6.4 Infiltration Trench

Figure 6-19. Infiltration Trench. Source: CASQA, 2003

Best Uses

- Limited space
- Adjacent to roadways
- Landscape buffers

Advantages

- Increases groundwater recharge
- Removes suspended solids
- Used with other BMPs
- No surface outfalls

Limitations

- Susceptible to clogging; fails with no maintenance
- No high water tables
- Permeability of existing soils must exceed 0.5 in/hr
- No steep slopes
- Drainage area less than 5 acres

Infiltration trenches are appropriate in areas with well-drained (Type A or B) native soils. Project applicants may wish to consult with Mosquito Abatement District staff for guidance regarding mosquito controls. An infiltration trench is a long, narrow, excavated trench backfilled with a stone aggregate, and lined with a filter fabric. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using swales, or detention basins is important for limiting amounts of coarse sediment entering the trench, which can clog and render the trench ineffective. Infiltration practices, such as infiltration trenches, remove suspended solids, particulate pollutants, coliform bacteria, organics, and some soluble forms of metals and nutrients from stormwater runoff. The infiltration trench treats the design volume of runoff either underground or at grade. Pollutants are filtered out of the runoff as it infiltrates the surrounding soils. Infiltration trenches also provide groundwater recharge and preserve base flow in nearby streams.

Design and Sizing Guidelines

DRAINAGE AREA AND SETBACK CONSIDERATIONS

- When the drainage area exceeds 5 acres, other treatment measures should be considered.
- Infiltration trenches work best when the upgradient drainage area slope is less than 5 percent. The downgradient slope should be no greater than 20 percent to minimize slope failure and seepage.
- In-situ/undisturbed soils should have a low silt and clay content and have permeability greater than 0.5 inches per hour. In-situ testing is required to confirm permeability of trench site. CASQA's BMP Handbook recommends against using infiltration trenches in Type C or D soils.

- There should be at least a 10-foot separation between the bottom of the trench and the seasonal high groundwater level to prevent potential groundwater contamination.
- Trenches should also be located at least 100 feet upgradient from water supply wells.
- A setback of 100 feet from building foundations is recommended, unless a smaller setback is approved by geotechnical engineer and allowed by local standard.

TREATMENT DIMENSIONS AND SIZING

- The infiltration trench should be sized to store the full 48-hour water quality volume.
- A site-specific trench depth can be calculated based on the soil permeability, aggregate void space, and the trench storage time. The stone aggregate used in the trench is normally 1.5 to 2.5 inches in diameter, which provides a void space of 35 to 40 percent. A minimum drainage time of 6 hours should be provided to ensure satisfactory pollutant removal in the infiltration trench. Trenches may be designed to provide temporary storage of storm water. Trench depths are usually between 3 and 8 feet, with a depth of 8 feet most commonly used.
- The trench surface may consist of stone or vegetation (contact local municipality to determine if vegetation is allowed) with inlets to evenly distribute the runoff entering the trench. Runoff can be captured by depressing the trench surface or by placing a berm at the down gradient side of the trench. The basic infiltration trench design utilizes stone aggregate in the top of the trench to promote filtration; however, this design can be modified by substituting pea gravel for stone aggregate in the top 1-foot of the trench. Typically, there is about 35 to 40% void space within the rock.
- Use trench rock that is 1.5 to 2.5 inches in diameter or pea gravel to improve sediment filtering and maximize the pollutant removal in the top 1 foot of the trench.
- Place permeable filter fabric around the walls and bottom of the trench and 1 foot below the trench surface. The filter fabric should overlap each side of the trench in order to cover the top of the stone aggregate layer. The filter fabric prevents sediment in the runoff and soil particles from the sides of the trench from clogging the aggregate. Filter fabric that is placed 1 foot below the trench surface will maximize pollutant removal within the top layer of the trench and decrease the pollutant loading to the trench bottom, reducing frequency of maintenance.
- The infiltration trench should drain within 5 days to avoid vector generation.
- An observation well is recommended to monitor water levels in the trench. The well can be 4 to 6-inch diameter PVC pipe, which is anchored vertically to a foot plate at the bottom of the trench.

INLET TO THE TREATMENT MEASURE

- A vegetated swale or detention basin should be established adjacent to the infiltration trench to capture large sediment particles in the runoff before runoff enters the trench. If a swale is used, installation should occur immediately after trench construction using sod instead of hydroseeding. The swale should be graded with a slope between 0.5 and 15 percent so that runoff enters the trench as sheet flow. The swale or detention basin should be sized according to Sections 6.4 and 6.6 respectively.

- If runoff is piped or channeled to the trench, a level spreader should be installed to create sheet flow.

IF VEGETATION IS ALLOWED AT TRENCH SURFACE

- Infiltration trenches can be modified by adding a layer of organic material (peat) or loam to the trench subsoil. This modification enhances the removal of metals and nutrients through adsorption. The modified trenches are then covered with a permeable geotextile membrane overlain with topsoil and grass or stones.
- If surface landscaping of the trench is desired, contact local municipality to determine if this is allowed.
- Plant species should be suitable to well-drained soil. See planting guidance in Appendix A.
- Use integrated pest management (IPM) principles in the landscape design to help avoid or minimize any use of synthetic pesticides and quick-release fertilizer. Check with the local jurisdiction for any local policies regarding the use of pesticides and fertilizers.
- Irrigation should be provided as needed to maintain plant life.

CONSTRUCTION REQUIREMENTS

- The drainage area must be fully developed and stabilized with vegetation before constructing an infiltration trench. High sediment loads from unstabilized areas will quickly clog the infiltration trench. During project construction, runoff from unstabilized areas should be diverted away from the trench into a sedimentation control BMP until vegetation is established.
- When excavating, avoid spreading fines of the soils on bottom and sides. Remove any smeared soiled surfaces and provide a natural soil interface into which water may percolate.
- Minimize compaction of existing soils. Protect from construction traffic.

MAINTENANCE CONSIDERATIONS FOR ALL TREATMENT MEASURES

- See Chapter 8 for specific maintenance guidance.
- A Maintenance Agreement should be provided and should state the parties' responsibility for maintenance and upkeep.
- Prepare a maintenance plan and submit with Maintenance Agreement. Maintenance plan templates are in Appendix G.

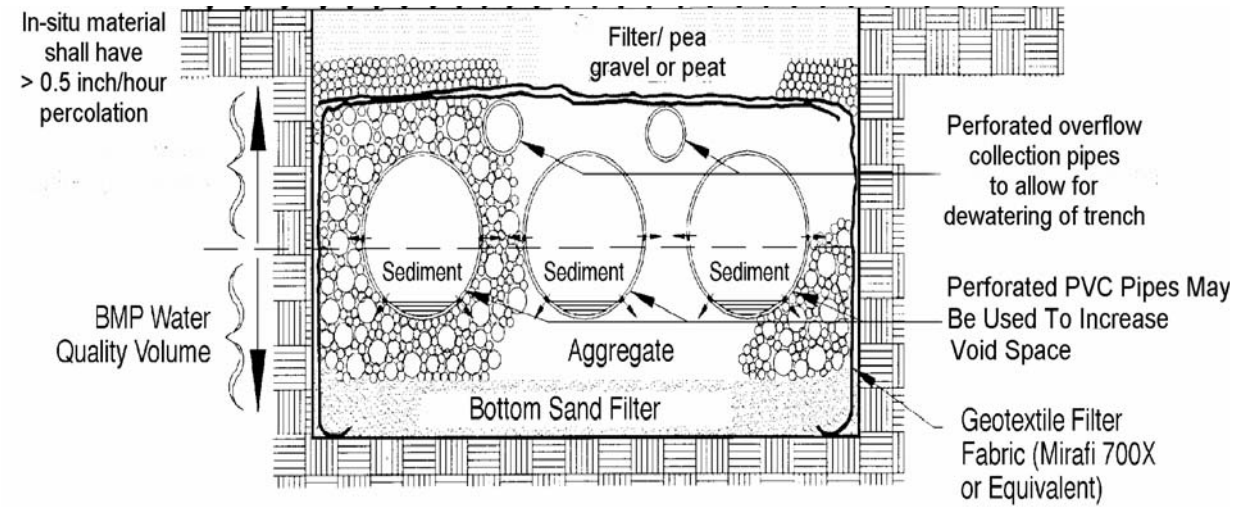

Figure 6-20: Infiltration trench cut-away view

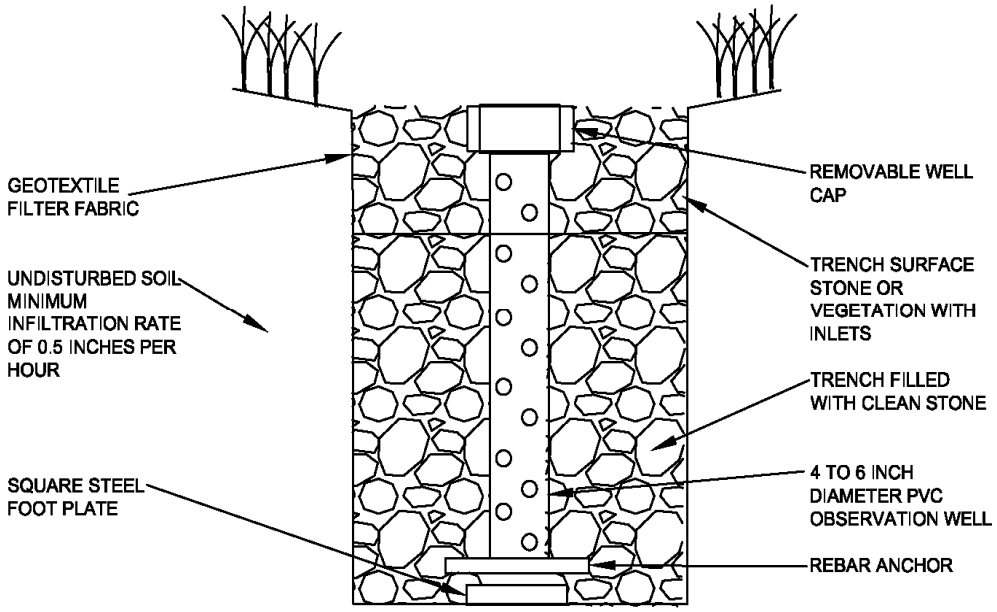

Figure 6-21: Cutaway view: Infiltration Trench with Observation Well

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