

## CONTAMINANTS

- It is important to understand the processes that move pollutants to less hazardous locations or change the nature of the pollutant to a less harmful form because these processes are the tools of environmental protection
- This is often a task that requires an understanding of how pollutants are effected by environmental conditions
- Contaminants in the environment are driven to change by
  - o Physical forces which can move contaminants to new locations often without significant change in their chemical properties
    - Contaminants released into soil and water can move into regions far from their origin under the forces of wind, gravity and water flow
    - Many dissolved contaminants can adsorb onto solid surfaces, such as soils where they may become immobilized
    - Water flow can erode contaminated soils and transport sediments carrying sorbed pollutants over long distances
  - o Biological activity where microbes have the ability to break down many kinds of contaminant molecules

## FATES OF CONTAMINANTS

- There are numerous fates of contaminants in the water and soil environment
  - o They may remain unchanged in their present location
  - o All or a portion might be carried elsewhere by transport processes
    - Movement into other phases, such as the air, soil and water
    - Movement within one of these phases
  - o All or a portion might be transformed into other chemical species by natural chemical and biological processes
    - Biodegradation
      - Where pollutants are altered by biological processes from microbes in aquatic and soil environments
    - Bioaccumulation
      - Where pollutants accumulate in plant and animal tissues to higher concentrations than their original environmental locations
- Water is always a potential conveyor of contaminants, whereas soil can be either an obstacle to contaminant movement or a contaminant transporter
- Soils tend to slow the passage of groundwater and provides solid surfaces to which contaminants can sorb, delay or stop their movement in the environment
- However, soils can also be transported from one location to another, by wind and water flow, transporting the contaminant that it carries

## NAPL

- One of the more common threats to surface and groundwater is contamination by chemicals and fuels either thru accidental releases into the environment or by leakage from underground storage tanks
- These chemicals and fuels are commonly referred to as NAPL (Nonaqueous Phase Liquids) meaning that they are liquid contaminants that do not dissolve in or easily mix with water.
- Common examples of NAPLs include oil, gasoline and other petroleum products
- Because of their lower solubility, NAPLs in contact with environmental waters dissolve slowly and act as a long-term source of water contamination
- Depending on the nature of the NAPL, once these contaminants travel downward through soils and enter a groundwater system they may either float above the water table or can sink through the water to impermeable soil structures such as bedrock where they collect in bottom pools.
- Because of their high toxicity, even small amounts of these substances can contaminate very large volumes of soil and groundwater
- If a contaminant spill is small, most of the pollutant may be tied up in the soils above the water table.
- Remediation techniques may include physically removing the contaminated soil or by allowing for bioremediation from microorganisms
- However if the spill is large enough or the groundwater table is shallow, the mobile NAPLs may contact groundwater where excessive pumping of groundwater may be the best way to solve the contamination issue