DAVID HEMSTOCK on golf course drainage

MANAGING WATER

It's official! According to figures from the National Environment Research Council, we have had a year of awful weather. Four years of drought conditions, which started at the end of 1988 and resulted in depleted water stocks over much of the country, have been countered by last winter's well above average rainfall and a gloomy summer with slightly above average rain, an awful lot of it falling in one of the wettest July months for 30 years.

The bad weather during the summer and autumn of 1992 was instrumental in the financial hardship felt by some new course development projects, adding to the misery of the trough of recession. Earthworks came to a standstill from June onwards for many, and the windows for proper seed-bed preparation and sowing were few and far between.

Judging by the number of enquiries we've received from existing clubs on drainage problems, many established courses had a wet and soggy time of it over the winter of 1992/93.

It's ironic, of course, that I should have co-written an article for this magazine, ('Too hot to handle', Jan 1992) just before the flood, based on the imponderables of global warming and the implications on drought and water use efficiency. Cue for the weather to hit back; predictably unpredictable in our corner of Europe.

Partly due to this unpredictability, we do have a tendency in the UK to avoid the issue when it comes to long term improvements to water sourcing and storage, drainage and irrigation. We can always be pretty sure that today's problem – drought or flood – is unlikely to last too long, and is quite likely to be solved by one of those characteristic 'mood-swings' in the weather. Install a new drainage system, followed by four years of drought, and you will have members muttering about over-draining (whatever that is) and the essential nature of fairway irrigation.

When dealing with a new course, the opportunity to tackle issues such as water sourcing and storage strategy, the integrated design of drainage and re-contouring, and the efficiency of irrigation really should be grasped as early as possible. We know how important water is, where we need it and where we don't, but it is useful to take a look at the integral system, from cloud or sprinkler to outfall.

In essence, the water which is required in summer for irrigation falls in winter. If the course does not store water in winter for irrigation directly, mother nature does geologically or a water company does for a financial return. If the NRA allows it, and water passes by or through or lies under the course, abstraction and storage is possible. Of less interest to the NRA is the fate of drainage water, the constraints on use of this source are less rigorous than some of the others. Rainwater harvesting is a neat idea, i.e. recycling rainfall, avoiding potential pollution problems, making secondary use of a drainage system, but there are problems.

Firstly, if water percolates freely through the soil profile to groundwater, directing it through pipes may not be possible or may not be very fruitful. The type of course with this problem is also the one most likely to have water sourcing problems, unfortunately.

If this is not the case, but the contours do not naturally lead to a useful outfall, it may be possible to lead water away from a natural catchment, around the nose of a hill for instance, to an artificially extended catchment. This is assuming that infiltration of water into the soil is reasonable or that the soil can be manipulated to absorb water rather than allowing it to go, possibly to waste, as run-off.

The proportion of rain which becomes run-off or infiltration depends on many factors; slope, drainage, soil type and compaction status, rainfall intensity etc. On a compact soil, run-off may constitute virtually all of the fate of rainfall, similarly on a sloping site run-off may predominate in heavy rainfall events; this is the basis of the 'American' style, heavily re-shaped, course with swale and gully-pot drainage system which relies on run-off to work.

Run-off would normally find its way into an open watercourse or more permeable area and hence to drains or groundwater. It is quite easy to collect water as run-off in low spots where it lies, but to transfer it to the ideal position may often require pumping, which is better avoided if there is an alternative.

To increase the amount of water finding its way into a drainage system, and therefore increasing the control of where it goes to, a more intensive pipe system is needed in conjunction with a permeable topsoil, or some method of intercepting water at the surface is required, by improving soil infiltration or by introducing drains and/or slits, grooves etc. with sand to the surface.

The technique for designing a rainwater harvesting system that I use is based on the contour bund (or grip) method used in Africa against erosion on sloping land and sometimes in forestry and moorland drainage. Drains or slits with a highly permeable surface area follow the contour with a slight grade to act as water interceptors. At calculated intervals the interceptors connect with a carrier system, which may be sealed to prevent 'blow-outs' occurring, which takes the water down the slope to the required place. The flatter the land in question, the easier it is to avoid problems caused by exceptional rainfall events.

I have covered the subject of drainage systems and installation in some detail in another previous article ('Drainage Decisions' Oct. 1992). Basically, purely from a drainage rather than a rainwater harvesting point of view, the system installed initially is usually there to keep the water table below the level of significant root activity as well as to collect areas of water concentration, i.e. hollows, bases of banks, greens, bunkers, springs etc. Operating below the surface layer, this system requires regular aerating or de-compaction treatment on most topsoils. If these treatments cannot effectively keep water infiltrating through the soil then help may be needed from a 'by-pass' system such as sand slitting – to remove water directly from the surface and transfer it to the carrier system. At the same time, the slit system is acting as a close-spaced soil drainage system, absorbing soil water and reducing compactibility potential. This is a key point: pipes and slits may not be there simply to pick up wet spots, a more important role may be to keep soils inherently dryer, thus reducing compaction problems.

If drainage water is being harvested, it is worth directing it to the chosen point with the maximum preservation of 'head', which might be useful. So, having directed water to a particular point, and solving problems on the way, how is it going to be stored?

I am personally very keen on

EFFECTIVELY

Half full or half empty? Optimist or pessimist; the weather makes us one or the other. Look objectively at long term climatic trends

water features on the golf course, whether or not they come into play. A round of golf is an encounter with nature, and anything which increases the diversity of flora and fauna on the course must be a good thing. However, an area of water designed to store water for future use will require some sort of treatment to disguise the draw-down that is inevitable once irrigation is underway. This could be very expensive, yet still not be particularly attractive or natural in appearance. Protecting banks from fluctuating water levels requires stone, concrete or similar revetment, gabions, mattresses, palisades, plastic reinforcement, or whatever. And the more shapely the edges are made in an attempt to soften the pond or lake appearance, the higher the cost is likely to be. Civil engineering solutions to a problem often prefer straight lines and even grades.

On this subject of water features with engineering implications, an interesting encounter with an NRA official recently revealed what might be a possible development in their policy towards golf constructions with regard to water storage. Apparently the similarity between a golf course under construction and various mineral extraction sites had not gone unnoticed, particularly the laxity of controls on the former when compared to quarries, opencast sites etc. Very high run-off rates were to be expected on both, particularly the major golf course projects involving large amounts of topsoil strip. Rigorous demands on settling lagoons and balancing ponds common to mineral workings may become essential to golf and other developments soon.

Following construction, the very effective drainage systems of some courses, whether relying on swales and carrier pipes or under drainage and slitting could also cause problems downstream, with immense peak drainage flows compared to previous land uses. These abnormal peak flows could be blamed on over-efficient drainage, changes to catchment characteristics, or even on untreated and widespread compaction on the course.

Perhaps the water feature installed as a combined golfing hazard and wildlife sanctuary might have a further dual role in storing water for future use and in temporary storage of potentially damaging storm flows.

In a true re-circulation system – where water is pumped back up to maintain flow of water through ponds to aid aeration or to occasionally top up water levels in ponds or storage reservoirs – a sizeable pump may be required. I say 'may be' because I have been involved with three new golf course developments where only a small, constant flow was required to maintain water levels, this within the range of the irrigation system itself to supply through a valve arrangement. However, all three systems were designed to operate with a smallish pump feeding water from the outfall end of the watercourse system to separate from the irrigation main. Inevitably, moving large amounts of water costs a lot of money, but it is not just Kiawah Island clones that can justify total water management.

Managing water effectively in the UK means removing it efficiently from the rooting depth of the turf, applying it only when needed (which is a science rather than an art) and manipulating what passes through to maximum benefit, so long as the course of nature is perverted no more than temporarily and harmlessly.

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