

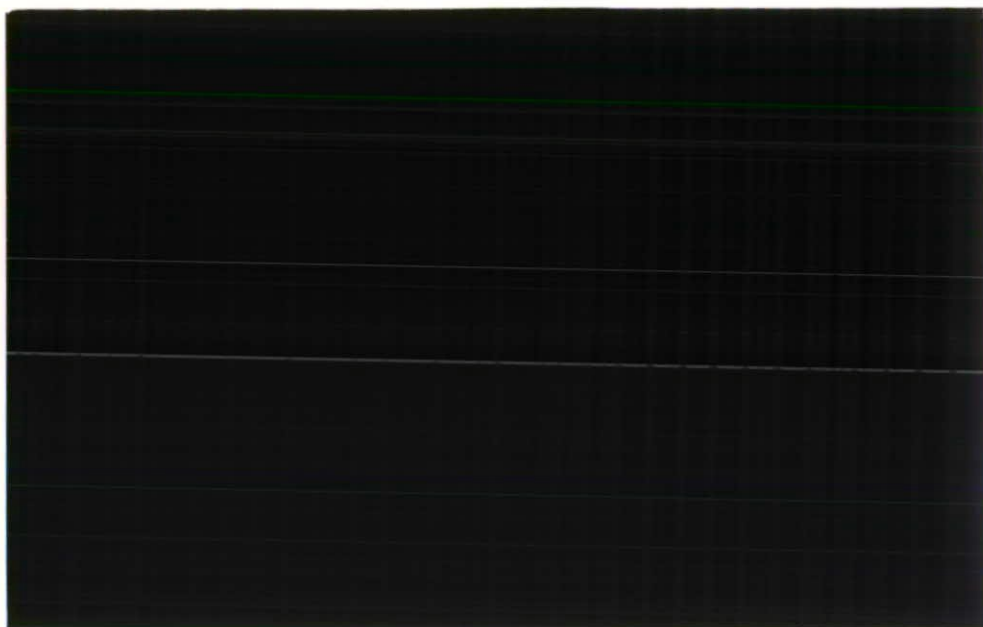
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**PROJECT FD0403
ARCHIVE OF RUNOFF AND
RAINFALL DATA**

**UK FLOOD EVENT ARCHIVE
ANNUAL REPORT**

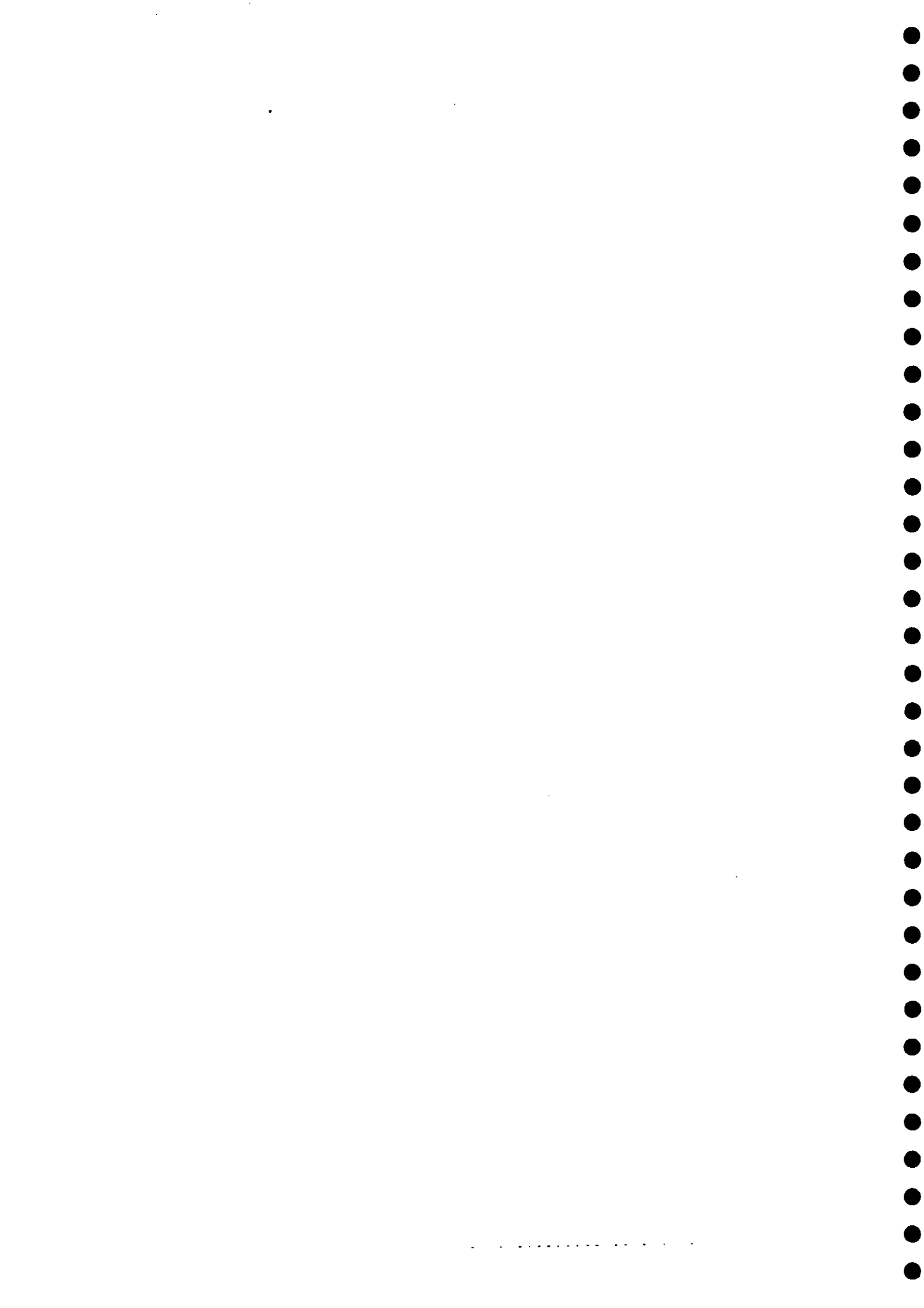
H.A. HOUGHTON-CARR

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March 1993

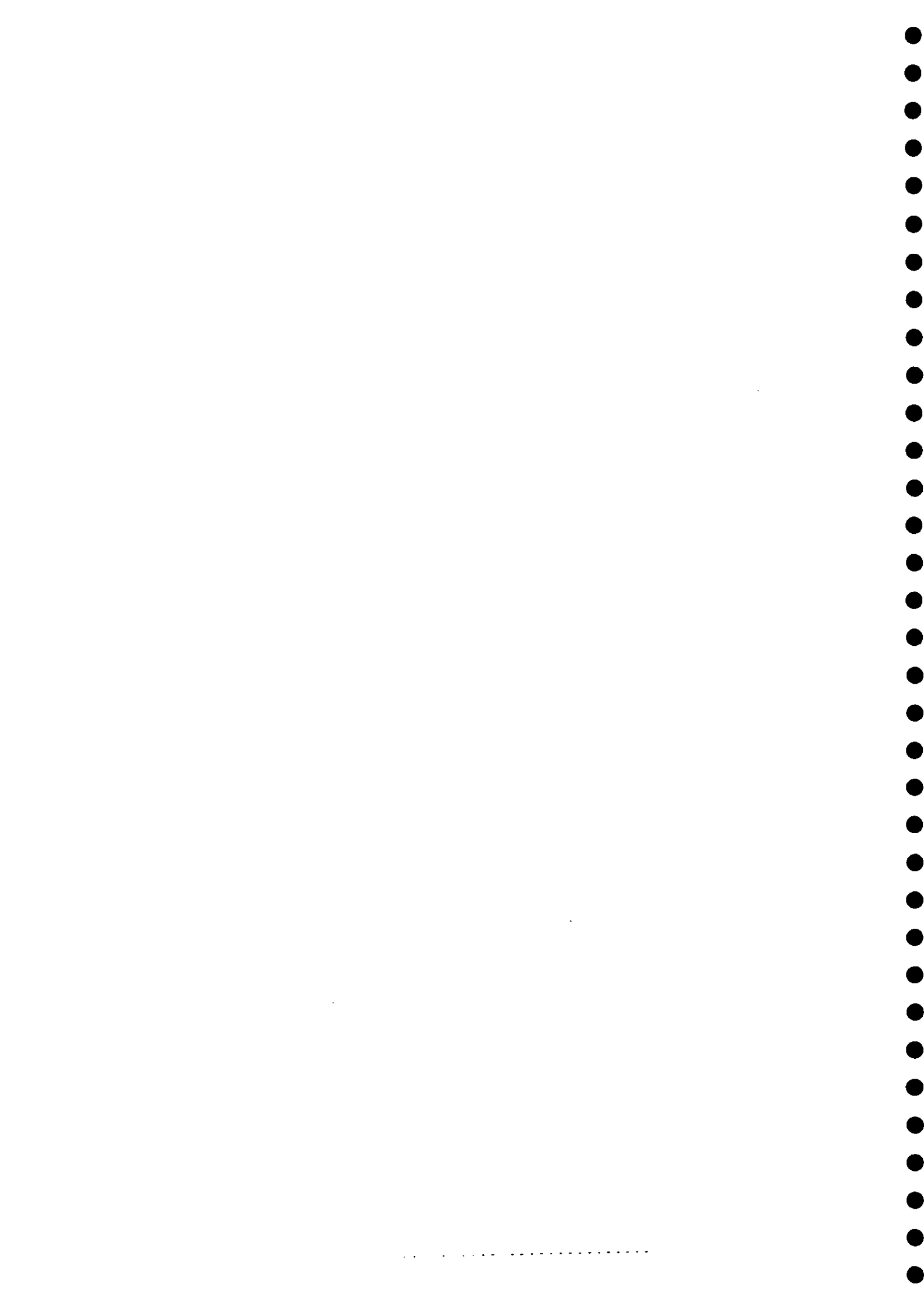


Executive summary

The MAFF-supported UK Flood Event Archive at the Institute of Hydrology is a unique collection of flood event and catchment data for hydrological studies.

The archive currently contains 4448 flood events from 308 catchments throughout the UK. In the past year analysis has been completed on 442 flood events, and is continuing on another 132. Descriptive summaries, data and results from the project are published in the five-volume Representative Basin Catalogue for Great Britain. Since the catchment entries in the catalogue are collated and printed automatically from data stored in the archive, the information presented will change with time as existing data are reviewed and updated, and as new data and new facilities are added to the archive. There are currently 129 catchments designated 'representative basins', five of which have been designated within the past year. Another four potential representative basins are awaiting confirmation. The number of requests for data from the archive has increased following publications of the Representative Basin Catalogue and the higher profile given to the archive by the Institute of Hydrology.

The collection, processing and analysis of flood event data and the review of the representative basin network will continue through 1993.



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1 Introduction

The MAFF-supported UK archive of runoff and rainfall data at the Institute of Hydrology is an outstanding example of the many large datasets available to hydrologists. The archive, known at the UK Flood Event Archive, is a unique collection of flood event and catchment data held on an ORACLE relational database management system on an IBM 4381 mainframe computer. The archive contains details of nearly 4500 flood events from more than 300 UK catchments and is used extensively, not only to support flood modelling studies at the Institute, but also by National River Authority (NRA) regions, Scottish River Purification Boards (RPBs), consultancies and universities for a broad range of scientific and engineering applications.

The year 1991-2 saw the successful launch of the five-volume Representative Catalogue for Great Britain (Boorman et al, 1991), the publication of a publicity brochure promoting the project to the hydrological community (Boorman et al, 1991), and the presentation of a paper about the archive and catalogue at the British Hydrological Society's Third National Symposium in Southampton (Houghton-Carr & Boorman, 1992). This annual report summarises the achievements of the project in the past financial year 1992-3.

After this introduction the report is divided into five sections. The first section considers the background to the archive and to the Representative Basin project. This is followed by a section devoted to the archive, and containing details of the numbers of events analysed in the past year. Section three is correspondingly focused on the Representative Basin project. The fourth section describes the publications from the project. In the final section the progress of the project is summarised, and the proposed work in the next financial year outlined.

2 Background

The requirement for an archive of flood event data at the Institute of Hydrology came from the Flood Studies project which began in 1969 and required data from many catchments throughout the UK. The Flood Studies Report (FSR) was published by the Natural Environment Research Council in 1975, and has been augmented by 18 supplementary reports published by the Institute of Hydrology between 1977 and 1988. However there are still many uncertainties involved in flood estimation, and a need for great knowledge and understanding of the physical processes involved. This MAFF project is one of several pieces of research being conducted at the Institute of Hydrology, with the aim of improving on the methodologies of the FSR and subsequent supplementary reports.

The objective of the project is to assemble a national archive for the development of rainfall-runoff modelling for flood hydrology, and the project supports project FD0404 on flood hydrograph estimation procedures. The project achieves this goal through the collection, processing and analysis of runoff and associated rainfall data from past flood events. A flood event is essentially defined as a rise and subsequent fall in the river level, together with the causative catchment rainfall. Figure 2.1 is a standard retrieval from the archive illustrating a typical flood event. River discharge is plotted against time to depict the catchment hydrograph, and hourly rainfalls through the event are plotted as hyetographs of both catchment average and point estimates.

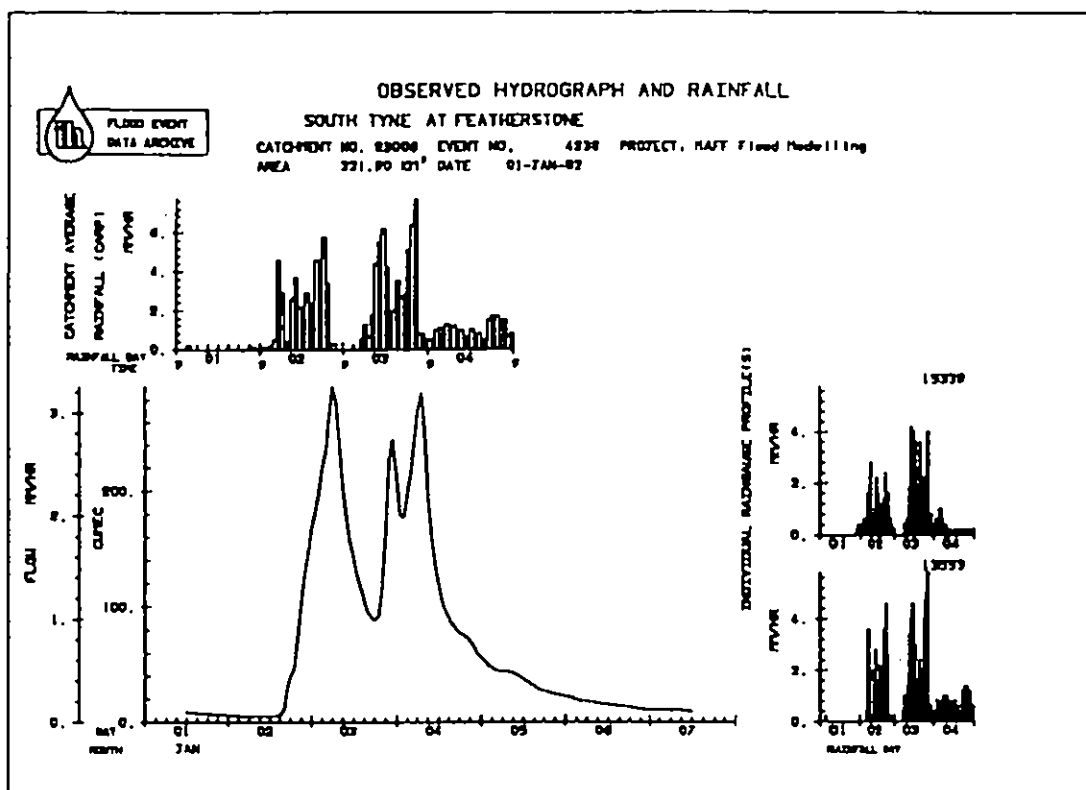
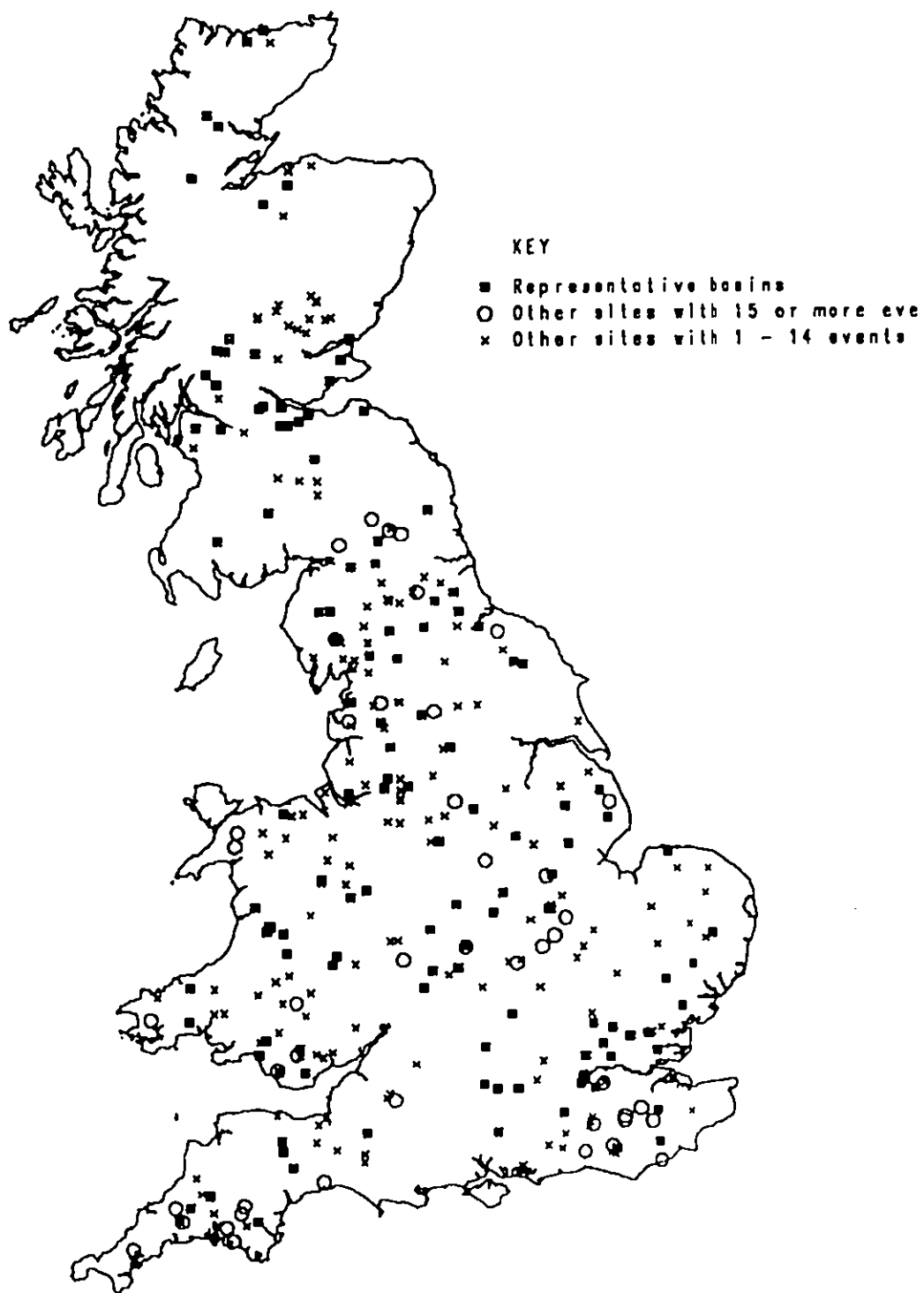


Figure 2.1 A typical rainfall-runoff event

Day-to-day work entails liaison with gauging authorities to discuss catchment selection, data transfer and future data requirements, as well as collection, processing and analysis of flood event data and evaluation of results. The collection of high quality runoff and rainfall data remains at the heart of this project, and gathering the data together from many different data suppliers, abstracting the particular periods of interest and collating the various data types is inevitably a time-consuming process.

Catchments appear in the Representative Basin Catalogue for Great Britain if flood event data are held at the Institute of Hydrology or if the catchment has been identified as one which could supply good quality data in the future. The five-volume catalogue of 333 catchments includes not only details of the flood events, but also the descriptions and statistics necessary for a full understanding of their hydrological regimes. Figure 2.2 shows the locations of the representative basins and other catchments with flood event data in the UK. The data from the network provide a ready-made, long-term resource that will enable flood defence projects to make rapid progress during the currently time-consuming phases of catchment assessment and data preparation. Catchment entries in the catalogue are collated and printed automatically from data stored in the archive, so the information presented will change with time as existing data are reviewed and updated, and as new data and new facilities are added to the archive.

The motivation behind establishing a network of representative basins is threefold. Firstly a full range of catchment types is necessary to understand the variability of hydrological processes, and by promoting the idea of a Representative Basin Catalogue and the uses that can be made of it, gaps in the geographical coverage and in the range of catchment types



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Figure 2.2 Map showing the distribution of catchments

represented will be highlighted and hopefully filled. The second reason is to ensure maintenance by gauging authorities of a least a minimum set of gauges that can characterise both rainfall patterns and flow regimes. Finally the project highlights the requirement for high quality, long term flow and rainfall records at a variety of resolutions for both regional and national strategic studies.

3 Flood Event Archive

The UK Flood Event Archive currently contains 4448 events, the majority of which are fairly simple short duration rainfall-runoff events of the type used for the FSR, and illustrated in Figure 2.1. In the past year, analyses have been completed on 196 events from Northumberland, 139 events from southwest England, 96 events from eastern England, and 11 events from northeast Scotland. Analyses are continuing on 95 events from Northumberland and 37 events from the Welsh Borders region. Although the majority of events have return periods of less than 10 years (Houghton-Carr, 1990), when a substantial flood does occur, efforts are made to collect and analyse the flood event data. Analysis has recently been completed on the February 1990 flood on the Tay river system in Scotland (Houghton-Carr & Boorman, in press). This was an extreme flood event with less comprehensive raingauge coverage and a snowmelt component, but can nevertheless easily be accommodated within the archive framework.

Figure 3.1 shows the distribution of event dates with a breakdown according to the project for which they were collected, though of course once entered on the archive events may be used for many different projects. Results from analyses are also stored on the archive and it is very easy, using Standard Query Language (SQL), to access these data in any number of ways and to select them according to many different criteria.

4 Representative Basin Catalogue

There are currently 129 catchments designated 'representative basins' and 209 other catchments with flood event data on the archive. The designation of representative basins was made in conjunction with gauging authority staff during the early 1980s. This designation requires reappraisal, and the past year saw the start of this review process in consultation with the gauging authorities, with the first edition of the catalogue providing the basis for discussion. The Scottish RPBs are particularly enthusiastic, and to date two of the seven RPB regions have been formally reviewed. An additional five basins (included in the 129 total above) have been designated in Highland RPB region to join the two already there, and four others have been earmarked in North-East RPB region where there were formerly none, awaiting confirmation of the installation of new recording raingauges. The review will continue through 1993, concentrating mainly on the ten NRA regions of England and Wales.

The response to the Representative Basin Catalogue from the hydrological community has been good. The five volumes of the catalogue are available individually or as a set, and to

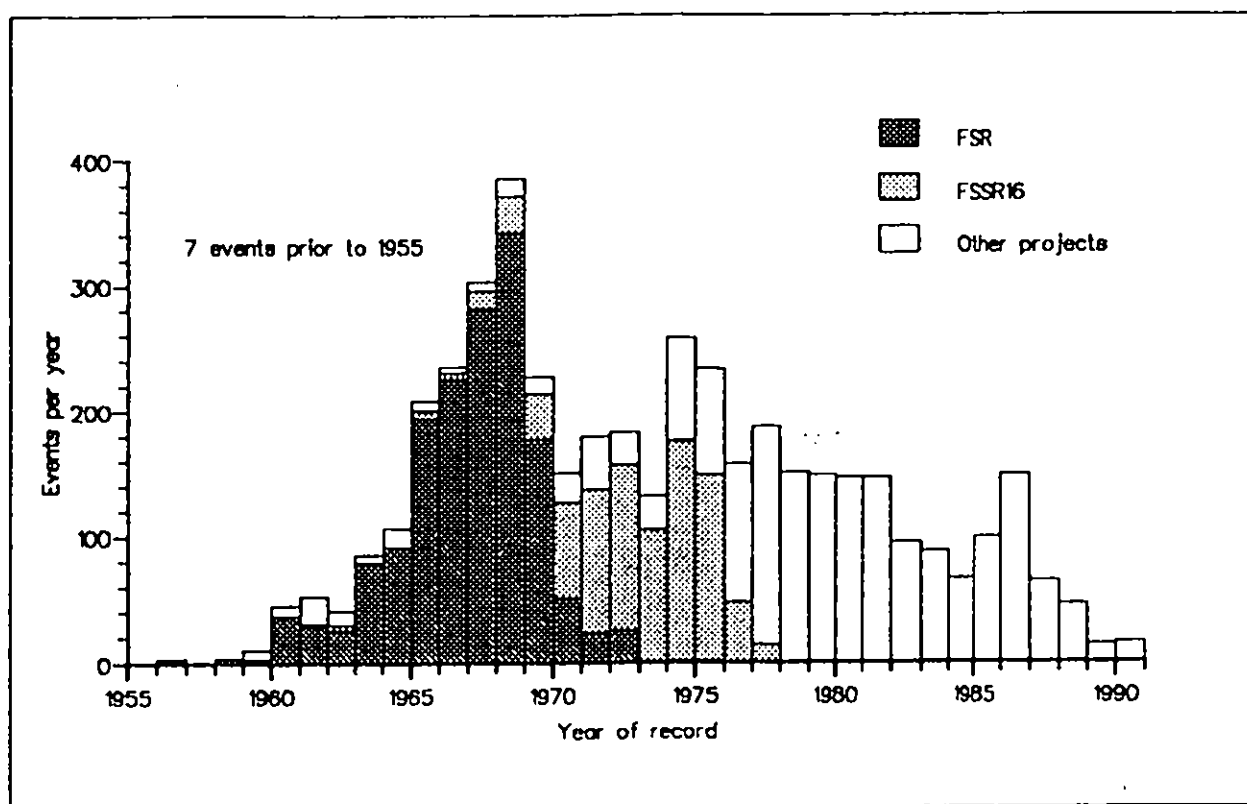


Figure 3.1 Distribution of flood events by date and project

ensure up-to-dateness individual catchment entries may also be obtained. Volumes of the catalogue have been distributed to MAFF regional engineers, and the catalogue has been promoted to the NRAs and RPBs, several of whom have purchased the volumes for their particular region.

5 Publications

Inevitably the past year could not be as productive as the previous one in terms of publications. Apart from this annual report, there are two publications from the project. The first of these is another edition of the UK Representative Basin and Flood Event Database Manual which is a comprehensive guide to the Flood Event Archive and the analysis programs (Boorman & Houghton-Carr, 1992). The second publication is the report on the floods on the Tay river system in Scotland in February 1990 (Houghton-Carr & Boorman, in press) which also lists other references to Tay flood research. In view of the recent and even larger flood in January 1993 a similar study needs to be undertaken.

6 Summary

The UK Flood Event Archive at the Institute of Hydrology is a unique collection of flood event and catchment data for hydrological studies. One of the principal objectives of the archive project is to extend the number of catchments for which large numbers of events are available and to increase the range of catchment types represented, in order to understand the variability of hydrological processes and improve the accuracy of design flood estimation using rainfall-runoff modelling techniques. Another objective is to incorporate more data describing extreme flood events within the archive e.g. all floods of return period greater than 25 years. The final objective is to maintain the continuity of data collected by a number of operators and promote the value of longer-term data. With the current uncertainty over how the climate may be changing, it is essential that these strategic data sets are established and maintained efficiently. The number of requests for data from the archive has increased following publication of the Representative Basin Catalogue and the associated publicity.

Future data requirements from the representative basin catchments are likely to focus on long-sequences of daily or sub-daily rainfall and runoff data for continuous simulation models. Such models will be an exciting prospect for the future, providing another investigative route for flood hydrograph estimation, and the necessary data will be easily incorporated within the archive framework, whilst maintaining the current facility to isolate individual flood events.

The archive has capitalised directly from advancements in database management systems, digital mapping and information technology within the computer industry. The latest step within this process is movement from an IBM 4381 mainframe to a workstation-based UNIX environment in May 1993. Computing power and graphical capability will be significantly enhanced, but some of the archive's software will need considerable modification to operate successfully under the new system. Many additions to the Representative Basin Catalogue and improvements to the existing components will be made after the transfer. The priorities for publication after transfer will be a new edition of the database manual and a second edition of the catalogue. Progress will be described in the next annual report.

The project had no progress milestones to meet in 1992-3, but now looks forward to fulfilling the December 1993 milestone of completing the review of the representative basin network, the progress of which will again be described in the next annual report. An additional milestone for March 1994 is a study of the feasibility of adding radar rainfall to the archive. This development would provide the opportunity to evaluate rainfall over poorly instrumented catchments, with the possibility of analysing otherwise unusable flood events.

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