Pumping to Daylight

BY JOSH GIRARD

I own and operate a small, custom home and remodeling business in northern Vermont. Currently, we're in the process of developing a seven-lot subdivision on a 36-acre parcel of low-lying, valley farmland that abuts a river. The land's topography is flat, though it quickly drops in elevation as it approaches the river, far from our new five-acre subdivision (the remaining acreage has been designated as common land). Also, the water table is fairly high and variable. Test pits dug in 2015 during the project's design phase confirmed the groundwater could vary from 5 to 7 feet deep below grade (on average), depending on the season or on how wet or dry the weather has been.

For this development, these two factors necessitated our having to pump the groundwater from the footing drains, since the flat site didn't allow for draining to daylight. To stay out of the water table, we had to install our new foundations much higher than the existing grade, backfilling our foundations with 4 to 5 feet of trucked-in sand and scraped topsoil.

EXTERIOR SUMP PUMP

To discharge potential groundwater, we employed a site-drainage detail I picked up from an excavation subcontractor a decade or so ago. On the exterior side of the foundation, we installed a big culvert vertically that acts as a sump pit well and collection point for the home's perimeter and under-slab drains **(1)**. The culvert installation was straightforward enough, though the trickiest tasks were first determining the sump-pit depth (relative to the high water-table elevation) and connecting up the pump in a confined space.

Typically, we install exterior sump pumps on all our new homes where draining to daylight is not an option, regardless of the height of the site's water table or soil drainage class. The pumps are positioned lower than the perimeter and under-slab drains, so in most cases the drains are never going to see water. But with this site's high, fluctuating water table and location in a low-lying valley adjacent to a river watershed, the perimeter and under-slab drains have a greater potential of filling with groundwater.

Setting the depths. Last December, when we excavated the hole for the foundation of the third home in the development, we hit high water 5 feet below grade,

The author and crew install a 30-inch-diameter culvert vertically to act as a sump pit well next to the home's foundation **(1)**. The under-slab drainage **(2)** is connected to the perimeter drains through sleeves cast into the footing **(3)**. The culvert is muscled into place **(4)**. In this completed home's sump, the pump-to-house wiring connections are made at a wall-mounted junction box **(5)**.

Photos by Tim Healey

largely due to an unusually wet late summer and fall. So we adjusted the basement hole depth to 3 feet (2 feet above the high-water line), then put in a 6-inch layer of clean stone. I like to pour footings on a stone base rather than on undisturbed soils to help level the formwork and provide drainage. As to pump placement, we generally set the bottom of the sump pit 18 inches below the top of the footing (see Exterior Sump Pit, right).

Under-slab drainage (radon). We install under-slab piping on all our new homes primarily for drainage, though it serves as cheap insurance in case radon rears its ugly head (we build in a Zone 3 "low potential" radon zone, though the vast majority of Vermont is in a Zone 2 moderate zone). Our standard layout is a 6-foot-on-center spacing of perforated piping **(2)**, which is connected to the perimeter drains through sleeves cast in the footings **(3)**. Future-proofing for radon, we also rough-in a 3-inch dedicated vent stack from the under-slab piping and through the roof, which a radon mitigation fan can easily be cut into.

Sump-pit install. With the perimeter and under-slab drains joined, we excavated the sump-pit area. We dug beyond our planned sump-pit depth to first install a 12-inch lift of gravel wrapped in filter fabric. Next, we ran a short length of pipe from the drains to our sump location and then moved the 30-inch-diameter high-density-plastic culvert into place, first cutting a slot in its bottom edge in order to slip it over the drain pipe **(4)**. We wrapped the cut slot in filter fabric, then installed a second lift of gravel 18 inches deep to help stabilize the vertically installed culvert until it was backfilled with sand.

Connecting the pump. After backfilling and running a 2-inch PVC discharge pipe and electrical conduit to the sump, my crew hoisted me into the culvert. I'm a big guy and a 30-inch-diameter space is a tight fit, but I managed to set our 3/4-hp sump pump on a concrete paver to elevate it above the gravel, and then connect the pump's discharge pipe, which leads to a roadside ditch roughly 75 feet away. Working from above, a crew member screwed a junction box near the top of the culvert **(5)**, while I set the pump's control- and overflow-alarm float lengths. We made our power and control connections from the pump and house at the box, then fastened a 30-inch-diameter hard plastic lid to the culvert.

The sump has an overflow alarm, which is located near where the conduit passes through the foundation. This is right next to the home's septic alarm, since the site's high water table also required engineered mound septic systems.

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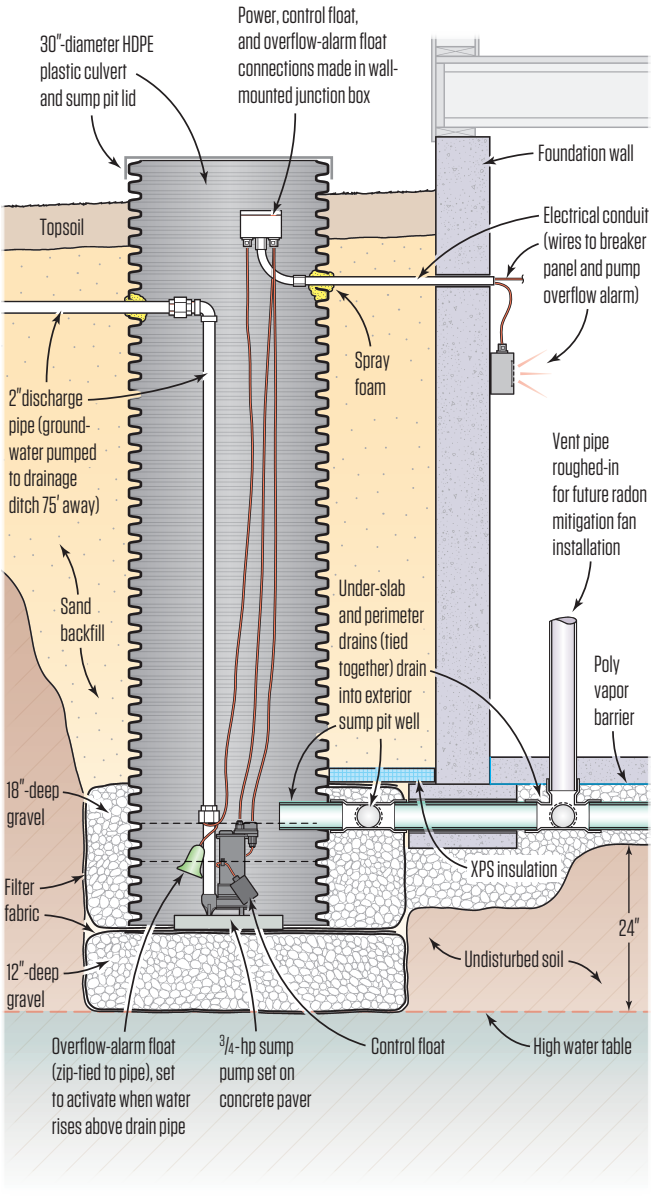
Exterior Sump Pit



The foundation holes were dug 24 inches above the historic high water-table line while the bottom of the sump pits were set 18 inches below the top of the footing. Potential groundwater will be discharged into drainage swales 50 to 100 feet away from the development's seven sump pit wells. Pump activation can be fine-tuned by adjusting the length of the float lines.