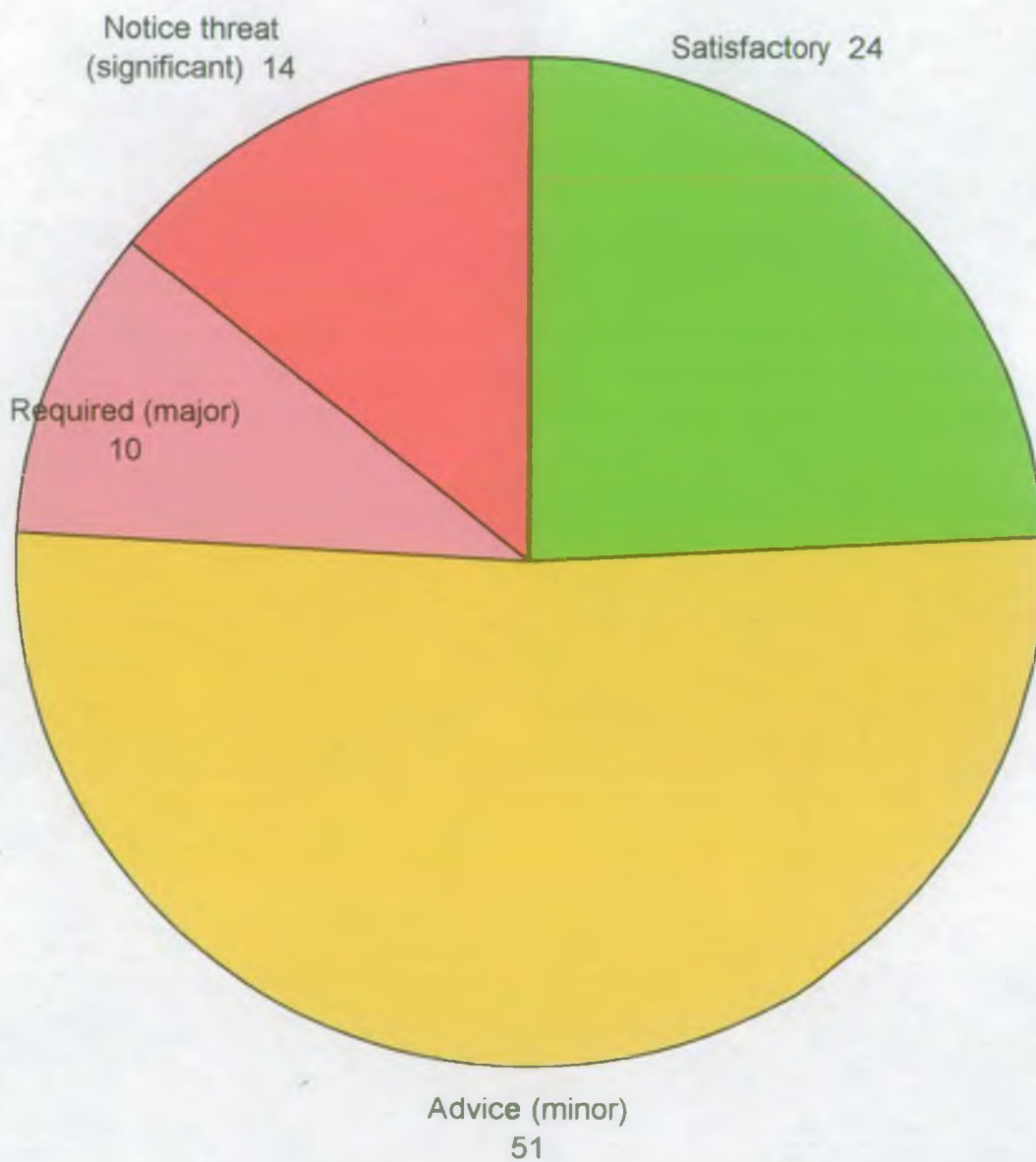
3b





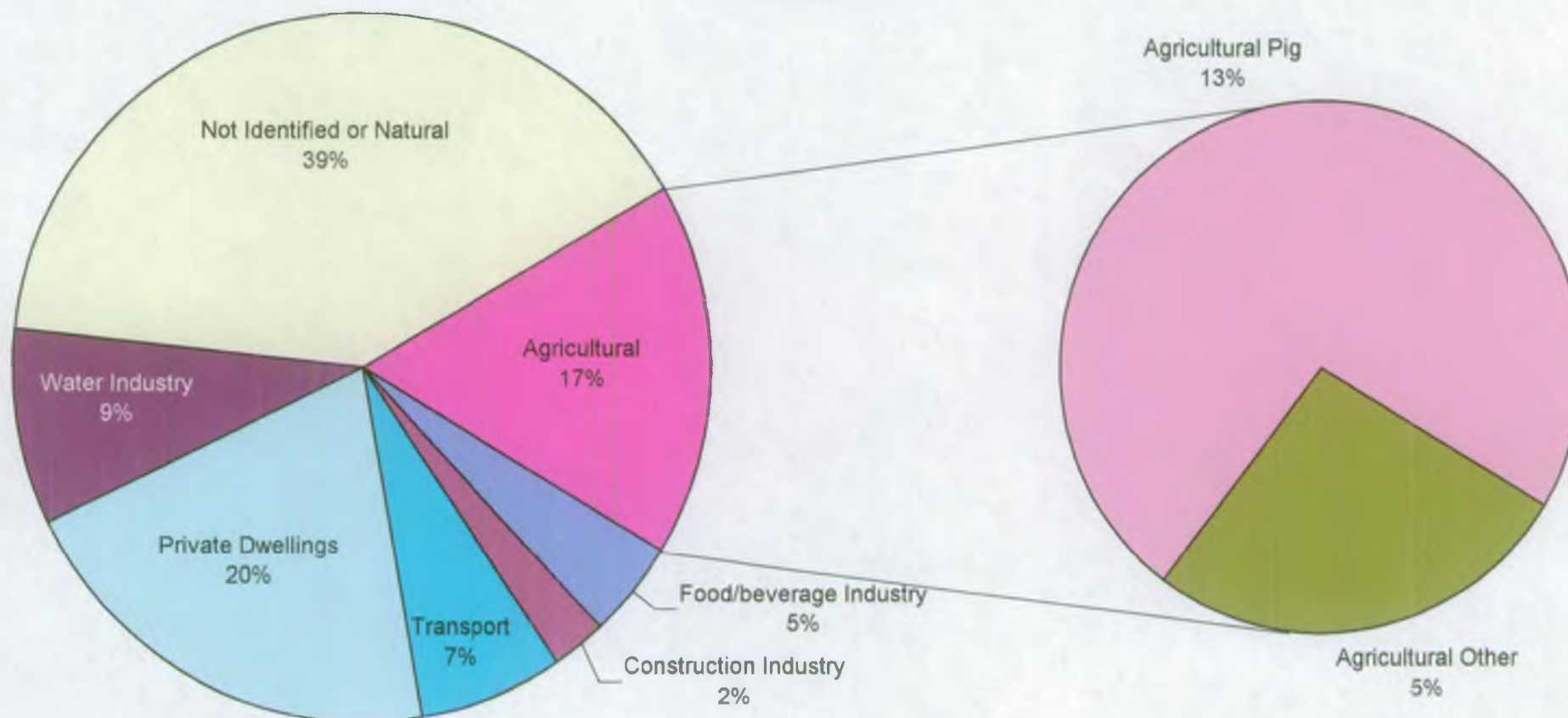
Upper River Deben Pollution Prevention Needs  
Sites corresponded with.

3c



Upper River Deben  
Reported Pollution Incidents  
1991 - 2002  
Source

3d





Upper River Deben  
Reported Pollution Incidents  
1991 - 2002  
Pollutant

3e

