

# SLOPE STABILITY





# Slope Failures (what you see)

- Shallow surface failures (saturation)
- Localized slumps (seepage's)
- Full height slumps (seepage's)
- Slip circle failures

# Glacial Till



# EROSION CHARACTERISTICS

Varies by soil type

# EROSION

Most erodable soil - Silty Sands

# EROSION



# Slopes

Cut Slopes

Embankment Slopes

# Cut Slopes

- Primarily Slopes in Glacial Till
- Tills Found Throughout NS
- Other Soils - Other Problems

# Contributing Factors

- Height of slope
- Inclination
- Loading (structures)
- Climatic factors (north/south facing)
- Water (ground & surface)
- Erosion
- Natural processes (creep)

**Which Factors Are Most  
Critical?**

# Most Critical Factors

- Water

- Water

- Water

# Water Effects

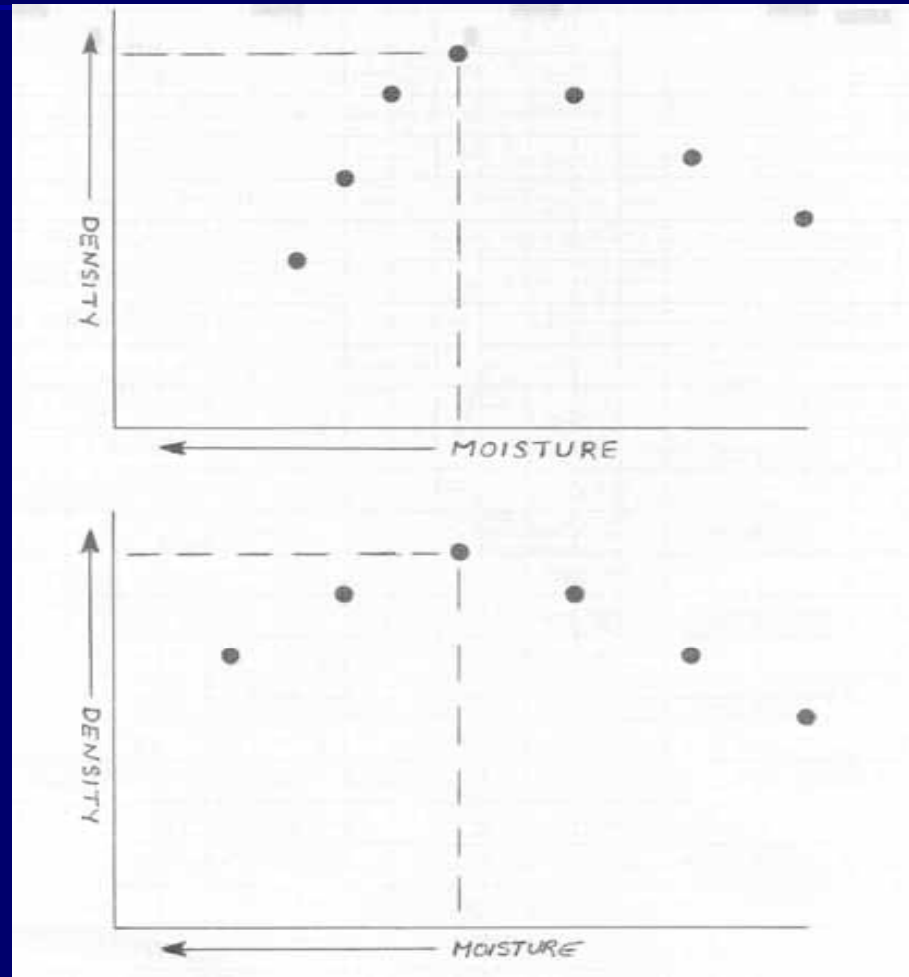
- Water concentrates in sand layers
- Freezing causes saturation (spring thaw)
- Pore water pressure (during/after cut)
- Saturation of surface soils

# Seepage



# DENSITY EFFECTS

# MOISTURE/DENSITY



# Slope Failures



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# Slope Failures



Highway 105, South Haven  
Victoria County  
19 May 82

# Slope Failures



# Slope Failures



# Slope Design

- Site Assessment
- Subsurface Investigation

# Site Assessment

- Topography
- Adjacent slopes
- Surface water
- Drainage patterns

# Embankments

# Embankment Failures

- Building on soft or weak soils
- Construction methods (rapid loading)
- Poor drainage
- Damaged culverts
- Height of embankment
- Erosion (toe)

# Embankment Failures



# Embankment Failures



# Embankment Failures



# Embankment Failures



WHAT CAN WE DO???

Flatten Slope  
(if practical)

# Stepped Slope



# Move the Road

Anything to Improve  
Drainage!

# Drainage

Drainage Blankets  
(minimum 0.5 m thick)

# Drainage Blankets



# Drainage

Surface Drainage

# Surface Drainage



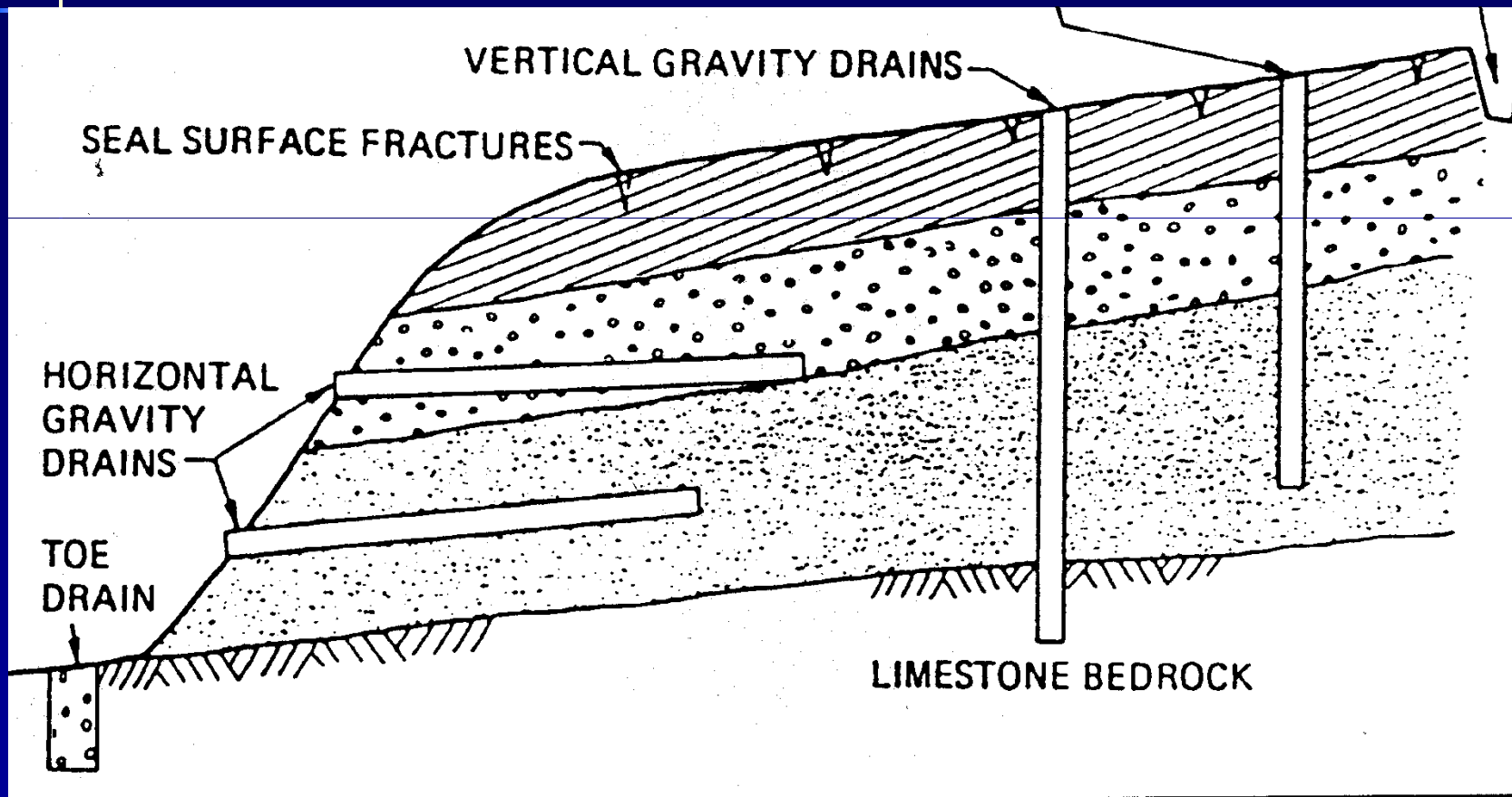
# Subsurface Drainage

Drainage Trench  
(crest, toe or mid-slope)

# Drainage Trench



# Horizontal Drains



# Structural Options

# Sheet Pile Structure

(Deep failures)

# Berm



# Steel Bin Wall



# Rock Filled Gabions



# Concrete Block Wall



# Reinforced Concrete Wall



# Reinforced Earth Wall



# Reinforced Soil



# Biotechnical Solutions



# Recap

- Look at existing slopes
- Investigate
- Find the water & attempt to control it
- Choose a control option

Questions??