Managing water resources:

A good practice guide for navigation authorities

Association of Inland Navigation Authorities

Foreword

The provision of an adequate supply of water is essential to the operation of the inland waterways and the effective management of water resources is fundamental to all navigation authorities. The changing legislative and regulatory regime in the UK places a greater onus of responsibility on navigation authorities to quantify and justify their demands for water. This guidance note is designed to help navigation authorities ensure that adequate water supplies are made available to meet the current and future needs of their waterways.

The use of the methods outlined in this guidance note will help all navigation authorities, particularly the smaller ones with limited resources, determine the reliability of their water resources and demonstrate their needs for water. The guidance summarises and presents in simple terms the complex and evolving legislative and regulatory regime in the UK, and it provides step-by-step guidance for carrying out water resource assessments to support applications for abstraction licences.

The guidance also contains suggestions as to whom navigation authorities with limited expertise in water resource issues may turn to for expert assistance. Through AINA, smaller navigation authorities are able to access the knowledge and expertise that exists throughout the industry. We are grateful to the Environment Agency and British Waterways for their major contribution towards the production of this guidance. We also gratefully acknowledge the contribution of the Department for Environment, Food and Rural Affairs as this document is a product of its research funding for AINA.

Ian White
AINA Chairman

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About AINA

The Association of Inland Navigation Authorities (AINA) was set up in December 1996 with strong encouragement from Government to provide, for the first time ever, a single voice on waterway management issues. The broad purpose of AINA is to facilitate the management, maintenance and development of the inland waterways for navigation as an economic, environmental, recreational and social resource.

AINA has 29 members including the three largest inland navigation authorities – British Waterways, the Environment Agency, the Broads Authority – and also local authorities, drainage commissioners, property development companies, port and harbour authorities, original canal companies, national parks, The National Trust, and other charitable trusts.

Between them, AINA members own, operate and manage some 5,000 km of waterway representing almost a complete UK coverage. Each member has its own constitution, aims and objectives and, in many cases, Acts of Parliament regulating the operation of their waterways.

AINA's key objectives are to:

- represent the owners and operators of the UK's inland waterways; and
- develop and share best practice for waterway management

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1. Introduction

1.1 The droughts of the 1990s highlighted the fragility of the country's water resources. The images of standpipes and water tankers during the 1995 drought were unacceptable not only to the public and politicians but also those managing water resources. The threat of changes in climate having the potential to lead to more severe droughts has ensured that water resources has remained a matter of public concern.

1.2 The Government is committed to providing a sustainable water supply system for England & Wales. In 1996 it published *Agenda for Action*[1], a framework document which set out to ensure that the water required in the longer term was provided effectively, efficiently and in an environmentally sustainable way. In 1999 it followed this up by issuing the document *Taking Water Responsibly*[2] in response to its consultation on changes to the current water abstraction licensing system.

1.3 The Environment Agency has responsibility for strategic water resources planning in England and Wales. In March 2001 it published *Water resources for the future: A Strategy for England & Wales*[3], a vision for providing sustainable water resources over the next 25 years.

1.4 The strategy examined the uncertainties about future water demand and availability including the potential effects of climate change and societal values. Whilst it accepted the need to provide water for navigation purposes and requested that navigation authorities plan for any increased demand for water, the strategy concluded that current water resources were insufficient in a number of areas and that action would need to be taken over the next 25 years to ensure a sustainable water supply. The conclusions of the strategy are reflected in the Water Act 2003 which pays close attention to the linkages between different aspects of water management, such as the management of water resources, water quality and flood alleviation and control. Within this context it is vital that navigation authorities understand the impact of their operations on the water environment.

[1]Agenda for Action. Department of the Environment, 1996.
[2]Taking Water Responsibly. Department for the Environment, Transport, and the Regions, 1999.
[3]Water Resources for the Future: A Strategy for England and Wales. Environment Agency, 2001.

2. Legislative and regulatory framework

2.1 The effect on the environment of using water for navigation purposes was not considered when the waterways were first constructed. However, since 1945 the use of water has been subjected to increasing control to minimise the risk to the environment. Today, the Environment Agency, under the Water Resources Act 1991, regulates the abstraction of water from any surface water or groundwater source in England and Wales.

2.2 The Environment Agency is currently reviewing the quantities of water which can be abstracted from any of the 129 catchments in England & Wales through its Catchment Abstraction Management Strategies (CAMS). Work began in 2001 and the Agency plans to have produced all 129 CAMS by 2008.

2.3 The main aims of CAMS are:

- to make information on water resources and licensing practice available to the public;
- to provide a consistent approach to local water resources management recognising the reasonable needs of water users and the environment; and
- to provide the opportunity for greater public involvement in managing the water resources of a catchment.

2.4 A CAMS will determine the water resource status and future abstraction policy for a particular catchment. It is possible that it may require the quantity of water abstracted to be reduced if current levels are unsustainable. It is vital therefore, that navigation authorities ensure that the Environment Agency is fully aware of the needs of navigation by quantifying their water requirements and providing qualitative evidence of sustainability.

2.5 At present, statutory navigation authorities are exempt from the need to obtain a licence for surface water abstractions (groundwater abstraction is not exempt). However, the Water Act 2003 will require abstractions by navigation authorities which have an effect on external water systems to be licensed. When applying for licences, authorities will need to justify their requirements possibly by means of a quantitative analysis. There will be a transitional period to allow time for navigation authorities to prepare their applications but once this has expired, unlicensed abstractions will be unlawful.

2.6 Whilst it is too early to say how the abstraction provisions of the Act will be implemented, Appendix 1 shows in diagrammatic form the circumstances in which licences are likely to be required in the following cases:

- Reservoirs
- Controlled feeders
- Back-pumping systems
- Dry dock (emptying)
- Engineering works
- Canalised rivers and river navigations

2.7 All licences will be time-limited with the presumption of renewal providing that three conditions are met:

- there is no environmental damage;
- the continued justification for the water can be demonstrated;
- the abstracted water is used efficiently.

It is likely that some form of monitoring will be required to demonstrate that these requirements are being met.

2.8 The Water Act 2003 also gives the Environment Agency the power to enter into water management schemes with the holder of an abstraction licence. These schemes will be an agreement on the operation of the water resources infrastructure associated with an abstraction. It is probable that schemes will be used in environmentally sensitive catchments where abstractions could impact on designated sites such as cSAC or SSSI.

2.9 The most likely timetable for implementation of the Water Act 2003 provisions relating to abstraction for navigation is November 2005 with transitional arrangements applying until November 2007. In practice this means that navigation authorities must apply for abstraction licences before November 2007. If a navigation authority fails to meet this timetable then the abstraction will be in breach of the Act and subject to a £20,000 fine per offence.

2.10 In 2002 the European Union Water Framework Directive was passed. This has the objective of achieving good ecological status or potential of all water bodies in Europe by 2015. These water bodies include canals and river navigations. The timetable for reaching this objective is very tight and River Basin Plans, the management plans for meeting the objective, have to be completed by 2009. It will be important for all navigation authorities to be fully involved with the River Basin Planning process. AINA will provide further guidance on the Water Framework Directive and its implications for navigation authorities in due course.

3. Guidance on how to assess water resources

3.1 It may be self-evident that waterways depend upon water and that they demand the assured provision of considerable quantities at all times. However canals differ significantly from rivers in terms of their requirements. Whereas river navigations and canalised rivers can, to a large extent, depend on the water naturally flowing in the river, canals are artificial structures which derive their supplies directly or indirectly from overground sources such as springs, streams and general land drainage or from underground sources such as wells, boreholes and mine workings. For this reason a review of the various sources of water supply is particularly important in the case of canals.

3.2 The purpose of this section is to give guidance to all navigation authorities in producing water resource assessments for their waterway(s). The guidance may be used by navigation authorities wishing to carry out assessments for themselves, or as the basis of a brief for navigation authorities wishing to employ expert consultants.

3.3 There are many components that make up a water supply system and equally, a large number of features that place demands upon it. Waterways of all kinds require adequate water to maintain navigable depths in channels and to allow vessels to pass through locks, but there are demands of other kinds which this section will describe and also indicate what is involved in meeting them. The most important part of any water resource assessment is the need to identify and quantify the sources of, and demands for, water.

3.4 The identification of sources and demands can be carried out by the layman using the guidance within this document. However, quantifying those sources and demands is the most difficult phase of any water resources study and is normally the domain of specialist hydrologists.

3.5 Quantification is much easier if measurements are taken on the waterway. Any measurements, locations and other field information derived from the guidance given in this section will enhance the quantification analysis. However, all data and information collated will require interpretation by a specialist. In the absence of measurement information derived from this guidance, the parameters will have to be estimated by a specialist using other, more complex techniques.

3.6 The ultimate aim should be to determine an overall water resources position for each waterway by quantifying the total flow of water into and out of the waterway. Appendix 2 indicates the data that would ideally be required to form the basis of such an assessment and guidance on its applicability is given in the following pages. By itself, Appendix 2 provides the basis for only a rudimentary assessment of water resources. However, the data derived from it, coupled with other information which can be obtained as described in this document, will enable the specialist to determine, with some accuracy, the water resources position for each waterway.

3.7 Identification and quantification will normally be carried out in two stages – a site survey followed up with a desk-top mapping exercise.

Site survey

3.8 It is essential that the physical characteristics of the waterway be known and confirmed by a site survey. The sources of water and demands for water that need to be noted during the site survey are set out in the following table. These need to be considered taking into account the effect of features such as weirs, sluices, pipes and pumps. It is advisable to survey the waterway during periods of low rainfall, e.g. in August, and after periods of heavy rainfall, e.g. in January to establish the nature of sources and demands under different conditions. Whilst undertaking these site surveys it is important to note the grid reference of the feature either from a map if it is visible or from a GPS (Global Positioning System). These Grid References will be one of the basic details required to complete an abstraction licence application.

Sources	Demands
Rivers	Lock operations
Reservoirs	Evaporation and transpiration
Streams, ditches and brooks	Leakage, seepage and percolation
Groundwaters	Abstractions and water sales
Discharges	Feeds to other waterways and watercourses

3.9 In carrying out a site survey it is useful to collect as much anecdotal evidence as possible. Boaters with permanent moorings may be particularly good sources of such information. The information gathered could cover subjects such as the following

Boat numbers
How many boats were observed on the waterway? Where were they located? How many boats were using or queuing for the locks? Ask the boaters to fill in questionnaires regarding their trips. This information will then be used to estimate the lock usage and the volume of water used at each lock (see 3.21).

Stream flow
Which streams are flowing into the waterway? What are the levels in the streams? (measured, for example, against the top of the bank). How often do the streams dry up? Which streams run all year?

Identifying and quantifying sources of water

Rivers

3.10 In the context of navigation, rivers serve two main purposes; they may in themselves be used as a waterway, and they may provide a source of water for another waterway such as a canal.

3.11 In the case of river navigations and canalised rivers the flow of the river itself is normally used to meet the navigational requirements. In the latter case water supply to the canalised sections is normally controlled by weirs and sluices. It is important to note the location of any interaction between the main river and the artificial cut, including the location and length of any weirs and the destination watercourse for water flowing over them.

Direct pumped river abstraction to waterway

Opposite

1. Uncontrolled feeder stream to waterway

2. Measuring inflows to waterways

3.12 Direct abstractions from rivers for canals will normally be controlled by the use of weirs, sluices, pumps or combinations of the three. The location of any abstractions for supplying canals should be recorded along with the method and location of any controls.

Reservoirs

3.13 The way in which a particular canal obtains its water supply depends to a large extent on local geological conditions which also influence the pattern of rainfall runoff. Reservoirs have often been built to cope with seasonal demand for waterway use and variations in rainfall. Ideally, this should be of such a size and design as to meet the needs of the waterway and its users even over a long period of drought. Modern design rules enable reservoir sizes and reliable yields from particular catchments to be estimated and these should be recorded.

Supply reservoir to waterways

Streams, ditches and brooks

3.14 These surface water sources can be the main source of water to a waterway. They can vary in size, gradient and the season of year during which they provide water. Some small streams may only supply water during the winter and spring months. The location of the surface water source should be recorded together with the approximate dimensions of the watercourse. Surface water sources may be controlled or uncontrolled. If there is any control on the watercourse, such as weirs or pumps, then the type and dimensions of control should be recorded as well as its location.

3.15 The Environment Agency has the largest network of flow gauging stations in the UK and should be the first point of contact for navigation authorities wishing to quantify the flow of any surface watercourse. If the flow is not measured comparisons will need to be made with streams and brooks which are measured and have similar characteristics. It will be necessary to contact the Environment Agency or engage specialist consultants to undertake this task. Appendix 3 gives contact details for the Environment Agency area offices in England and Wales.

Groundwater

3.16 Many waterways obtain or supplement their supplies by pumping from wells, boreholes and mine workings. The location of any pumping station should be noted together with the source of water for the pump and the receiving water body. If the design rate of the pumping station is known then it should also be noted. The size of the pumping main should also be estimated and recorded. As groundwater sources were not exempt under the Water Resources Act 1963, navigation authorities should already hold licences for these sources.

Discharges

3.17 Discharges of treated industrial effluents such as those from sewage treatment works are sometimes used as sources of supply as is surface water from newly developed areas. However the latter is of little benefit unless it can be discharged into a reservoir – otherwise the supply is likely to come mainly when existing sources are yielding plentifully.

3.18 The input of discharge water to the system via pipes is normally very flashy with very little in the way of storage within the pipe system. It is also difficult to establish the nature and extent of any piped system. However, it would be of benefit to know details of the location of any pipes and an estimate of their length and diameter.

Identifying and quantifying demands for water

3.19 The assessment of the water required for a waterway is not a simple process. Part of the demand will depend on lock operations for boat traffic and will vary with traffic patterns. Other parts will be less controllable. Even on the assumption that leakage and similar losses are kept in check they will still be liable to variation according to weather conditions. In any event, the demand presented by a typical narrow canal will be entirely different from that of a wide canalised river which may be used for supplying industrial needs on a major scale.

Lock operation

3.20 Lock operation represents one of the major demands on water. In a complete cycle of filling and emptying the chamber a measurable volume of water is drawn from the upper and discharged into the lower level though the quantity actually used in traffic depends on a number of factors. These include the design of the lock ie conventional or staircase; whether it is left empty or full, whether intermediate gates or side ponds are used; the direction of traffic; and whether users share the use of the lock.

3.21 A lock of water is not a fixed quantity. For a narrow lock taking the traditional 22m by 2.15m canal boat it will vary between about 0.09 and 0.15 Ml depending on the 'rise', and it is usual to take a figure of 0.115 Ml as an average. For a wide waterway taking 4.3m beam boats of the same length the volume would be rather more than double and a figure of 0.25 Ml would be a fair average. The larger locks found on river navigations and ship canals would take much larger quantities.

Opposite

1. Surface water discharge to waterway
2. Highway discharge to waterway

The volume of water used during each lock cycle can be calculated accurately using the formula:

Volume of water used =
lock width x lock length x lock drop

The width, length and drop should be measured in metres to allow the volume to be calculated in cubic metres. Using this formula, it is important to calculate the volume of water used during each lock cycle at every lock along the navigation.

3.22 There is a great deal of information available from navigation authorities about lock usage. British Waterways has a national archive of lock usage and uses sophisticated mathematical models to predict boat movements and lock use. The Environment Agency has similar information for its waterways. This information would be useful in estimating the likely lock usage on waterways where no measurements are taken.

3.23 All navigation authorities should consider installing a means of measuring lock usage. The technology is very simple, normally an airtight pipe in the lock chamber connected to a pressure switch and a counter.

Leakage, seepage and percolation

3.24 The largely invisible effects of evaporation, transpiration, seepage, percolation and leakage are often much greater than the quantities seen to be used at locks. The distinction between leakage on the one hand and percolation and seepage on the other is that the former takes place through definite channels whereas the others are a general diffusion of water through the bed and banks of the waterway.

Lock gate leakage

3.25 Serious losses of water, whether through leakage or percolation can usually be detected and measured by observing the fall in water level in a suspected section after isolating it at locks or by temporary dams. On the assumption that losses detected would be checked by carrying out remedial works, it should not be necessary to make allowance for them assessing normal water demands. If the natural water table in the adjacent ground is fairly high, as would be case generally with river navigations and canalised river sections, the loss of water from this cause will not be significant. However, with artificial canals, it may represent an appreciable proportion of the total demand and is likely to continue unless remedial work is carried out over the affected length.

Evaporation and transpiration

3.26 Evaporation takes place from all free water surfaces, increasing with atmospheric temperature but decreasing with its humidity. In a hot, dry summer it will be at its maximum whereas in cold, wet weather it may even be negative, the direct precipitation in some periods being more than is lost by surface evaporation. In many places waterways receive rainfall running off the surface of adjacent land areas, so that during wet periods there could be net gain.

3.27 Transpiration refers to water absorbed by vegetation and subsequently lost to the atmosphere. So long as there is no undue growth in the water margins the loss is not great and can be reckoned as part of general evaporation losses. Where boat traffic does not keep weed growth in check, as in unnavigable feeders, serious loss of water may occur when the weeds are not cleared.

3.28 Various estimates have been made of the loss by evaporation to be expected from waterways. For reasons already given it can vary widely; another factor being that in hot weather the water in narrow shallow canals will warm up more than in the larger river navigations and thus result in proportionally greater losses in regions where natural water supplies are sparse. Nevertheless, losses from evaporation and transpiration are small in comparison with the losses to be expected from leakage, seepage and percolation.

Estimating total loss of water from leakage, seepage, percolation and evapotranspiration

3.29 Trying to quantify each of the components contributing to the losses described above is extremely difficult, if not impossible. The alternative is to estimate the loss from measurements of water into the navigation and water out with the difference between the two being the total loss of water. Even this rudimentary analysis would require a great deal of information and measurements to be taken and it is not expected that the majority of navigation authorities will have the necessary resources to do this. A more simplistic approach would be to use existing data on canal losses to estimate the loss from the navigation. British Waterways has an extensive database of canal losses which could be used for this purpose. Typically, the following statistics could be used for estimating losses.

Loss Rate (million litres per kilometre per week)	Type of Canal
1.75	Average loss rate, waterway in good condition
5.0	Summer loss rate, waterway in the south with chalk geology.
3.0	Summer loss rate, waterway in the midlands with clay geology and well boated.

Third party abstractions and water sales

3.30 Some navigation authorities supply surplus water to waterways managed by other authorities or to industries and other users otherwise unconnected with the waterway.

3.31 In the latter case these supplies range from cooling water for medium sized power stations to industrial supplies for various factories' and works' purposes and to small individual users such as farmers for agricultural operations. The larger users in most cases return the water, less any evaporation losses although not necessarily near the point at which the supply is taken. The smaller users may consume the whole of their intake. In any event, it is expected that the navigation authority would meter any water abstraction by agreement with third parties.

Feeds to other waterways and watercourses

3.32 At any point along a waterway, water may be transferred to another. In this way what is a demand in one case becomes a source for the other. Elsewhere, a waterway may drain into another watercourse, and ultimately to the sea. This transfer normally occurs with water cascading over a weir. The location, size and water level over the weir should be noted. This water information can then be used to convert the water level over a weir into a flow. A standard formula to use is:

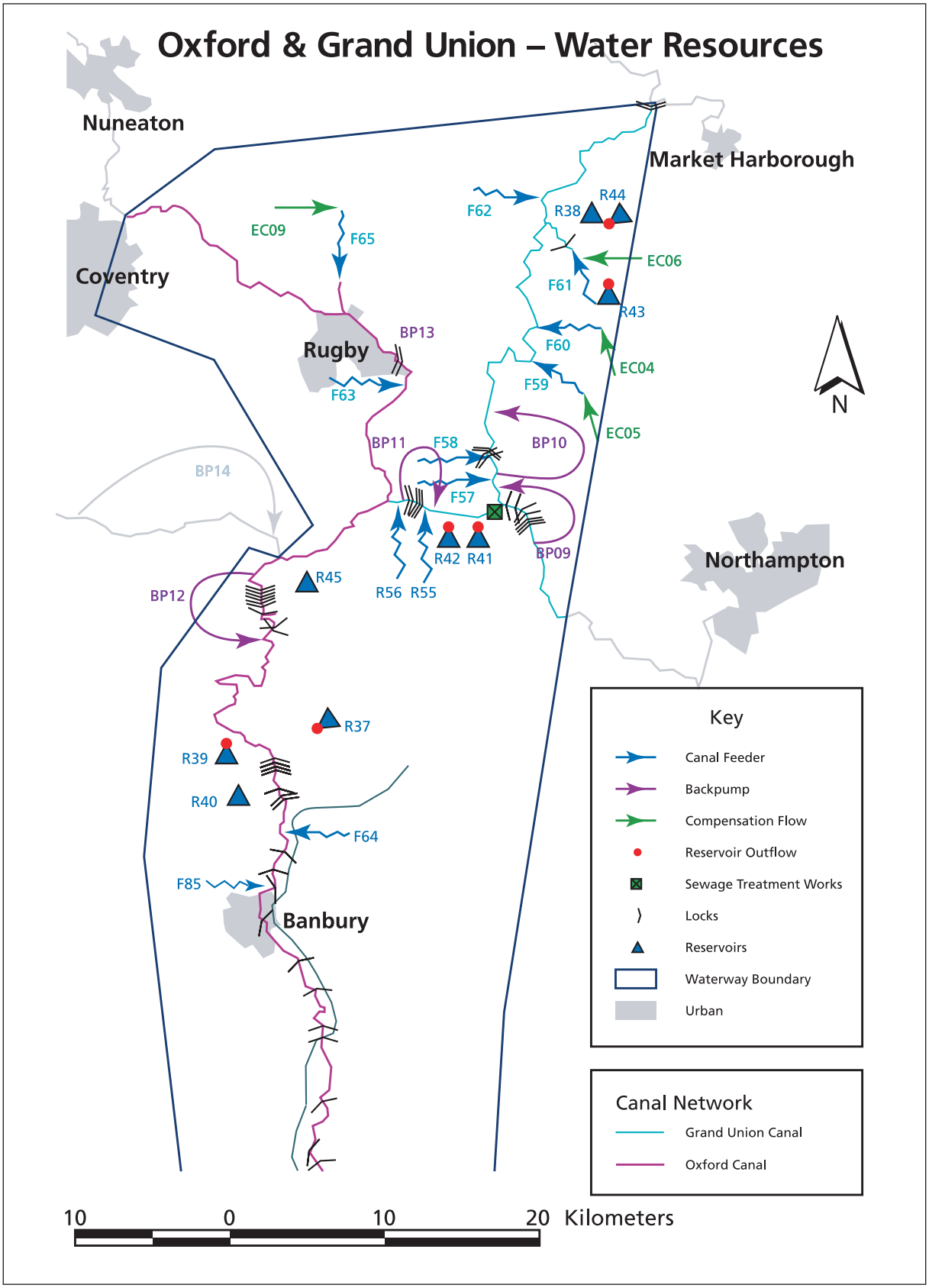
$Q=1.5bh^{1.5}$ where

Q = flow in cumecs
b = length of weir in metres
h = water level over weir in metres

Desk-top mapping

3.33 The site survey should be followed up by the mapping of the locations of the major water sources, control features and demands of the waterway. The cross-referencing of the site visit records with Ordnance Survey data should assist. An example of the water features on a geographical map is shown in the example overleaf.

Georaphical map



3.34 At this stage, it is also important to find out about the local issues within the catchments that relate to the navigation. There are a number of sources for water related information which are produced by the Environment Agency. The most important documents available include Local Environment Agency Plans (LEAPs), Catchment Abstraction Management Strategies (CAMS) and Regional Water Resource Strategies. These documents will give an indication of the environmental concerns in the catchment, the water available and potential solutions. It would also be worth visiting the Environment Agency web site and accessing the local issues pages – www.environment-agency.gov.uk

Climate change

3.35 The scientific community now believes that there is overwhelming evidence that climate change and global warming is taking place. The future scenarios show less rainfall in the summer, higher temperatures and greater winter rainfall, depending on location in the UK. Although the uncertainty in these estimates is large it is incumbent on navigation authorities to at least think about how climate change could affect them. The Environment Agency is due to publish guidelines on climate change and water resources in 2005. These guidelines should be taken into account when compiling a water resource assessment.

3.36 The research into climate change in the UK is undertaken by UK CIP, a consortium of specialist organisations and sponsored by the Department for the Environment, Food and Rural Affairs (Defra). The future scenarios of climate change were published in 2002 and are available on the internet at www.ukcip.org.uk

Appendix 1

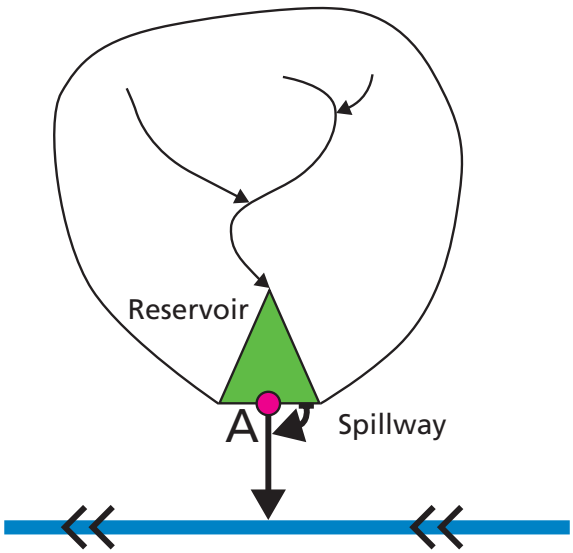
The implementation of the navigation abstraction licensing provisions of the Water Act 2003 is currently being developed by the Environment Agency and Defra.

Under the current regime, all transfers of water into and out of waters over which navigation authorities have functions are exempt from abstraction licence control where they are carried out in connection with those functions. The effect of section 5 of the Water Act 2003, taken with section 3, is to limit that exemption, and to require the licensing of controllable transfers of water from any source of supply into water systems operated by navigation authorities. However certain types of water transfer will not require an abstraction licence. These comprise water transfers made wholly within water systems operated by a navigation authority; water transfers between a supply reservoir (which discharges only to a water system of the authority) and a water system of the authority; and (subject to certain exemptions) water transfers from a water system of the authority to inland waters not forming part of such a system.

It should be noted that the expression 'water systems' is defined by section 5 as meaning a canal or a harbour; it does not include a navigable river.

The following diagrams illustrate AINA's current interpretation of the provisions of the Water Act 2003. However it should be noted that this position may change as implementation progresses.

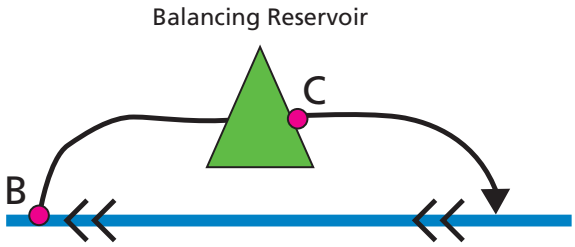
1. Reservoirs



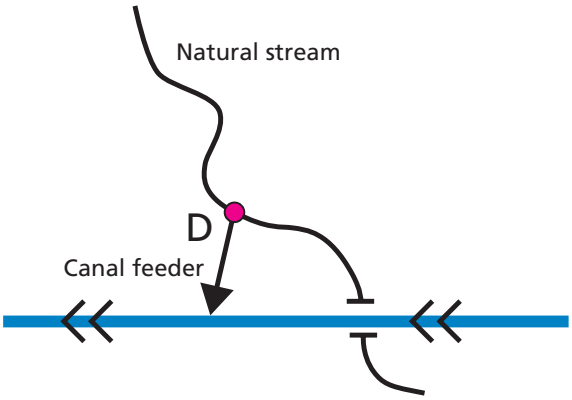
The abstraction of water at a navigation authority supply reservoir occurs at the reservoir outlet valve (point A) where water is removed from the reservoir to the downstream watercourse. Section 5 of the Water Act 2003 exempts such reservoirs, which discharge only to a water system of the navigation authority, from requiring an abstraction licence. This discharge includes the spill from the reservoir.

The reservoir above would be exempt as both the outlet valve and spill discharge to the canal.

Section 5 of the Water Act 2003 defines balancing reservoirs as being part of a navigation authority's water system. The abstraction from the canal to the balancing reservoir (point B) and the abstraction from the reservoir to the canal (point C) are transfers within a water system of the authorities and exempt from the requirement to be licensed.



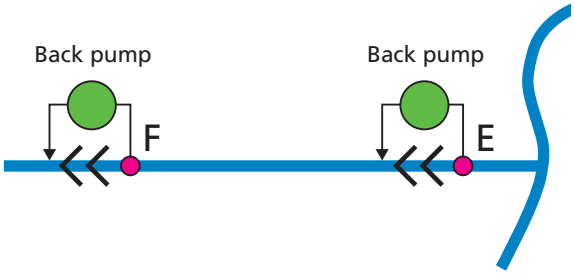
2. Controlled Feeders



The construction of canals and other inland waterways often resulted in streams being diverted to supply the waterway. If the diversion of water is controllable by sluice, weir or pump then an abstraction occurs at the control structure. The Water Act 2003 will require the abstraction or removal of water from the stream to the canal feeder to be licensed. A licence will therefore be required at point D.

If a stream enters an inland waterway in an uncontrolled way, no abstraction is taking place and there is therefore no requirement for a licence.

3. Back-pumping systems

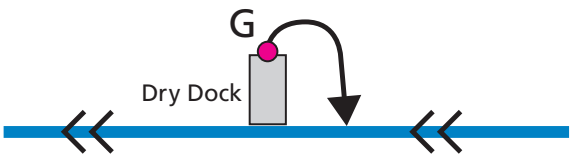


A back-pump when operated will physically remove water from one source of supply to another. The running of the pump therefore causes an abstraction to take place.

The abstraction at Point E is exempt if the point of abstraction and the transfer is within a navigation authority's system. If the point of abstraction is not within a system of the authority's then the abstraction is licensable.

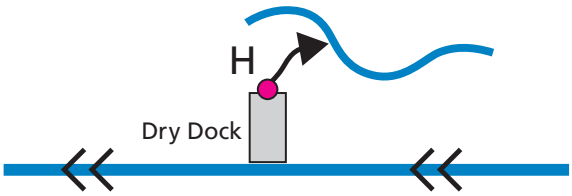
The abstraction associated with the backpump at point F is straightforward. The transfer of water is within the navigation authority's water system and is therefore exempt from licensing.

4. Dry Dock



The filling of dry docks is exempt from abstraction licensing. However the emptying of dry docks is only exempt if the water is emptied back into the same waterway. This is shown by the abstraction at point G.

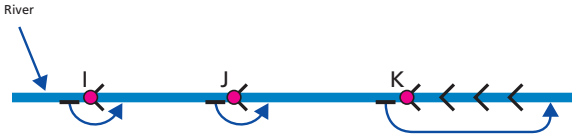
If, in the emptying of a dry dock, the water is transferred to a downstream watercourse then a licence is required for the abstraction at point H.



5. Engineering Works

The dewatering of a pound either into downstream pounds or watercourses is exempt from abstraction licensing.

6. River Navigations



As noted, the exemptions for abstraction licences contained in section 5 of the Water Act 2003 do not apply to navigable rivers. This term is not defined and it is not therefore possible to state with certainty what the abstraction requirements for a river navigation with locks and possibly canalised sections will be.

At present it is understood that no abstraction licence will be required for single locks on a river navigation (points I and J). However if a section of the river containing more than one lock is by-passed (for example by the river following its original unnavigable course) a licence may be necessary at point K. Advice on individual cases should be sought from the Environment Agency.

Appendix 2

Water Resources Assessment

Water into the waterway

1. Lock use

	Annual		Daily	
A. Number of lock uses (first lock on navigation)				
B. Volume of Lock		m^3		m^3
C. Volume of water used during lock usage ((A*B)/1000)		Megalitres		Megalitres

2. Streams flowing into the waterway

D. Estimated inflow from surface water streams (1:10 year drought)		Megalitres		Megalitres

3. Discharges (Not included as flow not guaranteed during drought)

E. Number of pipes into navigation				Number
F. Average diameter of pipes				Metres

4. Inflows from Pumps

G. Design rate of pump		Litres per second		
H. Volume of water from pump		Megalitres		Megalitres

5. Total Inflow into waterway

Total Inflow into waterway		Megalitres		Megalitres

Water out of the Waterway

6. Lock use

	Annual		Daily	
I. Number of lock uses (last lock on navigation)				
J. Volume of Lock		m^3		m^3
K. Volume of water used during lock usage ((A*B)/1000)		Megalitres		Megalitres

7. Losses

L. Length of				
M. Typical Loss Rate		1.75		Ml/Km/Wk
N. Total Loss of water from waterway		Megalitres		Megalitres

8. Total water out of the waterway

Total water out of the waterway		Megalitres		Megalitres

9. Water Resource Position

Water Resource Position (5 minus 8)		Megalitres		Megalitres

Appendix 3

The Environment Agency – structure and contact details

Head office

The Environment Agency's head office is split between Bristol and London. It is the focus for national policy and for ensuring that policies are delivered consistently, while allowing for local differences in environmental, social and economic climate where appropriate.

National centres

The Agency has eight national centres providing technical and scientific expertise to support key areas of work. Examples include the National Flood Warning Centre and the National Water Demand Management Centre.

National Services

There are 22 National Services, such as the National Laboratory Service and the National Library and Information Service, to provide efficient services across the Agency.

Regional Offices

The Environment Agency is divided into eight regions – Southern, Thames, South West, Midlands, Anglian, Wales, North West and North East – each of which has a Regional Office, presided over by a Regional Director. They provide both a focus of co-ordination and technical and administrative support to the 26 Area Offices.

Area Offices

There are 26 area offices across England and Wales. They are responsible for the day-to-day management of the area and for making sure that the needs of the local community are met and for dealing with emergencies and incidents. Each area office has a customer services department.

Useful addresses

Head Office

Rio House
Waterside Drive
Aztec West
Almondsbury
Bristol BS32 4UD
Tel: 01454 624 400
Fax: 01454 624 409

Anglian Region

Regional Office

Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough PE2 5ZR
Tel: 01733 371 811
Fax: 01733 231 840

North East Region

Regional Office

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

Northern Area Office

Waterside House
Waterside North
Lincoln LN2 5HA
Tel: 01522 513 100
Fax: 01522 512 927

Northumbria Area Office

Tyneside House
Skinnerburn Road
Newcastle Business Park
Newcastle upon Tyne NE4 7AR
Tel: 0191 203 4000
Fax: 0191 203 4004

Central Area Office

Broomholme Lane
Brampton
Huntingdon PE28 4NE
Tel: 01480 414 581
Fax: 01480 413 381

Useful addresses

North East Region cont.

Dales Area Office

Coverdale House
Amy Johnson Way
Clifton Moor
York YO30 4GZ
Tel: 01904 692 296
Fax: 01904 693 748

Eastern Area Office

Cobham Road
Ipswich
Suffolk IP3 9JE
Tel: 01473 727 712
Fax: 01473 724 205

Ridings Area Office

Phoenix House
Global Avenue
Leeds LS11 8PG
Tel: 0113 213 4600
Fax: 0113 213 4609

North West Region

Regional Office

P O Box 12
Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

North Area Office

Ghylf Mount
Gillan Way
Penrith 40 Business Park
Penrith, Cumbria CA11 9BP
Tel: 01768 866 666
Fax: 01768 865 606

Central Area Office

Lutra House
Dodd Way
Walton Summit
Bamber Bridge
Preston PR5 BBX
Tel: 01772 339 882
Fax: 01772 627 730

South Area Office

Appleton House
430 Birchwood Boulevard
Birchwood
Warrington
Cheshire WA3 7WD
Tel: 01925 840 000
Fax: 01925 852 260

Midlands Region

Regional Office

Sapphire East
550 Streetsbrook Road
Solihull
West Midlands
Tel: 0121 711 2324
Fax: 0121 711 5824

Lower Severn Area Office

Riversmeet House
Newton Industrial Estate
Northway Lane, Tewkesbury
GL20 8JG
Tel: 01684 850 951
Fax: 01684 293 599

Upper Severn Area Office

Hafren House
Welshpool Road
Shelton
Shrewsbury SY3 8BB
Tel: 01743 272 828
Fax: 01743 272 138

Upper Trent Area Office

Sentinel House
9 Wellington Crescent
Fradley Park
Lichfield
Staffordshire WS13 8RR
Tel: 01543 444 141
Fax: 01543 444 161

Lower Trent Area Office

Trentside Offices
Scarrington Road
West Bridgeford
Nottingham NG2 5FA
Tel: 0115 945 5722
Fax: 0115 981 7743

Thames Region

Regional Office

King's Meadow House
King's Meadow Road
Reading
Berkshire RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

North East Area Office

Apollo Court
2 Bishops Square Business Park
St. Albans
Hertfordshire AL10 9EX
Tel: 01707 632 300
Fax: 01707 632 500

South East Area Office

Swift House
Frimley Business Park
Frimley
Camberley
Surrey GU16 5SQ
Tel: 01276 454 300
Fax: 01276 454 301

West Area Office

Isis House, Howbery Park
Crowmarsh Gifford,
Wallingford
Oxfordshire OX10 8BD
Tel: 01491 832 801
Fax: 01491 834 703

Useful addresses

Southern Region

Regional Office

Guildbourne House
Chatsworth Road
Worthing
West Sussex BN11 1LD
Tel: 01903 832 000
Fax: 01903 821 832

Hampshire & Isle of Wight Area Office

Wessex Business Park,
Wessex Way
Colden Common
Winchester
Hampshire SO21 1WP
Tel: 01962 713 267
Fax: 01962 841 573

Kent Area Office

Orchard House
Endeavour Park
London Road
Addington
West Malling
Kent ME19 5SH
Tel: 01732 875 587
Fax: 01732 875 057

Sussex Area Office

Saxon House
Little High Street
Worthing
West Sussex BN11 1DH
Tel: 01903 215 835
Fax: 01902 215 884

South West Region

Regional Office

Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

Cornwall Area Office

Sir John Moore House
Victoria Square
Bodmin PL31 1EB
Tel: 01208 78301
Fax: 01208 78321

Devon Area Office

Exminster House
Miller Way
Exminster
Devon EX6 8AS
Tel: 01392 444 000
Fax: 01392 442 109

North Wessex Area Office

Rivers House
East Quay
Bridgewater
Somerset TA6 4YS
Tel: 01278 457 333
Fax: 01278 452 985

South Wessex Area Office

Rivers House
Sunrise Business Park
Higher Shaftesbury Road
Blandford DT11 8ST
Tel: 01258 456 080
Fax: 01258 455 998

Environment Agency Wales

Regional Office

29 Newport Road
Cardiff
CF24 0TP
Tel: 02920 770 088
Fax: 02920 798 555

Northern Area Office

Ffordd Penlan
Parc Menai
Bangor
Gwynedd LL57 4DE
Tel: 01248 670 770
Fax: 01248 670 561

South East Area Office

Abacus House
St. Mellons Business Park,
Fortran Road
Cardiff CF3 0EY
Tel: 02920 770 088
Fax: 02920 798 383

South West Area Office

Llys Afon
Hawthorn Rise
Haverfordwest
Pembrokeshire SA61 2BQ
Tel: 01437 760 081
Fax: 01437 760 881

Notes

Association of Inland Navigation Authorities

Fearns Wharf
Neptune Street
Leeds
LS9 8PB

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F: 0113 2458394
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