4.1-d SUBSURFACE INFILTRATION SYSTEM

Alternative Names: Sump, Drywell, Infiltration Trench, Infiltration Galleries, Leach Fields

Installation of a proprietary prefabricated infiltration system, Rainstore®.

DESCRIPTION

Subsurface infiltration systems are underground holding areas that receive and store stormwater from impervious areas such as roofs, driveways, and parking lots. Detained stormwater slowly infiltrates through the bottom and sides of the system into the surrounding sub-soil. These systems are typically filled with clean, angular gravel that is ¾ to 1½ inches in diameter, a prefabricated product, or corrugated pipe. Prefabricated systems are rigid structures that are wrapped with geotextile fabric, placed into the trench, and then backfilled with gravel. Cleanouts and observation wells are typically designed into these systems to facilitate inspection and maintenance.

Subsurface infiltration systems promote stormwater infiltration, reduce discharge of stormwater to receiving waters and drainage systems, provide pollutant removal, and help recharge groundwater.
APPLICABILITY

- Widely applicable for storage of runoff from roof tops, driveways, and parking areas. Pretreatment is required if these systems accept driveway or parking lot runoff due to high fine sediment loading.

- Typically used on sites where there are space constraints or a very high percent of impervious surface.

- Not appropriate for areas with seasonally high groundwater (e.g., SEZ) where groundwater contamination and low infiltration rates are concerns.

- Site on relatively flat terrain (less than a 5 percent slope). Subsurface infiltration systems may be sited on steeper terrain by designing flatter storage cells that step down the steeper slope.

- Avoid placing within 600 feet of a drinking water source.

- Avoid placing infiltration trenches in locations sloping towards foundations.

Advantages

- If properly installed and maintained, subsurface infiltration systems can significantly reduce or eliminate the discharge of runoff from impervious surfaces to receiving waters or drainage systems.

- Reduces the peak loading of receiving waters and storm drain systems.

- Can be designed to be located below parking and landscaping.

- Allows for the use of entire site.

Disadvantages

- May be expensive to install.

- Unless adequate pretreatment is provided, applicability is limited to sites with low pollutant loads.

- If inflowing pollutant loads are high, frequent maintenance will be necessary to maintain effectiveness.

- If subsurface infiltration systems are not designed with accessible maintenance ports they are nearly impossible to maintain without rebuilding the system.

- Incorrectly designed or poorly installed systems may be structurally unsound.

- Subsurface systems may be “out of sight, out of mind” and not receive regular maintenance. New property owners may be unaware of the existence of these systems.

DESIGN CONSIDERATIONS

- Size subsurface infiltration systems to retain at least the 20-yr/1-hr storm volume generated from the tributary impervious area.

- Where space is limited, consider use of prefabricated subsurface storage chambers instead of gravel-filled infiltration trenches to increase stormwater storage capacity. Prefabricated systems typically have between 80 and 90 percent void space compared to 40 percent void space for gravel. This greater void space allows for more storage in a smaller footprint.
- Subsurface infiltration systems which will be load bearing shall be designed by a licensed professional civil engineer or other qualified professional to ensure structural integrity.

- Subsurface installations which utilize a prefabricated product shall follow the manufacturer’s specifications for design and installation.

- Consult the NRCS Tahoe Basin Soil Survey (NRCS 2007) or the BMP Calculation Spreadsheet (found at: www.tahoebmp.org) for design guidance. The BMP Calculation Spreadsheet estimates potential depths to groundwater, restrictive layers, and soil permeability rates for every parcel in the Lake Tahoe Region.
  
  - On-site measurements of the Ksat are typically recommended over values estimated in the BMP Calculation Spreadsheet for designing an infiltration trench.
  
  - Depth to seasonal high groundwater, bedrock, or a restrictive layer shall be at least 1 foot below the bottom of the trench.

- Pretreatment of runoff for oil and grease is necessary for large parking lots, commercial sites, and industrial sites when a significant potential exists for discharge of contaminants to groundwater or surface water (e.g. spills and high concentrations of oil/grease).

- Sediment traps may be sufficient for low polluting residential and small multifamily sites.

- For soils with slower Ksat rates, consider lining the bottom of the trench with 6 inches to 1 foot of sand. This technique provides a layer of soil that may infiltrate better than the native soils during freezing conditions.

- Avoid infiltrating water adjacent to structures when the ground slopes towards the foundation. In this instance, install a subsurface drain to convey runoff to a more appropriate location for infiltration.

Subsurface Infiltration System with Pretreatment Figure

Water flows through a pretreatment system to remove pollutants prior to discharging to a subsurface infiltration system.
INSTALLATION CONSIDERATIONS

- Install subsurface infiltration systems after other pollutant sources have been stabilized to avoid clogging the trench during subsequent construction activities.

- Avoid excessive compaction of the bottom of the system during construction. Use lightweight equipment when excavating to protect the Ksat of the underlying soil. Place excavated material downslope from the infiltration system in a stable location to avoid washing material back into the trench should a runoff event occur.

- The bottom of the system shall be flat to provide uniform infiltration across the surface area of the infiltration system.

- Install inspection and clean out ports in all subsurface infiltration systems.

- Wrap the system with non-woven geotextile fabric to reduce sediment migration into the infiltration system. This should extend the effective life of infiltration system and reduce the need to rebuild a clogged system.

- If installing a gravel system, use gravel that is angular, washed, and uniformly graded to ¾ to 1½ inches in diameter. This specification will provide roughly a 30-40 percent void space for storage or runoff.

- If gravel aggregate is not washed prior to delivery, it shall be washed on site to remove dirt and fines before placement into the infiltration system. Ensure that dirt and fines washed from the gravel are contained on site and do not enter a drainage system.

- Install a containment border around the system. Within 5 feet of a structure use a noncombustible border such as larger rocks.

- Ensure the surrounding surface is stable. This will reduce the potential for erosion to occur if the capacity of the infiltration system is exceeded during a runoff event.

- Ensure that runoff from impervious areas will flow into and not bypass the system.

- Vehicles shall not park or drive on an infiltration trench. Install parking barriers next to infiltration trenches constructed near vehicles parking areas.

INSPECTION AND MAINTENANCE

- Inspect all subsurface infiltration systems at least twice annually, including at the end of the wet season to allow summer maintenance and after periods of substantial runoff. Remove and properly dispose of accumulated sediment, debris, litter from sediment traps, or other pretreatment areas.

- Remove excessive sediment and fine particles from subsurface system by introducing water into the system to re-suspend fine particles and then removing the water with a vactor system.
Commercial installation of prefabricated proprietary infiltration system with accessible cleanout ports.
### Subsurface Infiltration System Inspection and Maintenance Table

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| Inspect for signs that stormwater runoff is properly accessing the infiltration feature. It may be necessary to pour water on the impervious surface the feature is designed to capture.  
- Repair any blocked or diverted conveyances. | Before and during major storms | Water Source | Trash bag  
Shovel |
| Inspect the feature for standing water.  
- If water has not fully infiltrated after 96 hours then rehabilitate the infiltration feature (described below).  
- Contact your local vector abatement office for specific instructions on controlling mosquitoes until rehabilitation can be performed. | 96 hours after major storms | | Tools suggested per qualified individual |
| Inspect any inlets, pretreatment systems, and sediment traps for trash and debris (especially pine needles).  
- Remove trash and debris. | Monthly  
(April–Oct) | | Leaf rake  
Trash bag |
| For larger prefabricated installations, inspect all maintenance ports annually and record depths in a logbook. When accumulated material has decreased infiltration capacity by 30%, remove (e.g. vactor) accumulated material out of the infiltration facility. | Annually | Stadia rod | Vactor Truck  
(for large installations) |
| Inspect for upslope or adjacent contributing sediment sources to reduce the accumulation of sediment in the infiltration feature.  
- Stabilize contributing erosion and bare soil areas to prevent sediment entry into infiltration feature. | Spring | | Soil Amendment,  
Seeds/Plants, Irrigation,  
Mulch, Erosion Control  
Blanket, Riprap, or Coir Logs |
| Inspect for sediment and debris accumulation in the infiltration feature especially at the inlet.  
- If there is visual evidence of sediment at the top of the trench.  
- When dry, remove gravel, sieve gravel to remove sediment, clean or replace the underlying fabric, replace cleaned gravel and dispose of sediment in a TRPA approved stable on-site location or out of the Lake Tahoe Region. | Semi-annually (spring and fall) and after major storms | Shovel | Shovel  
Sieving Screen  
Trash Bag |
| Inspect site for unusual or unsafe conditions (snowplow damage, structural damage, dumping, vandalism, etc.).  
- Repair structural components as necessary. | Annually in spring | | Tools as needed |
| Inspect infiltration feature for signs of compaction caused by vehicle traffic. Compaction will compromise performance and cause the feature to fail.  
- Rehabilitate infiltration feature to its designed Ksat rate.  
- Install parking barriers to exclude vehicle entry if signs of vehicle-caused compaction exist. | Annually in fall | | Parking barrier  
Installation tools |
| Monitor ongoing effectiveness and determine whether another BMP type or additional BMPs could improve long-term effectiveness and improve benefits to costs versus the existing infiltration feature.  
- Analyze Inspection and Maintenance Log for trends and recurring issues.  
- Prepare a plan that more effectively addresses stormwater capture, reduces long term maintenance costs, and improves overall effectiveness and safety of the BMP. | Every 5 years | Qualified Inspector or Consultant | Qualified Inspector or Consultant |