538 Attachment 7

City of Allentown

Appendix G
Preliminary Site Investigation and Testing Requirements

Required data and site information. The following data shall be gathered utilizing standard testing procedures as part of a preliminary site investigation:

- Bedrock composition: Any apparent boundaries between carbonate and noncarbonate bedrock must be verified by a qualified geotechnical professional.
- Bedrock structural geology: This includes the possible presence of faults and mapping of conspicuous fracture traces or lineaments.
- Overburden and soil mantle composition and thickness.
- Permeability of the soil.
- Depth to the seasonal high water table.
- Presence of special geologic features: This includes sinkholes, closed depressions, fracture traces, lineaments and geologic contacts between carbonate and noncarbonate bedrock.

Investigation Required for All Sites

Review of available data, maps and reports. Some of the required information, as listed above, can be found in existing published data. Suggested resources include the following:

- Geologic maps and references for the development area.
- The Little Lehigh Creek Basin Carbonate Prototype Area Closed Depression Map - available at the LVPC.
- USGS topographic maps.
- Lehigh and Berks County soil survey maps.
- Aerial photographs from the LVPC or other sources.
- Relevant Pennsylvania Geologic Survey Open File Reports (Kochanov 1987a, 1987b) that provide maps of sinkholes and karst features for Lehigh and Berks Counties.

Field inspections. In addition to gathering data from published sources, a field inspection of the proposed site is required. A field inspection can provide additional information relating to site features such as carbonate bedrock features, indicators of seasonal high stream level or water table levels, streams, springs, etc. Soil test pit and percolation test requirements: A minimum of one test pit and a minimum of two percolation tests are required for every site. A test pit is a two- to three-foot-wide, eight-foot-deep trench excavated with a backhoe for observing subsurface conditions. The test pits will be used to describe soil depth and quality, including soil horizons, and testing of permeability or percolation rates.

Percolation tests are to be conducted as follows (adapted from § 73.15. “Percolation Tests” of the Pennsylvania Code):

1. The percolation tests shall be made in separate holes uniformly spaced over the possible infiltration area.
2. An “initial presoak” should not be performed.

3. Percolation holes located within the possible infiltration area shall be used in the calculation of the average percolation rate.
4. Holes having a uniform diameter of six to 10 inches shall be bored or dug as follows:
   a. To the depth of the bottom of the possible infiltration BMP.
   b. Alternate depths if the test pits/auger holes indicate that the soils are more suitable at a different depth (i.e., if a clay horizon is identified and more suitable soils are located beneath the horizon, and infiltration test should be performed in the suitable horizon).
5. The bottom and sides of the hole shall be scarified with a knife blade or sharp-pointed instrument to completely remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. Loose material shall be removed from the hole. Two inches of coarse sand or fine gravel shall be placed in the bottom of the hole to protect the soil from scouring and clogging of the pores.
6. Immediately before the percolation test, as a final presoak, water shall be placed in the hole to a minimum depth of six inches over the gravel and readjusted every 30 minutes for one hour.
7. The drop in the water level during the last 30 minutes of the final presoaking period shall be applied to the following standard to determine the time interval between readings for each percolation hole:
   a. If water remains in the hole, the interval for readings during the percolation test shall be 30 minutes.
   b. If no water remains in the hole, the interval for readings during the percolation test may be reduced to 10 minutes.
8. After the final presoaking period, water in the hole shall again be adjusted to approximately six inches over the gravel and readjusted when necessary after each reading.
   a. Measurement to the water level in the individual percolation holes shall be made from a fixed reference point and shall continue at the interval determined from step No. 7 (above) for each individual percolation hole until a minimum of eight readings are completed or until a stabilized rate of drop is obtained, whichever occurs first. A stabilized rate of drop means a difference of 1/4 inch or less of drop between the highest and lowest readings of four consecutive readings.
   b. The drop that occurs in the final period in percolation test holes, expressed as inches per hour, shall be used to calculate the average percolation rate.
   c. When the rate of drop in a percolation test is too slow to obtain a measurable rate, the rate of 0.25 inches per hour shall be assigned to that hole for use in calculating the average percolation rate. The infiltration area may be placed over holes with no measurable rate when the average percolation rate for the possible infiltration area is within the acceptable range.

When a percolation test hole yields a percolation rate of greater than 12 inches per hour, the proposed infiltration area may not be designed or installed within 25 feet of this hole unless the municipality determines that a testing anomaly caused the fast percolation rate and a retest of the area yields acceptable percolation rates. This percolation rate limit is established to protect groundwater quality and to minimize the risk of subsidence.

Additional Site Investigation and Testing Required if Infiltration is Proposed

Soil test pit requirements: The required number of test pits varies with effective soil thickness. As risk factors increase, the number of test pits increases. A minimum of two test pits, uniformly spaced within the proposed infiltration area (e.g., the two pits should be centered on

each half of the proposed infiltration area), are required for any site proposing infiltration unless the applicant can demonstrate that one test pit is adequately representative of the area proposed for infiltration. For larger infiltration areas, multiple test pits shall be developed at the densities as listed below:

Effective Soil Thickness (feet)	Test Pit Density (per acre of proposed infiltration area)*	Percolation Tests (per acre of proposed infiltration area)**	Auger Grid Spacing (feet on-center)
8	4	8	50
4 to 8	6	12	35
2 to 4	8	16	25

* No. of test pits required = Infiltration square feet/43,560 square feet x test pit density from chart rounded up to the nearest whole number.

** No. of percolation tests required = Infiltration square feet/43,560 square feet x percolation tests from chart rounded up to the nearest whole number.

Soil auger testing requirements for carbonate areas: Because soil depth is not uniform in many carbonate areas, test pits will not be sufficient to accurately determine the depth to bedrock. Augering provides this essential data as inexpensively as possible. Track-rig rotary soil auger test drilling allows relatively inexpensive, qualitative determination of the presence of overburden voids and will generally penetrate to the top-of-bedrock. Augers typically extend to depths of 20 feet. Special augers extend to as much as 50 feet. Augers do not extend into the bedrock. Auger testing should be performed in a grid pattern across the proposed infiltration area, spaced as indicated in the above table. percolation testing requirements: A minimum of six percolation tests shall be conducted in accordance with the procedures listed above unless the applicant can demonstrate that fewer tests accurately represent the percolation rate of the proposed infiltration area. Additional testing shall be required if the initial test results show significant variability in percolation rate. For larger infiltration areas, percolation tests shall be conducted at the densities listed in the table above.