City of St. Johns, Michigan
Wellhead Protection Program

A Wellhead Protection Program is a preventative program to insure the purity of groundwater by determining the area that City wells draw water from, conducting a risk assessment of that area and taking preventative measures to guard against pollution of the underlying groundwater.

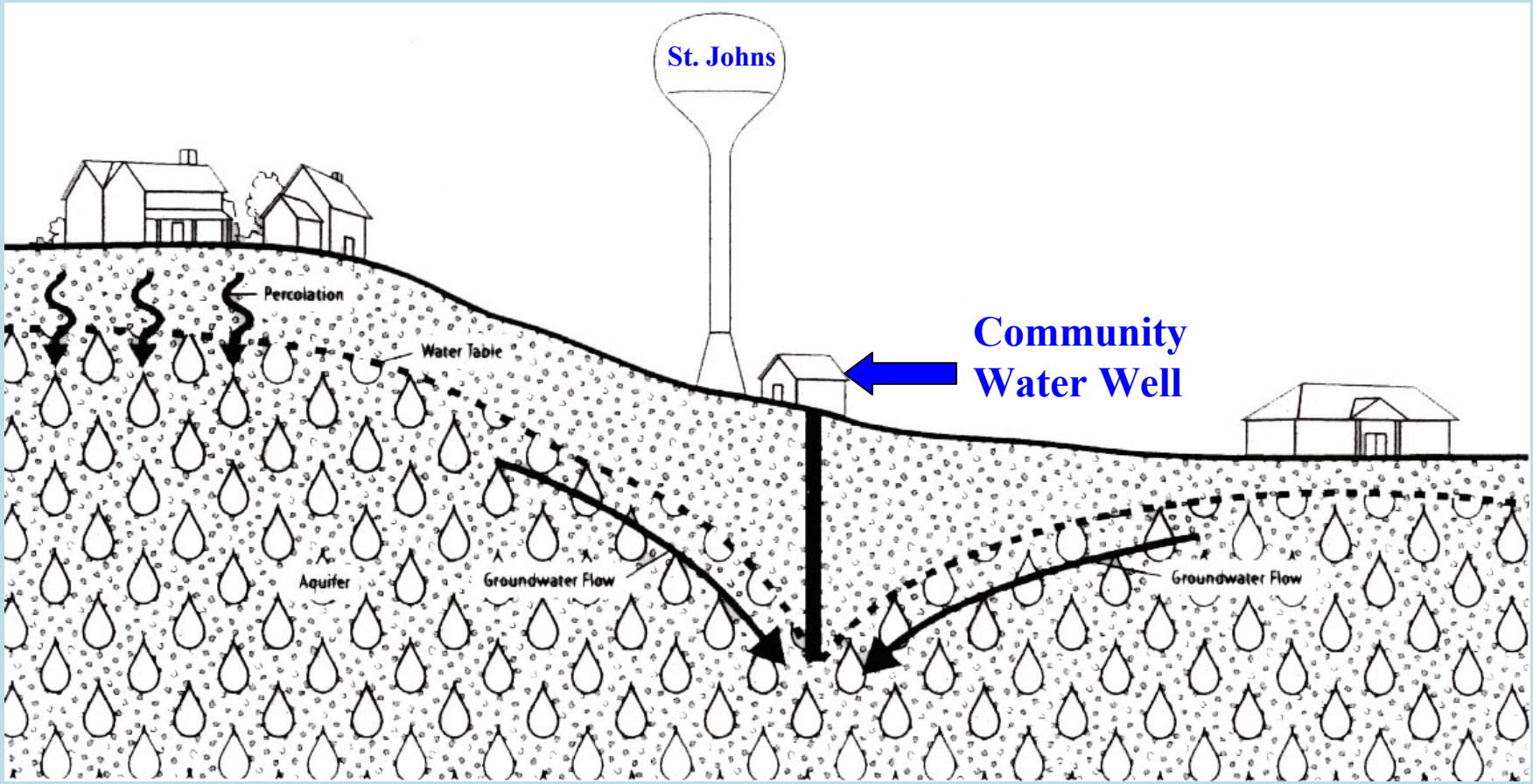
In order to understand what wellhead protection is all about, one must be familiar with much broader concepts, such as the hydrologic (water) cycle, what groundwater is, an how we tap into this resource.

Please click through this presentation and if you have any questions, please contact the City of St. Johns Water Department at (989) 224-8944.

Wellhead Protection Program

- **Why is Wellhead Protection Important?**
  - **Ground water protection cannot be achieved by relying solely on soil's natural filtration capacity or on the confining layers above our deep aquifers. Rather, efforts to safeguard public health are strengthened by the thorough contaminant source inventory that wellhead protection programs require.**
  - **Unfortunately, contaminated groundwater is difficult and expensive to clean up. Solutions can be found after groundwater has been contaminated but this isn't always easy. The best thing to do is adopt pollution prevention and conservation practices in order to protect important groundwater supplies from being contaminated in the first place. It is always better to protect what we have now than to try and clean it up later.**
  - **The reasons for a Wellhead Protection program's approach to protecting the quality of our public drinking water supplies are obvious economically and legally, but its benefits for human health and welfare are immeasurable.**

Groundwater Flow Diagram



The Water Cycle

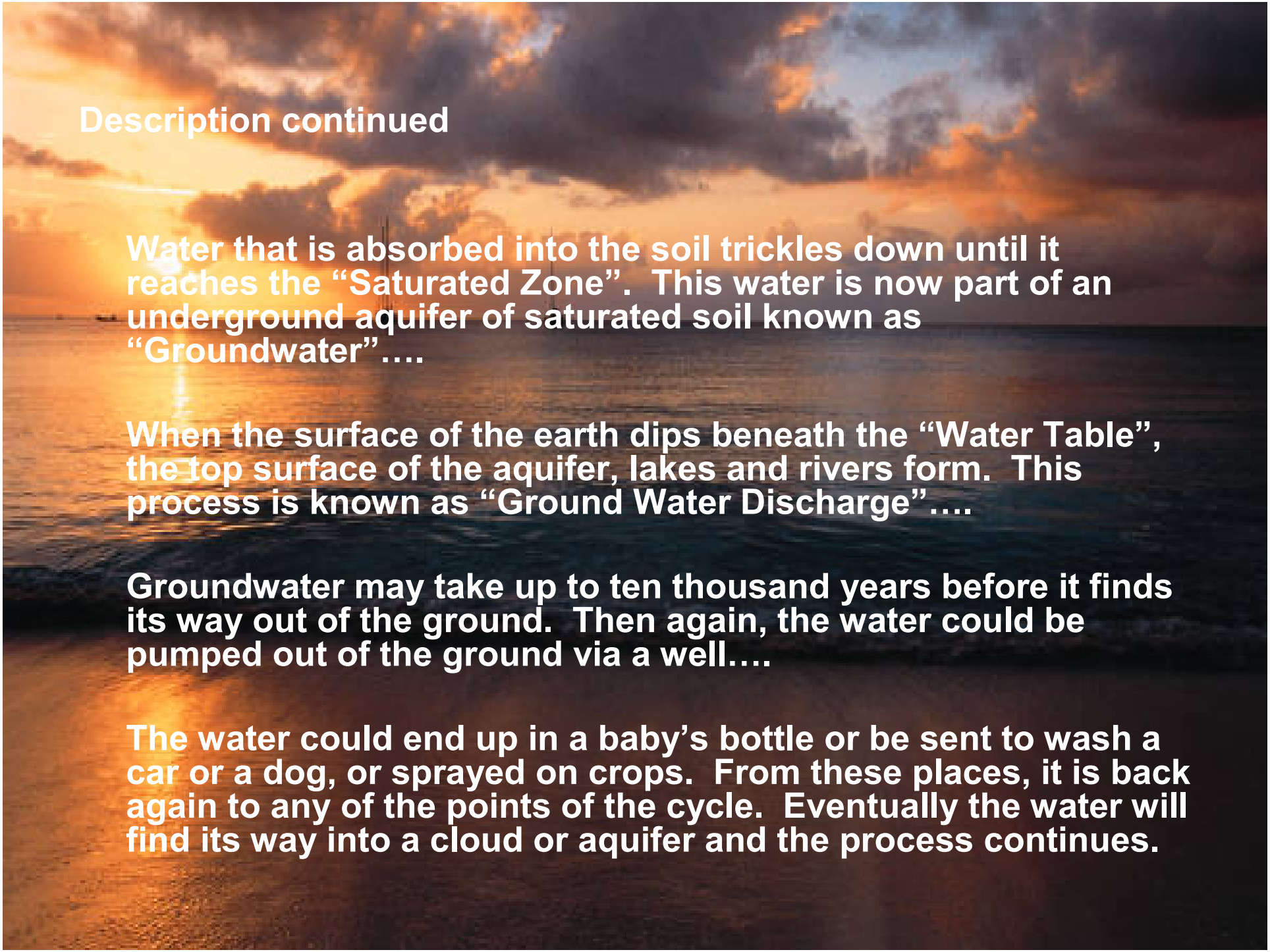
- Description

From the time the earth was formed, water has been endlessly circulating. This circulation is known as hydrologic (Water) cycle….

The sun shines on surface water and warms the water. This turns the water into vapor. The water vapor rises from the surface and goes into the air, where it becomes a cloud….

As the cloud rises, it cools and its ability to hold water is weakened. The tiny droplets combine to form larger droplets until the cloud is no longer able to hold them. It rains…..

Water falls to the earth and seeps into the soil. If the soil is saturated, impenetrable, or the volume of water is more than can be readily absorbed, it runs along the surface (where it pins a stream and eventually makes its way back to a lake or ocean)….



Description continued

Water that is absorbed into the soil trickles down until it reaches the “Saturated Zone”. This water is now part of an underground aquifer of saturated soil known as “Groundwater”….

When the surface of the earth dips beneath the “Water Table”, the top surface of the aquifer, lakes and rivers form. This process is known as “Ground Water Discharge”….

Groundwater may take up to ten thousand years before it finds its way out of the ground. Then again, the water could be pumped out of the ground via a well….

The water could end up in a baby’s bottle or be sent to wash a car or a dog, or sprayed on crops. From these places, it is back again to any of the points of the cycle. Eventually the water will find its way into a cloud or aquifer and the process continues.

What is Groundwater?

- There are two types of water below the surface: Soil moisture, in the unsaturated zone, and Groundwater.
- Soil moisture, in the unsaturated zone, contains both air and films of water in the spaces between soil particles. This is the water used by plant roots.
- Groundwater is subsurface water that completely fills (saturates) the pore spaces of soil or rock formations below the water table, which is the upper surface of the saturated zone.

- Groundwater is in constant motion. Like surface water, groundwater flows downhill by the force of gravity. Groundwater also flows from areas of higher pressure to areas of lower pressure.
- Groundwater flows at different rates through different soil types. For example, sandy soils contain larger pore spaces than clay soils, but do not contain as much total pore space as clay soils.
- Because of this, groundwater moves more quickly through sandy soils. Clay soils have a higher porosity, and tend to hold water. Groundwater moves much more slowly through clay soils.
- In Michigan, groundwater may move as much as 3-4 feet per day (in sandy soils) to as little as a couple of inches per day (in clay material).

Groundwater Contamination

- Water can be contaminated by many sources, including materials we depend on in everyday life. These materials come from….
  - ❖Household products, such as solvents and cleansers
  - ❖Automotive products, such as gas, oil and antifreeze
  - ❖Septic systems
  - ❖Fertilizers and pesticides
  - ❖Landfills and lagoons
  - ❖Leaking underground storage tanks

Sources of Groundwater Contamination

- "Point Source" Pollution
  - This occurs when pollutants are dumped directly into surface water. For example:
    - An industry dumping wastes directly into a river
    - A person dumping motor oil or trash into a stream

  This type of pollution has been strictly regulated by federal and state laws since the early 1970s.

Sources of Groundwater Contamination

- "Non-Point-Source (NPS)" Pollution
  - NPS comes from a combination of sources, rather than a specific point. Causes of NPS include:
    - Leaching (from landfills, fertilizer or pesticide use)
    - Leaking (from cracked underground oil or gas tanks)
    - Runoff (from polluted rain or melting snow that contains salts used to remove ice)
    - Erosion (from construction, farming and other sources)

Wellhead Protection Program

- Links
  - Tips on protecting groundwater
    www.groundwater.org/GWbasics/topten.html
  - Thorough delineation of groundwater and groundwater protection
    www.epa.gov/safewater/protect/swbasics.html
  - Michigan's Drinking Water tutorial from MSU
    www.gem.msu.edu/gw/tutorial/whatis.html
  - Wellhead Protection case studies in Michigan
    www.gem.msu.edu/casestd/casestd.html