



## **A Guide to Improving Driveways & Access Lanes**



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**Best management practices to improve your driveway and minimize long term maintenance.**

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# What is runoff?

Runoff is rain or melted snow that flows across the ground. Through the water cycle, water from precipitation will be absorbed by plants or infiltrate into the soil. However, as humans alter the earth's surface, such as by developing land with buildings, houses and impervious surfaces, we begin to need better management of excess water. You may have noticed excess water causing damage to your unpaved driveway or access lane. The most effective way to address the problem is by identifying the cause of the symptoms.



## Why does it matter?

Driveway erosion impacts your wallet and harms the environment. Stormwater runoff can create flooding, erosion, and other types of water pollution.

### Pollution

In Pennsylvania sediment is the number one pollutant in streams. Sediment can clog drainage systems and lead to severe flooding. Sediment can also destroy critical animal habitat and even clog the lungs of aquatic life. Trying to manage sediment entering streams can be like watching your money wash away.



### Erosion

Stormwater runoff can speed up the erosion process. Adding stone is frequently a band aid fix that does not properly address driveway erosion. Ongoing driveway repairs can cost a great deal of money.



## Long-Term Benefits

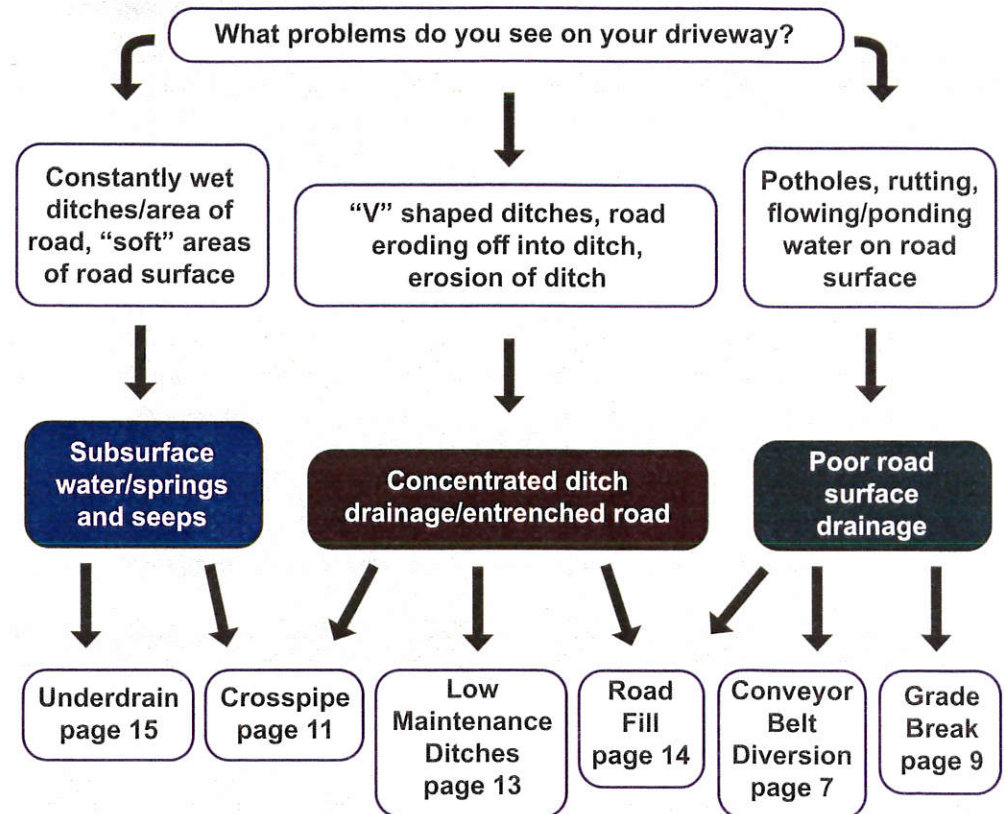
Determining the source of runoff damage on your driveway has many positive effects. Properly managing this runoff will decrease driveway maintenance costs in the long term. Changes you make can decrease future flooding as well since there will be less sediment clogging drainage pipes. Decreasing the amount of sediment pollution also has a great deal of impacts on the environment. Decreased sediment pollution also means fewer damaged aquatic habitats.



The runoff from your driveway can also create safety and liability issues. When runoff carries sediment off of your driveway and onto the public road, it can create dangerous driving conditions. This can also be an issue if this runoff freezes and creates large patches of ice on the road. In the image above, runoff from the driveway is responsible for creating a hazard on the public road. If someone were to get hurt, the homeowners would be to blame.

## Driveway Damage Flowchart

Use the flowchart below to help determine what Best Management Practice (BMP) will work for your driveway.



Don't address symptoms, address the problem by identifying the cause of the symptom.

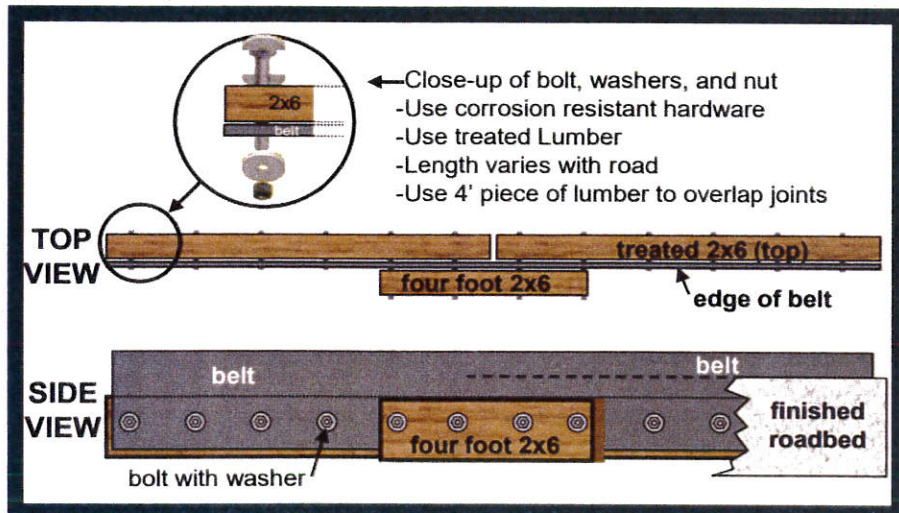
\*Note: Some municipalities have ordinances that may include restrictions or specifications for work done on your property. Be sure to check these before beginning any work.

# Conveyor Belt Diversion

A conveyor belt diversion is a structure, consisting of a wide belt attached to treated lumber and buried in the road. It reduces erosion on the road surface by diverting runoff to a designated outlet. The belt can be driven over, and works to stop water from flowing directly down the road surface. This practice is similar to grade breaks. They are low maintenance and relatively inexpensive.

## Installation Tips:

1. Install the conveyor belt diversion at a minimum 30 degree angle to the road.
2. Fall: Minimum of 3% of continuous fall toward the outlet.
3. Belt should go beyond the road surface on both sides to prevent water from flowing around the belt and back onto the road.
4. Mark conveyor belt diversions with reflective posts along the road edge to avoid damage during future maintenance or snow removal.
5. Used belts may be available at a local quarry or mine at low or no cost. Belts typically come in 26"-30" widths. Unless they contain steel, most belts can be cut with a utility knife.



# Conveyor Belt Diversion

## Benefits:

- Long-lasting
- Low maintenance
- Inexpensive and relatively simple to install

BEFORE:



AFTER:



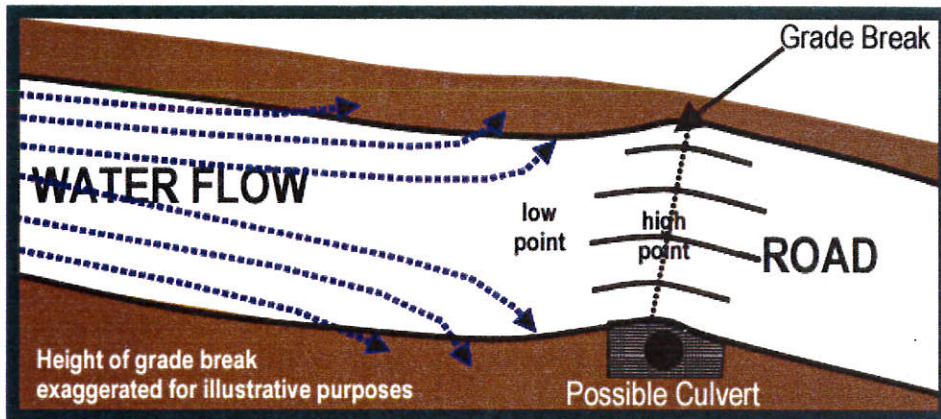
Cost Estimate: \$150-\$200 (\$1.25 per square foot)  
Used mining belts can sometimes be purchased for a reduced price, but are not always available.

# Grade Break

A grade break is a raise of road surface elevation that can help divert surface stormwater off of the driveway. Water will be redirected by the "hump" to the sides of the road, where it can drain to a designated crosspipe or swale.

## Installation Tips:

- Crosspipes and grade breaks typically go hand-in-hand when rerouting runoff away from your driveway surface.
- Be sure to taper the grade break into the road profile (it shouldn't look or function like a speed bump).
- Sloping driveways are a good fit for this feature, but a grade of more than 10% may be a bit too steep.
- A conveyor belt diversion may be a better option in this case.



# Grade Break

## Benefits:

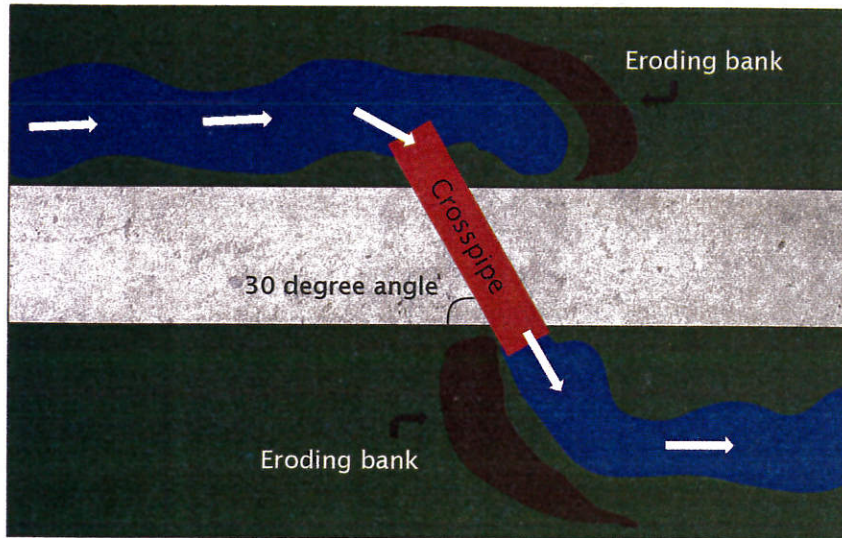
- Prevents surface aggregate and fine sediments from washing away
- Saves money on future road maintenance
- Can act as cover for crosspipes
- Relatively simple installation and low cost



**Cost Estimate: About \$1000 for 40 - 60 tons of 2A stone per grade break structure. This does not include the cost of a crosspipe.**

# Crosspipes

Installing crosspipes help to reduce erosion that occurs along roadside ditches (not stream pipes). This reduces the need for repeated ditch maintenance by breaking-up and dispersing runoff.



## Installation Tips

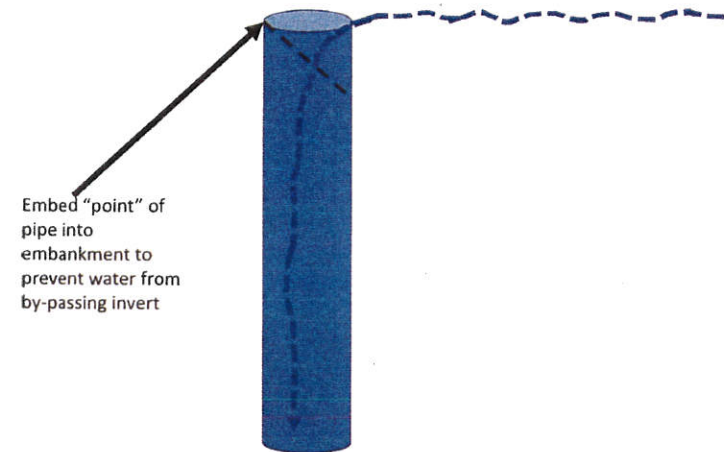
- A minimum 15 inch HDPE Corrugated Plastic Pipe should be used.
- Allow the "Natural Ground Elevation" at the pipe outlet to determine the crosspipe elevation. This will eliminate the need for trenches at pipe outlets, which require constant maintenance.
- Place pipe at an angle (at least 30 degrees) to allow water to flow more naturally into the pipe, which prevents erosion and lets the pipe clean itself of sediment/debris.
- Mitering the pipe inlet can help direct the flow of water into the pipe and prevent erosion by widening the pipe opening.

\*Drop inlets (grates like on storm sewers) are not recommended for use on unpaved driveways and access lanes.

# Crosspipes

A mitered pipe is angled where the water will be flowing in. This decreases the amount of turbulence through the pipe which helps it to handle more water.

Pipe miter, view from standing over pipe.



## Benefits:

- Reduces the amount of standing water on roadway, meaning less saturation on the surface
- Less opportunity for culvert clogging
- Reduces runoff and erosion on road surface
- Lowered potential for mosquito breeding in still water

**Cost Estimate: \$300-\$500 per 20-40 foot section of 15 inch HDPE Corrugated Plastic Pipe. Either on site road bed material (\$0 if no large stones are present) or 2A stone (\$30-\$40/ton) can be used to compact around the pipe(s).**

# Low Maintenance Ditches

Low maintenance ditches are intended to carry surface water with minimal maintenance and erosion. The best roadside ditches are vegetated, shallow swales that can carry water to a stable outlet.

Characteristics:

- A wide, parabolic shape (not "V" shaped)
- Shallow relative to the road surface (no large drop-off; can be safely maintained).
- Vegetated when possible.
- Lacks signs of excessive erosion.



**Cost Estimate:** The practice has essentially no material costs.  
Cost to rent an excavator to perform grading would vary.

# Road Fill

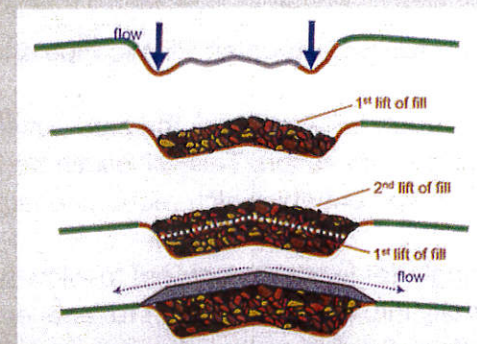
When your driveway/roadway is the lowest elevation compared to the surrounding land, water will naturally want to concentrate at the lowest point. Raising the road profile by bringing in fill makes installation of drainage practices easier. It also encourages sheet flow off of the road into the surrounding area instead of the road functioning as a stream channel.



Installation Tips:

- Clean fill such as shale or 2A modified stone should be used.
- Fill material should not have excessive amounts of clay or organic material.
- A good road base should be established to prevent future

- Enough fill should be added to restore the ability for water to follow natural drainage patterns.
- Fill should be placed in 6-8" layers and compacted in between each layer to ensure a solid road base.



**Cost Estimate:** Calculate how many tons of stone is needed for road section (see Quick Materials Calculation Sheet pg. 16).  
\$30 -\$40/ton for 2A stone (hauling and delivery).  
The practice is labor intensive, and it is highly recommended a contractor is hired to perform the work.



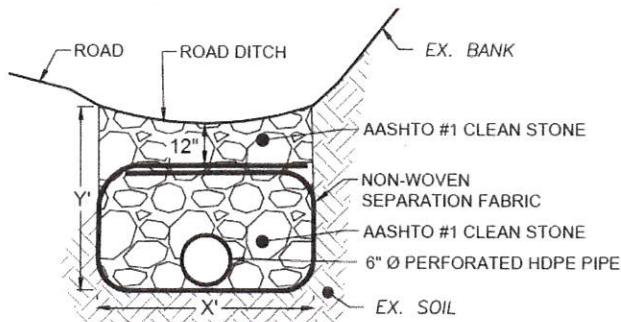
# Underdrains

A lot of road stability problems can be traced to subsurface drainage issues. An underdrain is installed to collect clean, subsurface water or spring water and carry it to a designated outlet. This keeps the water away from the road bed. These drains are very versatile, as the size and shape can be altered to match site characteristics.

Road surface drainage should not be directed into an underdrain. The sediment and debris carried in surface runoff will clog the underdrain. All underdrains should be installed with at least a 2-3% slope. If you choose to use woven separation fabric, be sure that it is single layered to avoid clogging of debris.

## Where to Use Underdrains:

- Where springs or seeps surface in the road or in the road ditch.
- Where road shoulders are wet, soft and rutting.
- Where road ditches have standing water or active flow due to springs and seeps.
- Where the cut bank is unstable and frequently fails due to bank springs or a saturated toe.
- Where subsurface water is suspected of causing stability problems in the road.



CROSS-SECTION VIEW

**Cost Estimate: \$50 - \$100 20 foot section of 4 - 6 inch perforated pipe - schedule 35 minimum, double wall (not rolled). Approx. 3 cubic yard of AASHTO #1 Clean Stone will be needed per 20 ft. of pipe = \$150. Separation fabric is not required but if chosen, must be woven.**

# Quick Material Calculations

Calculating amount of stone needed for raising the road profile:

$$\begin{aligned} \text{Length (ft.)} \times \text{Width (ft.)} \times \text{Height (ft.)} &= \text{Cubic Feet} \\ \text{Cubic feet} / 27 &= \text{Cubic Yards} \\ \text{Cubic Yards} \times 1.4 &= \text{Tons} \end{aligned}$$

Example: You have a section of driveway that you would like to fill that is 100 ft. in length x 15 ft. wide and you want to raise the road by 2 feet.

$$100 \text{ ft.} \times 15 \text{ ft.} \times 2 \text{ ft.} = 3,000 \text{ cubic feet}$$

To convert cubic feet to cubic yards, divide by 27 = 111.11 cubic yards

To convert cubic yards to tons, multiply  
 $111.11 \times 1.4 = 155.56 \text{ tons}$

For stone to be delivered, it will come on Triaxle trucks which haul approx. 20 tons per truck load.

Note: Quarries will only load full loads of approx. 20 tons.

Cost of hauling and delivery of stone is approx. \$30- \$40 per ton. (Note: stone cost and hauling costs are estimated).

$$155.56 \text{ tons} \times \$30 \text{ per ton} = \$4,666.80$$

# Resources

Thank you to Penn State Center for Dirt and Gravel Roads Studies, a great resource for gathering technical information in this booklet!



For more information from Penn State Center for Dirt and Gravel Roads on Best Management Practices for your driveway, visit the Center for Dirt and Gravel Road Studies website Technical Bulletins page.[dirtandgravel.psu.edu](http://dirtandgravel.psu.edu)

## Other great resources:

Westmoreland Conservation District website  
[westmorelandconservation.org](http://westmorelandconservation.org)

Main menu - Education > BMP Portfolio

Main menu - Programs > Dirt Gravel + Low Volume Roads

A supplemental video is available on the Westmoreland Conservation District's YouTube Channel.

Used mining belts for conveyor belt diversions can be purchased at Eastern Machine & Conveyors Inc. when available. Price can vary but averages at about \$20 for a 10 - 12' section

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