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## WHAT LIES BENEATH

### The role of drainage in soil infrastructure and site stability

Understanding the principles of proper drainage and control of surface and subsurface water and how these principles impact soil infrastructure is vital for the development of a stable site.

As you stand overlooking a project, you can see the impact of uncontrolled surface water as it sheets across the site. The movement of free water over an unprotected surface results in the deterioration of the site and is commonly known as erosion. The particles of the soil are destabilized, break loose from the surface and migrate with the water flow, creating erosion rills, shallow gullies and eroded creek channels. The uncontrolled flow and lack of adequate surface cover immediately are identified as the reasons for the soil loss and instability.

However, there is another flow pattern—not as easily identified—that also results in the destabilization of the Earth’s surface. This flow pattern is located beneath the surface, migrating along hair-like channels, through granular bands of soil and open seams of shale and stone. This flow of free water creates static water pools, saturated soils and increased pore pressure along slopes and hillsides.

The impacts of uncontrolled subsurface water are similar to those of its counterpart on the surface. Sinkholes develop as static water pools fill and dry out, and slip planes occur along steep banks, resulting in landslides and slope failure. The saturation of the soil along the toe of the slope reduces the load-bearing capacity of the supporting soil, resulting in potential global instability.

You cannot see these processes from the surface, but to stabilize your site, you must know they are there. Fortunately, we have a number of ways to determine if there is potential free water beneath the surface, and there are numerous ways to provide for the control of the water flow and its concentration in the soil.

Soil borings taken at the site provide onsite conditions; however, if the borings are taken during a dry period, there may not be any physical indication of potential moisture. A geotechnical engineer would be of great assistance, but funding for one may not be in the budget.

A good way to proceed with or without soil borings is conducting a thorough site inspection. Note the types of plant material on the site and any indications of wet spots along the slopes or at the toe of the slope. Search for the development of micro-knolls or micro-depressions across the site, indicating the potential development of underground static water pools. Review topographic and soil survey maps of the area to determine original flow patterns and identify the dominant soil and its general characteristics.

Once you have evaluated the site and determined the potential impact of the subsurface water, you can then begin to develop the procedures to direct and control its flow. This can take the shape of installing cutoff drains to intercept the excess water or using numerous drill point and composite drain systems to provide for site dewatering. Redirecting the subsurface flow and providing controlled collection and outlet points for the excess water will result in increased soil stability. **SWS**

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