CHAPTER 20

SERVICES FOR THE WATER INDUSTRY

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CHAPTER 20

SERVICES FOR THE WATER INDUSTRY

20.1 Introduction

20.1.1 In England and Wales until privatization in December 1989 there were 10 autonomous regional Water Authorities. Following privatization the functions have been split between the National Rivers Authority (NRA) and the Water Services PLCs (WSPLCs). The NRA has responsibility for river flooding, coastal flooding and sea defences, pollution monitoring, fisheries, and land drainage. The WSPLCs are responsible for water supply and demand, sewage treatment and disposal, and leisure facilities. The NRA Headquarters based in Bristol coordinates policy for the 8 regions: Anglia, Northumbria and Yorkshire, North West, Severn Trent, Southern, South Western, Thames, Welsh. The Water Services Association coordinates policy for the 10 regional WSPLCs. MAFF has a responsibility for land drainage and flood defence and provides some funding for the Storm Tide Warning Service in CFO. The Department of the Environment also has some responsibility for water quality and drought orders. NRA collects most of the rainfall and hydrometric data although PLCs collect some.

By October 1995 a new Environmental Agency will be formed merging the functions of the NRA, HMIP and the Waste Regulation function of the County Councils.

20.1.2 In Scotland the Scottish Environmental Department of the Scottish Office coordinates the management and development of water resources, but as a consequence of the Local Government (Scotland) Act 1973, the responsibility for management is split between two separate organizations. Control of pollution in rivers and certain tidal waters is the responsibility of seven River Purification Boards (RPBs) which also undertake river-gauging and some rainfall measurement. They also provide advisory services for flooding emergencies. Water supply, and the management of water resources and sewerage are the responsibility of the10 Regional Councils. There is also a Central Scotland Water Development Board which develops and operates major sources of supply on behalf of the Regional Councils in the populous parts of the Central Lowlands. In the three island areas of Shetland, Orkney and Western Isles, the Councils carry out all functions.

With the proposed reorganization of the Regional Councils the creation of 3 Water Authorities is under consideration which will have responsibilities for water supply and sewerage.

20.1.3 In Northern Ireland water resources are the responsibility of the Northern Ireland Department of the Environment, whilst river, local and urban drainage come under the Northern Ireland Department of Agriculture. The supply and utilities function scheduled for privatization during 1993 has been postponed.

20.1.4 Other national bodies with interests in applied hydrometeorology and research are the Institute of Hydrology, the British Geological Survey, British Nature, the Water Research Centre, Hydraulics Research, the Institution of Water Engineers, the Institute of Civil Engineers, the British Hydrological Society and a number of universities. Many require greater or lesser amounts of rainfall data; the Institute of Hydrology in particular take all daily rainfall data from the Office.

20.1.5 Many of these activities are satisfied by short-, medium- and long-term forecasts and warning services (see section 20.2) but there is also a need for data. The water industry is a major contributor to the rain-gauge network (section 20.3) and is involved in the development of radar (section 20.4). Data and advisory services including research investigations, often in collaboration with the organizations listed in paragraph 20.1.4, are provided by Commercial Services PSP Branch (section 20.5). Hydrometeorological publications are discussed in section 20.6.

20.2 Forecast and warning services for NRA and water undertakers

20.2.1 The responsibility for the issue of flood warnings, both river and coastal, rests with the NRA. The Office participates fully in flood warning schemes but strictly as advisor to the NRA.

20.2.2 The responsibilities of CS offices for the NRA and PLCs are set out in Annex B to chapter 1. Offices should maintain close liaison with the NRA and PLCs. This is assisted by regular visits by both sides to gain a better understanding of their respective operations.

20.2.3 Some of the routine services by designated offices take the form of warnings, particularly of heavy rain, thunderstorms, thaw and gales. In addition many NRA regions and PLCs prefer routine forecast services, usually

involving quantitative indications of rainfall amounts over specific catchments or sub-catchments. Procedures at NRA regions for the computation of run-off, river stage, etc. are required to take account of rainfall only when this is expected to exceed certain thresholds (e.g. 15 mm/day).

20.2.4 Several NRA regions and PLCs use internal computer networks for the fast exchange of information and many of these are suitable for the provision of forecast services via Viewdata. Where such facilities are requested they should be discussed with the Water Services Manager (WSM). Simple versions of Viewdata terminals are available to allow remote access to these computer systems by duty officers in the water industry on-call.

20.2.5 The services described above are mostly concerned with short-term developments requiring quantitative precipitation estimates. Forecasters should be aware of the limitations of using grid-point rainfall forecasts direct from the model output for this purpose, particularly in convective situations. Radar data can be very useful but care must be exercised in their use.

20.2.6 Some of the uses described in paragraph 20.1.4 require the provision of longer-period forecasting information, including quantitative rainfall and temperature values, significant weather, etc. To assist with such services CFO produce a quantitative temperature and precipitation extended-range forecast (see section 5.7) twice daily. This is the basis of the 5-day-ahead Rainfall Accumulations Forecast Service (see Annex A). It has been shown that local forecaster expertise contributes to the accuracy up to 48 hours ahead.

20.2.7 Warning of storm surges is provided by the STWS (see chapter 23) directly to NRA and as information to the Police and certain local authorities who have responsibility, following a warning, for alerting the public. Apart from surges, wind, waves, swell and onshore gales can lead to coastal flooding and NRA regions with a coastline have a requirement for information about these. The current wave models provide high-resolution (approx. 12 km) grid-point wave and swell data which are of considerable assistance in local flood forecasting. Tabulated forecast wave data is provided to all NRA Regions with a coastline, a service organized by STWS. All requests for similar information should be directed to AD(CF) through WSM. The NRA undertakes the transformation functions necessary to convert an offshore forecast to one for the Surf Zone.

20.2.8 When advising NRA regions, designated offices should always be alert to the severe problems which can be caused by rapid thawing of lying snow especially that in upland areas. Information about depths of lying snow in sparsely populated areas is often not available through normal meteorological reporting channels and NRA regions operational staff may be able to supply useful data not otherwise available.

20.2.9 In general services to NRAs and WSPLCs provided by designated offices should be negotiated and billed by them. All requests for waivers should be directed to WSM.

20.2.10 Considerable product development along with NRA regions has taken place. Attached is an example of a product which is provided by several Weather Centres to both WSPLCs and NRA regions.

WSPLCs are responsible for placing, through sub-contractors, many building and construction projects. This is expected to increase with emphasis on increased flood defences, improved water quality and tighter pollution controls. Indeed, some WSPLCs and NRA regions have made it a condition when letting a contract that the sub-contractor must receive a weather forecast for long sea-outfall work. Since privatization a considerable percentage of the WSPLCs have set up their own independent construction companies. Some construction companies have introduced units to deal specifically with water industry projects. Other services which can be provided to the water industry through Weather Centres are:

(1) Metbuild Downtime Summary
(2) Metbuild averages
(3) Construction Downtime Forecasts, and
(4) 'ITED' Reports.

The Monthly Prospect forecasts for 30 days ahead split into 3 periods:— Days 1–5, 6–15 and 16–30. These have been very favourably received by the industry. Details on prices and availability of long-range forecasts can be obtained through the Water Services Manager at HQ.

20.3 Rain-gauge data

20.3.1 There are about 5000 rainfall stations whose reports come to the Office most of which are now maintained by the NRA who collect the data and pass them on in bulk. Details of current and many past reporting stations are maintained on a computer index. Any enquiries concerning rainfall stations should be directed to (OP)3a which maintains the RAINMASTER index.

20.3.2 (OP)1a administers and inspects cooperating rainfall stations in England and Wales; in Scotland these tasks are delegated to the Edinburgh Climate Office and in Northern Ireland to Belfast Weather Office. Advice can also be given concerning the siting, installation and use of instruments for measuring the meteorological variables used to estimate potential evaporation.

20.3.3 Considerable effort is deployed within (OP)3a in the detection and elimination of errors in series of data and in the design of methods of storing the data in computer accessible form. Where measurements are made only irregularly (e.g. only on 5 days per week or in some cases as infrequently as 4 times per month), accumulated totals are computer-apportioned using a near-neighbour system to provide 'best estimates' of daily rainfall totals from the larger network of daily stations.

20.3.4 The incorporation of rainfall estimates based on measurements made with precipitation radar is discussed in section 20.4.

20.3.5 Data from rain-gauges maintained by the NRA regions are given free to the Office. After quality control and archiving the quality-controlled daily rain-gauge data are returned to the NRA regions individually, without charge, by (OP)3. As holders of the national rainfall archive the Met. Office charge only for administration and computer time in supplying raw, non-derived rainfall data to the NRA. An agreement between the Office and the NRA was signed and published in Autumn 1993. Copies are available at all CS Weather Centres and HQ Production Units. Additional copies can be obtained from the Water Services Manager at HQ.

20.4 Radar data

20.4.1 The NRA in England and Wales, and the DOE in Northern Ireland, are major contributors to the consortia, with the Office, responsible for the setting up of the precipitation radar network. The major external organizations make direct use of the data, which are of considerable benefit to them in their real-time operations. In Scotland, where three new radars came on line in 1992, the SDD share capital and operating costs with the Office but the water industry is not expected to be the main beneficiary of the additional data.

20.4.2 CS offices responsible for the provision of short-term forecast or warning services should maintain close liaison with the relevant regions on the matter of interpretation of radar data, but matters of a technical, as opposed to meteorological, nature should be referred to (OI)3. Where technical co-operation between NRA regions and (OI)3 is concentrated, the relevant CS offices should be informed. Training courses for NRA representatives and others in the use and interpretation of radar data are provided at the Meteorological Office College on an occasional basis. Enquiries received at outstations concerning such training should be passed to WSM who will liaise with the College.

20.4.3 All requests for access to real-time radar data should be referred to WSM.

20.4.4 Non-real time and historical use of radar data for the estimation of rainfall amounts is the responsibility of CS(PD), via the PARAGON archive. Radar rainfall data from 1982 onwards, or from the date of commencement of transmission (if later for a specified radar site), are archived on a 5 km grid. In near real time, radar-rainfall amounts derived from radar scans at 15-minute intervals are archived. Offline, with approximately 3 months delay, totals are derived from scans at 5-minute intervals. Offline daily totals are initially adjusted using data from the synoptic network of approximately 150 gauges and later by data from the network of approximately 4500 climatological stations. Near real-time radar data adjusted by gauge data from the synoptic network is also available. Online or offline radar data, or radar combined with gauge data can be supplied as grid point or contour fields. CS(PD) are also responsible for the routine production of quarterly reports containing summaries of the data availability for each radar site, comparisons of the frequency with which wet and dry conditions are recognized by radar and collocated gauges, and statistics of the ratio of radar to gauge rainfall values at these locations. However, requests for access to PARAGON archives for radar data are handled through CS(PSP).

20.5 Hydrometeorological services

20.5.1 Except for data specified in 20.3.5, PSP Specialist Consultancy Service at Bracknell is responsible for the commercial supply of quality-controlled rainfall data to most of the Water industry and to other customers. Non-routine requests for hydrometeorological data, estimates of rainfall, evapotranspiration and soil moisture deficits and other information are dealt with on a commercial basis by CS Standard Products Group. The enquiry bureaux also handle some telephone requests which are provided free providing no significant work is required.

20.5.2 Enquiries connected with legal or insurance matters including Pluvius insurance are dealt with in chapter 12.

20.5.3 The Office participates in water resource feasibility studies by providing information about rainfall averages and variability, evapotranspiration and soil moisture deficits and hydrologically effective rainfall, and by processing data for areas of special interest in the United Kingdom and overseas. CS Specialist Consultancy Service also carry out hydrometeorological research and development work. Special projects are initiated by users or may be necessary to answer complex enquiries. Some of this research and development work is done in collaboration with the bodies listed in paragraph 20.1.4. Commissioned research and investigation is normally charged on a commercial basis but charges may sometimes be reduced in collaborative ventures which are of particular benefit to the Office.

20.5.4 The National Flood Studies team, in which the Office played a major part, published in 1975 the *National Flood Studies Report* in five volumes. The Report describes investigations of methods of flood estimation for engineering design purposes. Volume II of the Report contains the meteorological studies. Using this material, CS Consultancy Group can provide for any point or area in the United Kingdom, tables of rainfall amounts for return periods from twice a year to once in a thousand years, and for rainfall durations of 2 minutes to 25 days. A more detailed breakdown of rainfall increments at half-minute intervals and storm profiles for any specified return periods can also be provided. Some revision of the *National Flood Studies Report* is being undertaken under a Memorandum of Understanding between the NRA, the Institute of Hydrology and the Met. Office.

20.6 METSTAR Consultants

20.6.1 METSTAR (METeorological Scientific & Technical Advice & Research) Consultants is a business unit of the Met. Office within the Commercial Services Division. The aim of METSTAR is to seek commissioned R&D projects in a wide range of areas including hydrometeorology. Expertise within the Met. Office may be supplemented with that available in other organizations, including commercial companies, to form teams which may best address clients' requirements. A commercial arrangement has been agreed between METSTAR, the Institute of Hydrology and the National Rivers Authority to seek business in the area of flood warning systems.

20.6.2 METSTAR has won a number of hydrometeorological contracts, working both in the UK and overseas. Currently, work on new techniques for the estimation of Probable Maximum Precipitation and Probable Maximum Flood is being undertaken with the Telford Institute, Department of Civil Engineering, University of Salford for the Department of the Environment. Work is also well advanced for the National Rivers Authority to develop a thunderstorm warning system based upon the use of radar and satellite data.

20.6.3 Hydrometeorological problems involving substantial R&D should be referred to METSTAR. Tailored solutions can be offered, which are based upon sound scientific judgement, and an awareness of the need for a cost-beneficial project plan.

20.7 Publications

20.7.1 Rainfall data are published both by hydrological authorities and by the Office. The National Meteorological Library at Bracknell holds copies of all of the latter and many of the former publications. There are sections of the bibliography covering both hydrology and hydrometeorology. A list of publications produced by the Office is available in a booklet *The Met. Office Publications*, copies of which can be obtained from Headquarters.

20.7.2 *British Rainfall* Summaries of rainfall data over the British Isles were first published in 1860 by the British Rainfall Organization (BRO). In 1919, the Office absorbed the BRO and took over the publication though data from Eire were omitted from 1940 onwards. Publication of *British Rainfall* by HMSO ceased with the volume for 1968.

20.7.3 *Rainfall 19..* After *British Rainfall* ceased it was decided that the Office (not HMSO) would publish, from 1969 onwards, an annual summary of United Kingdom rainfall not dissimilar in content from that of the 'General Table' — Table I of *British Rainfall*. Prior to the 1987 edition this was entitled *Monthly and annual totals of rainfall*

for the United Kingdom. Copies are issued free to rainfall observers if required. CS HQ can provide copies to meet other requests, on repayment.

20.7.4 Rainfall maps Maps of average annual rainfall 1961–90 on the scale 1:625 000 (approx. 10 miles to the inch) and 1:250 000 (approx.. 4 miles to the inch) will shortly be available. A4-size maps of monthly rainfall are available as Hydrological Memorandum No. 44. Maps of simplified average annual rainfall and of rainfall during the summer half-year (April to September) on a scale of 1:2 million are also available (see paragraph 12.6.1). These can be obtained only from the Office. Bulk stocks are held in the Standard Products Group at Bracknell but limited stocks are also held at Edinburgh Climate Office, Belfast Weather Office and at other CS offices.

20.7.5 Various memoranda providing summaries of data and the results of investigation and development work in the fields of rainfall, evaporation and soil moisture are published from time to time and are available for sale from the Standard Products Group. Sets of memoranda provide detailed rainfall summaries and frequency tables for all parts of the United Kingdom.

20.7.6 Met. Office Rainfall and Evaporation Calculation System The Meteorological Office Rainfall and Evaporation Calculation System (MORECS) was introduced in 1981. It provides weekly bulletins giving, for 40 × 40 kilometre squares covering Great Britain, objective estimates of:

a. The previous week's evapotranspiration.
b. The current status of soil moisture deficit.
c. The previous week's hydrologically effective rainfall, i.e. that portion of the rainfall providing the combined contribution to streamflow and groundwater.

20.7.7 The weekly MORECS bulletins are tailored to meet client requirements. Maps or tables for a variety of crops, soil types and locations can be selected, from a single square up to all 190. A definitive update, using up to 4500 rain-gauges is produced about three months in arrears. Of numerous applications, those concerned with flood control, leaching and water resources management are most relevant to the water industry. A climatology of the square version of MORECS is available from 1961 for comparative purposes. Additionally, climatologies can be calculated upon request for single rain-gauge sites. Sample bulletins, explanatory brochures and order forms are available from the Standard Products Group. A growing interest is being shown by the industry in Weather Sensitivity or Demand Analysis. Such studies are carried out by the PSP Consultancies Group in (CS).

5-DAY TEMPERATURE AND PRECIPITATION FORECAST

5-DAY PRECIPITATION ACCUMULATIONS FORECAST

RAINFALL ACCUMULATIONS

RANGES: 0=LESS THAN 1 MM L=1 TO 4 MM
M=5 TO 12 MM H=OVER 12 MM

DAY	DATE	PERIOD 00-12	PERIOD 12-24	FACTORS AFFECTING SUPPLY
TUESDAY	31/7/90	0	0	
WEDNESDAY	1/8/90	0	0	
		0001-2359		
THURSDAY	2/8/90	0		
FRIDAY	3/8/90	0		

COMMENTS
HIGH PRESSURE WILL ONCE AGAIN DOMINATE THE WEATHER, GIVING A LONG DRY SPELL WITH HIGH TEMPERATURES

		TEMPERATURE (DEG C)			WEATHER
		LAST WEEK	THIS WEEK		
		DAY MAX	NIGHT MIN	DAY MAX	FACTORS AFFECTING DEMAND
TUESDAY	31/7/90	20.2	13	28	DRY, LIGHT WINDS, SUNNY
WEDNESDAY	1/8/90	21.6	12	29	STAYING SUNNY. DRY
THURSDAY	2/8/90	19.2	13	32	LITTLE CHANGE. LIGHT WINDS. LITTLE CLOUD
FRIDAY	3/8/90	23.9	14	34	CLEAR SKIES. DRY

(A.L.1)