

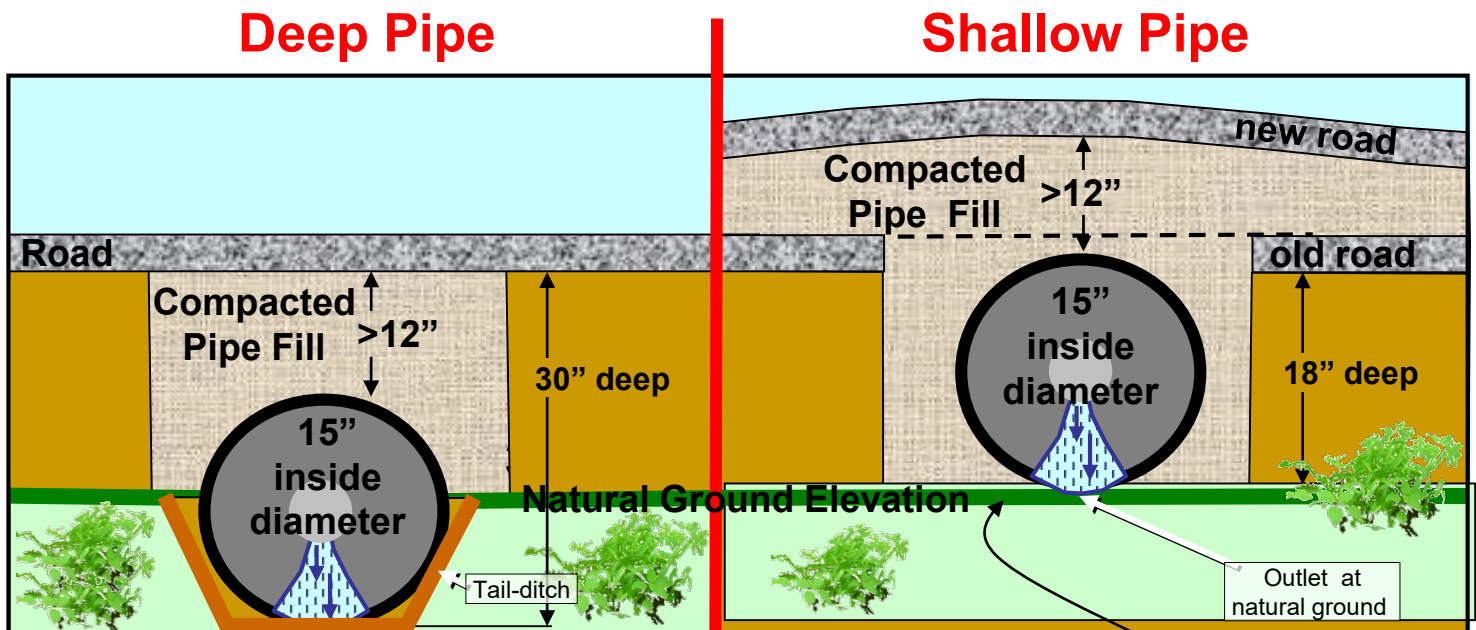
Technical Bulletin

Shallow Crosspipes

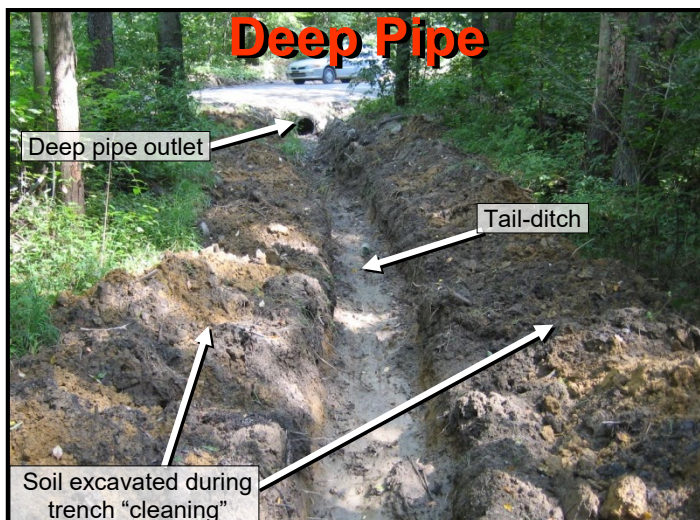
SHALLOW CROSSPIPE * -- A drainage culvert (road ditch outlet) installed to discharge at natural ground elevation, avoiding the need for an outlet trench or "tail-ditch."

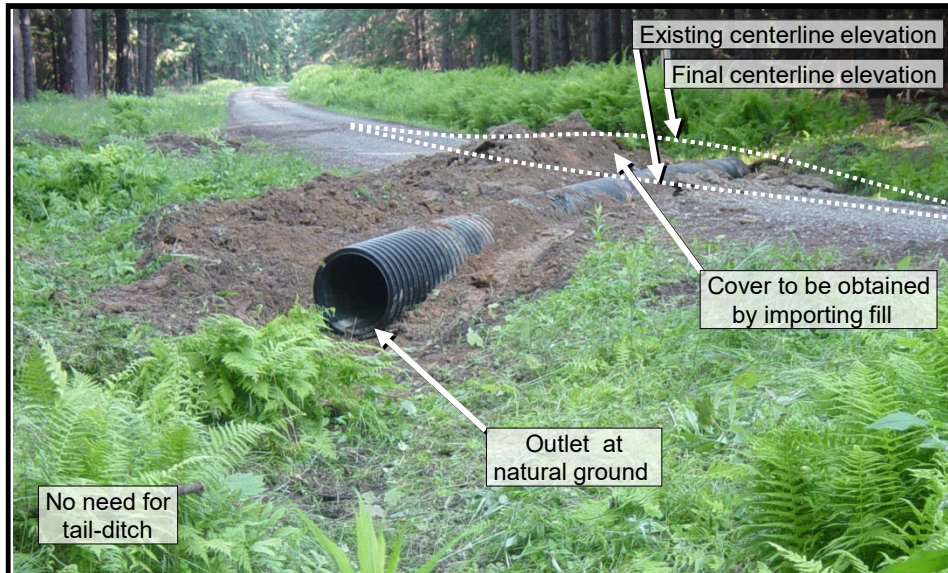
* Please also see the Center's related technical bulletin for crosspipe installation procedures.

The key to a **shallow crosspipe** is to allow the "Natural Ground Elevation" at the pipe outlet to determine the crosspipe elevation. Natural Ground Elevation simply refers to the height of the existing land at the pipe outlet. A traditional crosspipe, illustrated on the left below, uses the road surface elevation to determine the pipe installation depth. This can result in an excessively deep pipe, since the required pipe cover is often achieved by excavating deeper into the road. This method often requires an outlet trench, or "tail-ditch," which is a constant source of maintenance and erosion. By contrast, a **shallow crosspipe** is placed at an elevation where it drains to natural ground. Pipe cover is then obtained by importing fill over the pipe, not by digging deeper into the road. The best way to understand a shallow pipe is to compare it to a traditional deep pipe as shown below.



Looking at the crosspipe outlet, comparing deep and shallow pipe placements. Note the green "natural ground elevation" line. Traditional pipes dig down to obtain pipe cover. Shallow pipe placements are based off the natural ground elevation at the pipe outlet, and use fill to achieve pipe cover.





The crosspipe shown here is partially installed. Notice that the outlet of the pipe is at the elevation of the existing ground. No outlet trench or tail-ditch is required. At times, but not always, the top of the pipe may actually be ABOVE the existing road surface. The minimum of 12 inches of pipe cover will be obtained by importing material. When completed, the cover can create a grade break over the pipe.

If this pipe had been installed based off of the existing road surface elevation, the pipe would have been placed roughly 20 inches deeper into the road to achieve the necessary cover, resulting in a long and deep tail-ditch that would require on-going maintenance.

PROBLEMS ASSOCIATED WITH TRADITIONAL “DEEP PIPES”

When a pipe outlet is placed below the surface of the ground, it creates the need for continual maintenance of a “tail-ditch” to keep water flowing away from the road (illustrated in bottom left photo on page 1).

- Constant “cleaning” of tail-ditches costs money and generates large amounts of sediment.
- Unmaintained tail-ditches often clog, resulting in standing water at the outlet that can breed mosquitoes, saturate the road base, and lead to clogged pipes.
- Tail-ditches often carry drainage closer to streams and wetlands, making pollution more likely.

BENEFITS OF SHALLOW CROSSPIPES

- **Less Maintenance:** Having no tail-ditch to maintain will save time and money.
- **Less Problems:** Eliminating a tail-ditch reduces standing water to saturate road or breed mosquitoes.
- **Less Pollution:** Discharging drainage on natural ground gives maximum opportunity for infiltration.
- **Shallower inlet:** A shallow pipe often has less ditch and bank erosion at the pipe inlet.
- **Potential “grade break”:** The material imported to cover a *shallow crosspipe* can sometimes be used to create a grade break. These structures are designed to prevent water from flowing down the road by forcing it into road ditches. More info on grade breaks at www.dirtandgravelroads.org; resources: tech bulletins

INSTALLING A SHALLOW CROSSPIPE

1. **Determine proper outlet elevation:** Ideally, the bottom of the pipe outlet should rest on natural ground as pictured above.
2. **Dig pipe trench:** Pipe trench should be excavated based on outlet elevation. Ideally, pipe inlet should be placed in existing ditch line. Shoot for minimum $\frac{1}{4}$ inch per foot fall across trench (2%).
3. **Install pipe:** Separate bulletin about proper crosspipe installation available at: www.dirtandgravelroads.org; resources: tech bulletins.
4. **Cover pipe:** Shallow pipe installations typically require 30 to 60 tons of fill to obtain necessary pipe cover. Proper compaction is critical to avoid settling and pipe strain. Pipes should be covered with a minimum of 12 inches of compacted material (not including surface aggregate) before allowing traffic on the road. The fill should be tapered into the existing road elevation on either side of the pipe. The amount of fill needed and length of fill taper will depend on site conditions such as road slope and pipe depth. Transitions should be sufficiently long to accommodate expected traffic. In some cases, a grade break can be created with fill that forces water off the road and into the ditches and pipe.
5. Take care to maintain pipe cover during future grading cycles.

“Crosspipe elevation should be determined by the elevation of the existing ground at the pipe outlet, not of the elevation of the road surface”



This shallow pipe is being covered with fill. Here the fill will be approximately 18 inches above the existing road at the pipe, and taper for 50+ feet in both directions.