



guardians of drinking water quality  
**DRINKING WATER INSPECTORATE**

---

**THE DRINKING WATER**  
**INSPECTORATE**

**GUIDANCE ON THE WATER**  
**QUALITY ASPECTS OF**  
**COMMON CARRIAGE**

# **DWI GUIDANCE ON THE WATER QUALITY ASPECTS OF COMMON CARRIAGE IN RELATION TO PUBLIC SUPPLIES**

## **Introduction**

1. Common carriage is the shared use of the supply pipes and infrastructure of an existing statutory water undertaker's distribution system by a third party, in order to supply water to the third party's customers at another point in the system.
2. In the operation of common carriage, it is essential that there are adequate safeguards in place to protect public health. This can only be achieved by ensuring that all parties involved comply fully with the relevant drinking water legislation.
3. In February 2000 the Drinking Water Inspectorate (DWI) issued guidance on the drinking water quality aspects associated with common carriage operations. The advice was intended to assist parties involved in such operations prior to drawing up contracts for common carriage. This guidance updates the earlier guidance to reflect the changes in legislation under Water Act 2003.

## **Water Act 2003**

4. The Water Act 2003 (WA03) provides for a measured expansion of competition in the water industry by amending the Water Industry Act 1991 (The Act)<sup>1</sup>. Under WA03 a licensed water supplier will be allowed to access a water undertaker's supply system for the purpose of supplying water to eligible customers. Prospective suppliers will have to obtain either:
  - A 'retail' licence, which entitles the holder to purchase water from a water undertaker ('a wholesale supply') and to retail it to an eligible customer; or
  - A 'combined' licence, which is a retail licence with a supplementary authorisation enabling the holder to input water into a water undertaker's supply system in order to retail that water to an eligible customer.
5. Retail operations should have little or no impact on drinking water quality. However combined licensees will be eligible to supply water, via common carriage, to their customers.
6. Initially the minimum threshold for eligible customers will be 50 megalitres per annum, with domestic premises being excluded.

---

<sup>1</sup> From this point on, all future references to the Act mean the Water Industry Act 1991 as amended by Water Act 2003.

## **The Regulatory Framework**

7. Water undertakers and combined licensees are required to comply with the Act and with the Water Supply (Water Quality) Regulations 2000 in England and 2001 in Wales (the Regulations). However the water undertaker will retain overall responsibility for the operation of the distribution system.
8. Both parties will have a duty to supply wholesome water for domestic and food production purposes. Both parties will also be subject to the same level of audit and inspection by DWI, to ensure that the relevant regulatory requirements are being met. Failure to do so may result in enforcement action being initiated by DWI.
9. Any person concerned in the supply of water is liable under s70 of the Act for the offence of supplying water unfit for human consumption, subject to a due diligence defence. This means that water undertakers, combined licensees and their respective contractors may be investigated by DWI and may be prosecuted for the alleged offence. The meaning of water unfit for human consumption is not defined in the Act and it is a matter for the courts to decide on a case-by-case basis. However cases have been brought where consumers have rejected the water for drinking and food preparation on the grounds of unacceptable appearance or taste/odour.

## **Types of common carriage**

10. There are a number of ways in which common carriage may impact on the operation of existing treated water supplies, for example:
  - The supply of raw water for treatment at a water undertaker's water treatment works. This is not covered by WA03 but could occur by local agreement between the water undertaker and the owner of an abstraction licence.
  - The supply of treated water via an existing distribution system to a new distribution system. This is unlikely with the initial 50 Ml/annum threshold, but could apply if the threshold is significantly lowered and domestic properties become eligible.
  - The supply of treated water into existing distribution systems.

## **PART I PRE CONTRACT ASSESSMENT: WATER QUALITY AND ASSOCIATED HYDRAULIC CONSIDERATIONS**

11. Each water undertaker is required to have a Network Access Code, which sets out the generic terms and conditions for access to its distribution system. The Access Code should provide sufficient information for licensees to assess the viability of their proposals before approaching the undertaker to discuss access arrangements.
12. Prior to making any common carriage arrangements, the licensee and water undertaker must assess the likely impact of the licensee's proposals on the overall operation of the distribution system. This is to minimise the risk of consequential breaches of the drinking water quality standards or other regulatory requirements. Any other adverse impacts on the quality of water supplied, in terms of consumer acceptability, must also be assessed. The following topics should form part of these discussions, as appropriate.

### **Water treatment**

#### **Treatment of raw water by the combined licensee**

13. A combined licensee must be able to demonstrate that:
  - the quality of his source water has been assessed in accordance with regulation 15 of the Regulations (sampling new sources);
  - an assessment of the risk of contamination to the source has been carried out, including risk from *Cryptosporidium* as required by regulation 27;
  - the treatment applied is appropriate to the quality of the raw water, including the risk from *Cryptosporidium*;
  - the works operators are appropriately trained to operate the water treatment works; and
  - an appropriate level of monitoring is in place to ensure that the quality of the treated water leaving the works meets not only the regulatory requirements, but also the existing documented operational requirements of the undertaker where these are more stringent than the regulatory requirements.
14. One of the standard licence conditions for a combined licence is that the licensee will not be able to introduce treated water into the public supply system until DWI is satisfied that the relevant regulatory requirements are being met. This will be done as part of the technical audit process, which already applies to water undertakers. As such, each audit or inspection reflects the conditions found at the time and the associated report does not constitute a certificate of conformity.
15. The undertaker must also be satisfied that the licensee is able to meet any requirements for plumbosolvency control and fluoridation. It may also be necessary

to phase in the new water supply to ensure that changes take place gradually, thereby achieving consumer acceptability.

### **Impact on the undertaker's existing treatment works**

16. There may be a need for the undertaker to reduce the output from one or more of his treatment works to take account of the input being made by the combined licensee. This will depend on the point at which a licensee introduces his treated water into the distribution system and the volume and frequency that it is introduced. The undertaker must be satisfied that:
- the changes to the works throughput can be managed within the documented operational design guidelines for that works;
  - the operational changes will not have a deleterious impact on the quality of the treated water leaving the works; and
  - the resulting water quality will continue to meet all regulatory and existing documented company operational standards.
17. Any change to reduced throughput may need to be phased in gradually to minimise the risk of water quality problems and to ensure consumer acceptability.

### **Matching supply and demand**

18. The undertaker must retain overall control of the distribution system, including control of all inputs required to meet demand.
19. The licensee and undertaker must agree on the mechanisms for operating the system and balancing supply and demand. Both parties must also consider and agree on the arrangements for operating the system in emergencies.

### **The distribution system**

20. The need for feasibility studies or testing should be identified at the initial application stage<sup>2</sup>, with outcomes discussed at the detailed application stage. DWI expects to be consulted on any resulting water quality issues and may act as arbitrator in the event of any disputes regarding the results of any water quality testing or studies.

### **Hydraulics**

21. There will be an immediate impact on pressure and velocity in the distribution system as a result of adding a new source or supply to the system. This may increase pressure in some areas and reduce pressure in others. Similarly, velocity may increase or decrease in a particular main. Low pressures may lead to inadequate supply or, in the

---

<sup>2</sup> See Ofwat document titled Access Code Guidance [update reference when document finalised following consultation]

extreme, ingress of potentially contaminated water. High pressures will increase leakage and may cause additional leaks or bursts.

22. If the peak velocity in a pipe is increased by the new supply arrangement, there is a risk that deposits will be suspended and cause discoloured water. This is also a risk if flow directions are reversed. A new source could result in flow reversal for the whole or part of the day. Flow changes may cause consumer complaints for many hours.
23. Changes to flow routes and points of supply may increase the age of water delivered to some consumers. Several water quality parameters can change in concentration over time in the distribution system. For example, chlorine residuals reduce with 'age of water', whereas the concentration of disinfection by-products such as trihalomethanes (THMs) may increase. In addition, there is a greater risk of substances leaching from pipe materials and linings if the contact time with the water is increased. Excessive water age should, therefore, be avoided in line with existing documented operational practice.
24. Altering the distribution regime may also increase the residence time in service reservoirs. Longer than normal residence times may result in inadequate turn over of water, with a resultant risk of stagnation. This could have a major impact on water quality and should be avoided. In some cases, the installation of secondary disinfection may have to be considered.
25. Computer tools are available to assist the investigation of many of the above points. Conclusions will then be based on change in velocities consequent on the change of supply.
26. Network hydraulic modelling is widely accepted and almost universally used. Where water undertakers have such models, they should be kept up-to-date. In the event of a sufficiently detailed up-to-date hydraulic model not be readily available, then the effect of introducing an additional supply should be estimated using expert advice.
27. Water quality modelling is much less commonly used and suitable models will not be available for all situations. It is generally agreed that predictions of water age and chlorine residual are helpful indicators. Sedimentation, re-suspension and discolouration investigations will generally have to be carried out using hydraulic models, although the use of real time monitoring may provide useful information in this area.

### **Mixing of waters and changing waters**

28. There is a need to establish the impact of introducing a new source on the quality of water within the distribution system. The licensee's supply may displace the existing supply and create a new hydraulically discrete zone or there may be mixing with the undertaker's supply. Issues that need to be considered relate firstly to the interactions of the water with the components of the network and how this may impact on water

quality, asset condition and asset life, and secondly to the interactions between the two waters when they mix.

29. If the licensee's water is of similar quality to that supplied by the water undertaker the impact of interactions within the distribution system is likely to be minimal. There may still be problems during the changeover of supplies associated with changes to hydraulic regime. For example, the point at which the licensee's water enters the distribution system may change the velocity regime to the extent that existing deposits may be disturbed.
30. Significant water quality problems are likely to arise where the licensee's water is of very different quality to that supplied by the water undertaker, especially in terms of consumer acceptability. In general, scenarios that result in mixing of significantly different waters within a distribution system should be avoided. It is preferable to control the mixing, for example in a service reservoir, so that consumers receive a consistently blended supply. Checks should be made on the possible interaction of this blended supply with the distribution system as outlined in the paragraph below.
31. With adequate preparation (cleaning and/or renovation) of the distribution system, there will be circumstances where the water conveyed by a distribution system could be replaced with a different water without detriment to water quality. This may also be the case where mains are in good condition (i.e. not corroded or containing deposits or biofilms) and where no lead pipes are present in the water undertaker's pipework or the domestic pipework. It is important that the potential impact of new water on existing mains is assessed at the earliest opportunity.
32. In the longer term, changing the water type conveyed by a distribution system may impact on the asset life and condition and on resultant water quality. For example the introduction of softer waters may result in increased corrosion rates of iron mains. In the case of cement mortar lined pipes, waters of certain aggressivity may degrade the lining. Similar problems may be experienced with galvanised pipes.
33. Both parties need to agree on the approach to maintaining microbiological integrity of the system. The simplest way of achieving this is to ensure that the licensee's water is disinfected in the same way as the water undertaker's existing water. For example, there are significant risks associated with adding water with a free chlorine residual to water that has been chloraminated. Inappropriate ratios will lead to a loss of disinfectant residual and the potential generation of unpleasant tastes. It is also important to avoid adverse short term effects associated with chlorinous tastes, for example as the new supply is introduced. (See also "Consumer acceptability" below.)
34. Mixing of waters of different organic content, for example ground waters with surface derived water, can impact on the biofilm potential. Increased biofilm growth could result in a breach of the microbiological standards and also in taste problems. Although this could be prevented by increasing the disinfectant residual either at the water treatment works or via secondary disinfection, such action may result in

consumer complaints. There may also be implications for disinfection by-product (THMs) formation.

35. It is recognised that many distribution systems are currently operated with 'tidal regions' where consumers receive waters from different supplies at different times of day. Other distribution systems may receive water from sources of significantly different quality at different times of the year, depending on supply and demand. In these instances checks should be made on the interaction of licensee's supplies on all the water types and blends likely to be formed. Water quality modelling will assist in predicting the most appropriate blending ratios. (See also "Consumer acceptability" below.)

### **Water conditioning (including plumbosolvency control)**

36. The licensee's water supplies should include any chemical conditioning necessary to match that of the water undertaker's water supplies. This includes plumbosolvency control, softening, sequestration and corrosion inhibition.
37. Control of plumbosolvency and cuprosolvency is achieved by control of the pH of the water, its buffering capacity and by adding phosphates. The treatment required varies with water type. Where an existing water is replaced with a new water, the treatment applied should be the optimum achievable for the new water. It is possible that the reduction in lead concentrations achievable for the new water are different and this will require a re-assessment of optimisation of plumbosolvency control and the potential impact on future lead pipe replacement levels required to meet the standard for lead.
38. Surface-derived supplies tend to be more plumbosolvent, although not always so, than groundwaters, even when treatment for plumbosolvency is applied optimally. Similar considerations apply for blended waters. The requirement is that there is no material deterioration in plumbosolvency and cuprosolvency as a result of common carriage. Therefore a prediction should be made of the likely lead (and copper) concentrations at consumers' taps.
39. Corrosion inhibition, sequestration and softening are used for aesthetic reasons. These should still be maintained as their interruption, or cessation, is likely to impact on the quality of the water supplied and result in consumer complaints.

### **Fluoridation**

40. If a water undertaker is required by a Strategic Health Authority to add fluoride to its potable water supplies then the licensee will also be required to ensure that the water entering the distribution system contains an equivalent concentration of fluoride. If a licensee is required to fluoridate the water, he should also obtain an indemnity from the relevant authority.



## **Consumer acceptability**

41. Consideration needs to be given to any affect on the taste, odour and appearance of the water supplied to consumers. It is desirable, for example, that consumers continue to receive water of a hardness and mineral content that they are accustomed to receiving.
42. Consideration also needs to be given to maintaining any existing quality agreements that the water undertaker has with non-domestic customers. Some manufacturing processes require a water with a fairly constant chemical composition. It might be possible for them to handle changes in composition, providing there is adequate consultation and advance warning of the changes. However frequent or unplanned changes need to be avoided.
43. The impact of diurnal variation in quality due to the hydraulic characteristics of the distribution system also needs to be considered. Consumers might receive water from one source in the morning and from another sources in the evening, as demand patterns change. If these waters have a very different hardness, or other mineral content, or one is derived from surface water and the other from groundwater, consumers are likely to notice the difference and become dissatisfied. This would not be in anyone's best interest.

## **Operational maintenance and renovation**

44. Every so often water treatment works, service reservoirs and parts of the distribution system have to be taken out of service inspection, maintenance, repair and renovation. The impact of this on storage capacity and flow patterns is an issue for the existing single undertaker's operations. Under common carriage, these activities may also impact on the licensee's operations. The procedures for maintenance and renovation of important assets should be detailed in the Access Code and agreed as part of the access agreement for each common carriage contract. The issues discussed in the paragraphs above may also be affected by inspection, maintenance, repair and renovation activities.
45. Both parties need to take account of existing renovation programmes being carried out under Section 19 distribution system undertakings. Changes to these programmes as a result of common carriage would not normally be acceptable to DWI. The water undertaker's Distribution Operating and Maintenance Strategies (DOMS) also needs to be taken into account when drawing up the access agreement.

## **Standards and measures**

46. Standards and measures that need to be taken into accounts in the above assessments include:

- The Regulations (and subsequent amendments) and associated DWI Guidance.
- Relevant DWI Information Letters
- DWI Technical Guidance
- The Reports of the Group of Experts on Cryptosporidium in Water Supplies (Badenoch and Bouchier reports) (water treatment operation).

Relevant documents can be found on the DWI website [www.dwi.gov.uk](http://www.dwi.gov.uk)

## **PART II COMMON CARRIAGE AGREEMENTS: WATER QUALITY ASPECTS**

### **Preamble**

47. Part II considers the contractual conditions between the water undertaker and the licensee. The Access Code provides generic terms and conditions for access to the water undertaker's distribution system for common carriage. Each point of access will then need to be covered by a more detailed Access Agreement.
48. Water undertakers and licensees have a duty to supply wholesome water, which meets the standards and other requirements of the Regulations. Failure to do so may result in enforcement action being initiated by DWI. Water undertakers and licensees, and their respective contractors, may also be subject to criminal liability under Section 70 of the Water Industry Act 1991 for supplying water unfit for human consumption.
49. The water undertaker will retain overall responsibility for the operation of its distribution system. Operating considerations associated with a normal uneventful day would be fairly straightforward, but consideration would have to be given to arrangements under unusual and/or difficult supply conditions. Each of the items under the following checklist should be taken into account in drawing up the individual Access Agreements.

### **Checklist**

#### **I Volume**

- Total volume to be supplied (annually, monthly).
- Allowable variations (daily, hourly) (maximum/minimum flowrate).
- Agreement on how leakage is determined and whether the undertaker or the licensee makes up the difference.
- Agreement on balancing supply and demand. It is expected that the undertaker will retain overall control, including for example, control of all inputs to the distribution system.

#### **II Pressure**

- Maximum and minimum at point of input to distribution system.
- Allowable rate of change to avoid surge.

#### **III Quality**

- Reference to duties under the Regulations, and subsequent amendments, (with particular reference to Sections III, V, VI and VII) and the associated Guidance.
- Reference to anything that may be affected by or have influence on existing Section 19 undertakings or Departures authorised under regulation 20.

- The undertaker and licensee both have responsibilities for the quality of the water supplied, including the quality of the raw water and the quality of the water leaving their treatment works. Appropriate regulatory and operational monitoring must be undertaken.
- Where appropriate, the treated water leaving the licensee's treatment works will also have to meet the water undertaker's documented operational standards, which might be tighter than the regulatory standards.
- Any additional considerations, such as biofilm stripping or corrosion potential that need to be specified to avoid quality problems arising from mixing or to avoid impact on fabric of distribution system. This would have to include consideration of a range of aspects as discussed in Part I.
- Any additional conditions relating to plumbosolvency and cuprosolvency. This could include pH control and phosphate dosing.
- Fluoridation, if required by the strategic health authority.

#### **IV Monitoring**

- Water undertakers and licensees have responsibility for regulatory monitoring of the water leaving their respective treatment works, in service reservoirs and at consumers' taps. The results of this monitoring have to be reported to DWI as required under the Water Undertakers (Information) Direction 2004.
- Operational monitoring elsewhere will depend upon Access Agreement.
- Details of monitoring required at the point of input to the distribution system, including frequency, water quality parameters and hydraulic measures.
- Details of methodologies, analyses and equipment (meters, loggers and telemetry) to be used for monitoring.
- The use of common carriage may result in changes to regulatory water supply zone boundaries and supply point authorisations. These will have to be agreed with the DWI in advance, in accordance with the Water Undertakers (Information) Direction 2004.

#### **V Incidents**

- Both parties need to define responsibilities and procedures in the event of a plant failure or pollution incident.
- Both parties need to define responsibilities and procedures for notifying DWI of an incident under the Water Undertakers (Information) Direction 2004. The communication requirements between the parties in respect of water quality incidents need to be covered in the Access Code and Access Agreement.
- Both parties need to define responsibilities and procedures in relation to representation on any outbreak control team or incident control team.

## **VI Emergencies**

- If the risk is shared, contribution by both parties of sufficient supplies to maintain pressure in distribution system during emergencies.
- If the responsibility is shared, contribution by both parties of sufficient supplies for fire-fighting.