THE RIVER TEST

NRA

National Rivers Authority

Southern Region

Guardians of
the Water Environment

THE RIVER TEST

COURSE AND HISTORY

The River Test is probably the most famous chalk stream in southern England, draining a surface catchment of some 1,260 sq. km. It rises in the Upper Chalk near the village of Ashe, East of Overton and soon collects a handful of small spring-fed tributaries on its passage southwards; the Bourne Rivulet, the Dever, the Anton, the Wallop Brook and the Sombourne Stream. From the upper reaches the river widens considerably and meanders through a wide floodplain, flanked by water meadows. Within its broad valley it frequently splits to form a network of braided channels. From Mottisfont southwards, the Test flows over less permeable soils and rocks and is joined by the River Dun, Tadburn Lake, Greenhill Lear and the Blackwater. The wide floodplain continues to the tidal marshes between Testwood and Redbridge where the river outfalls to Southampton Water.

The Hampshire Rivers were once tributaries of the ancient Solent River which flowed eastwards from the River Frome to join the sea somewhere near Littlehampton in times when the Isle of Wight was part of the mainland. This trunk river system was dismembered during the Pleistocene Period when the sea made inroads into the catchment to the East and West of the Isle of Wight.

More recently, the activities of man have shaped the River Test. The braided channel system is a legacy of the historic uses of the river for milling, for land irrigation of "water meadows" and for navigation.

The river once provided power for wool processing, paper making, tanning, flour and grist milling and the generation of electricity, though none of the traditional mills have survived in working condition.

There are still extensive remains of the water meadow system, which was used to flood fields with the relatively warm river water in the early months of the year to promote an early growth of grass. The temperature of chalk streams is always higher than soil temperatures in the winter months due to the large groundwater component. "Carriers" along the sides of valleys were used to flood the meadows and the water was returned to the river via low level "drains". Many of these larger channels still exist but the system became derelict with changes in agricultural practice and because it was labour intensive.

Between Timsbury and Romsey a stretch of the Andover - Romsey - Redbridge Canal still exists. This canal was authorised under a private Act of 1789 and was 22 miles long with a fall of 176 feet. In the early part of the 19th Century an attempt was made to build a canal from Salisbury to join the Andover Canal at Mottisfont but it was never successful.

Peat has been dug for fuel in a number of places and there are "peat holes" on the North side of the Houghton-Horsebridge Road and the large pond near Marsh Court has the same origin.

GEOLOGY AND HYDROLOGY

The underlying rocks of the Test catchment form part of the northern flank of the Hampshire Basin, a geological feature in which the rocks slope gently or dip from the North to the South. The oldest rock is the Cretaceous Chalk which outcrops over the whole of the valley to the North of Mottisfont. This is a porous fine grained limestone which is generally very permeable. There are three main subdivisions, these being the Upper, Middle and Lower Chalk. The first outcrops over much of the catchment but there are some exposures of Lower Chalk, particularly in the North West above St Mary Bourne.

From Mottisfont southwards there are younger rocks of Tertiary origin. These are a mixture of silts, clays and sands which are much more impermeable than the Chalk. There is an important inlier of Tertiary rocks into the Chalk to the West of Kimbridge over which the River Dun flows.

The landscape of the area was shaped in the last Ice Age. The precise origin of the dry valleys in the rolling Chalk Downs is still uncertain, but they were probably formed by stream erosion when the ground was frozen, causing rainfall to run over the surface rather than soaking into the chalk.

Apart from evaporation, almost all of the 824 mm of annual rainfall that falls on the Chalk catchment soaks into its deeper layers which are fully saturated with water. The water moves through the Chalk under the influence of gravity until it issues from springs in the valley bottoms, feeding the river system with high quality water.

The National Rivers Authority collects information about the groundwater and its fluctuations using a network of over 440 wells and boreholes in the Test catchment.

Generally rain takes several months to find its way through the Chalk to the springs, so the winter rainfall which swells the underground reserves gives peak river flows in late spring and through the summer. With slight variation in flow between seasons, the river has created very little freeboard to the top of its banks.

Although the range of flows is slightly higher than the neighbouring River Itchen, maximum flow in any year is typically only 4–5 times the minimum. This contrasts sharply with the Wealden rivers where surface run-off in winter can boost flows several hundred times, and summer flows do not have the support of resilient springs.

For these reasons, chalk streams characteristically have few tributaries compared with rivers draining impermeable areas. The drainage densities of the Test and Itchen (km of stream/sq. km of land area) are around 0.12 compared with values of up to 0.47 for the clay-vale rivers of Sussex and Kent.

The actual line of the River Test and its tributaries falls approximately on a right angle grid pattern, reflecting the way the chalk was flexed by geological movement.

The NRA measures flows at a number of points using specially designed weirs. There are gauging stations on the River Anton at Fullerton, on the Wallop Brook at Broughton and on the River Blackwater at Ower.

The main long term flow records (since 1957) is from Broadlands where average flow is 11.8 m^3/sec (224 mgd). More recently an electromagnetic gauging station has been installed at Testwood.

WATER RESOURCES

The development of South Hampshire, based historically on rail and sea links, but more recently on the improved road network, has generated a continuing demand for water for domestic and industrial use.

The Water Act 1989 gave the NRA the duty to ensure that water resources are conserved and managed properly. Consequently the Authority will play an important role in balancing the needs of the environment with those of the water user in the face of future development.

The prolific chalk streams provide much of the water used in Hampshire, particularly from their lower reaches. Some water is also pumped from boreholes penetrating the chalk aquifer.

The NRA is now the licensing Authority for all abstrac-

tions and considers the environmental aspects of a proposed abstraction and its effect on other lawful water users. In order to protect river-flows, restrictions are attached to licences to ensure that water is only taken from specified locations and at times when it can be spared.

An important consideration is the extent to which the water is returned to the river and the point of its return. Water taken out of the catchment or "consumptive use" is a loss to the river system. Some uses such as spray irrigation are entirely consumptive because of evaporation or export out of the catchment. Conversely almost all watercress growing, gravel washing, and fish farming abstractors return all the water to the same location, so overall effects on flow are small. On average, 80% of water abstracted for domestic supply is returned to the river after proper treatment. On the River Test consumptive use represents only 2% of total average flow.

The major abstraction for public water supply at Testwood is located close to the tidal limit so that water is taken just before it is lost to the estuary. The licence ensures that sufficient flows are preserved for the needs of migratory fish.

Abstraction licensing was introduced by the Water Resources Act 1963 which was the first statute to control the amounts of water taken from rivers. At that time established abstractors were given "Licences of Right" to continue taking water at the existing rate and at the same location. The NRA has found that local abstraction on the Wallop Brook and the Bourne Rivulet causes low flows. Remedial action is being investigated by the NRA for both tributaries.

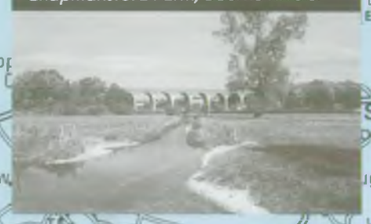
Fish farms and watercress farms were exempt from abstraction licensing until the Water Act 1989. Licences of Entitlement for established abstractors enabled them to continue taking water in the same amounts and at the same locations.

River Test at Chilbolton

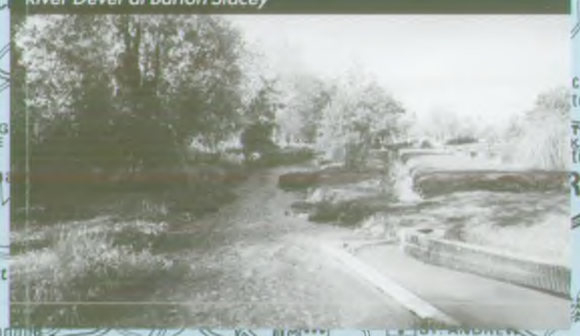
'Source of the Test'

River Anton, Upper Clatford

Chapmansford Farm, Bourne Rivulet



River Dever at Barton Stacey



Monitoring Groundwater levels

Measuring flows on the River Test

High quality game fisheries have made the River Test justifiably famous

Cartography prepared and published by ESTATE PUBLICATIONS
with the editorial assistance of the
SOUTHERN TOURIST BOARD
Based upon the ORDNANCE SURVEY maps with the sanction of the controller of HM Stationery Office.

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WATER QUALITY

The natural high quality of the chalk streams stems from their springwater which has had a long residence time in the ground and has been filtered through the chalk. The water is clear, hard and alkaline and its temperature varies little between seasons.

These features give chalk streams a good capacity to absorb and assimilate effluents.

The NRA sets objectives for river quality to protect natural stocks of fish and the uses to which the river is put. The highest objective in the classification is Class 1A (water of high quality suitable for potable supply abstraction, high class game and coarse fisheries). Altogether, 135 km of the 139 km of the River Test have this objective.

To achieve these standards, the NRA sets limits known as consent conditions on all permitted discharges, restricting their strength and quantity. Water abstracted for various uses and returned to the river amounts to a quarter of average total flow and consent conditions are stringent to ensure that re-used water approaches the natural river water quality.

There is little manufacturing industry on the River Test, the only significant discharge in this category being from a paper mill at Overton. It is testimony to the high quality of the river that its waters are used for washing and processing the paper used for British bank notes! The river has an objective of Class 1B (high quality water suitable for game and high class fisheries) for the 4 km below this discharge.

The largest volume of returned water is from the ten fish farms in the catchment and watercress farms on the Bourne Rivulet and River Anton. The high quality, the temperature profile of the river water, and proximity to markets make the valley ideal for these activities which bring economic benefit to the area. The effluents must meet the quality and volume conditions of NRA discharge consents, particularly with regard to the amounts of silt released and to the use of other pollutants.

The catchment is predominantly rural with a population spread across small towns and villages in the North, or concentrated in the conurbations alongside Southampton Water. There are two substantial discharges of treated sewage effluent made directly to the river; at Andover and Romsey where the sewage treatment works have consented dry weather flows of 16,000 m^3/d and 6,410 m^3/d respectively. Sewage treatment works at Chilbolton, Kings Sombourne and Stockbridge all have flows below 500 m^3/d. In addition there are two small sewage treatment works on the River Blackwater, one on the River Dever and one on the River Dun.

Wastewater discharged to the estuary from the major Southampton sewage works at Millbrook and Slowhill amounts to 49,400 m^3/d.

FISHERIES

It is the high quality game fisheries that have made the River Test justifiably famous. Its chalk water and abundance of weed are ideal for salmon and trout. Salmon have been caught as far upstream as Longparish but the main salmon and sea trout fisheries are downstream of Romsey. The middle and upper reaches are greatly esteemed for their trout and as the Mecca of dry fly fishing.

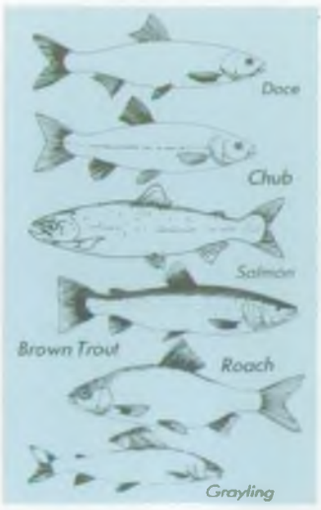
Chalk streams support an abundance of insects and other invertebrates upon which the fish feed. The water contains calcium with which shrimps, snails and other creatures can build external skeletons. Some eight species of stonefly nymphs, twenty-two species of mayfly nymphs, thirty-eight species of caddis and seventy other species of invertebrates have been recorded from the river.

The NRA has committed substantial resources to researching the status of salmon stocks and to their protection. Anti-poaching patrols are carried out on tidal waters and along all reaches of the river. As part of a fisheries management programme, hatchery reared salmon are restocked to the river. Fish passes have been installed at weirs and river structures to assist the passage of migratory fish to their spawning grounds. Such passes are operating successfully at Testwood, Nursling, Drawing-room Pool (on the Little River Test) and at Abbey Mill, Test Mill and Saddler's Mill in Romsey.

Electronic fish counters record the number of salmon running the river, enabling their movements to be related to flow, turbidity and other environmental parameters. Microtags inserted into young salmon have allowed the NRA and the Ministry of Agriculture, Fisheries and Food to investigate the migration of adult salmon whilst they are at sea. Some have been found off Western Ireland (which is on their route to and from feeding grounds near Greenland) and as far afield as the Faroe Islands.

Most recently, small scale radio transmitters have been attached to salmon to show which reaches of the river the fish frequent and also where they spawn.

A problem faced by salmon and the native brown trout is that the gravel areas in which they spawn have tended to silt. Chalk streams have a natural silt load and river keepers traditionally raked gravels to prepare for the spawning season. This practice has slipped into abeyance in recent years because of manpower and resource limitations on some estates. The NRA is investigating mechanical raking as an alternative to traditional methods. Scientists are also studying the occurrence, movement and source of sedimentation in the chalk streams.



Fish pass construction

FLOOD DEFENCE

The porous chalk enables rain to soak into the ground rather than running overland into the river. Flooding is therefore unusual in the headwaters or on the main river, though exceptional rainfall of 584 mm in four months in 1960 led to extensive flooding in the Test Valley and particularly in Stockbridge.

The NRA and riparian owners regularly cut weed to control river levels, especially when rapid growth of water plants in spring and early summer coincides with peak flows.

During agreed weed cutting periods the NRA operates a weed trapping boom at Timsbury to minimise blockages of culverts, sluices and grilles downstream.

Riparian landowners are responsible for operating and maintaining the many sluices which control the flows through the many carriers and feeder channels which run parallel to the main river channel.

The more flashy tributaries like the River Dun and the Blackwater, which drain clay and sandy areas, show more significant flow variations. Floods on the River Dun were caused by snow melt in 1914 and by heavy rainfall in 1974.

There is some tidal flooding of the riverside fields downstream of Testwood Mill during high spring tides where there are no tidal embankments.

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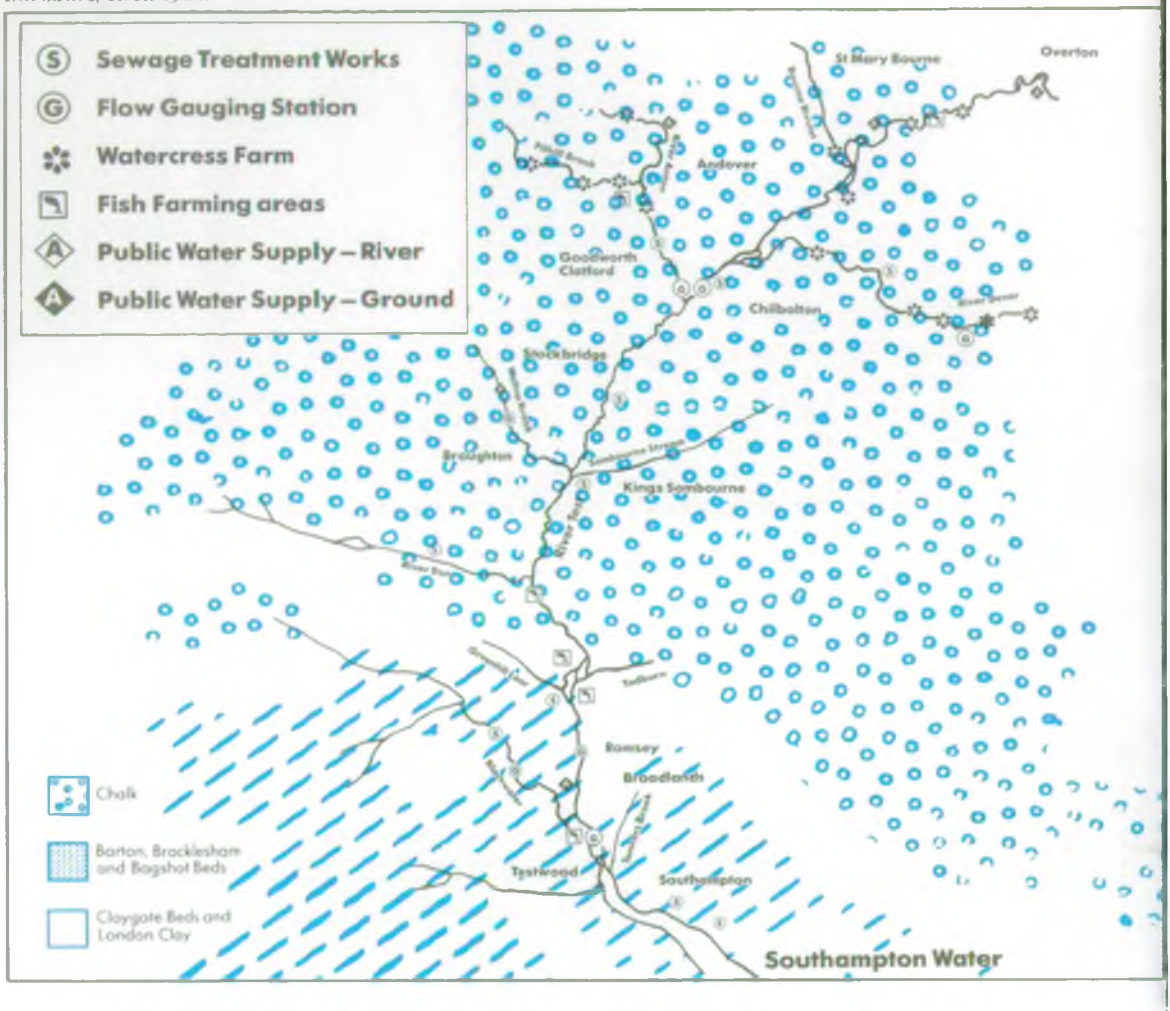
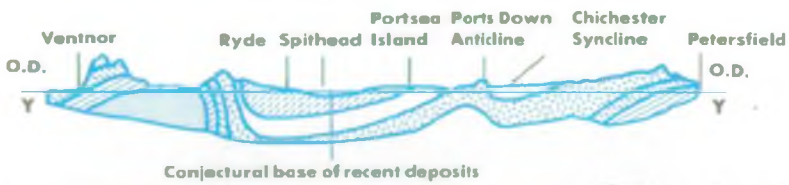
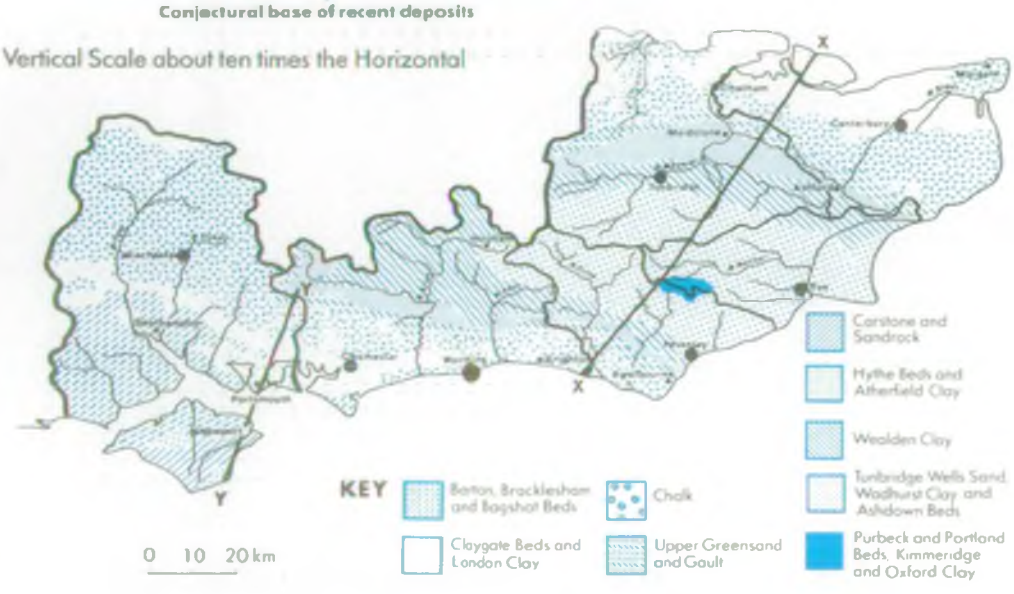


Sections showing the general relations of the rocks along the lines Y–Y' drawn on the map



Vertical Scale about ten times the Horizontal



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March 1991