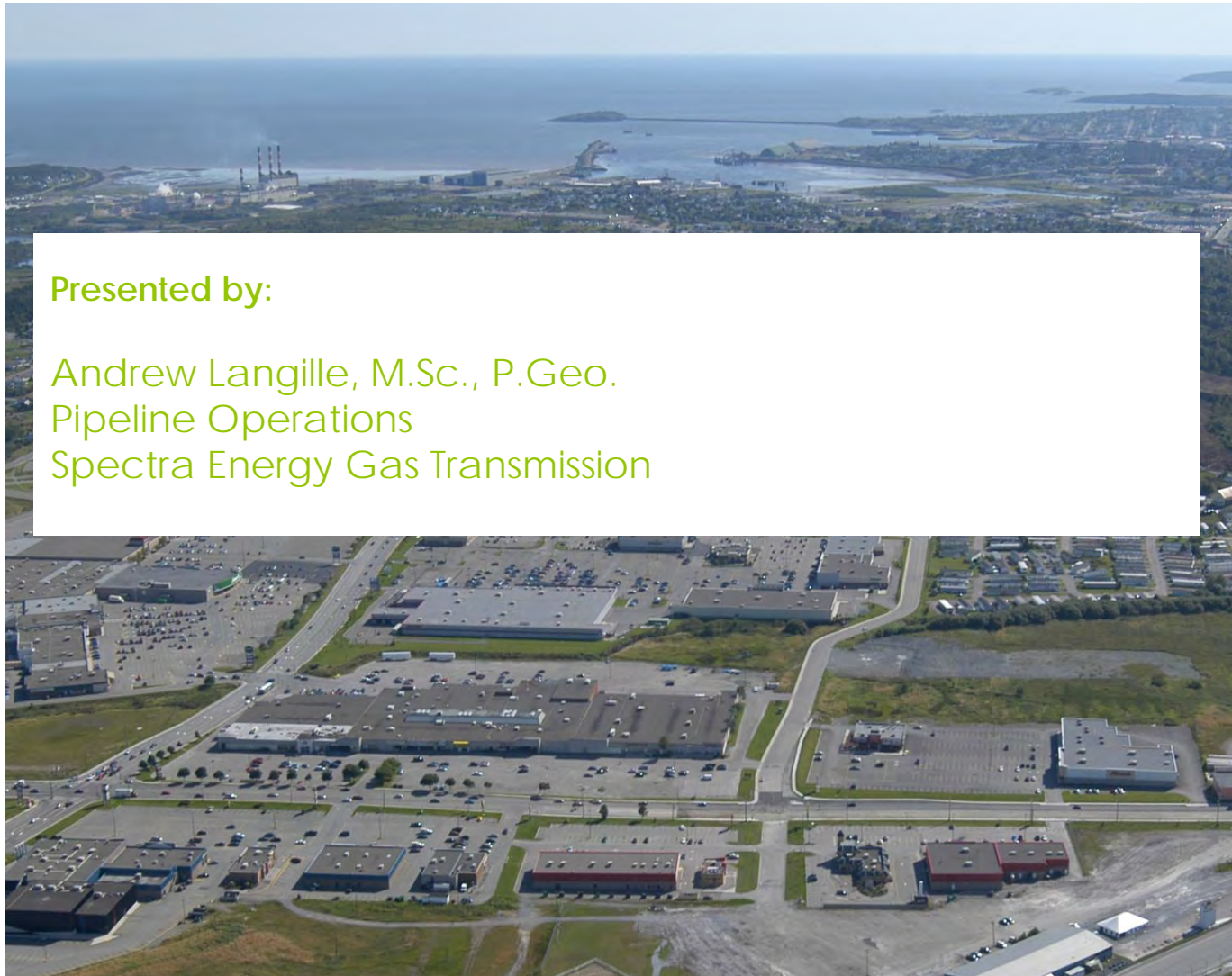


ENVIRONMENTAL CONTAMINATION IN REAL ESTATE

Note: Some slide materials borrowed from IRWA
course 603C

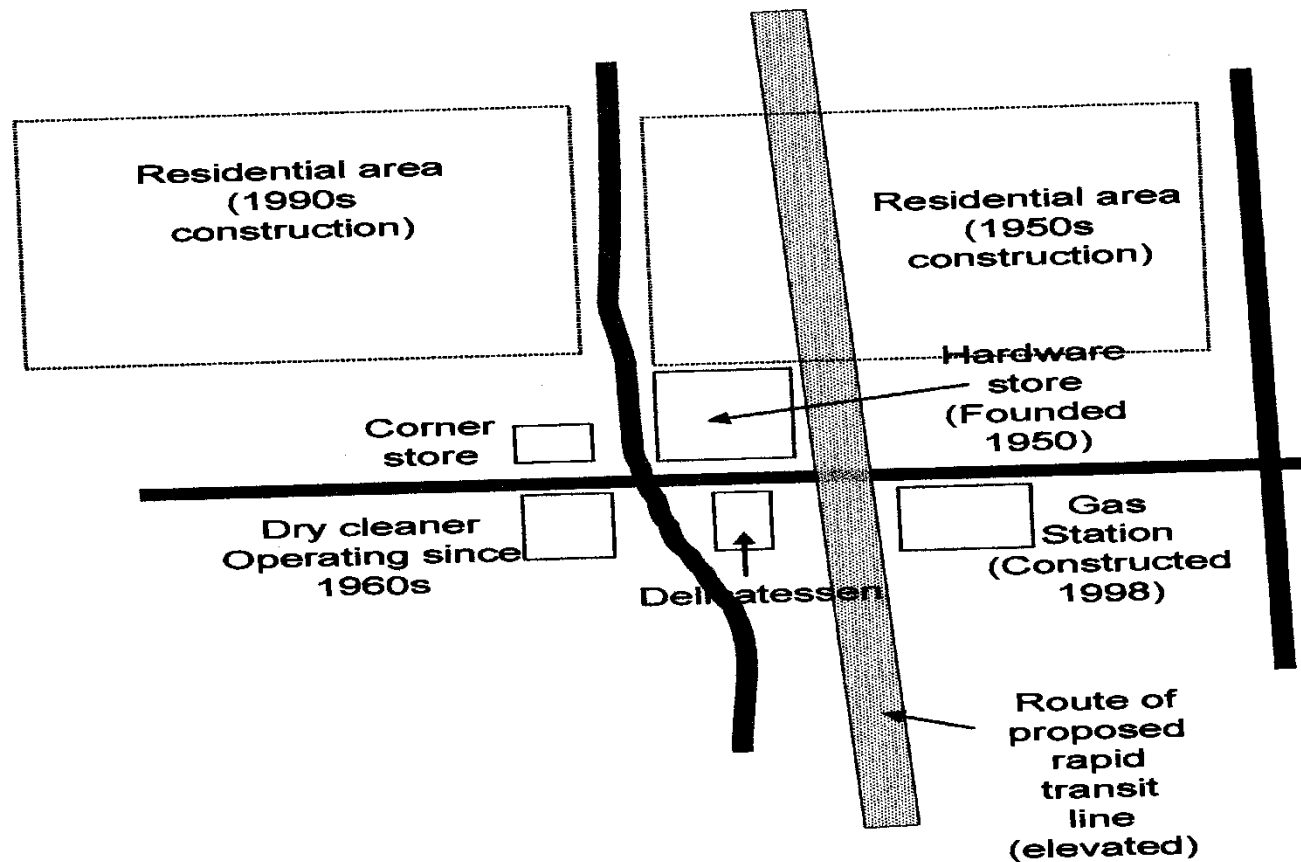


Definitions

Hazardous substances are any materials that pose a threat to human health and/or the environment.

A contaminated or hazardous waste site is a site at which hazardous substances occur in concentrations above background levels and where assessment indicates the site poses, or is likely to pose, an immediate or long-term hazard to human health or the environment.

What could be issues here?



Point Source Contamination

Point Source

... a release from a small, specific and usually identifiable area

- leaking storage tanks
- leaking buried pipes/transfer lines
- leaking lagoons
- landfill leachate seeps, leaking buried drums
- spills

Point Source Contamination



Non-Point Source Contamination

Non-Point Source

... a release over a wide area

- fertilizer applications
- infiltration of ditch water
- sewage sludge applications
- particulate fallout

Hazardous or Designated Substances

- Asbestos-containing material (ACM)
- Polychlorinated biphenyls (PCBs)
- Lead-based paints
- Mercury-containing equipment
- Urea formaldehyde foam insulation (UFFI)
- radioactive sources/radon gas

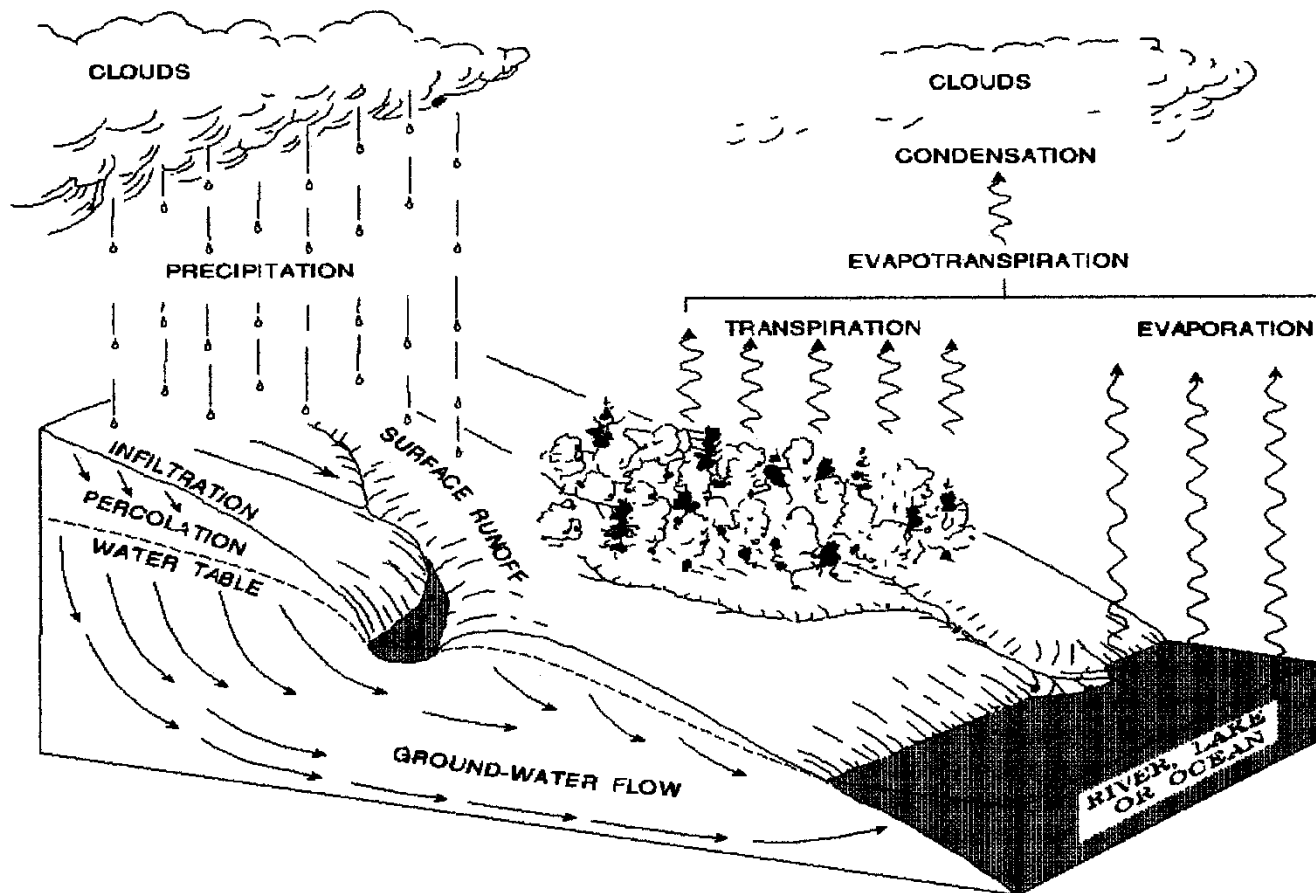
Definitions

Geology is the science that deals with the Earth, especially as recorded in rocks.

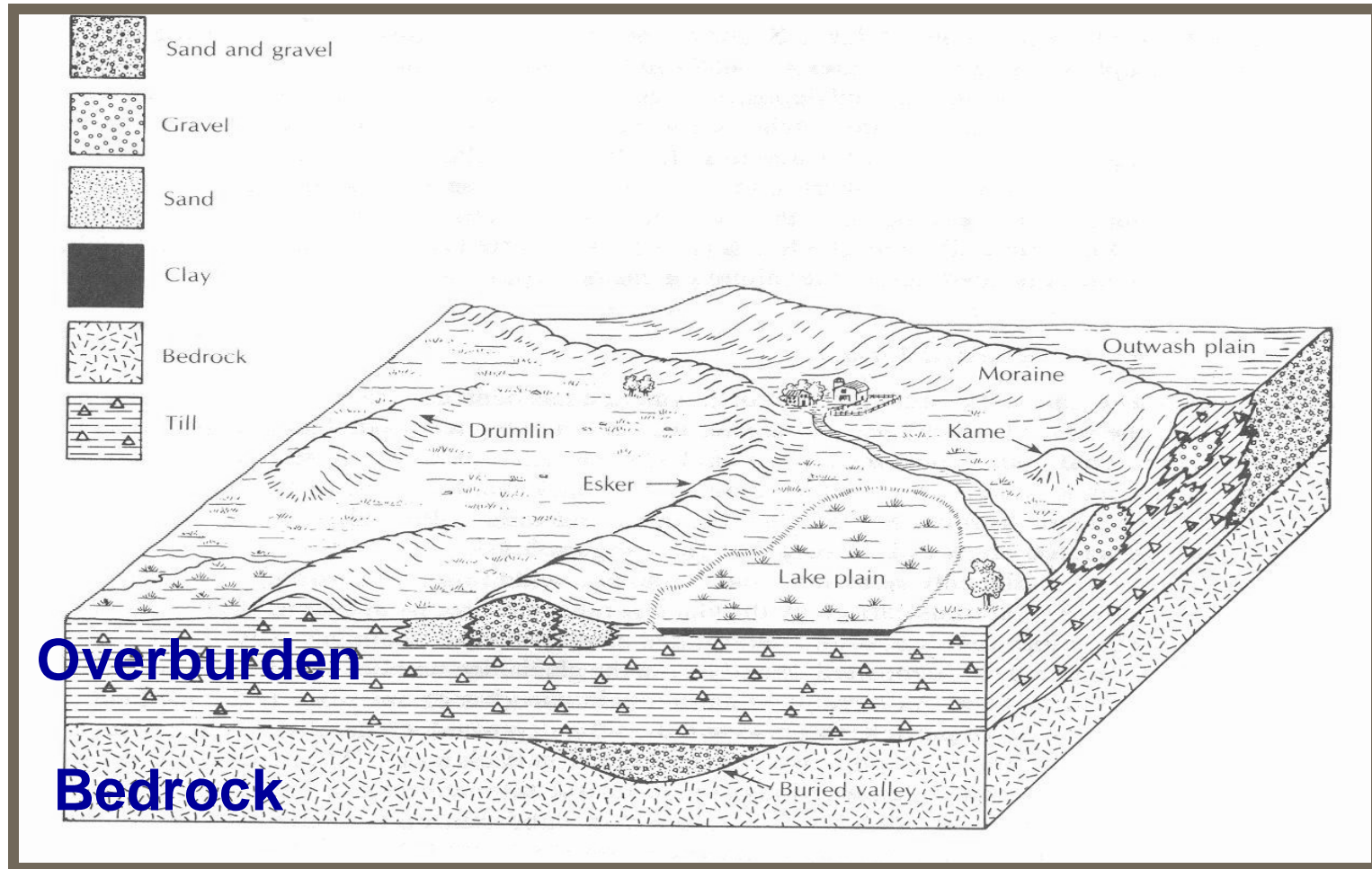
Hydrogeology is a branch of geology concerned with the occurrence, use and functions of surface water and ground water.

Hydrology is the science that deals with the properties, distribution and circulation of water on and below the Earth's surface and in the atmosphere.

Hydrology

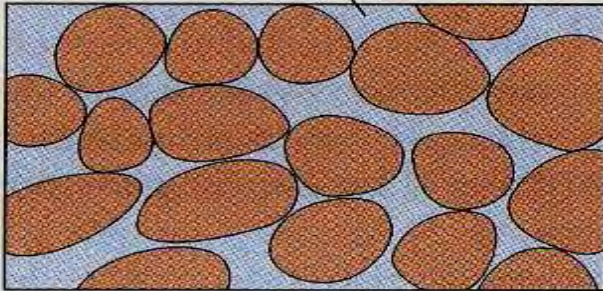


Subsurface

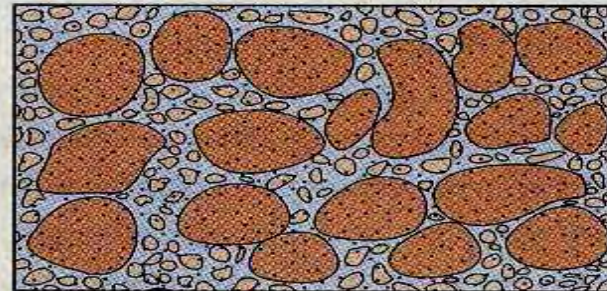


Porosity

Pore space

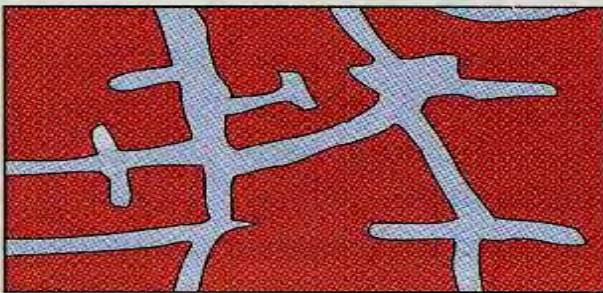


(a)



(b)

Fractures

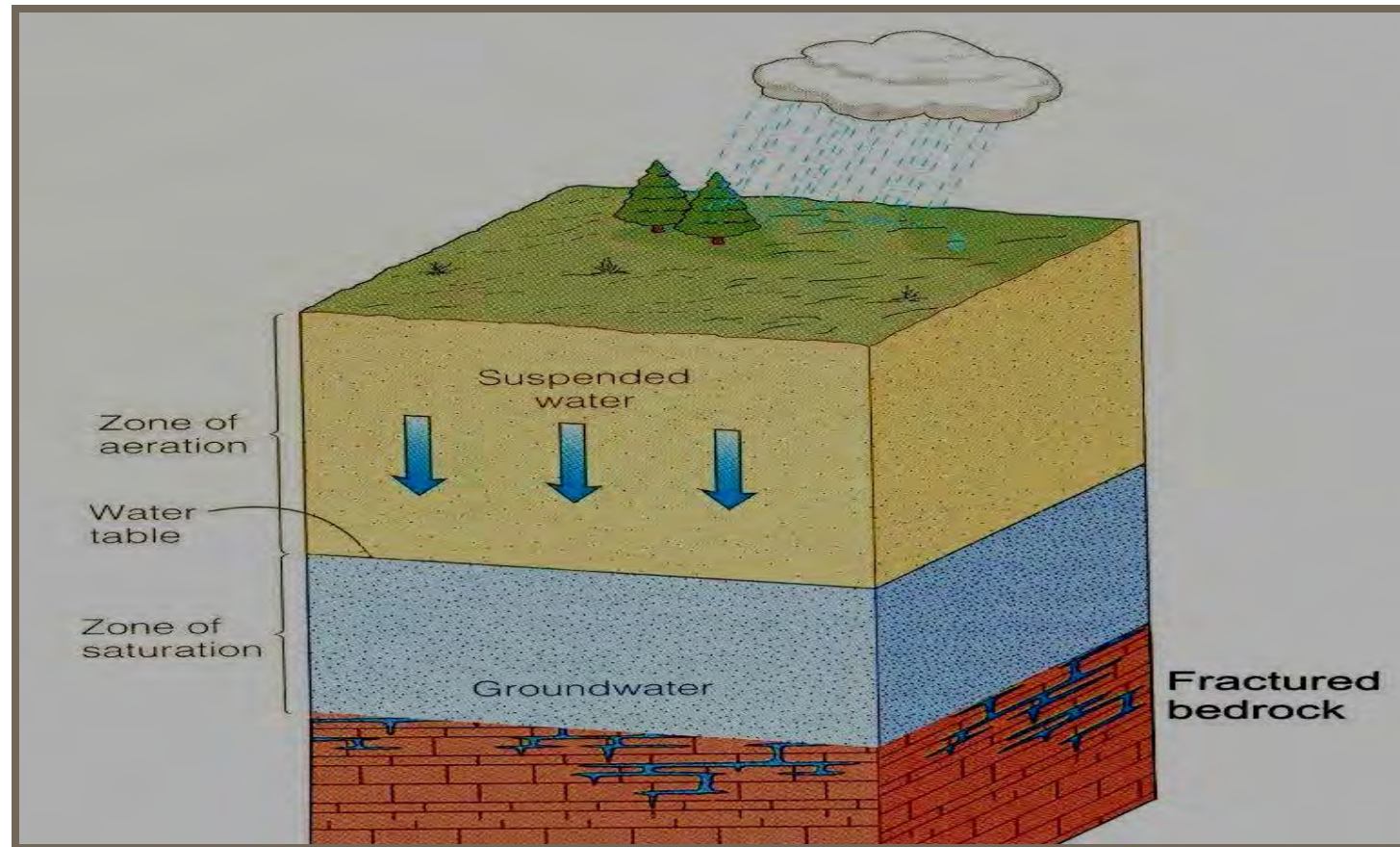


(c)

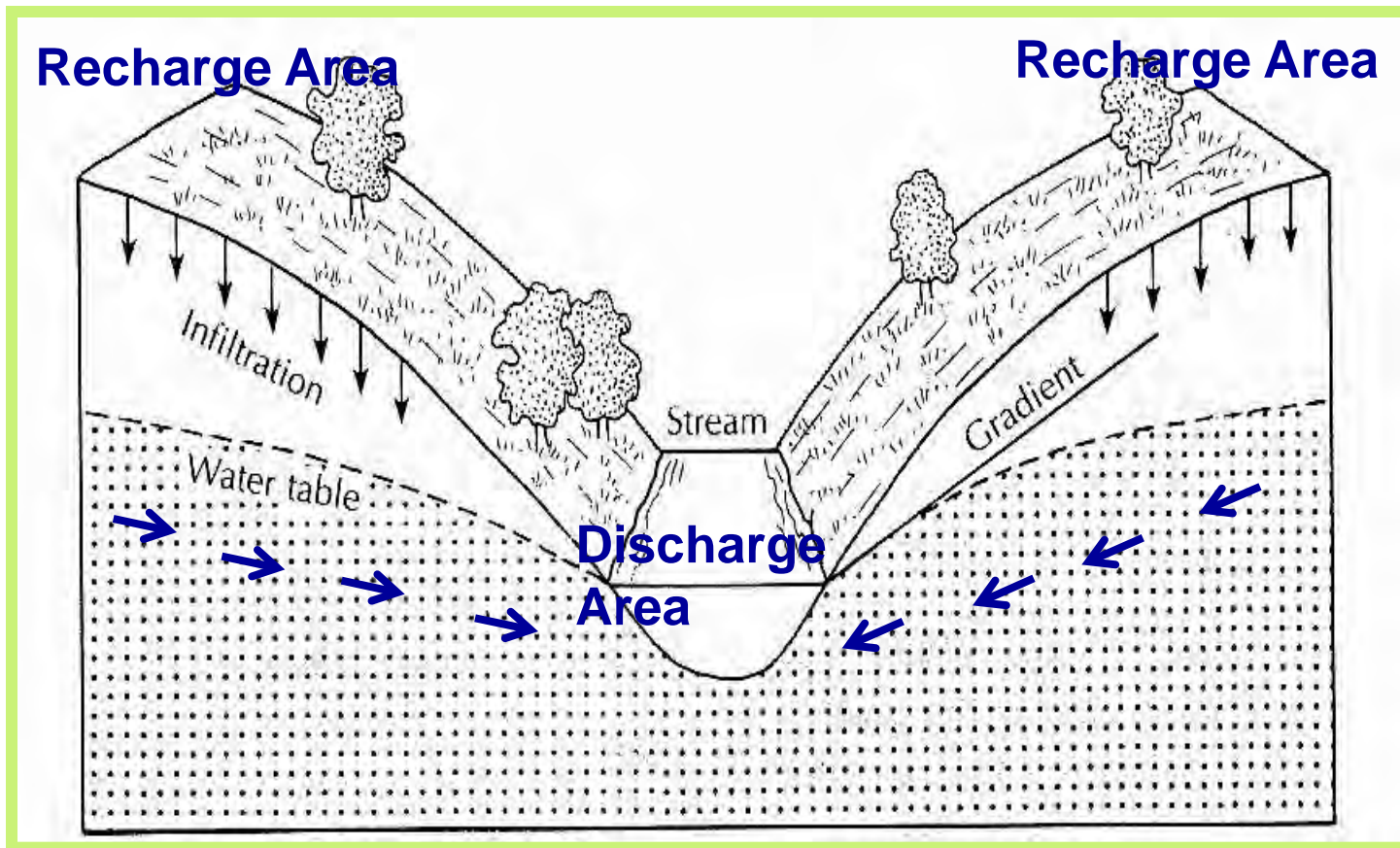


(d)

Groundwater



Groundwater Flow



Permeability

Permeability is a material's capacity to transmit water.

An *aquifer* is a geological unit having a high permeability.

As *aquitard* is a geological unit having a low permeability.

Organic v. Inorganic

Organic compounds are biological.

Contain carbon. (Methane, butane, acetone, toluene, acetylene, ethyl alcohol)

Inorganic compounds are mineral.

(Ammonium, cadmium, chromium, lead, mercury)

Contaminant Properties

Solubility

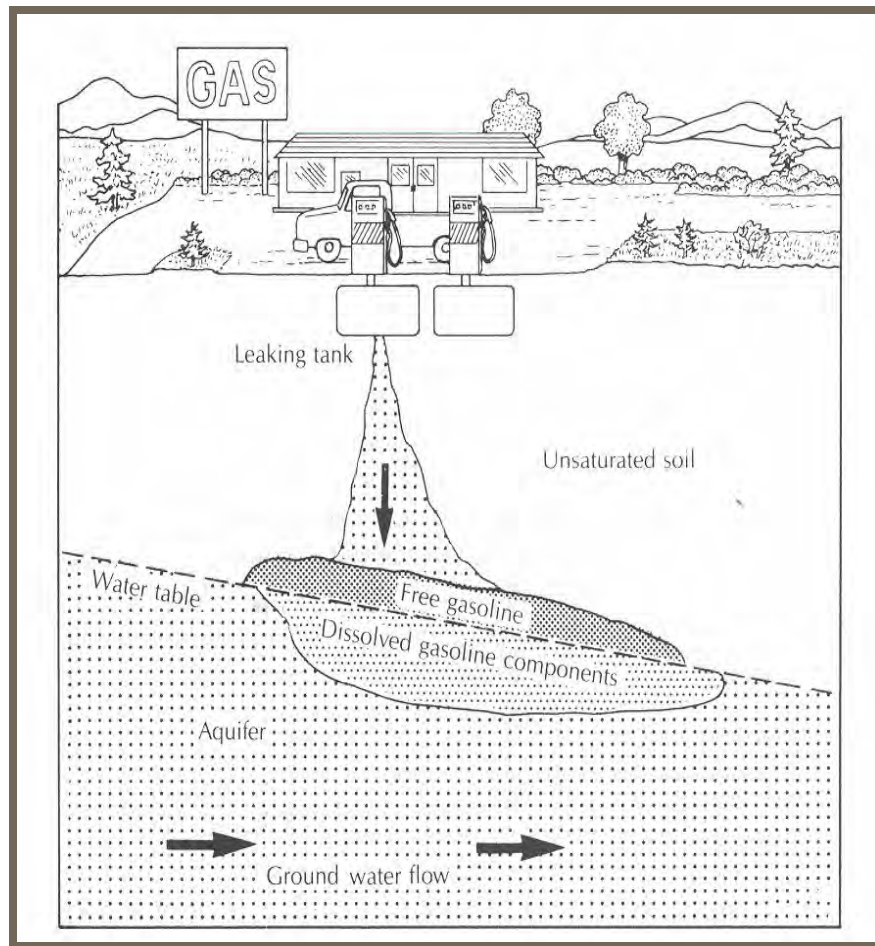
Miscibility

Specific gravity

Volatility

LNAPL

Light non-aqueous phase liquids



Lighter than water

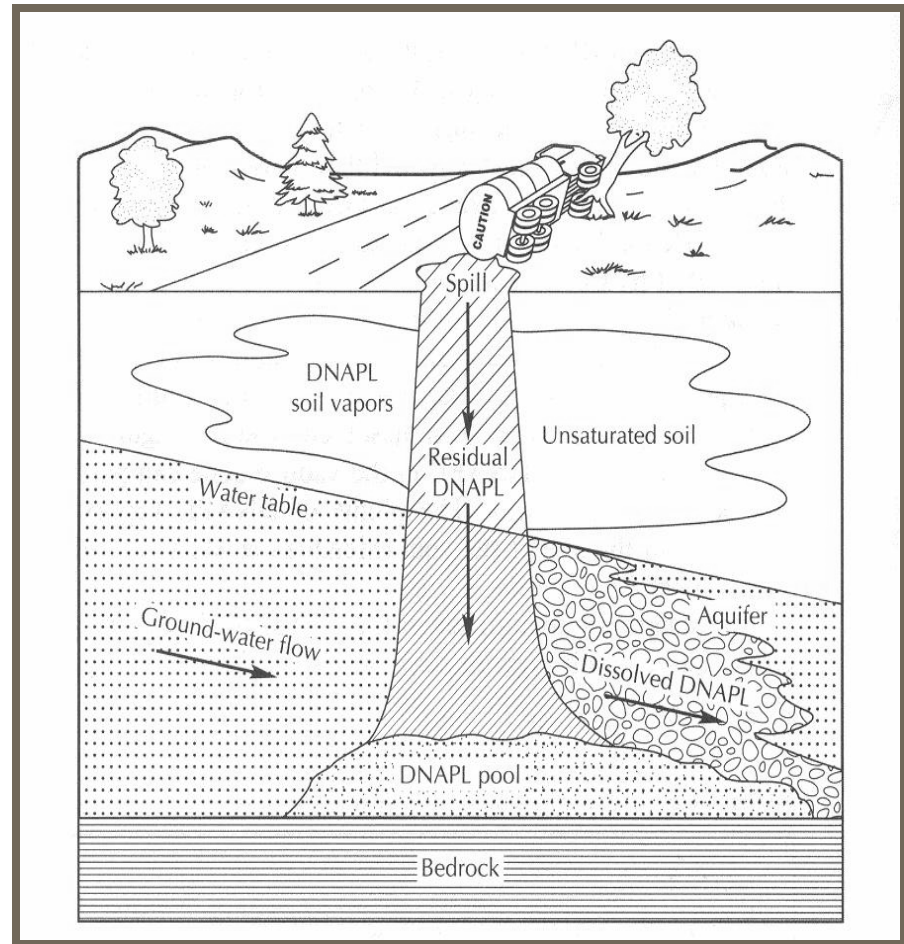
Gasoline

DNAPL

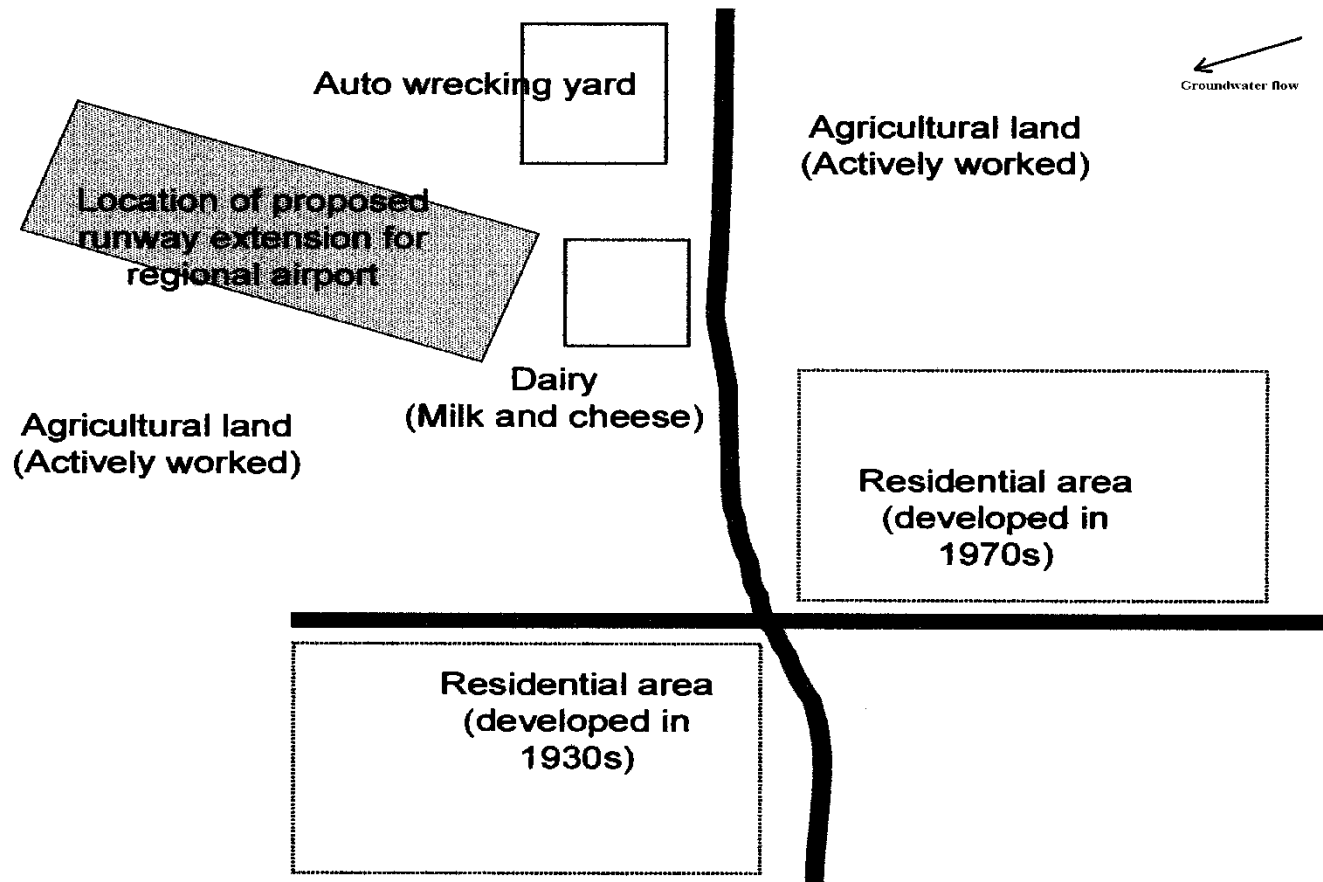
Dense non-aqueous phase liquids

Denser than
water

Trichloroethylene
(TCE)



Based on what we have covered, what are our potential issues here?



Environmental Site Assessments

... an analysis of a specific parcel of real property to identify environmental risk.

Phase I

Phase II

Phase III

Testing Methods

Non-intrusive

Intrusive

Testing Methods

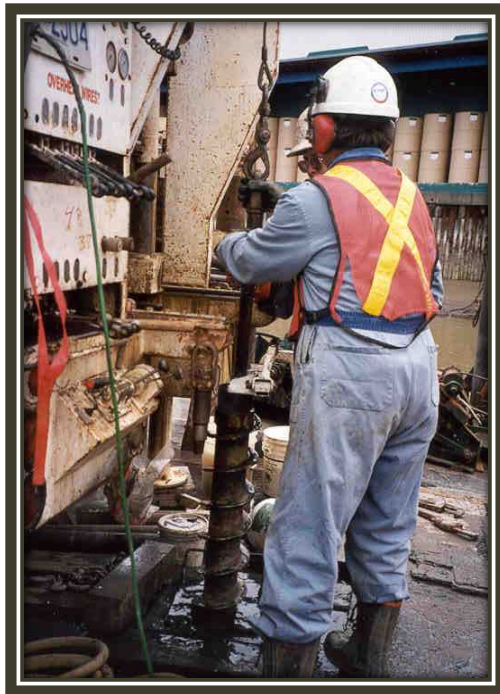


Geophysical survey



Auger drill rig

Testing Methods



Hollow stem
auger



Excavator

Testing Methods



Drilling inside
a building

Installing a
monitoring well



Testing Methods



Shallow test pit



Soil sample from
sonic rig

Testing Methods

Soil samples from
hollow stem auger



Sampling a
monitoring well

Environmental Site Assessments

... an analysis of a specific parcel of real property to identify environmental risk.

Phase I

Phase II

Phase III

Options

Contaminated site clean-up or remediation options range from do-nothing to partial or total remediation either *in-situ* (on-site) or *ex-situ* (off-site).

In-situ

In-situ remediation means to treat the contamination on-site or in-place.

- Ozone and oxygen sparging
- Excavation and on-site storage
- Excavation/treatment and replace
- Bioremediation
- Groundwater soil vapor recovery
- Phytoremediation
- Encapsulation
- Thermal desorption

In-situ: Vapor Extraction



In-situ: Encapsulation



In-situ: Encapsulation



In-situ: Bioremediation



Ex-situ

Ex-situ remediation means to remove the contamination from the site.

Excavation and off-site disposal at a legally authorized disposal site.

Ex-situ: Removal



Ex-situ: Removal



OBJECTIVES

Now, you are able to...

- ✓ Recognise situations that have the potential for site contamination
- ✓ Identify common types of contamination
- ✓ Discuss potential implications of contamination on the right of way and on the project
- ✓ Present options to manage or remediate environmental contamination

Questions & Discussion

