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### Parking Lot Discharge Study

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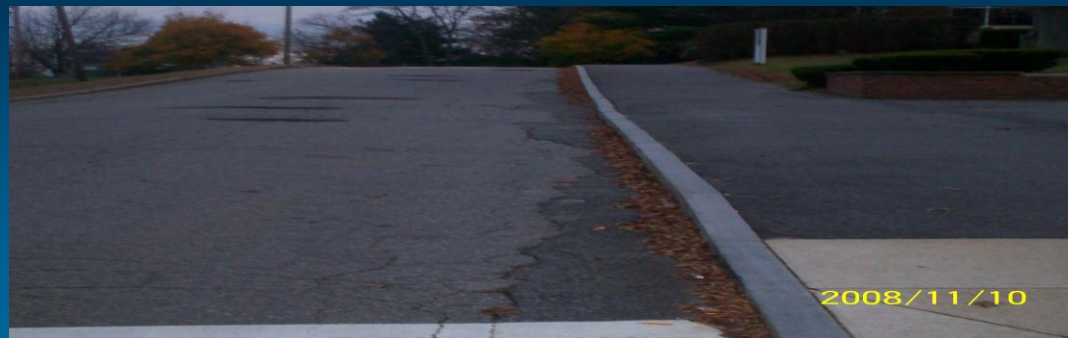
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# Porous Asphalt Pavement

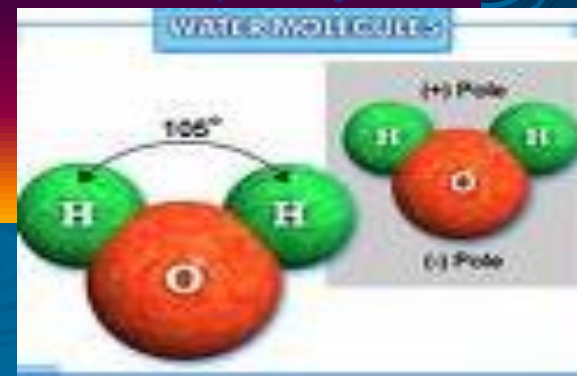
For the East Middle School  
Parking Lot





# Chemistry of Water

- Water is made up of atoms.
- Two hydrogen atoms bonded with an oxygen atom makes up a water molecule( $\text{H}_2\text{O}$ ).
- A molecule that has electrically charged areas is called a polar molecule. A substance that contains polar molecules is called a polar substance.
- The positive hydrogen ends of one water molecule attract the negative oxygen of nearby water molecules. As result, water molecules tend to stick together.
- The combined force of attraction among water molecules and with the molecules of surrounding materials is called capillary action.



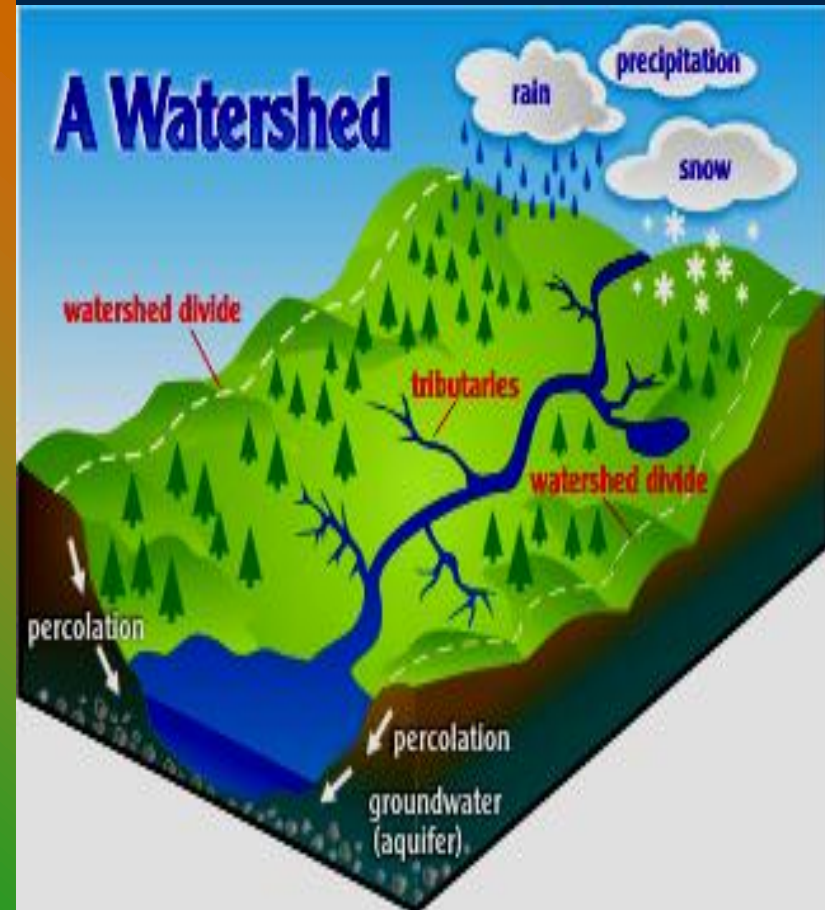
# Solution

- A solution is a mixture that dissolves in liquid easily.
- One reason that water is able to dissolve many substances is that it is polar.
- The charged ends of the water molecule attracts the molecules of other polar substances.
- Sugar is a familiar polar substance.
- As those sugar molecules dissolve other sugar molecules are exposed to the water.
- A non-polar molecule does not dissolve easily.



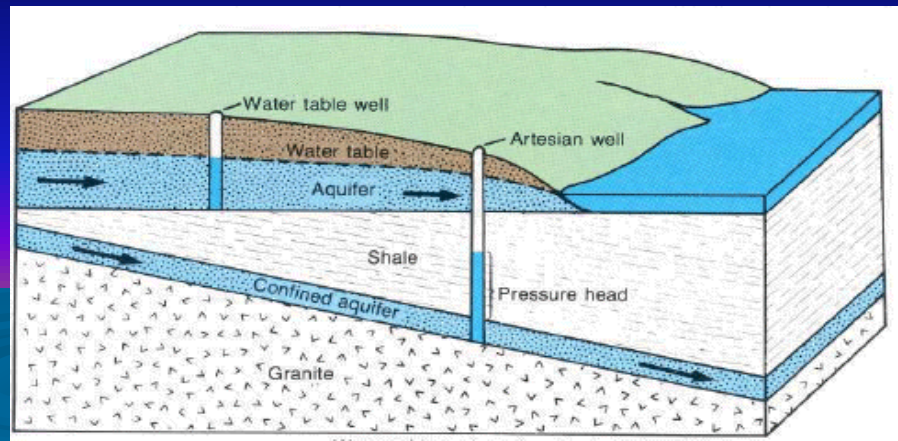
# Watersheds

- The land area that supplies water to a river system is called a watershed.
- Watersheds are also called drainage basins.
- All the water in a river system drain into the main river.
- A river can flow into another larger river.
- When rivers join another river system, areas they drain become part of a larger watershed.
- Some watersheds are very small.
- You can identify a river's watershed on a map by drawing an imaginary line around a region drained by all tributaries.
- The watershed of a stream that flows down a hill into a river, is just that hillside - maybe a square kilometer or two.



# Aquifers

- A underground layer of rock or sediment that holds water is called an aquifer.
- They can range in size.
- It provides water and crops for some people.
- The water is actually moving and seeps through the layers of the earth, but takes a long time to come back to the surface.
- It moves about 10m a year.
- The more permeable the rock and the more slopes there are, the slower the water runs and absorbs most of the water.

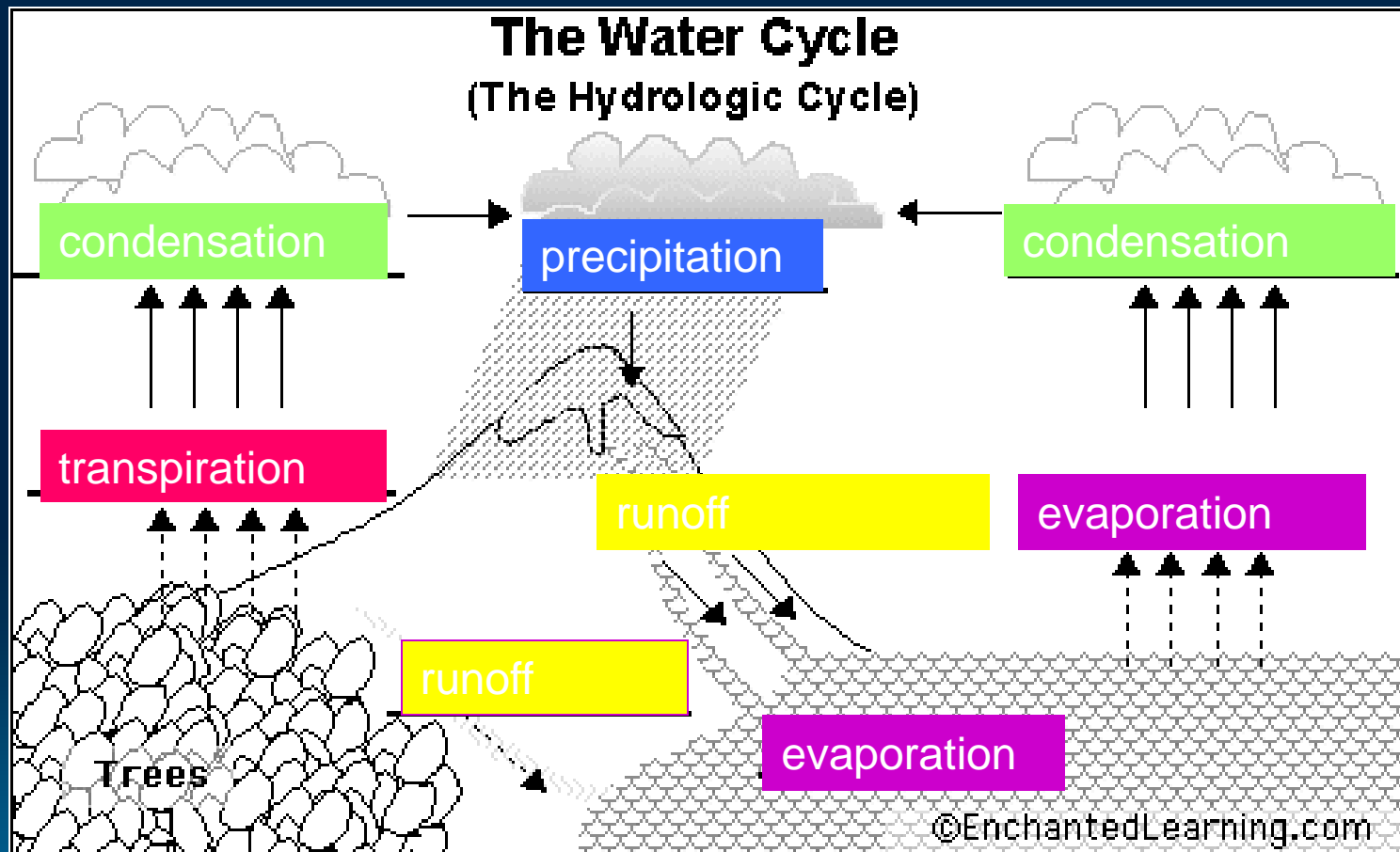


# Runoff

- Water runoff is a problem.
- It is a problem because when you have a slope and it rains all the water flows downward.
- All of the toxic and filthy material such as gas, mud, dirt, rocks, and more materials move with water.
- Then the water takes it down to an area or into the sewers that then lead to a body of water.
- All of that material gets put into the body of water and organisms living in it can get harmed.
- Also it will cause more pollution.



# The Water Cycle





# How do weather conditions affect asphalt

- When temperatures changes, it stresses the material in asphalt.
- In cold weather, precipitation can build up on the driveway, causing water to seep into the semi-porous surfaces.
- When water freezes it expands and then cracks form.
- After more water seeps through the cracks, the situation gets worse.
- Also, the buildup of car oil and the chemicals used to melt snow and ice during the winter can help break down the asphalt surface even more.



# What Porous Asphalt Is Made Of

4 inches thickness of porous Asphalt

4 inches thickness of  $\frac{3}{4}$  inch  
crushed stone

8-12 inches thickness of open graded reservoir  
subbase

4 inches thickness of  $\frac{3}{4}$  inch > crushed stone for  
frost protection

Soil permeability >0.5 in/hr

# Advantages

- Recharges groundwater so that it goes into an underlying aquifer.
- We will not have to use as much on piping, catch-basins, retention ponds, curbing, etc.
- Maintains recharge and capacity when frozen.
- Less salt or sand used to melt the ice on the lot.
- Pavement is meant to last about 20 years and *still* be in good condition!
- We will not be polluting as much water, rivers, lakes and streams.
- We will not have to repave the parking lot as much therefore, saving the school/school system a **lot** of money that will be able to go to the school.

# Disadvantages

- You may only use a Vac-Assisted dry sweeper.
- May need the proper construction stabilization and erosion to prevent clogging.
- Need the right quality of materials for success.
- You may not use accidental seal coating or similar surface treatment will result in a failure to this project.

# Cost

- The cost should be about 20-25% higher than regular dense mix asphalt but it will pay off later in the process
- You won't have to pay for salt or sand.
- You won't slip as much on ice.
- You won't have to pay for repairs.
- Or piping underneath for the runoff water etc.
- With dense mix asphalt the cost for the parking lot would be roughly \$102,000.00.
- With porous asphalt the cost of the parking lot would be roughly \$123,000.00 .
- The parking lot is about 25,434.84 feet squared .
- The total volume of the runoff of the pavement is 305,218.08 cubic inches.

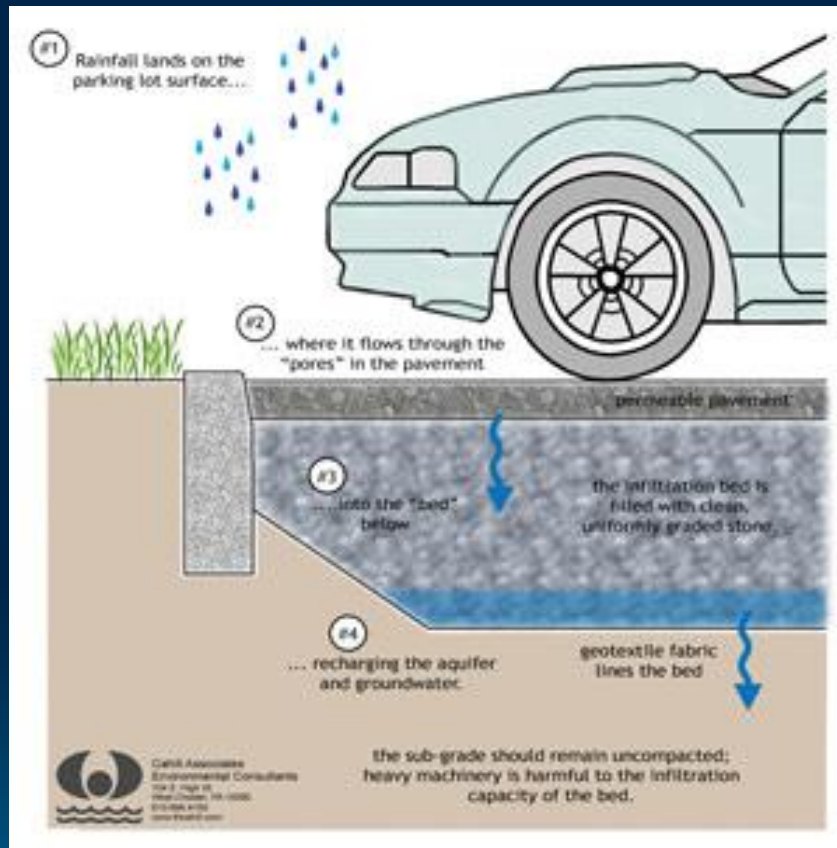




# Layers

- For the porous asphalt you need the correct amount of layers of the correct materials for the water to go through the pavement.
- You will have five layers of different materials.
- The bottom layer would be 0.5 inch/hours of soil permeability.
- The next layer will be four inches thickness of  $\frac{3}{4}$  inches crushed stone for frost protection.
- The next layer in the middle is 8-10 inch thickness of open-graded reservoir sub base.
- Then another layer of four inch (thickness) of  $\frac{3}{4}$  crushed stone.
- Then finally four inches of porous asphalt.

# Steps



- 1) Rainfall lands on the parking lot surface.
- 2) Where it flows through the "pores" in the pavement.
- 3) Into the "bed" below.
- 4) Recharging the aquifer and the groundwater.

# Monataquít Ríver





# River Pictures



# Porous Asphalt Pavement





# Regular Dense Mix Asphalt



# Demonstration

Click on the drop of water to see an example video of porous asphalt pavement. Watch as the water disappears into the ground.



Thanks for  
watching!

