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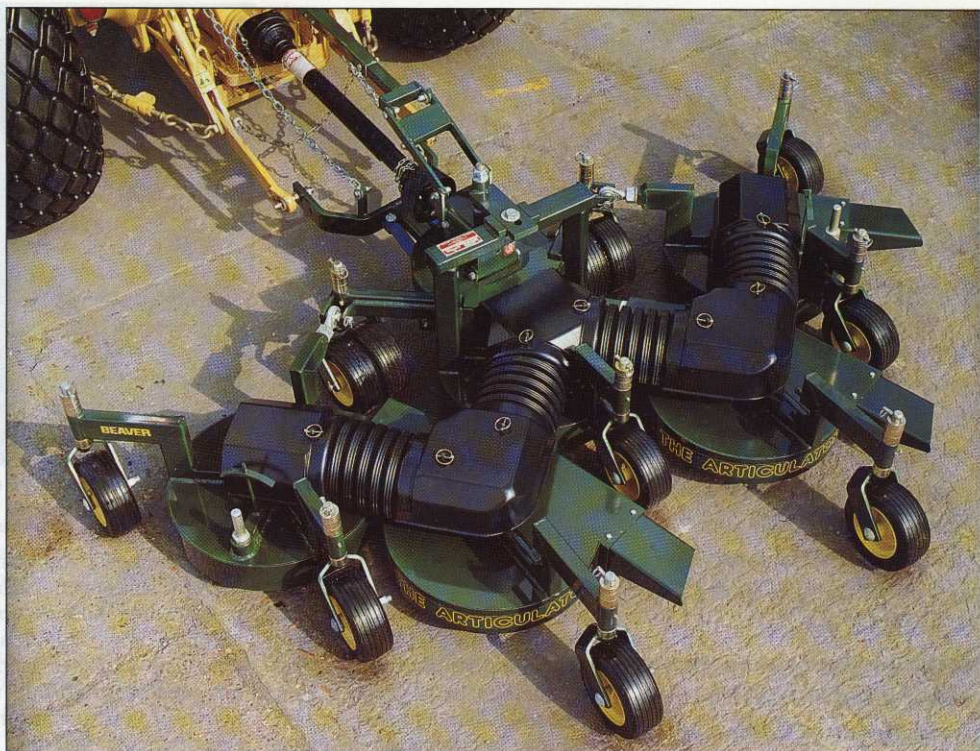
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JUST A DROP

It is not in the nature of Greenkeeper International to be alarmist, though with water companies and the NRA declaring (Flying Divots, February) that it will take two wet winters of recharge to return to average conditions, the pessimistic view must be taken: water may well be at a premium yet again. This feature article, taken from a paper given in November to an audience of European golf course developers and planners, offers the view that water is a precious commodity and must be managed with care.

With careful management the quantities of water required to maintain a golf course can be minimised. Nevertheless, whatever management systems are practised, a reliable water source will be required for any successful project: the quantities will vary according to the scope of the project, marketing philosophy, local climate, plant and soil types etc.

For 18 holes the quantities will vary from as little as 50m³/day for 18 greens only in the UK using part circle sprinklers, to circa 3000m³/day for a wall to wall project in the Mediterranean area. (1m³ = 220 imperial gallons)

The availability of water, or lack of it, may well influence the entire philosophy of the project and in extreme circumstances may force its cancellation. Thus it is vitally important that this aspect is explored in full prior to significant financial commitment.

It will not have gone unnoticed that in this country the reduction in available water for irrigation purposes has been making headline news for the past couple of years,

though what may not have been appreciated is that the problem extends throughout the southern half of Europe and North Africa. In nearly all locations, ground water levels have been dropping and there has been insufficient winter rainfall to fully re-charge surface storage facilities and the aquifer, on which increasing domestic, leisure, and industrial demands have been made.

Unfortunately golf courses have been perceived as the villain of the piece: when public supplies are curtailed why should an 'elitist' sport have unlimited supplies? I do not propose to go into the agronomic or commercial arguments, except to say that the irrigation issue does get bad press at home and overseas, and the golf industry as a whole must improve its image. It must counter such ill-informed argument with a reasoned and responsible approach to the issues, in the hope that those responsible for the provision of water appreciate the position and take more kindly and realistically to requests for abstractions. A recent policy

statement from a left of centre Spanish political party requires all new golf courses to use Treated Sewage Effluent (TSE).

The obvious source of water, particularly for the smaller demand project, is likely to be the potable (drinking) water supply, which, if not already laid on, will need to be extended to the site. Few if any water supply companies will permit a direct connection between the public mains and an irrigation system, even if the flow is available at the right pressure, owing to the need to protect the public from potential contamination of the supply. Therefore a break tank will be required and thereafter a pumping system to extract the water from the tank to supply the distribution system. Compared with the possible alternatives, the capital costs are low, but there may be planning constraints. The 'snags' with this type of supply are principally two.

The first is the extremely high cost of the water. A recently quoted project in SE England was 69p per m³, and it was estimated that this project - 18 holes, greens, tees and

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Ornamental lake - note grass to water's edge

approaches - would require something like an additional 1000 rounds of golf purely to meet the operating cost!

Even if the economic argument can be satisfied, the other critical factor is the unreliability of the supply. At times of stress, owing to a reduction of the companies water reserves or the additional domestic load placed upon the overall reticulation system, supplies may be reduced or totally curtailed, this at a time when most needed.

In very exceptional cases, to overcome one or both of these limitations, a reservoir may be constructed to accept water from the public supply during off peak months at reduced charges, with

this water been drawn off during the irrigation season. For those of you in the UK using existing public supplies, check the supply is through a dedicated meter or you may also be paying a sewage charge for irrigation water!

Many courses and planned projects are in the theoretically enviable position of having surface water (rivers, streams or lakes) on or in close proximity to the site, but again there are snags, for in very few countries is a direct unlicensed abstraction from these sources permitted.

Licensing is required to protect the rights of other existing and potential users of water from the same source, and owing to ➔ 36

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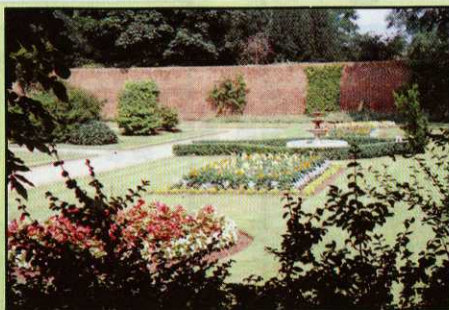
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The answer

35 → the aforementioned crisis situation which has arisen, a licence may well be refused or at best limited to abstractions at off-peak periods and/or constrained to ensure that stipulated minimum flows are maintained in the stream or river. Thus there may well be a requirement for a reservoir. In some countries these supplies can be so seriously polluted that agronomic and health factors will have to be taken into account: ridding this water of undesirable deleterious material, so as not to effect the performance of the mechanical components of the system, may also increase the capital costs.

The operating cost may well be low, in this country typically the licence will permit the amount used to be charged for at approximately 1.5 pence m³. However, be warned – there are moves afoot to increase the cost per m³ and to stipulate a minimum charge which may well in the foreseeable future be the maximum permitted by the licence. Nevertheless this should still be a long way off the cost of potable water.

The third principal source of water for golf course projects is ground water, ie. that contained in water bearing underground strata. It should be initially established if the site overlies such strata, and that the required quantities can probably be obtained. Again, the full licencing procedure must be followed. In most countries no work can start until such time as the relevant authority has given its consent, the full licence will not be granted until the borehole has been proved, and consent does not imply a license will be issued. As with surface water, to ration supplies a balancing reservoir may be required and certainly from our experience it is more economical to install even a small one, pumping for 24 hours from the borehole to extract at night for the irrigation cycle. Quality may be an issue.

There is no doubt that in some countries or regions of same, the authorities are, or will be, putting pressure on new golf developments to use treated sewage effluent. This solution, however, is not as straightforward as some would

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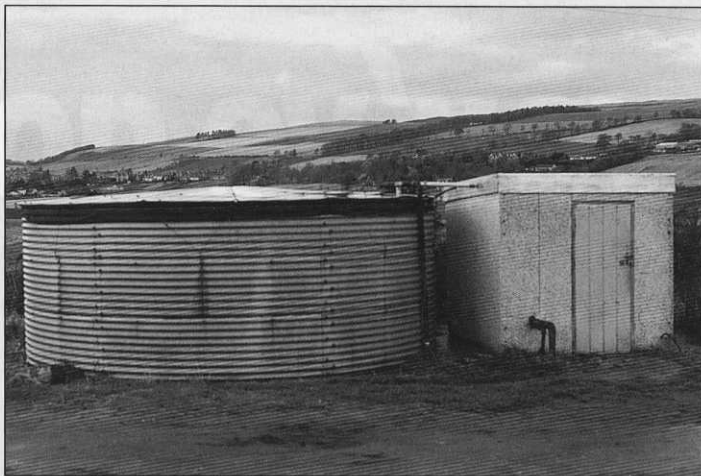
think, as there are quality and quantity issues.

The obvious quality issue is one of odour and, by implication, health. It must be confirmed that the quality will be such that all recognised standards are achieved at all times, (or alternatively at not insignificant cost if further treated). The chemical analysis may be such that a high salt content, (or in industrial areas heavy metals), is such that there may be short or medium term persistent harmful effects on the turf sward.

Discharge quantities may vary according to the time of day, and in holiday areas weekly, therefore it must be confirmed, or arrangements made, to ensure the correct quantities are available at all times for irrigation purposes. Although there may be no charge for taking TSE, there could well be a high capital cost in transferring the water from the plant to the site and further treatment to bring it to an acceptable level.

Technically, in this country, no licence is required. However the NRA will take into account the effect on flows in streams and rivers and may, if the discharge is critical to the environmental balance, object to its use.

Finally, on sites with certain soil types it may be possible, providing the golf course design and drainage plan take it into account, to store surplus rainfall in a reservoir for irrigation use. You will have noticed that whatever the source there will in most cases be a need for a balancing tank or reservoir, ranging in size from say a nominal 50m³ for a 'greens only' project, to say 60,000m³ or more for 18 greens, tees and fairways in the UK if the entire season's requirement needs to be stored. It is important to note that storage reservoirs



Typical public supply balancing tank for a UK greens only project



Winter storage reservoir drawn down at the end of the summer. Note unsightly view from adjacent tee

should for preference be situated off course, as inevitably they will become unsightly when drawn down, thus there is a requirement for additional land to be made available, which should be taken into account at the feasibility stage and subsequently at the

planning application.

To ensure the most economic and practical answer to this ever increasing problem, it is vitally important that the client, his golf course architect, agronomist and irrigation consultant, co-operate fully. Their combined knowledge

should, except in the most extreme cases, provide a solution. The irrigation consultant, with his wide range of experience, will establish with the agronomist the nett water requirements of the project and convert these into gross requirements (which are significantly higher), taking into account such factors as irrigation efficiency, overthrow, lake surface evaporation losses etc., and probably in warmer climes, landscape requirements. Thereafter he will establish how this water is to be sourced, confirming quality and quantity, and whether or not there is a need for a reservoir (if so its capacity), treatment etc., apply for licences and handle all the negotiations and all paperwork that entails. To ignore the water requirements at the planning stage is at the developers peril!

To summarise: Potable supplies – generally for smaller projects have a low capital but relatively high operating cost, the quality is good but can be unreliable. Surface water – low capital and operating costs, a reservoir may be required and a licence will be needed, quality should be confirmed as acceptable. Ground water – a high capital and low operating cost, quality generally is good, a licence and reservoir is required. Treated Sewage Effluent (TSE) – this is a minefield: probable high capital costs with major quality issues. Rain water – feasible in some cases, high capital, low operating cost. Reservoirs – these are required in most cases, costs (additional to land purchase) will vary dramatically depending on soil/strata types and, of course, volume required.

■ The author, Philip York, is an irrigation consultant with Philip York and Partners.



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Just when things start to go right... something always goes wrong. Take comfort from Murphy's Law in the knowledge that other greenkeepers too are having their problems.

If you're managing a golf course under unusual or particularly trying conditions, Greenkeeper International would like to hear from you.

Drop a line to the editor. Meanwhile, sit back, read on - and realise you're not on your own...

You think you've got problems..?

Run, rabbit, run

Wind, rabbits and a severe lack of water are the three principal difficulties facing John Phillips, who single-handedly looks after the nine hole St David's City golf course in Dyfed, west Wales. If those three handicaps are not enough, the sight of small mounds of finely excavated soil on the fifth tee reminds John of a fourth problem which appears regularly at random around the course.

"Moles simply come and go as they please," he points out. "I've tried most deterrents but they just pop up again somewhere else, usually in the middle of a green or a tee. I'd welcome advice from other greenkeepers who have managed to get rid of moles."

Founded in 1902, St David's City Golf Club has the dubious distinction of being the most westerly course in Wales. Situated within the

Pembrokeshire Coast National Park, it enjoys spectacular views over Whitesands Bay towards Ramsey Island, while being directly exposed to the prevailing south-westerly winds which sweep up St George's Channel from the Atlantic Ocean. And therein lies the greenkeeper's main problem.

"There's rarely a day when the wind doesn't blow," comments John. "This causes erosion, difficulty with establishing new grasses and rapid drying out of the turf." The last-mentioned point is compounded by the fact that there is no irrigation on the course. As a result, John spends much of the summer carting water from a nearby well to each of his nine greens. Using a second-hand farm vacuum tanker of 1000 gallons capacity, water is sucked out of the well, carried to the green and forced out over a 30 yard arc via a hand-held hose and spray nozzle.

"The level of the well means that I am limited to about 500 gallons per green, applied every other day during the worst summer dry periods," he explains. "I would like to water more often, but we simply do not

have the supplies available." Water did dry up in 1990, so the greens were left to fend for themselves. Fortunately, the rain came before all the grass had died away. Being built entirely on sand, there is little moisture retention within the turf. This, reasons John, is not necessarily a bad thing: "The grasses that do grow are of very fine quality and extremely hardy," he explains. "Furthermore, in the 12 years that I've been here, the course has never had to close due to poor surface or weather conditions. Even when it snows, the combination of wind and fine, close turf prevents it from setting."

The one problem which gives John the biggest headache of all can be seen on and alongside all nine fairways on the course. Rabbit holes litter the ground like mini bomb craters creating hazards for golfers and the mower alike. "We are under attack by rabbits on three sides," comments John. "Their digging regularly results in lost balls and impossible lies. It also means that some part of the course is always under repair."

Lack of funds has kept the lid on



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John Phillips examines freshly-made mole hills in the middle of the fifth tee at St David's City golf club

machinery investment over the years. As a result, fairways are mown with an elderly set of standard trailed gangs which tend to scalp the undulating turf, further encouraging erosion and rabbit attack. "We desperately need a twin-roll floating head machine to limit the scalping," says John. "My second investment priority is for pumped irrigation to every green." However, with just 120 members and a major reliance on visiting golfers during the summer, it looks as if John could be hand watering the greens on this beautiful, yet remote gem of a course for a few more years to come.

Common as muck...

The approach of spring is viewed with more than a little trepidation by the two greenkeepers responsible for Minchinhampton Golf Club's Old Course, near Stroud in Gloucestershire. For Derek Hankins and his assistant Lionel Creed, D-day is an annual event, marked by an invasion which leaves the ground looking not unlike the Normandy beaches in places. The critical date is 13 May – the day each year that grazing is permitted once again on the common land on which the famous old course is situated.

"It's like a rodeo here during the middle of May," commented Derek. "Can you picture the scene? Up to 500 head of cattle arrive on the common from their winter quarters and see all the fresh, lush grass just aching to be eaten." The regulations concerning the use of the common, of which some 100 acres are leased by the club from the National Trust, state that only the fairways, tees and greens can be cut. The length of the grass, however, has no bearing whatsoever on where the cattle go or where they sleep, excrete and urinate. As a result, the first three hours every morning from 14 May through to late October see Derek and Lionel setting off in different directions around the 18 hole course. Shovel and switch in hand, they remove droppings deposited on the turf the previous day and night, placing them carefully in the rough and semi-rough.

Any thought of using them on the vegetable or rose garden cannot be entertained because the rules state that no manure can be removed from the common. When the piles of droppings get too large, they are spread far and wide by chain harrow. As a result, the grass and the grazing are, in Derek's words, 'absolutely fabulous'. Minchinhampton's Old Course has shared the common with livestock for close to 100 years, so golfers have become quite used to carefully lifting and replacing the ball on the fairways and greens' approaches.

One aspect of the National Trust's regulations on which Derek would appreciate a little greater flexibility concerns the fencing of the greens. "Under the bye-laws, we cannot fence any green without the permission of the land owner," he explained. "At the moment, we have



Derek Hankins, left and Lionel Creed remove horse droppings from the ninth green on the Minchinhampton Old Course

temporary fences around six greens, and these are only permitted after damage has been caused to the turf and repair is necessary. "It really is heart-breaking to mow a green only to see a horse or cow running or urinating on it minutes later."

The effect of urine on fine turf is devastating. "The grass is dead within a couple of days," said Derek. Hoof marks are easier to deal with, but it all takes time. Ask Derek how many days Lionel and himself spend each week on pure greenkeeping and his answer is "about two". The rest of the time is spent clearing, cleaning and repairing the turf.

Grazing cattle and horses are not the only headache faced on Minchinhampton Common.

Because the land is open for the enjoyment of the public on foot or horseback at all times for recreational purposes, the two greenkeepers have a number of other regular problems to deal with. It is not uncommon to see riders direct their steeds straight across a green, while summer weekends would try the patience of the most mild tempered person.

Car loads of picnickers, dog walkers, kite-flyers and 'nature' lovers descend on the common to take in the delights of this corner of the Cotswolds. However, their appreciation of golf and the greenkeeper's skills varies greatly. "I've chased games of cricket and tennis off the greens," pointed out Derek. "And at night, the joy riders appear. One green was churned up recently three times in a week by a car or motor bike."

In spite of all the aggravation, Derek and Lionel derive great satisfaction from the fact that they manage to keep the course in excellent condition for much of the year. The results of their efforts are highlighted by the club's 600-strong membership and a 12 month waiting list, proving that golf on the unique and totally natural Old Course at Minchinhampton has never been more popular.

Wired for defence

Two hawthorn hedges, a water-filled ditch and two wire fences topped with barbed wire have not proved a sufficient deterrent for trespassers wanting to get onto Wall-sall Golf Club's 120 rolling parkland acres. So, with full police permission, course manager, Steve Wood, has installed 'razor barb' wire in the most vulnerable areas within the southern perimeter of this picturesque wooded course, situated just three minutes from the M6 motorway and less than eight miles from Birmingham city centre.



Steve Wood with 'razor barb' wire

"The most common problem is ball theft after a golfer has driven on the 465 yard fifth hole," explained Steve. "However, much more serious is the vandalism caused to the greens and tees, with flags and markers stolen or broken. The irrigation equipment is also a prime target. In the past few years we have had to replace or repair sprinkler heads, control valves and solenoids to the tune of £4000, and that's no laughing matter."

Maintaining the security fence on the remote south side of the course takes one man eight hours a week during the summer. And even the 'razor barb' has not produced an entry proof barrier. Despite being made from high tensile steel, it can be cut neatly and quickly using bolt

cutters by anyone determined enough to want to gain entry. "The police have said they are powerless to prevent people breaking in," commented Steve Wood. "We'll simply have to persevere with our fencing systems."

Another time consuming task, adding at least an hour to the normal daily work routine around the 18 hole course, is the repair of bunkers and the surrounding turf following the ravages of foxes and their cubs. There are about ten pairs of foxes living on or close to the course and Steve said that the scene resembled a zoo in the early mornings. The biggest problem is caused by digging in the faces of the bunkers, with holes often appearing on the green's apron or even the putting surface itself.

"Repair is carried out by filling the holes with the excavated soil or sand," explained Steve. "However, the sand is often contaminated and will require changing to maintain the correct particle size. Foxes can create a lot of mess and damage." Control is difficult in an area surrounded by housing as many of the local people like to encourage the foxes, leaving food out for them at night. As a result, the preferred control method is by trap, releasing the caged animal in the countryside away from Birmingham. Early Sunday morning shoots have been arranged, but these have to be finished by the time the first golfers appear and also produce protests from the club's animal-loving neighbours.

Apart from controlling unwanted humans and creatures, the other major problem faced by Steve is the level of grass growth on the course during the spring and summer months. "If we don't cut the fairways every day, the grass becomes virtually uncuttable and the ball unplayable," he commented. "As it is, we have to brush the turf before mowing if it's at all wet from dew or rain." This action helps the grass both stand up and dry out, improving the throw from the mower and minimising the risk of clumps of wet, freshly-cut grass dropping onto the turf. The reason for the phenomenal growth is a subsoil of dense, yellow clay which holds the water and makes the course 'a real picture' during even very dry summers.

Of course, it's a different story in the winter and Steve and his five assistants have to plan their work accordingly. Although extensive drainage has been carried out on all fairways, the subsoil takes a long time to dry out, especially after extensive rainfall. This produces soft surfaces which cannot take heavy equipment without marking. "Construction work, aeration and many other turf jobs need to be completed by November or we face having to wait until the spring," pointed out Steve. "However, I'm sure there are many courses which could do with the water we've got, so I'm not complaining. It's all part of the joys of greenkeeping."

Michael Bird

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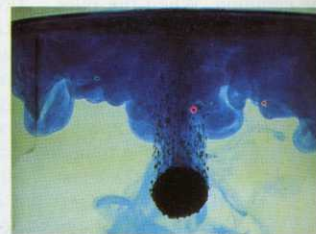
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