

5.7 INFILTRATION FACILITIES

5.7.1. INTRODUCTION

Infiltration basins are vegetated stormwater retention facilities designed to capture runoff and allow it to infiltrate directly to the soil profile rather than discharging to receiving waters. This practice is intended to mimic the natural rainfall retention and infiltration characteristics of undeveloped watersheds. Basins are typically excavated in native soils, constructed above grade using structural walls, or created with berms. Typical designs allow for complete infiltration of the capture volume within 2 to 3 days and provide a splitter structure to route surplus inflows around the facility when full. Infiltration basins are generally suitable for treatment of drainage areas from 5 to 15 acres. A schematic of an infiltration basin is presented in Figure 5-20.

Vegetation resistant to temporary inundation should be used in the facility. Root penetration and thatch formation maintains and often enhances infiltration capacity of the basin floor. In addition, vegetation can trap stormwater constituents by growing through accumulated sediments and preventing re-suspension. Vegetation also provides nutrient uptake in the shallow root zone and a substructure for microbial residence.

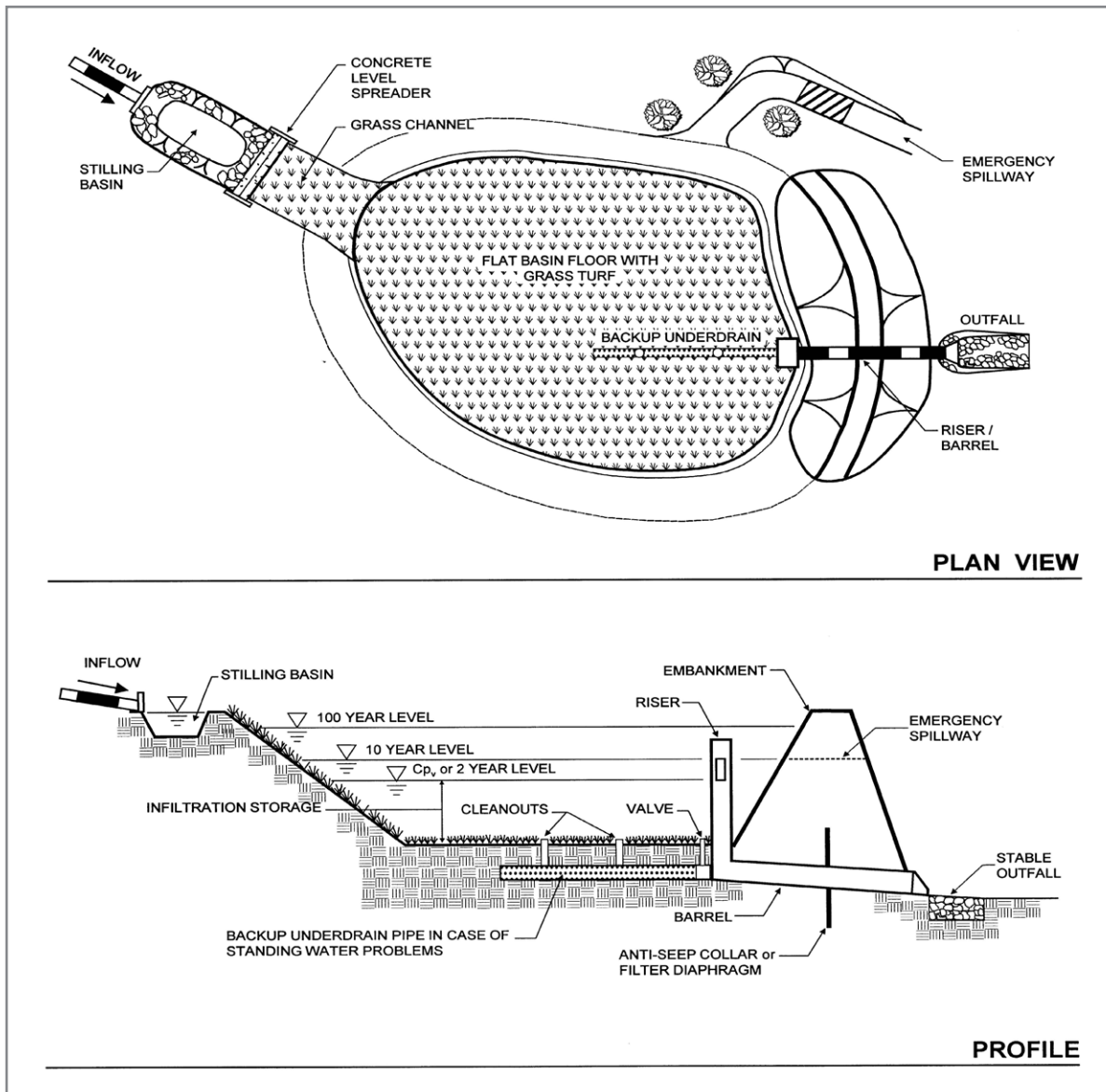


Figure 5-20: Infiltration Basin Schematic. (Photo courtesy of MDE, 2000)

ADVANTAGES

- This approach provides a 100% reduction in the volume discharged to surface waters, for frequent small storms.
- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.
- If the volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

LIMITATIONS

- Infiltration basins may not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour which is not appropriate at sites with Hydrologic Soil Types C and D.
- Infiltration basins are not suitable on fill sites or steep slopes.
- Upstream drainage area must be completely stabilized before construction.
- Once clogged, it can be difficult to restore functioning of infiltration basins.
- Basin depth to groundwater should exceed 4 feet.

5.7.2. DESIGN AND SIZING GUIDELINES

1. **Basin Sizing:** The volume of the basin should be sized to retain at least the volume of runoff from a 1.5-inch rainfall event. Maximum water depth in the basin should not exceed 2.0 feet.
2. Provide pretreatment if sediment loading is a maintenance concern for the basin.
3. Include energy dissipation in the inlet design for the basins.
4. The bottom elevation shall be at least 4 feet above the seasonally high groundwater table.
5. Obtain soil borings to determine the soil infiltration rate.

SITING

The key element in siting infiltration basins is identifying sites with appropriate soil properties, which is critical for long term performance.

- Determine soil type (consider RCS soil type A or B only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high-water table, and estimated permeability.
- Groundwater separation should be at least 4 feet from the basin invert to the measured ground water elevation. There is concern at the State and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.
- Infiltration basins should be located away from buildings, slopes and highway pavement (by a distance greater than 20 feet) and away from wells and bridge structures (by a distance greater than 100 feet).
- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.
- Dry weather flow should not be present in the tributary watershed.

Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabilized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete. Place excavated material such that it cannot be washed back into the basin if a storm occurs during construction of the facility.

Build the basin without driving heavy equipment over the infiltration surface. Any equipment driven on the surface should have extra-wide (“low pressure”) treads or tires. Prior to any construction, rope off the infiltration area to stop entrance by unwanted equipment. After final grading, till the infiltration surface deeply.

5.7.3. RECOMMENDED MAINTENANCE

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Observe drain time for the basin after completion or modification of the facility to confirm that the basin drains within 48 hours.
- Schedule annual inspections to identify potential problems such as erosion of the basin side slopes and invert, the existence of standing water, and the accumulation trash debris, and sediment.
- Remove accumulated trash and debris annually.
- Avoid reversing soil development; scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification through the use of a hand-guided rotary tiller or a disc harrow pulled by a very light tractor.