The Environmental Corner

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Preferential Pathways

Underground Pipes And Utility Lines Can Be Conduits For The Migration Of Contaminants

You can imagine that if wastewater is discharged into a sewer line with cracks in it that the wastewater could contaminate the soil and groundwater. After all, sewer pipes can be very old and made of a variety of material such as transite, clay, concrete, plastic or steel. Of course, leaks are not uncommon in sewer lines. Sewer lines can crack or break, they can corrode, or the couplings, where pipes are fitted together, can leak and result in "point source" areas of contamination. Sags and low points are common when a sewer line goes underneath streets and structures. These low areas can result in sediment and dense chemical liquids pooling in these sag points, resulting in contamination source areas. Sewer pipes can become blocked and clogged and result in backups that can create points of leakage.

Historically speaking, sewer pipes were not designed to be leak proof. The first sewers were essentially brick lined tunnels. Later, short sections of clay pipes were coupled together to create long lengths of sewer. The clay sections consisted of a male end and a female (bell) end and the lengths of clay pipe were coupled together. Gaskets were hopefully placed in the bell end to minimize the leakage, but of course, those gaskets would degrade over time. Transite pipes and concrete pipes similarly had male and female ends and were coupled together.

It's easy to understand that old pipes (even newer pipes if not cleaned and maintained or properly constructed) could have "point source" areas where wastewater, ladened with chemicals, could be released into the subsurface environment. In fact, there is considerable litigation ongoing across the country regarding this very issue.

But pipes and utility lines play a much larger role in the spread and migration of contamination than just serving as a conveyance line for wastewater and the associated release of chemicals into the subsurface from breaks, cracks and sags. Until the relatively recent invention of horizontal drilling, the preferred method of installing flexible pip-

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March 2013

ing (e.g. small diameter gas lines) and communication cables (e.g. telephone, fiber optics, internet and television cables), trenches were dug and pipes were laid in the trenches. Crushed gravel or sand (bedding material) was placed in the bottom of the trench and the piping and utility lines were laid down on top of the bedding material. The trenches were then backfilled with the bedding material and the pipes and utilities were covered.

The bedding material protected the pipes and utilities from being broken when the trenches were compacted. Bedding material is also helpful in locating underground piping and utilities as it was visually different from the native material and could be identified if earthwork was taking place in and around the utility trenches. Typically speaking, bedding material is much more permeable and transmissive than the native surrounding material. It is this higher permeability and transmissivity that enables water and vapors to migrate through the utility corridors. The utility corridors are considered preferential pathways.

Imagine a situation where trenches are cut across a large property that has a very tight clay soil. The water table is high and is present in the trenches. The piping and utilities are laid in the trench and the trenches are backfilled with a sand or gravel. Years later, chemicals are spilled onto the surface and they migrate through the unsaturated soil and into the groundwater. The contaminated groundwater doesn't flow very fast through the native clay material, but when it hits the trench and the backfill it moves rapidly through the more permeable material. The contamination follows the path of least resistance along preferential pathways. The contamination can flow in a direction that is completely different than the natural hydrogeologic conditions.

The affect of vapors migrating along the utility corridors occurs in much the same way. Volatile chemicals present in soil and groundwater prefer to be in a gaseous state as vapors. The vapors find the path of least resistance and will migrate through material that is more permeable than the native material.

It is quite common for vapors to migrate along these utility corridors (preferential pathways) and the migration will often dictate the course of the environmental investigations and cleanups.

As such, it is important to evaluate whether the utility corridors are serving as migration pathways for contaminated groundwater and vapors. Groundwater and vapor testing (soil gas) should be conducted along the utility corridors to identify or rule out the migration of contaminants along these preferential pathways.

If contamination is identified along these utility corridors, steps can be taken to remediate them and stop the ongoing migration. Failure to understand the subsurface utilities and whether they serve as a conduit for contaminant migration could result in missing the mark on the fate and transport of the chemical release and the cost effective remedial cleanup approach.

With 30 years of experience, Steve Henshaw holds professional geology registrations in numerous states. As President and CEO of EnviroForensics, Henshaw serves as a client and technical manager on projects associated with site characterization, remedial design, remedial implementation and operation, litigation support and insurance coverage matters. He has acted as Project Manager or Client Manager on several hundred projects, involving dry cleaners, manufacturers, landfills, refineries, foundries, metal plating shops, food processors, wood treating facilities, chemical blenders and transportation facilities. He has built a leading edge environmental engineering company that specializes in finding the funding to pay for environmental liabilities. By combining responsible party searches with insurance archeology investigations, EnviroForensics has been successful at remediating and closing sites for property owners and small business owners across the country, with minimal capital outlay from clients. He is a regular contributing writer for several dry cleaning trade publications on environmental and regulatory issues and remains active with dry cleaning associations by providing insight on changes in law and policy. Visit www.enviroforensics.com; e-mail: shenshaw@enviroforensics.com.