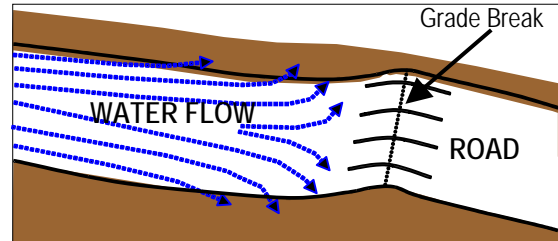


**GRADE BREAK** – A small intentional increase in road elevation on a downhill slope, which causes water to flow off of the road surface to both sides into ditches or dispersal areas.

**PURPOSES** – The main purpose of a *grade break* is to prevent erosion of road material caused by build up of water volume and velocity in the travel lanes. They also calm traffic speeds.



NO GRADE BREAK – Water flows on road causing excess erosion and aggregate loss.



GRADE BREAK – Interruption in slope redirects flow and causes water to leave road area.

## BENEFITS OF GRADE BREAKS:

- *Grade breaks* conserve road material and prevent eroded road surfaces
- *Grade breaks* reduce road maintenance expenses
- *Grade breaks* conserve aggregate by removing the water's erosive force from the road
- *Grade breaks* calm traffic by inducing lower driving speeds

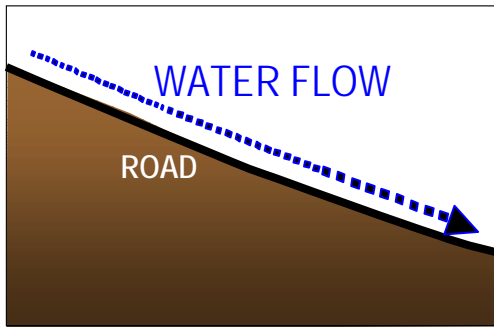
## WHERE TO USE GRADE BREAKS:

- On any sloping section of road that has evidence of water velocity damage to the surface.
- Before stream crossings to force road surface drainage into turnouts or vegetative filters.
- At intervals frequent enough to prevent a concentration of water to cause erosion of the road surface or of the discharge area. If ruts are forming on the driving surface or stones 1 inch or larger are being moved by concentrated water flow, some correction is needed.
- Prior to cross pipes to cause water to flow into the inlet side ditch. Discharge to the side ditches should not be located where it can erode cover off of the end of the pipe.

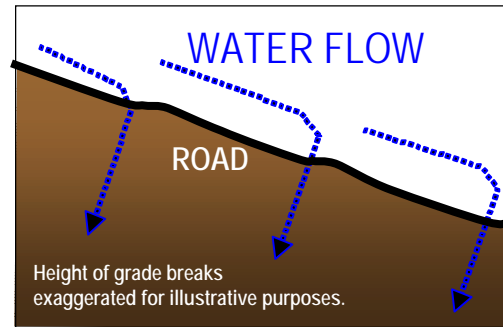
*Grade breaks* are easy to build with normal machinery. They are inexpensive, but highly effective structures to reduce and prevent erosion of dirt and gravel roads!

The publishers of this publication gratefully acknowledge the financial support of the Pennsylvania State Conservation Commission. For additional information or assistance, contact: Center for Dirt & Gravel Roads Studies, Penn State University, 207 Research Unit D, University Park, PA 16802 (Toll-Free Phone: 1-866-668-6683, Fax: 814-863-6787, Email: dirtandgravel@psu.edu). Additional copies available on our website at: [www.dirtandgravelroads.org](http://www.dirtandgravelroads.org)





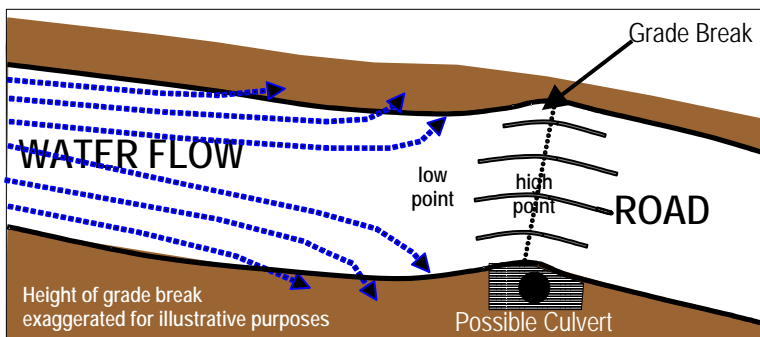
NO *GRADE BREAKS* – Water flows on road causing excess erosion and aggregate loss.



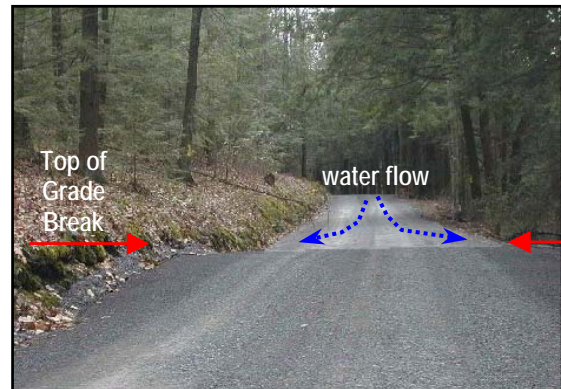
*GRADE BREAKS* – Increase in slope disrupts flow and causes water to leave road area.

### IMPORTANT CONSIDERATIONS:

- **Spacing:** On a long sloped road, multiple *grade breaks* may be used in succession to bleed water from the road and prevent the buildup of erosive volume and velocity. The degree of slope is the determining factor in *grade break* spacing. Steeper slopes require *grade breaks* to be constructed closer together because water will build volume and velocity more rapidly.
- **Equipment:** Most municipalities can make a *grade break* with their own equipment. A bulldozer is preferred, but in most cases, a grader can be used.
- **Transitions:** It is important to gradually taper the edges of a *grade break* back into the road grade. Driving through the finished *grade break* in a car at a reasonable speed is one test of this structure. If the ride is too rough or the car "bottoms-out", the structure needs to be tapered more. The iron clad test of a *grade break* is the ability to plow snow. The plow should ride into and out of the *grade break* without cutting the road surface. A good *grade break* is very subtle.
- **Maintenance:** Grader operators need to be instructed to maintain crown through a *grade break* without eliminating it. Traditional grading operations strive to eliminate surface deviations. Uninformed operators may see *grade breaks* as a source of road material for use in other areas.



Compressed illustration showing road surface water drainage patterns at grade break.



*GRADE BREAK*- Notice the contour of ditch on the left side of the road

### BROAD BASED DIPS:

A *broad based dip* is somewhat like a *grade break* except it conveys water from the uphill road ditch and road surface across the road and to a discharge area. *Broad based dips* are also effective structures in diverting water and will be the subject of a future technical bulletin.