



# Site Drainage Strategies

by Gordon Tully

Builders and designers have numerous tactics for dealing with water in the ground, but not necessarily a clear strategy of which measures to use when, and why. This column takes a strategic look at water in and on the ground. Not all flooding problems are solvable, but their impact can be controlled by educating yourself and your client about what to expect and how to prepare for the inevitable.

## The Site as Part of a System

Every site is part of a larger watershed that sooner or later will be overwhelmed by unusual weather. The

issue for the builder and designer is not whether a site will flood, but how often, and what the flood will be like when it occurs. The tributary issue is how to explain to the owner that the house is "guaranteed to flood."

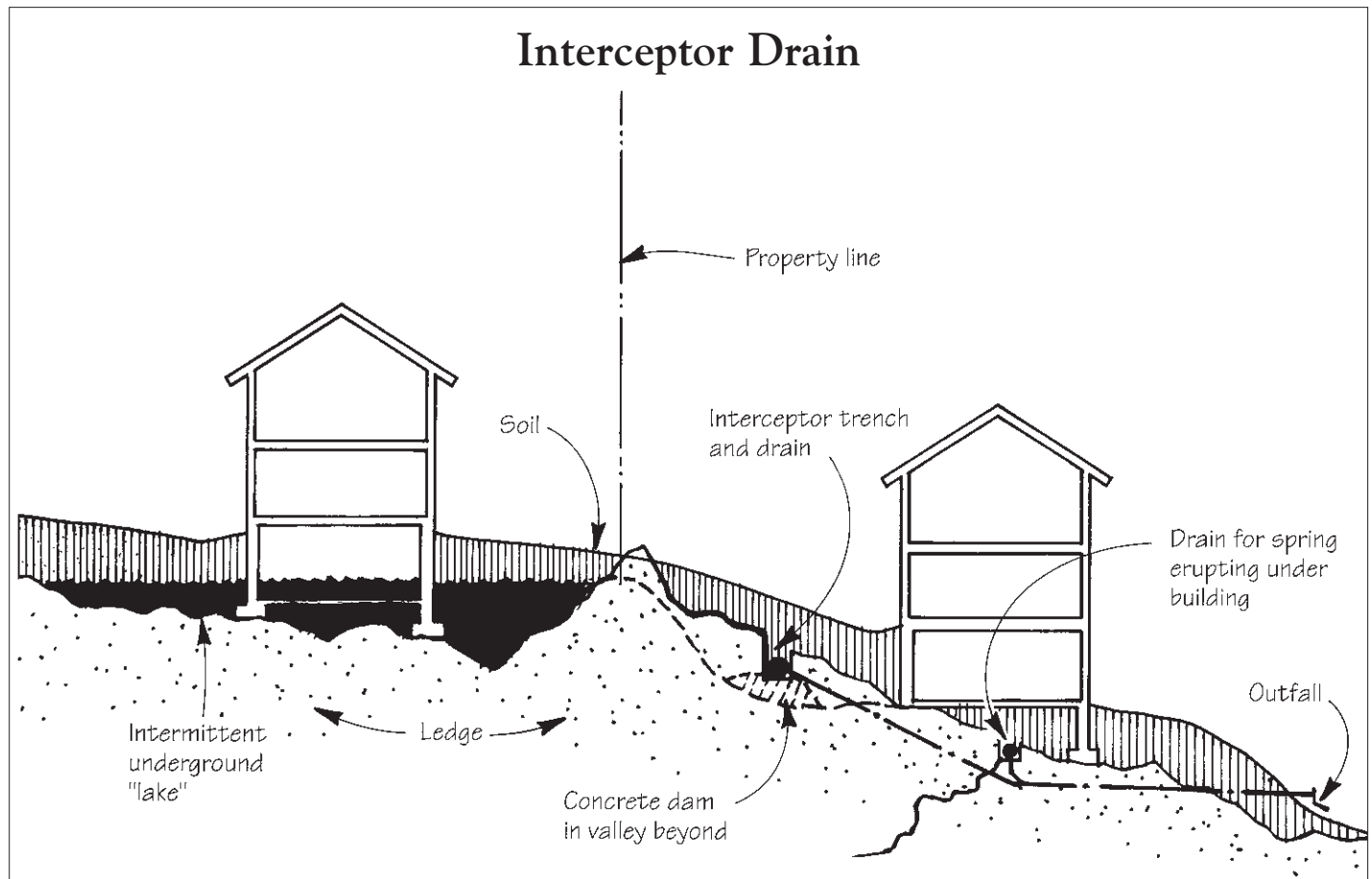
In evaluating the risks and remedies for water in or on the ground, it is helpful to identify three kinds of water:

**1. Water that falls directly on the site** is the easiest to deal with, but predictably, this makes builders and designers lazy. The result is that most water damage comes from overflowing gutters, clogged leaders, and a grade that slopes toward the house. Fix these

things, and you have fixed 95% of site water problems.

**2. Water that flows underground or on the surface** in a finite, modest stream is also relatively easy to deal with because you can redirect its flow. This implies, however, that there is a place to dump the water on site that is lower than the lowest elevation of the house. Dump the water higher and you run the risk of creating a small underground lake, perhaps in a bowl formed by rock or clay (see sketch, below).

**3. Water that forms a "lake"** (under or on the ground) is the tough problem. When the lake is small and fed by a finite, periodic underground flow (as in



Shown here are two house sites on a moderate slope with ledge. The uphill house is built above a pocket in the ledge that periodically creates a small underground lake. Pumping is the preferred solution if a place can be found to dump the water; other options are to waterproof the basement or build the house entirely above the high-water mark. The downhill site is easier to protect with an interceptor drain that picks up the water running down the ledge and discharges it below the house. Concrete dams across low points in the ledge help drive all the flow up into the pipe. A cleanout is required, because the pipe is likely to fill up with sediment over time.

the example just mentioned), pumping works fine. If the lake is underground and extends well beyond the site — high ground-water conditions — you can sometimes cure the problem by pumping. In relatively impervious soils, it is feasible to draw down the water table, or “dewater,” because it takes time for the surrounding water to make its way through the soil and refill the hole. This kind of dewatering is routine for construction done below the water table, but I suspect it is not a common permanent fix. As the soil becomes more porous, the pumping cost climbs until it is no longer feasible to dewater after construction.

Whenever you propose pumping to an owner or buyer, pose the question of who will keep the pump running in a power failure, and suggest dual pumps for security. If a “fail-safe” solution is required, an emergency generator or battery backup is called for.

### When It Floods

When the soil is too porous to justify pumping or the lake forms on the surface, there are two alternatives:

1. In a big flood you have no choice but to let the water rise and hope the house survives intact.
2. When occasional moderate flooding is expected, turn the house into a boat using waterproofing. This works if the water doesn't get too high, but it is tricky and expensive.

### Waterproofing

Waterproofing systems that treat only the foundation walls are intended to protect the building from wet ground, not from flooding. Turning a house into a boat with full-treatment waterproofing requires heavy-duty measures. First, the waterproofing must run continuously under the floor and wrap up the walls to a safe height. Second, every penetration of piping, ducting, and so on must be sealed to the waterproofing.

Finally, once the house is really watertight, it will try to float in whatever water surrounds it. A slab strong enough to withstand the 312-psf buoyancy uplift pressure from a mere 5 feet of water requires careful engineering and steel placement (for comparison, an ordinary wood floor is designed to withstand the weight of only 8 inches

of water).

In addition, since all waterproofing leaks (like all boats), a small sump pump is still necessary to deal with the flaws. With sufficient storage and few enough flaws, such a pump might be safe without emergency backup.

### Full Disclosure a Must

Buyers encourage builders and designers to relieve them of anxiety by producing a guaranteed, trouble-free product. The conscientious builder and designer may try to oblige, but when it comes to ground-water problems, this strategy is bound to backfire.

Since you can't guarantee against flooding, your job is to learn as much as you can about the potential for flooding, inform the owner, describe various remedies, then stand back and let the owner decide what course to take.

Point out that ground water is notoriously difficult to predict, that more complete knowledge is possible at a cost, that your knowledge is therefore limited, and that in any case, there is no such thing as a risk-free house.

### Just Say No

If possible, the designer and builder should focus on the owner's perception of the flooding hazard rather than the actual hazard. Along with the probability of occurring, the possibility of flooding carries with it a set of perceived costs to the owner. As a result, one owner will spend a fortune on what he thinks of as perfect security, while another will be happy operating a portable pump.

Why people build on sites that are guaranteed to flood or wash out is a puzzle for socio-biologists, not you. Building codes exist because owners and developers are often short-sighted and emotional, so you need to meet minimum standards regardless of the pressures the owner puts on you.

You are better off passing up a job than risking a blot on your escutcheon — by building too close to the water table, for example. ■

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