



**Technical Bulletin: Water Restrictions
And Watering Specification**

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The information on water quantities and numbers of applications has been provided by the Department of Water Management, Silsoe College, Cranfield University.

1.0 INTRODUCTION

- 1.1 Following concerns expressed by BALI over the liability imposed on landscape contractors to water plants sufficiently in the face of increasing water shortages and subsequent water restrictions, a legal opinion was sought by JCLI to clarify the law. This note outlines how the implications of this opinion affect the landscape practitioner and how watering may be specified in landscape contracts to best suit the needs of the client, contractor and landscape contract administrator. **It must be stressed that these are opinions of the probable interpretation of the law.** They have not been tested in court. OFWAT and the Water Companies Association have declined to take action on this opinion and therefore practitioners should weigh their actions accordingly.

2.0 RESTRICTIONS ON WATER SUPPLY

There are three different statutory watering restrictions that may be imposed by the water authorities.

2.1 Hose Pipe Bans

Hose pipe bans are imposed by a water undertaker under Section 76 of the Water Industry Act 1991. They appear to apply to gardens which exist for purely private enjoyment which are watered by water 'drawn through a hose pipe or similar apparatus'.

Counsel's opinion paraphrased below, is that the hose pipe ban does not, by implication, seem to apply to the following:

1. landscape areas provided in connection with new or existing development to which the public has unrestricted access either permanently or during at least the majority of daylight hours;
2. landscape areas where public access is restricted only at evenings and weekends, provided this is for security purposes, rather than securing the area for private enjoyment;
3. landscape areas accessible only by payment of a fee unless the prime purpose of the area is to benefit the owner/occupier or employee and public access is ancillary;
4. landscape schemes provided as a benefit to the public and adjoining occupiers as part of a planning submission;
5. where water is applied by a water bowser filled from the mains and then used to water plants (although it appears that water authorities are willing to restrict this operation, even where it involves the use of second quality water);

Note: These opinions have not been tested in court nor do they necessarily concur with the views of the government, the Water Authorities or their regulatory bodies (see Appendix A).

2.2 Drought Orders

In the event of exceptional shortages, a Drought Order may be imposed by The Secretary of State under Section 73 of the Water Resources Act 1991. Under such an order, restrictions are directed on the use of water under a hierarchy or priority of applications which are specified and progress from the watering of parks, recreation grounds, allotments, sports grounds, golf courses up until safety, hygiene and essential domestic uses are affected.

Under Section 74C of The Water Resources Act 1991, a Drought Order may authorise the NRA to stop or limit the taking of water from specified sources.

2.3 Drought Directions

These may be made directly by The Secretary of State under Section 74 of The Water Resources Act 1991, but are reserved for extremely serious shortages and covers operations similar to Drought Orders.

3.0 ISSUES TO BE CONSIDERED

3.1 Landscape architects must consider the following issues:

1. The implications of watering or not watering; for example, it is unlikely to be cost effective in schemes with low capital value such as woodland, shelterbelts etc., but establishment is delayed if the majority of plants die and are replaced.
2. The means of watering: whether by irrigation hose or (expensively) by bowser, site layout and location will obviously affect the relative economies of either process. Where possible the design should include an appropriate and efficient means of watering.
3. The purpose of watering: whether it is to achieve optimum plant growth or to prevent plant death.
4. Who is to pay for the water supplied, contractor or client?
5. The possibility of conflict between contractor and client in acting within the contract; for example a client's refusal to instruct watering despite the contractor's request to do so, the subsequent responsibility for plant failure and the role of the Landscape Contract Administrator.
6. The nature of landscape scheme concerned: whether the site's landscape can be said to be for purely private purposes or whether it is for commercial or public purposes.
7. The likelihood of drought conditions occurring: whether drought conditions may lead to extra contract administration and extra contract costs and whether these are paid by the client.

3.2 Decisions taken at this stage will have a direct bearing on whether adequate water will be supplied to achieve and maintain healthy plant growth (or even just plant survival) and on the total cost of the project. Strict, very onerous specifications may impose unnecessary costs, with the contractor pricing for every conceivable water restriction or allowing for very high replacement costs on high drought losses.

3.3 It appears normal at present for contractors not to tender prices that reflect the likely eventuality of drought conditions with its attendant costs, although this situation is changing.

4.0 SPECIFICATION OPTIONS

4.1 Option 1: Performance:

Watering can be specified by performance, i.e. a result is specified for a healthy plant at the end of the contract period. The Contractor is entirely responsible for the loss of plants and for watering, whatever the circumstances, and there are not provisions for the client to pay for additional watering. This is suitable for all types of contract, particularly for lower unit cost works, e.g. transplants, low value plants. Insurance against drought is costly but may be appropriate for contractors and may possibly be demanded for very high value contracts to ensure fair tenders, although enquiries should be made to larger Lloyds brokers before specifying such action. If there is a demand for drought insurance it is likely to become more easily available and cheaper.

4.2 Option 2: Performance Plus:

Alternatively, watering can be specified by performance with additional watering (when restrictions apply) at the contract administrator's discretion. Again a result is specified for a healthy plant at the end of the contract period and it should be specified that the Contractor is entirely responsible for the loss of plants (regardless of whether additional watering is instructed or not). However, Provisional Items are included for the supply and application of water from an alternative source which may or may not be instructed when restrictions apply. Since this work will be part of the Contract Sum there should normally be no problem with instructing it. See Appendices B and C. Insurance may also be appropriate, see Option 1 above.

4.3 Option 3: Operation:

Watering can also be specified entirely by operation, ie. all watering is instructed using Provisional Items in the Bill/Schedule of Quantities (see Appendix B). The watering is specified in terms of quantity per plant or square metre as appropriate (see Appendix C). Plant failures remain the responsibility of the Contractor provided that watering is instructed during periods without rain during the growing season. This specification is more suited to higher value planting projects e.g. container grown shrubs, large trees etc., (but see also Appendix B paragraph B10).

5.0 CHOICE OF SPECIFICATION OPTION

Each option of specification has its pitfalls and advantages.

5.1 Performance specification (Options 1 and 2) invites higher tender prices due to their higher imposition of risk and the strong possibility that the Contractor may risk drought losses to win the project (specification of the liability for defects in replacements becomes more important in such circumstances). The Landscape Contract Administrator may not have to visit site so often to monitor quantities of watering being dispensed, but still has a duty to ensure watering is done properly, particularly if the defects period terminates in winter, when stressed plants are less evident.

5.2 The specification by measured operations (Option 3) relies on every high on-site involvement by the Landscape Contract Administrator to instruct watering at the appropriate time, to check that the amount of water specified is applied (and applied correctly), and even to modify the quantities of water and frequencies of watering for particular plants/areas in order to achieve optimum results.

5.3 With each option the client can have a clear indication of the likely maximum costs, whilst being assured of competitive prices. There are unlikely to be cost claims for extra watering under a threat of plant failure although if adequate watering is not

instructed in Option 3 (and in Option 2 during periods of restrictions) the Contractor is likely to disclaim responsibility for plant failures.

- 5.4 In the case of the performance options, the Contractor should be able to make a realistic estimate of watering costs and plant losses. Even in drought conditions, the unit cost of replacing transplants (and other low plants such as bare root, easily propagated shrubs) is relatively small in relation to the original ground preparation and planting costs. The Contractor either submits low prices for replacement planting and hopes for rain, or submits high prices for watering and hopes for drought. The conflicting aspirations should counteract each other in competitive tenders.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Watering Points

Designers should consider the inclusion of watering points on all projects where a water supply is available. The specifier should draw the tenderers attention to whether watering points are available on the site. Watering points and their use should comply with local Water Authority bye-laws and be distributed at 50m centres. They should have a 25mm pipe delivering water at 40psi and should be available throughout the contract the maintenance period. Metering of the water supply should be considered.

6.2 Reduce Water Related Plant Losses

The designer must be constantly aware of and design for the relationship of other factors affecting plant water loss, namely solar radiation, humidity, weed competition and wind speed. Even pollution is known to increase the transpiration rate of plants (particularly sulphur and nitrogen oxides (Colwill et al 1979). The use of early planting, tight plant handling specifications, pruning of branches to reduce transpiring area, alginate root dips, polyacrimide (inert water retentive) additives, mulches, drip and leaf-applied mist irrigation and thorough weed control may all aid in plant establishment. Consideration should be given to storing run-off from roofs etc., on building projects, for use in irrigation although, unless the capacity is high, the stored water is rapidly used and not replenished until subsequent rains. The cost benefit of such measures should be assessed and their use seriously considered.

7.0 REFERENCES AND FURTHER INFORMATION

7.1 References:

Advances in practical arboriculture, Forestry Bulletin 65, Edited by D. Patch, Forestry Commission HMSO 1987.

Grace, Dr. J. Water Relations and Irrigation Methods for Trees. Ibid. p.100 1987

Winter, E.J. Water, Soil and the Plant. Macmillan London 1974

Atlas of Irrigation Need, HMSO, 1967

7.2 Further Information

UK Irrigation Association (UKIA) – impartial association of practitioners, academics etc. exchanging information on irrigation. (Tel: 01525 863000 Fax: 01525 863001)

Local ADAS offices – see local phone book

Silsoe College, Cranfield University, Silsoe, Bedford MK45 4DT
Tel: 01525 863000 Fax: 01525 863001 – contact Tim Hess, Department of Water Management. Offer a site specific irrigation service based on computer model.

APPENDIX A



THE WATER SERVICES ASSOCIATION
OF ENGLAND AND WALES

Director & Secretary Janet Langdon



THE WATER COMPANIES' ASSOCIATION

Director & Secretary Michael Swallow

Mr K J Fraser
Chairman
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5 April 1993

Dear Mr Fraser

Hosepipe Bans

We refer to your letters in February to Mr Swallow of the WCA and to the Chairman of the WSA (Miss Langdon's letter of 22 February refers). We have now studied the advice which you obtained from Counsel last September. With respect, however, we do not find it convincing.

Counsel suggests that the ban "is only intended to affect those gardens which exist for purely private enjoyment", and expresses the view that "access by the public or a class of the public is the principle determining factor" (paragraph 12 of the Opinion). But the public are extensively admitted, for example, to gardens in the National Gardens Scheme, and it surely cannot be the case that these gardens are thereby rendered "public". Clearly they remain private, even where payment is required for admission.

Nor does it seem at all certain that "landscaped areas around commercial developments to which the public have permanent free access will not be covered": the test here would seem to be whether or not the public have a legal right to resort freely to the area concerned, or whether the developers retain such a degree of control as would entitle them to turn the public off if they were so minded.

We all tend to think and speak in terms of hosepipe "bans", but of course the Act also envisages "restriction" of use of water. In fact, undertakers will not normally prohibit use if restriction is sufficient, adopting the line that they do not wish, any more than your members would, to see plants and flowers wither. At the same time, they are subject to vociferous complaints from other users who resent prohibition or restriction of watering their own small gardens if larger areas are apparently able to use water freely - and this, in practice, leads generally to cautious and yet reasonable policies.

No doubt the members of the JCLI already maintain close contact with their respective water undertakers at times of deficiency of rainfall, and I am sure that undertakers will always give all possible consideration to your members' suggestions and representations when hosepipe restrictions have to be contemplated.

Yours sincerely

Janet Langdon
Director and Secretary

Michael Swallow
Director and Secretary

APPENDIX B

Measurement of Watering by Operation

- B1 Watering by operation should all be Provisional and only undertaken by instruction. Normally all Provisional Work is omitted at the beginning of the Contract and later instructed if required.
- B2 As much as possible of the work should be measured, with rates provided by the tenderer and extended to be incorporated in the tender sum.
- B3 The amount of watering measured needs to be realistic, an underestimate will mean the need to ask the client for more money for the project, an overestimate will mean the final account will be significantly less than the budget, or that tenders will all be well over budget.
- B4 The client must be advised that if abnormally dry weather is experienced during the contract period then additional money may be required to ensure plant survival or, in the case of Option 3 (Operation), the plants die and are not replaced by the Contractor.
- B5 For Example:

PROVISIONAL ITEMS – WATERING Rate £

Apply water from site hose points
(including the cost of the metered water)

**** litres/m ² planting areas (*times)	****	m ²
**** litres/standard tree (*times)	****	No
**** litres/extra-heavy std tree (*times)	****	No
**** litres/m ² grass (*times)	****	m ²

Supply and apply water by bowser during
period of 'Hose Pipe Ban' (*times)

**** litres/m ² planting areas (*times)	****	m ²
**** litres/standard tree (*times)	****	No
**** litres/extra-heavy std tree (*times)	****	No
**** litres/m ² grass (*times)	****	m ²

Supply and apply water by bowser
during 'Drought Order' (*times)

**** litres/m ² planting areas (*times)	****	m ²
**** litres/standard tree (*times)	****	No
**** litres/extra-heavy std tree (*times)	****	No
**** litres/m ² grass (*times)	****	m ²

Notes:

1. The method of measurement needs to be explained in the tender documents – in the above example, the quantity (number or m²) is the estimated number of applications multiplied by the square meterage on plan or number of trees.
2. The types of area/plant to be watered will vary depending on the project.
3. For suggested quantities of water and number of applications see Appendix C.
4. All the *'s should be completed by consultants **prior** to tender.

- B6 For specification Option 2 (Performance Plus) the first section in B5 above (Apply water from site hose points) would be omitted because it would be the Contractor's responsibility.
- B7 A variation of Option (Performance Plus) would be to also make the "Supply and apply water by bowser during hose pipe ban" the Contractor's responsibility and only measure operations for drought orders (and drought directions).
- B8 It is debatable whether watering plants during drought directions (and possibly even drought orders) can be justified and hence whether it should be measured. In such circumstances it is likely to be impossible to get any sort of water for plants and therefore any requirement on the Contractor to water/or to replace losses will probably be unreasonable.
- B9 In the situation where there are no hose points, the heading "Apply water from site hose points (including the cost of the metered water)" should read "Supply and Apply water (when there are no water restrictions)". Additionally, if the hose points are not metered delete "(including the cost of the metered water)".
- B10 For projects where there are no hose points and no locally available water and where plant material is of low value (eg. rural roadside planting) if the watering is by performance then in a tender situation contractors are likely to opt to replace plants rather than water them. Hence at the end of the maintenance period the plants will have just been planted! If this is undesirable Option 3 (Operation) should be used provided the client is prepared to pay the extra costs involved both for the watering and the contract administration.
- B11 If it is considered not possible for contractors to make a reasonable estimate of the cost of bowser water during periods when restrictions apply then the supply should be a Provisional Sum and the application measured. For example:

PROVISIONAL ITEMS – WATERING

Apply water from site hose points
(including the cost of the metered water)

Rate £

*** litres/m ² planting areas (*times)	****	m ²
*** litres/standard tree (*times)	****	No
*** litres/extra-heavy std tree (*times)	****	No
*** litres/m ² grass (*times)	****	m ²

Allow provisional sum for the supply of
water to the site by bowser

**** **

Apply water from bowser during
period of 'Hose Pipe Ban' or 'Drought Order'

**** litres/m ² planting areas (*times)	****	m ²
**** litres/standard tree (*times)	****	No
**** litres/extra-heavy std tree (*times)	****	No
**** litres/m ² grass (*times)	****	m ²

Notes: See Notes in B5 above.

- B12 Note: Second quality water is not readily available in the south of the UK and Local Authorities often restrict its use in publicly accessible areas for environmental health reasons.

APPENDIX C

Water Quantities

- C1 The amount of irrigation water required by plants is affected by numerous variables such as:
- * Individual plant requirements dependent on species and size
 - * The ability of individual plants to win water at differing soil moisture contents related to their physiology
 - * Rate of evapotranspiration, dependent on the weather
 - * The effective amount of rainfall and, equally important, its frequency
 - * The soil type and its water holding capacity
 - * The nature of the subsoil and its drainage – both of these can be very variable and non-standard on man-made sites
 - * Other site conditions including exposure and so on
- C2 In many construction contracts the qualities of subsoil and topsoil are not precisely known until the contract is in progress and hence precise calculations of water requirements are not possible prior to tender. Additionally many smaller projects do not warrant the cost of precise calculation or the cost of contract administration to ensure the water is applied in the right amounts.
- C3 In the case of watering by performance there is no need to specify water quantities but it is preferable to specify the depth of soil wetting – e.g. ‘the full depth of topsoil’ for projects with topsoil laid to specific depths in different areas. It is also necessary to specify the purpose of watering, e.g. to ensure establishment and survival or to ensure establishment and continuing growth.
- C4 For some projects (for example, long term maintenance of prestigious projects) it may be appropriate to establish the quantities of water required on the basis of the variables in C1 above. In such cases plant, soil and irrigation specialists will probably be required to establish the quantities required. This approach is regularly used for agricultural crops, and organisations like ADAS or Silsoe College can provide site specific irrigation forecasts. On projects where topsoil is to be imported the analysis of potential topsoil could include a figure for Available Water Capacity so that calculations can be made of the quantity of water required to return the soil to Field Capacity.
- C5 It must be remembered that in many landscape situations the purpose of watering is to ensure establishment and once established the plants will never be watered again (or in some cases only when conditions are very severe). In such situations in particular, watering should encourage plants to establish a good extensive root system by watering heavily and infrequently.
- C6 However, for projects where such precision is not required and where watering is measured the following ‘rules of thumb’ are suggested as the **water quantities for each watering in litres per square metre** for different types of soil and rooting depths:

Root depth (mm)	Soil AWC (Available Water Capacity) Class		
	Low	Medium	High
150	15	20	37
300	30	40	75
600	60	80	150

Notes:

1. This table can be interpolated and extrapolated for various soil depths and soil types as appropriate.
2. One litre of water per square metre is the same as 1mm depth of water.
3. Example soils:

Class	Type	AWC (mm/m)
-	Coarse sand	85
Low	Coarse sandy loam	130
Low	Loamy sand	130
-	Sandy clay	140
-	Sand	150
Medium	Medium sandy loam	170
Medium	Clay	170
Medium	Loam	170
-	Clay loam	180
-	Silt loam	190
-	Loamy very fine sand	220
-	Very fine sandy loam	220
-	Very fine sand	230
High	Loamy peat	330

4. The following root depths are suggested for typical types of planting during the establishment period:

all types of grass	150mm
shrub and ground cover planting, transplants, etc	300mm
standard and larger trees	600mm

5. In the case of plants watered individually the water quantity from the table should be multiplied by an appropriate rooting area to achieve the water quantity required for the plant. For trees this should typically be the surface area of the tree pit unless the pit is exceptionally large compared to the size of the tree at planting. For example, a transplant in a 0.5 x 0.5 x 0.3m pit on a medium soil will need 0.5 x 0.5 x 40 litres, i.e. 10 litres, whereas a semi-mature rootballed tree in a 2 x 2 x 0.9m tree pit on a medium soil will need 2 x 2 x 120 litres, i.e. 480 litres.
6. The quantities assume a 75% depletion and refilling to field capacity at each watering, i.e. the amount that will be needed to thorough wet the soil once it has dried to the point that any plants in it would start to wilt.

C7 The number of times water will need to be applied will depend on location, weather and soil conditions. Using the above 'rules of thumb' for quantities of water at each watering, Figure 1 and Table 1 give the average number of irrigations per year and the average number of irrigations required in a dry year (where a dry year occurs on average once every 5 years).

Table 1 can be interpolated and extrapolated for different soils.

The number of times water will need to be applied will also depend on the result desired – a wildflower meadow requires less frequent watering than a bowling green. Additionally, watering should be carried out when required rather than at a pre-determined frequency.

- C8 Regular inspections of soil conditions are required to ensure the water is wetting to the right depth and to ensure watering takes place well before it is critical. The specification should require the Contractor to do this monitoring in the presence of the Landscape Contract Administrator.
- C9 Specifications and regular inspections are also required to ensure the water actually soaks into the ground rather than runs off. Run off is a particular problem on sloping ground or where large quantities of water need to be applied, for example to trees, where watering pipes or depressions around the tree may be appropriate.

Acknowledgement: The information on water quantities and numbers of applications has been provided by the Department of Water Management, Silsoe College, Cranfield University.

Note: It is anticipated that more accurate information on water quantities and number of applications will become available as more research and monitoring is undertaken.

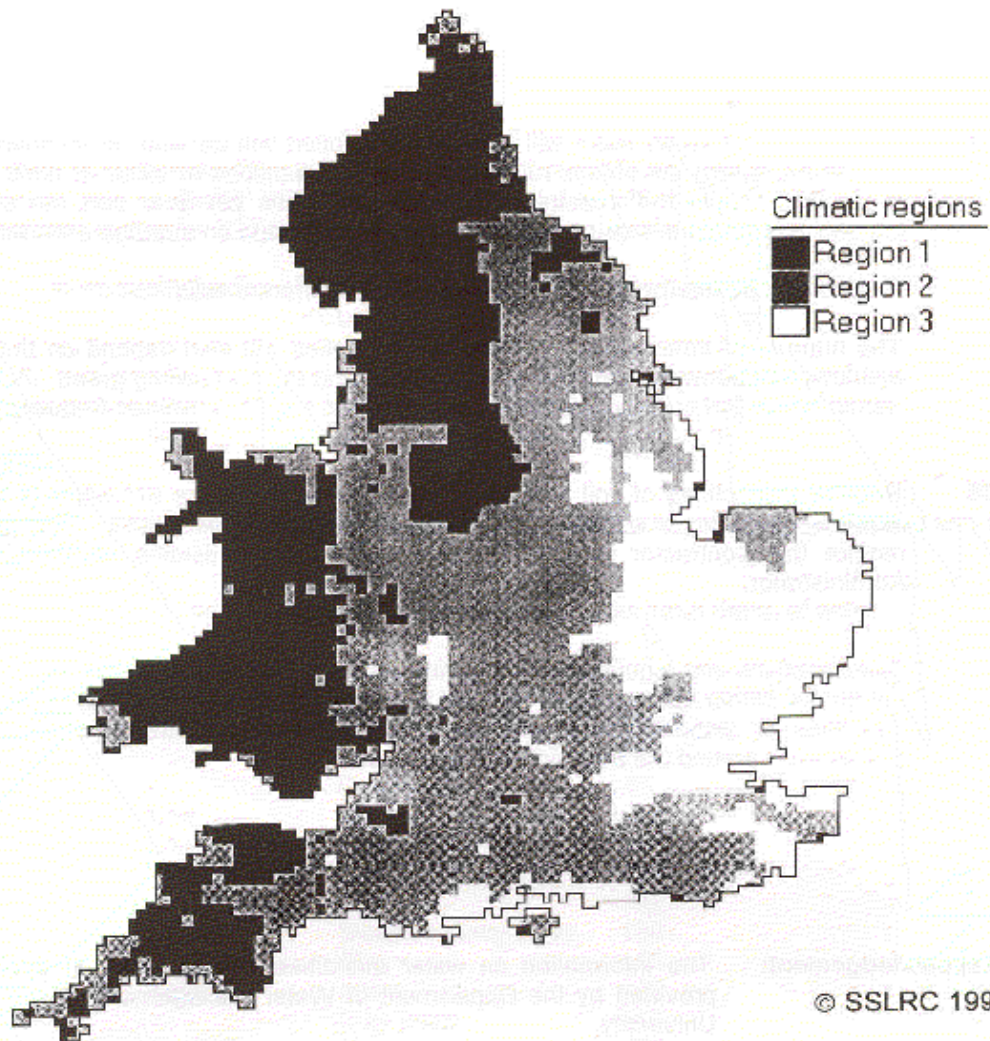


Figure 1 Regional classification of England & Wales
 (The data used to produce Figure 1 were obtained from LANDIS, the Land Information System held by the Soil Survey and Land Research Centre)

Region	Year	Average Year			Dry year		
	Soil AWC Root depth (mm)	Low	Med	High	Low	Med	High
1	150	11	8	3	14	10	5
	300	4	3	1	6	5	2
	600	2	1	0	3	2	1
2	150	15	11	5	19	14	7
	300	6	5	2	9	7	3
	600	3	2	1	4	3	1
3	150	22	16	8	27	20	10
	300	10	8	4	13	10	5
	600	5	3	1	6	4	2

Table 1 Number of Irrigations per year