TECHNIQUES FOR CONTROLLING SHORELAND EROSION PART 2

PLANNING, DESIGNING, AND CONSTRUCTING A SHORELAND RESTORATION

2017 Wisconsin Lakes Partnership Convention

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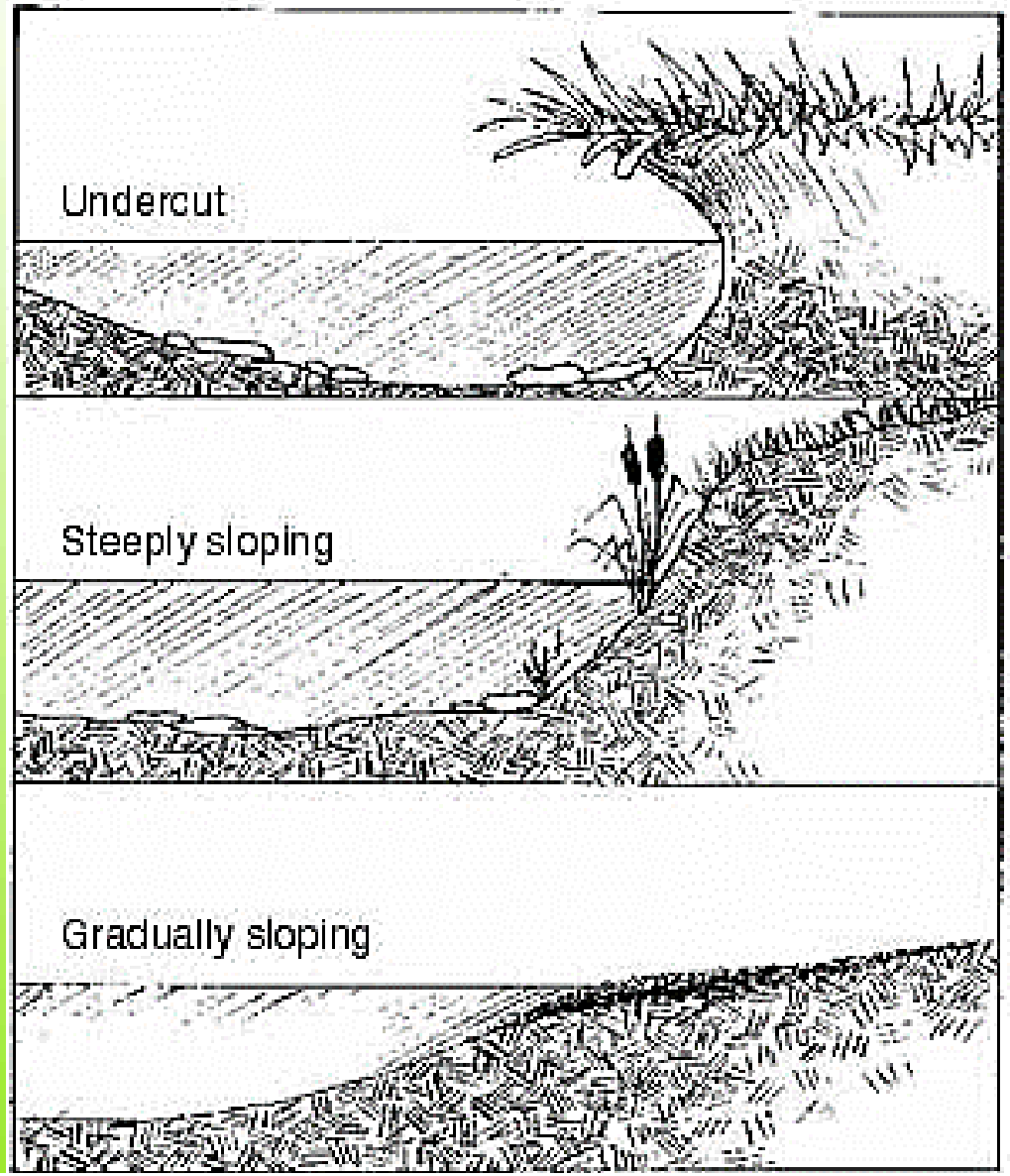
OUTLINE

- Planning: What problems do you need to address? What are the causes of erosion?
- Design Tools & Techniques: Calculations, Spreadsheets, Standard Drawings, Specifications, and Materials
- Construction and Installation

Causes of Erosion - Passive

Passive = physical features

- Bank or Shoreline Characteristics
  - soil types & properties
  - geology
  - geometry
  - natural vegetative cover
- Currents
- Wind (fetch)
- Wave action



Shoreline and lakebed shape, soils, and vegetation

Causes of Erosion - Passive

Passive = physical features

- Groundwater (seeps)
- Frost/thaw
- Ice heave
- Adjacent Features/Character
  - watershed patterns
  - long shore currents
  - tributary areas / flowing water

Slump in Bank due to over-saturation - Passive

Seepage

Ice
Heave
Action

Natural Wave Action

Causes of Erosion – Active

Active – due to human factors

- Waves – caused by boat wakes
- Exposed soil/Loss of Vegetation
  - Lawns, landscaping, logging
  - Equipment storage
  - Animal damage (trampling or over-grazing)
- Impervious surfaces
- Inappropriate engineering
- Ineffective Drainage
- Water level fluctuations
  - Seasonal
  - Damming of flowages creating new banks
- Land use/development beyond the immediate shoreline
  - Road placement

Wake Created Wave Action

Removal of Vegetation

Removal of Vegetation

Ineffective Drainage & Loss of Vegetation

Loss of Vegetation due to Equipment Storage

Impervious Surface, Ineffective Drainage, and Exposed Soils

Inappropriate Design/Engineering

Removal of Vegetation, Ineffective Drainage and Erosion Control Methods

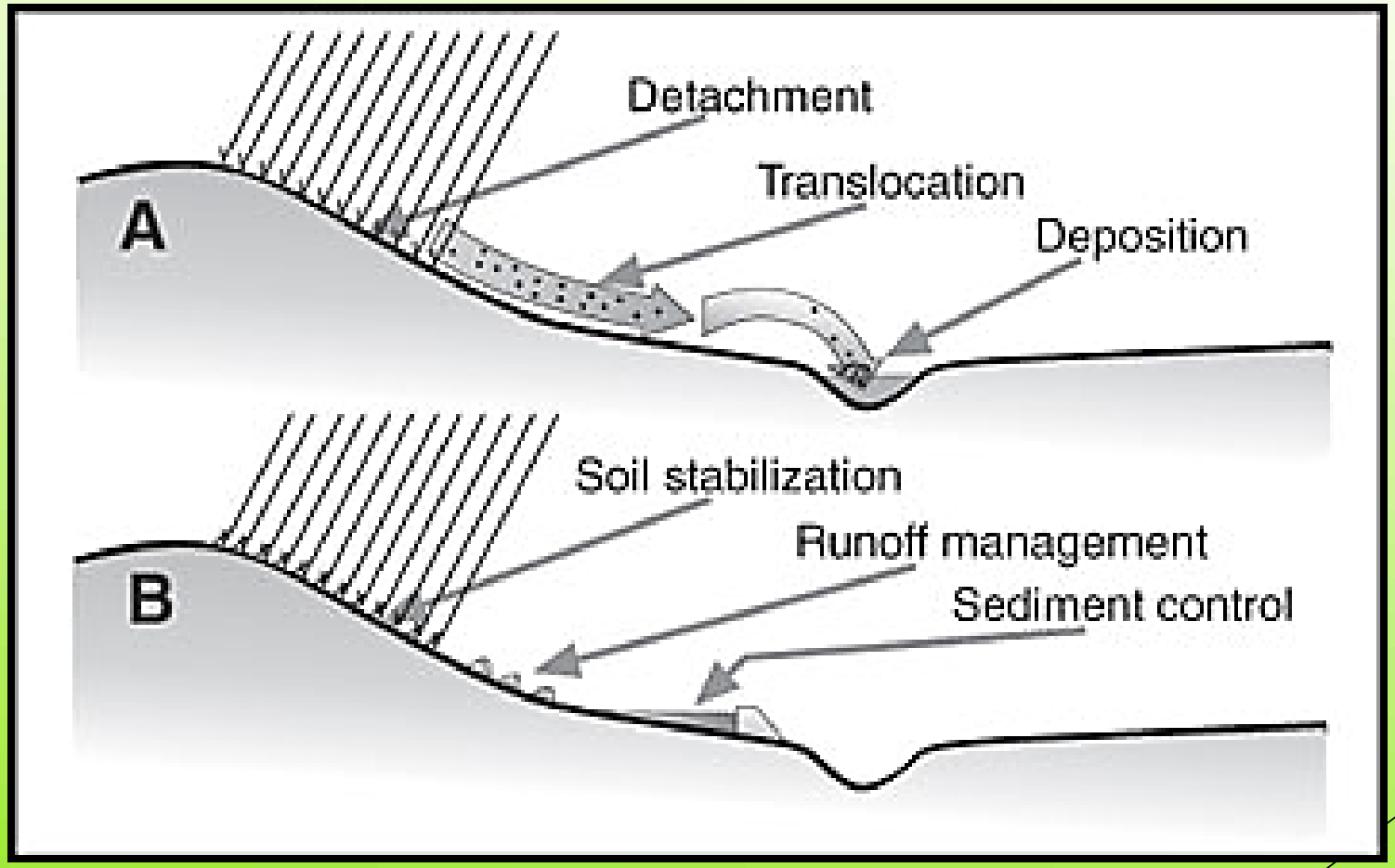
Upland Runoff Issues and Channelized Flow

Water Level Fluctuations, Seawall Overtopping, and Splash Impacts

New Shoreline

Unstable Soils
on a steep bank

Slow - Stop - Soak



The Objective of Erosion Control

Slow the water down

Stop the soil movement

Soak the water in

Erosion Control Planning– Site Evaluation

Define the cause(s) of erosion:

- Upland runoff? Impervious areas? Velocities?
- Wave energies? Boat or wind generated?
- Ice action? Prevailing wind direction?
- Water level fluctuations? Floods or Droughts?
- Groundwater seeps?
- Slope gradient (steepness) and bank height?
- Stability of native soils? Fill soils?

Planning Concepts – Incorporating Landowner Preferences

- Existing Structures to be Removed or Remain?
- Walking Paths or Travel Areas?
- Equipment Storage and/or Fire Pit Areas?
- Existing and Proposed Vegetation?
- Current Level of Maintenance/Mowing?
- Access to Lake and Docks/Piers?
- Well and Septic Area Locations?

Planning Concepts – Site Evaluation

Other Considerations:

- Soil type - conducive to slope stability at given angle without toe protection?

- Parcel development is limiting a stable slope (i.e. home too close to slope break or existing vertical walls, driveway placement and angle of slope)

- Impervious surfaces (i.e. roofs, patios, garage roofs, driveways)

- Managed runoff (i.e. rain gutters, runoff directed away from the lake or infiltrated)

Planning Concepts – Site Evaluation

Other Considerations:

- Lake channel (narrow areas) or controlled wake areas create constant waves so vegetation can not establish

- Extreme ice action continuously removes or stresses soil/plants

- Erosion intensities are too high for existing vegetation

Technical Planning Assistance:

County Land & Water Conservation Departments

USDA Natural Resource Conservation Service

Wisconsin Department of Natural Resources

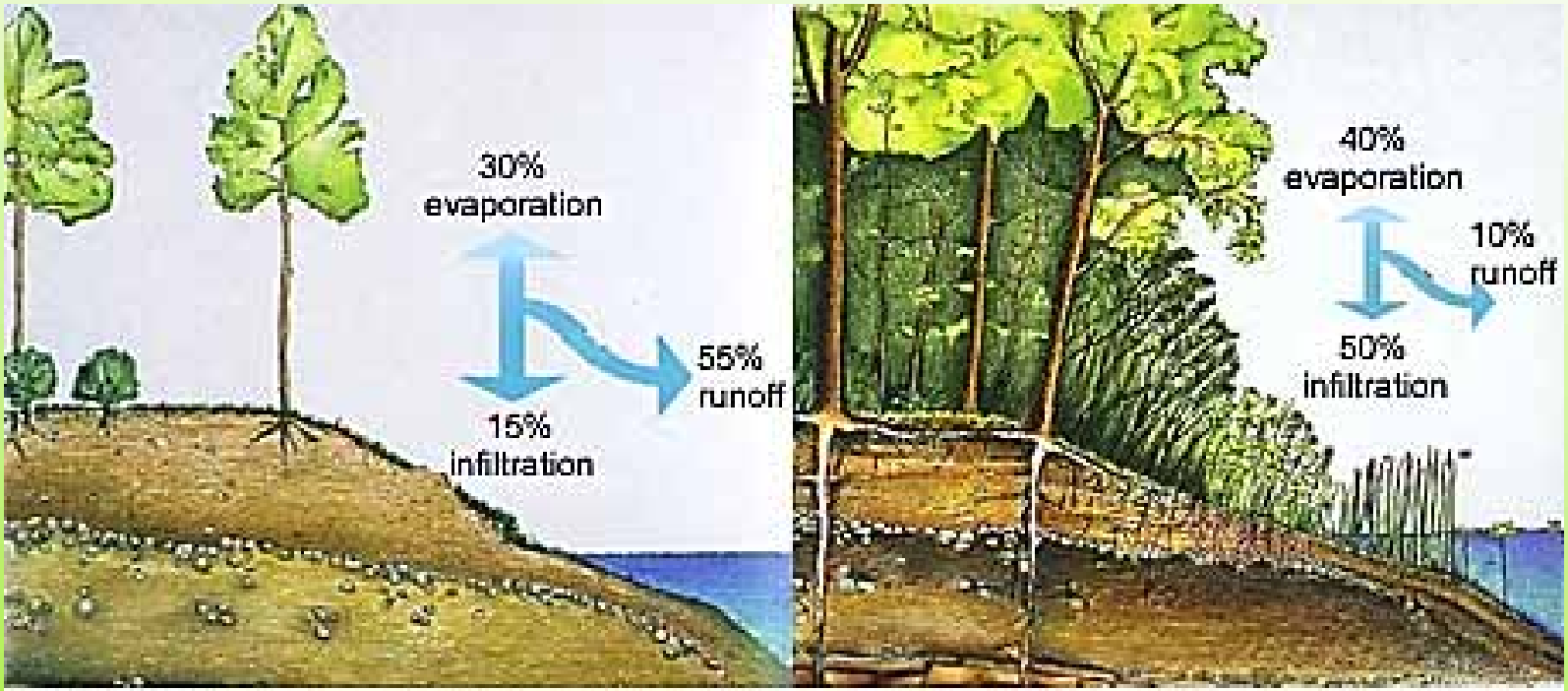
WI Dept. of Agriculture, Trade, & Consumer Protection

Private Consultants & Businesses

Design - Vegetative Treatment Only:

- Minimal fetch distance (<0.5 - 1 mile)
- Protected cove or bay (not point or island)
- Shoreline does not face prevailing winds (i.e. faces east and rarely gets a westerly wind)
- When boat traffic waves are not common or constant (i.e. no motorized traffic allowed, no public landing, SLOW NO WAKE zone = decrease in the wave intensity)
- When water level fluctuations do not harm vegetation survival rates and/or success (dam management)

VEGETATIVE TREATMENT



Water quickly runs off a shoreline cleared of natural vegetation, washing nutrients and pesticides into the water. A natural shoreline holds rainfall, which soaks into the soil; less water, soil and chemicals run into the lake or river. Shoreline and aquatic plants anchor shoreline areas, helping to protect them from erosion due to runoff and waves.

Design – Rock Riprap, Geobags, and Sediment Logs

Issues are:

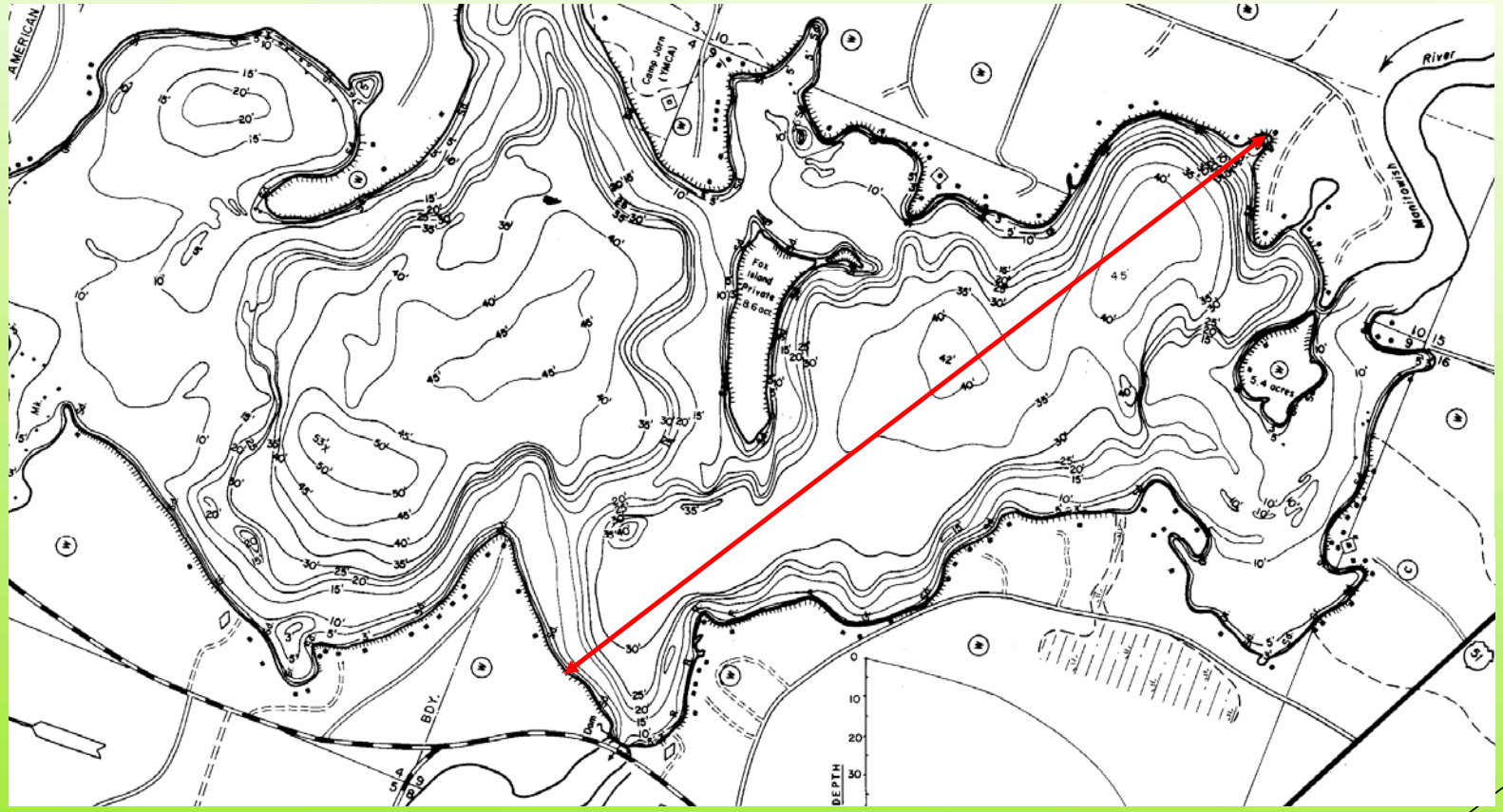
- Water level fluctuation
- Unstable Soils on a Steep Bank
- Wake Induced Wave Action
- Removal of Vegetation
- Not the Original bank

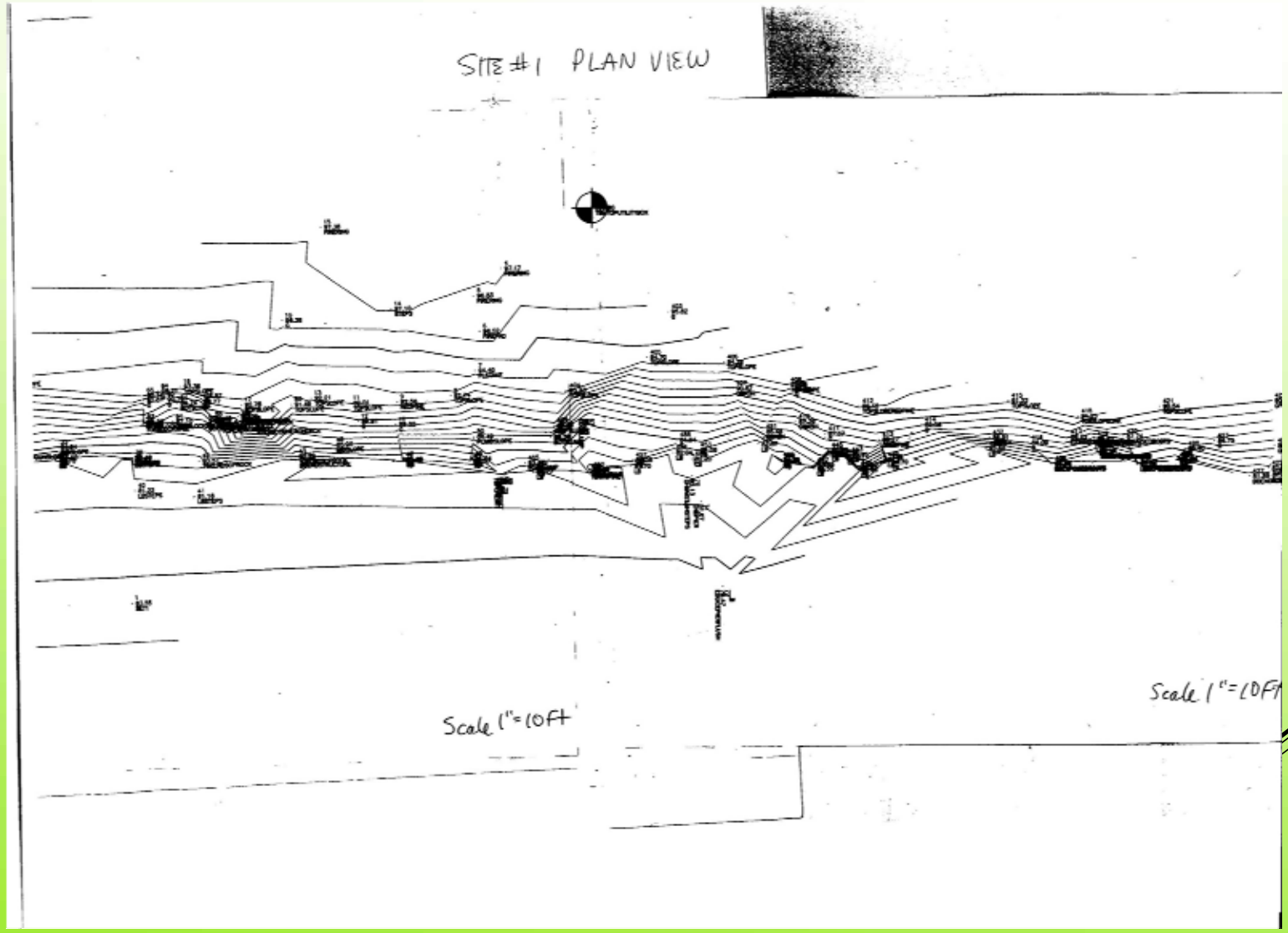
SOILS

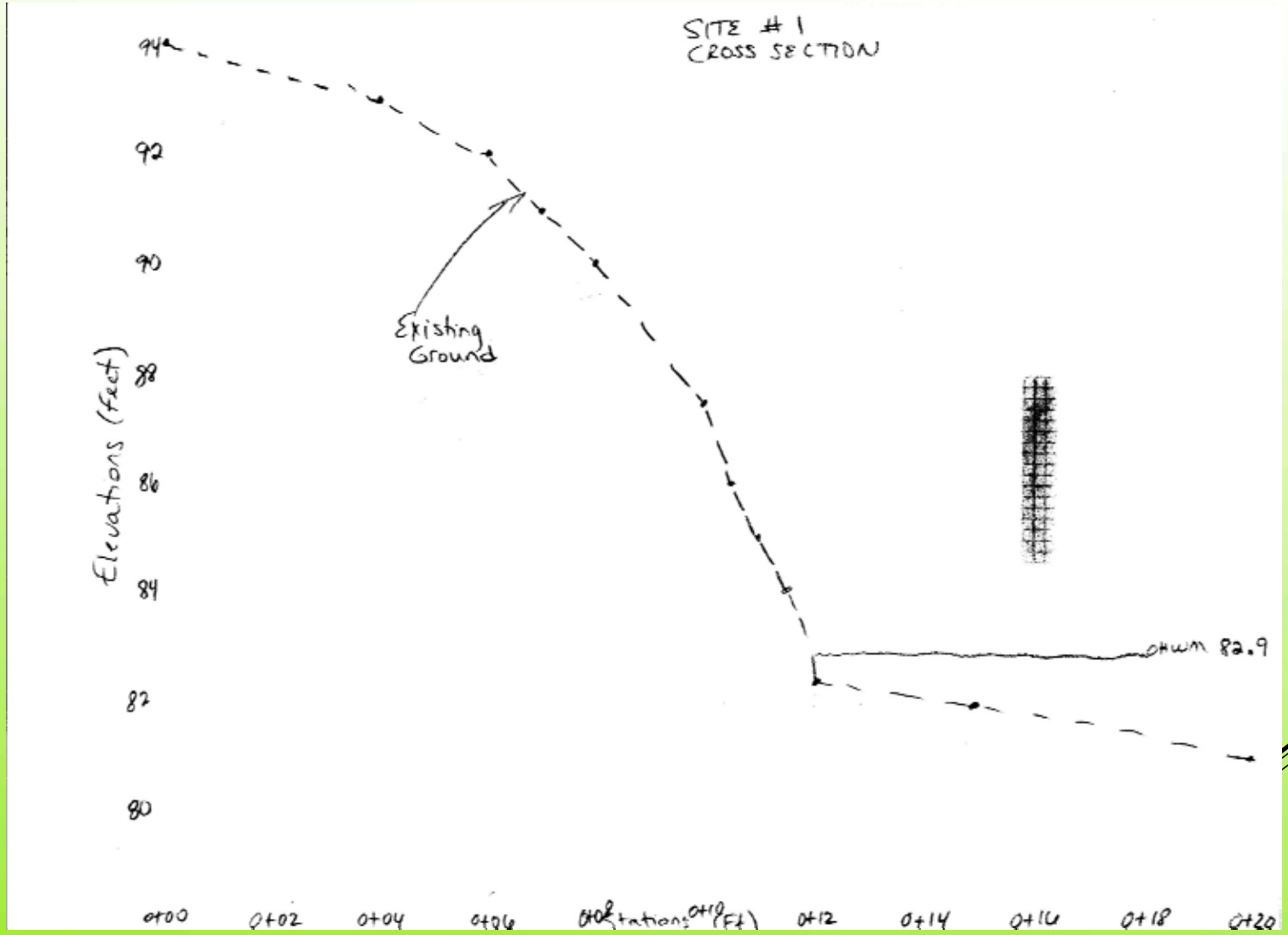
PLANNING FOR PERMITTING

- Fetch
- Erosion intensity *
- Federal Permits*
- DNR permits*
- County permits
- Local permits

Fetch distance = 1.12m, Average Depth = 22.5ft

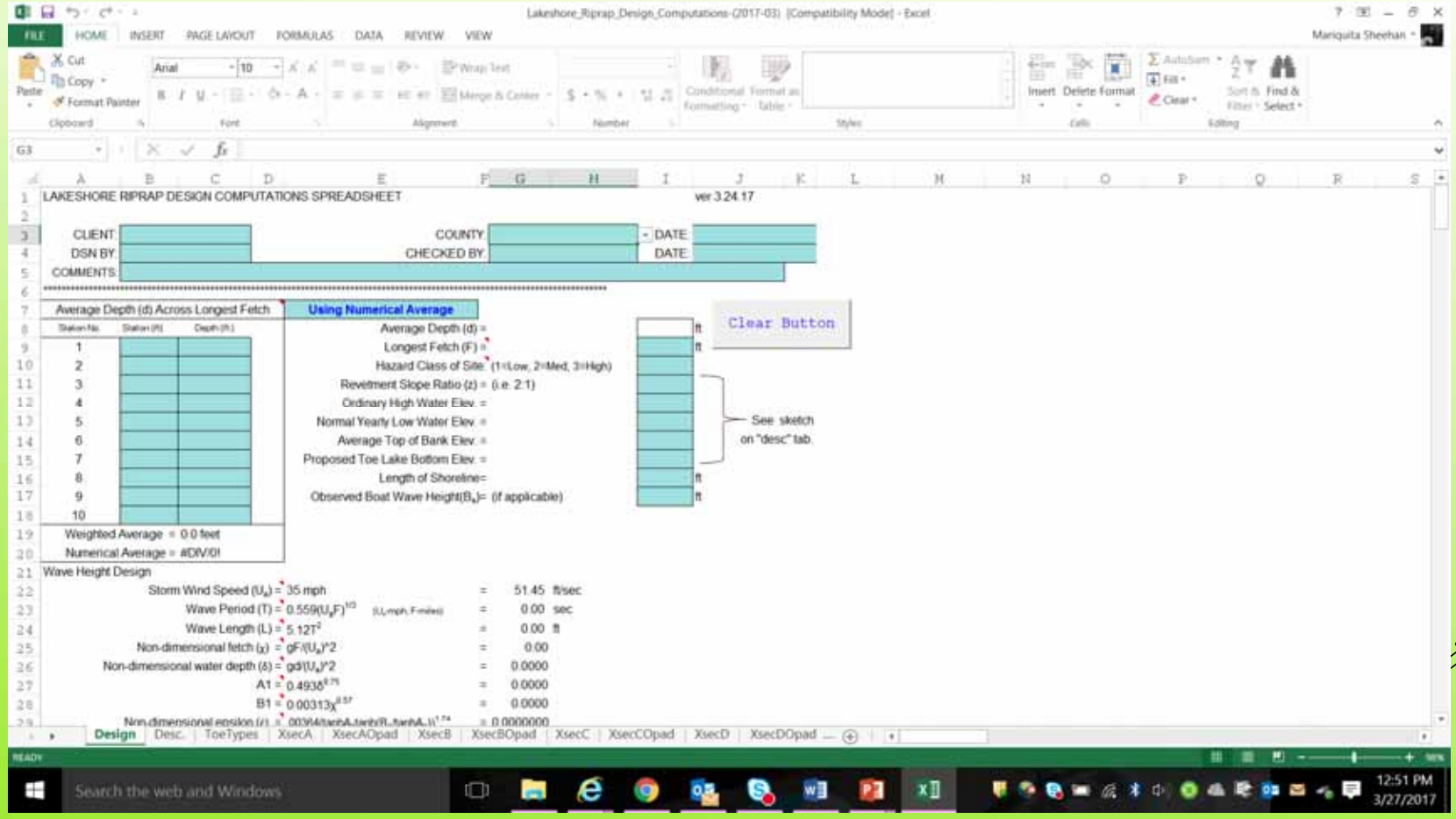



SITE #1 PLAN VIEW
Scale 1"=10ft
Scale 1"=10ft


SITE #1
CROSS SECTION
94
92
90
88
86
84
82
80
Elevations (feet)
Existing Ground
0+00
0+02
0+04
0+06
0+10
0+12
0+14
0+16
0+18
0+20

SPREADSHEET:

HTTPS://WWW.NRCS.USDA.GOV/WPS/PORTAL/NRCS/DETAIL/WI/TECHNICAL/ENGINEERING/?CID=NRCS142P2_025422



INST

INSTALLATION OF GEOBAGS, SEDIM
LOGS AND PLANTS

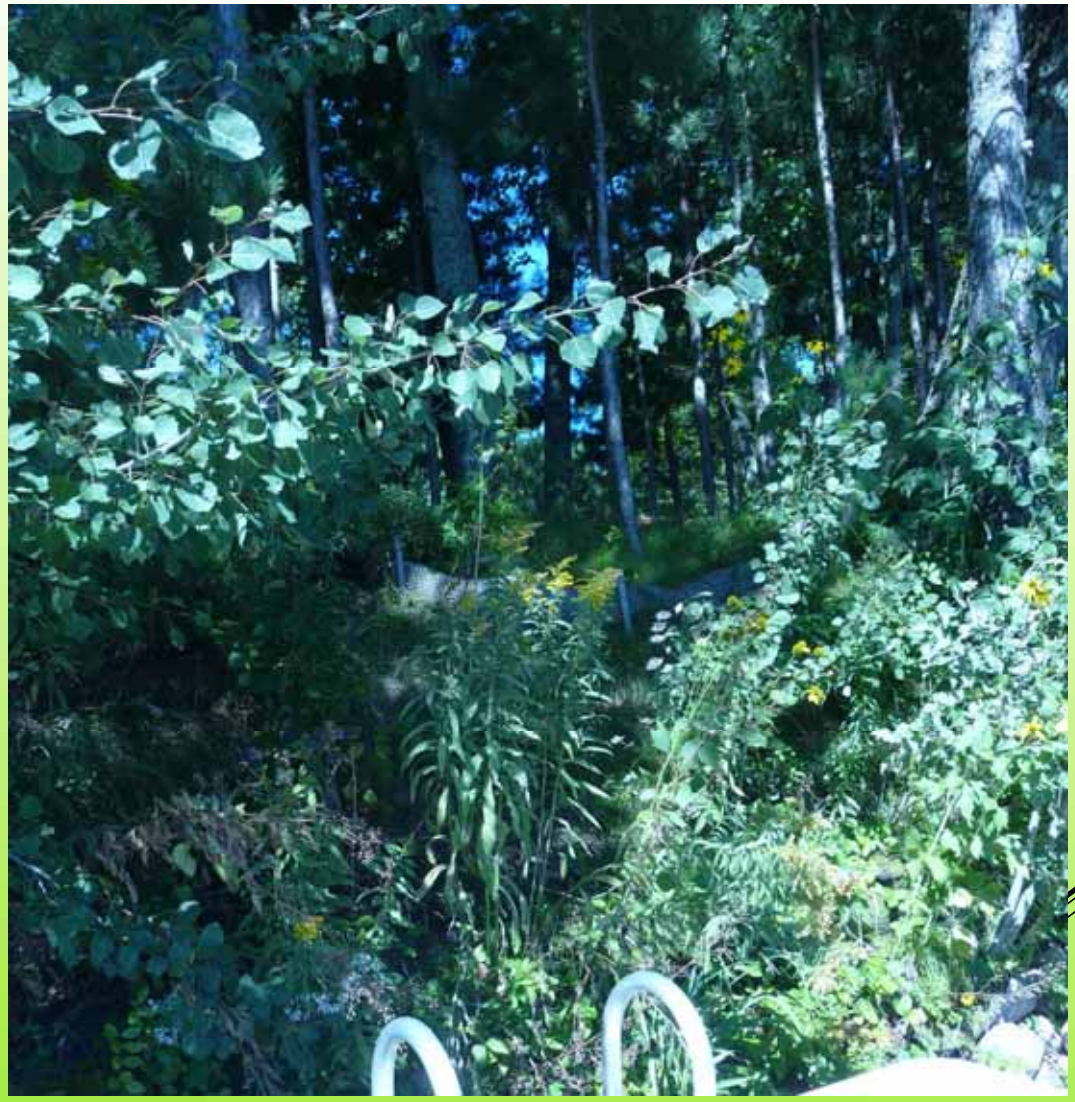
INSTALLATION OF GEOBAGS, SEDIMENT LOGS AND PLANTS

2012

2013

2013

2015



2015

2016