Planning and Design of Smart Infrastructure for Biodiversity Protection

Nature Based Solutions and Climate Resilience

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Natural Capital- The stock of natural assets that produce benefits to people in the form of Ecosystem Services.

Ecosystem Services- The benefits people derive from nature that supports and fulfills human life.

Nature Based Solutions- Solutions to projects that utilize Natural Capital for the benefit of humans in a sustainable manner.

Climate Resilience

- ***Resilience*** **is the characteristic of a system that allows it to absorb, cope with, recover from, or more successfully adapt to adverse events (such as Climate Change).**

Natural Capital that we utilize, try to protect, and should manage in a sustainable manner!

Nature Based Solutions- Examples

- WATER
- FERTILE SOIL
- NATURAL FORESTS
- FRESH AIR
- WILDLIFE
- PLANT MATERIAL FOR FUELS
- PLANT MATERIAL FOR FOOD
- BUILDING MATERIALS

- **Each element of natural capital can be enhanced or degraded through human activity, such as road construction, land clearing, forest burning, or mining.**

- **Natural capital is often damaged by climate change i.e. warming climate, longer droughts, more intense rains.**

- **Infrastructure projects need to utilize natural capital, be sustainable, and build with resilience to climate change to minimize it's negative effects.**

Climate Change Forecasts for Nepal

- Temperature records show a warming trend, with projected increases of between 1.8 and 5.8 degrees (Centigrade) by the 2090s
- Annual precipitation is projected to decrease by 10 to 20 percent across the country, with dryer winters but wetter monsoon summers
- Extreme flow events, increased rainfall intensities, and climate variability suggest that traditional flood design recurrence intervals of 100 years for bridges should be increased
- Sequences of drought and storms, as well as warmer temperatures, will promote more fires, followed by increased erosion and slope instability.
- Increased climate variability and more extreme conditions.

Nature Based Solutions

- Protecting Water Quality
- Enhancing Water Availability
- Vegetation for Resources and Soil/Slope Stability
- Protecting Soil Resources/Erosion Control
- Vegetation for Carbon Sequestration
- Protecting Wildlife/Promoting Connectivity
- Managing Materials Sources

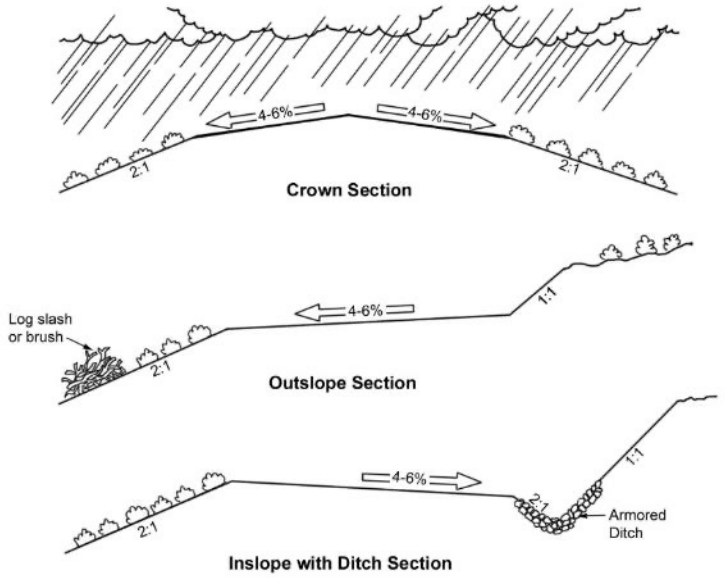
Protecting Water Quality

Water- One of our most precious resources-

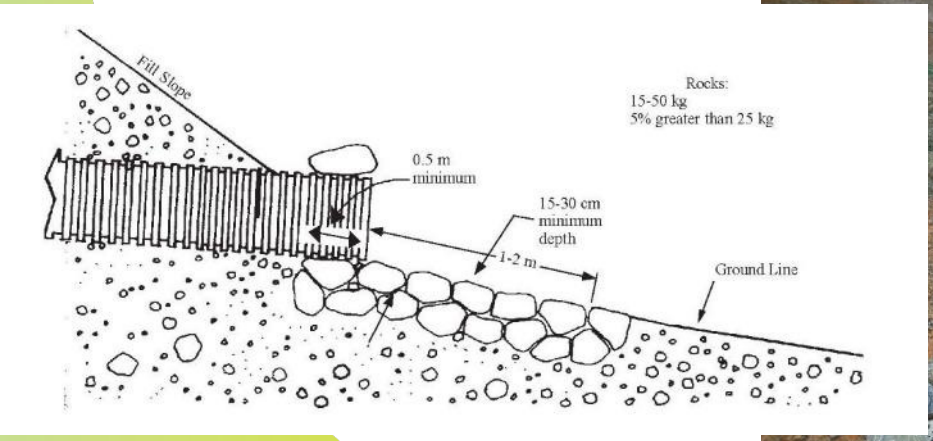
Protecting Water Quality

Roads can seriously degrade local water quality

Protecting Water Quality



BMPs, Drainage Measures



Enhancing Water Availability

Roads for water
Meta Meta

Water from feeder road is collected and diverted into a water storage structure or a farm though a trench/ditch

Good news: many things can be done

Flood water spreaders from road surface to enhance soil moisture and recharge groundwater

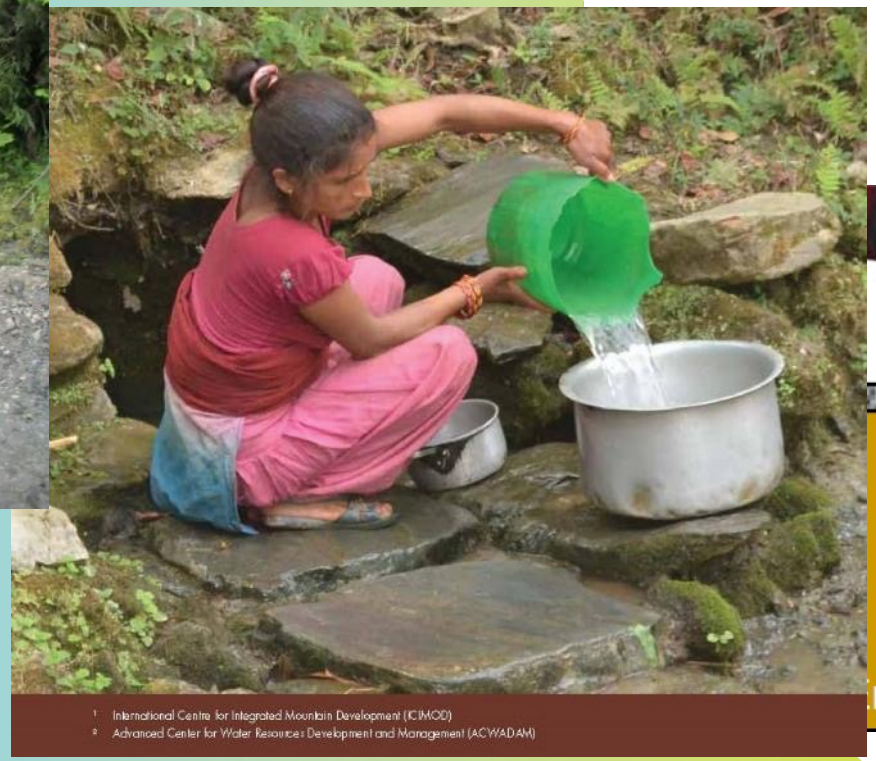
For more information contact :
www.roadsforwater.org
fvansteenbergen@metameta.nl
adeligianni@metameta.nl

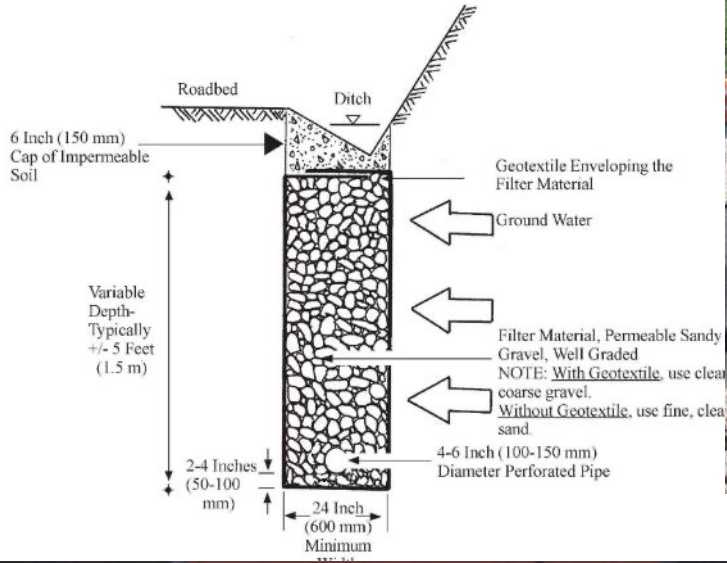
Enhancing Water Availability

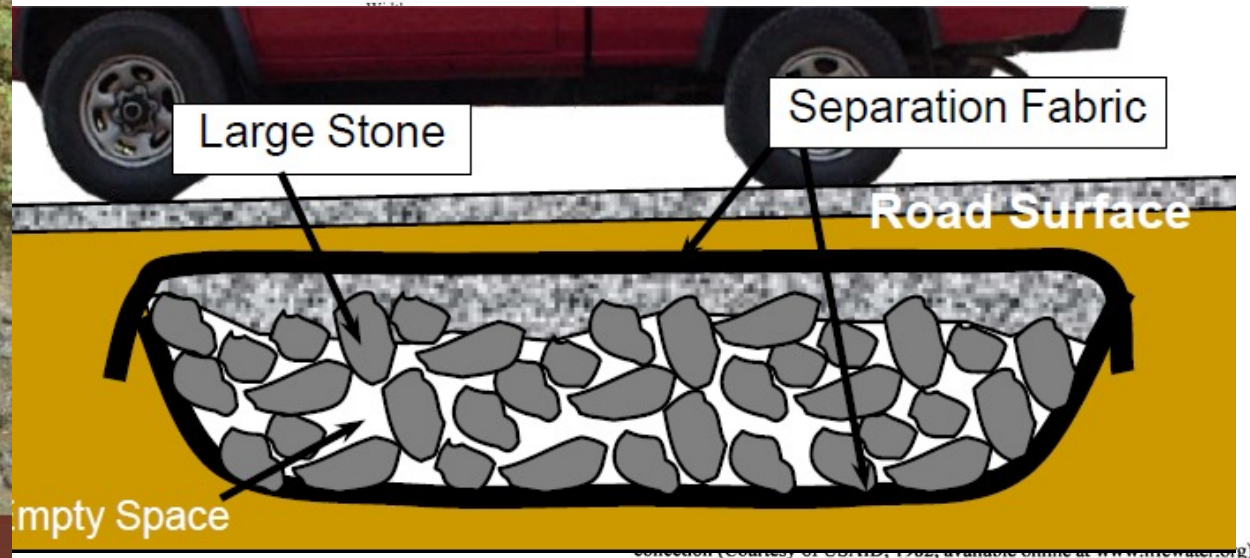
Spring Source Protection/Enhancement

Avoid Spring Areas!

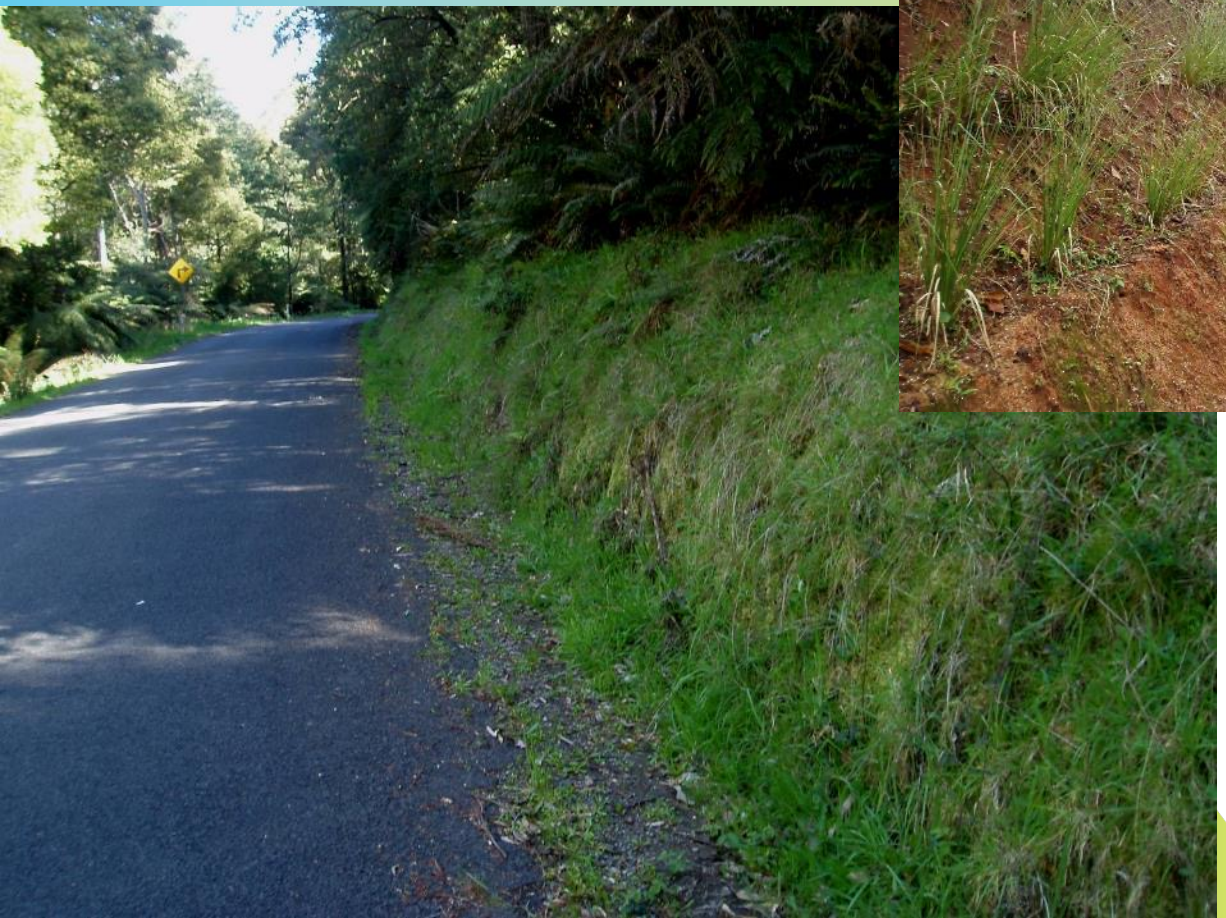
Capture Spring Water!







Vegetation for Resources and Soil/Slope Stability



Vegetation for Resources and Soil/Slope Stability

Importance of Root Strength

Photo 8: Vetiver roots in soil (left and middle) and when gro

Vegetation for Resources and Soil/Slope Stability

Soil Bioengineering

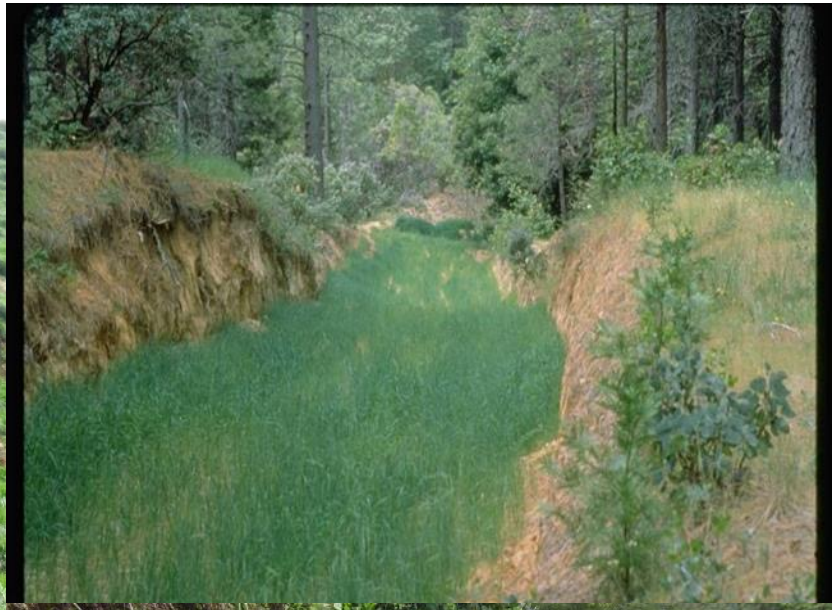
Vegetation for Resources and Soil/Slope Stability

Vegetation for Resources

Vegetation for Carbon Sequestration

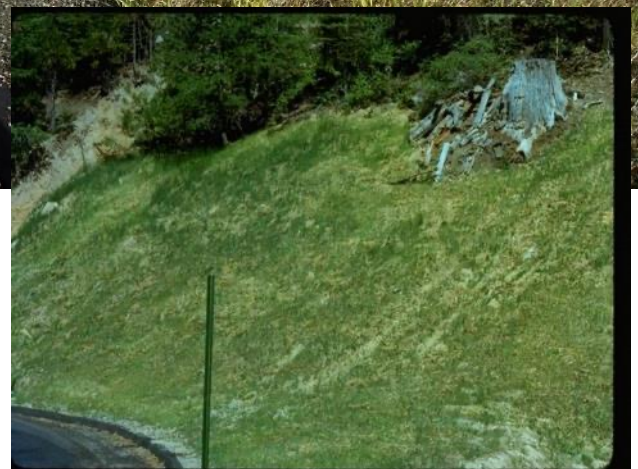
Climate Mitigation- Reforestation after Clearing

Protecting Soil/Erosion Control



Protecting Soil/Erosion Control

Storm Damage Protection

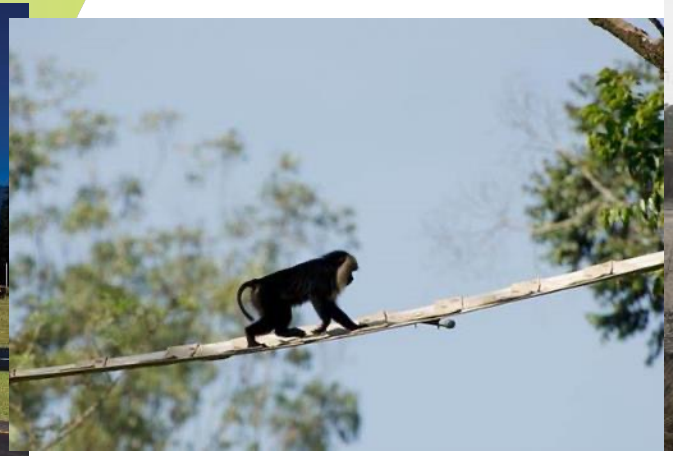


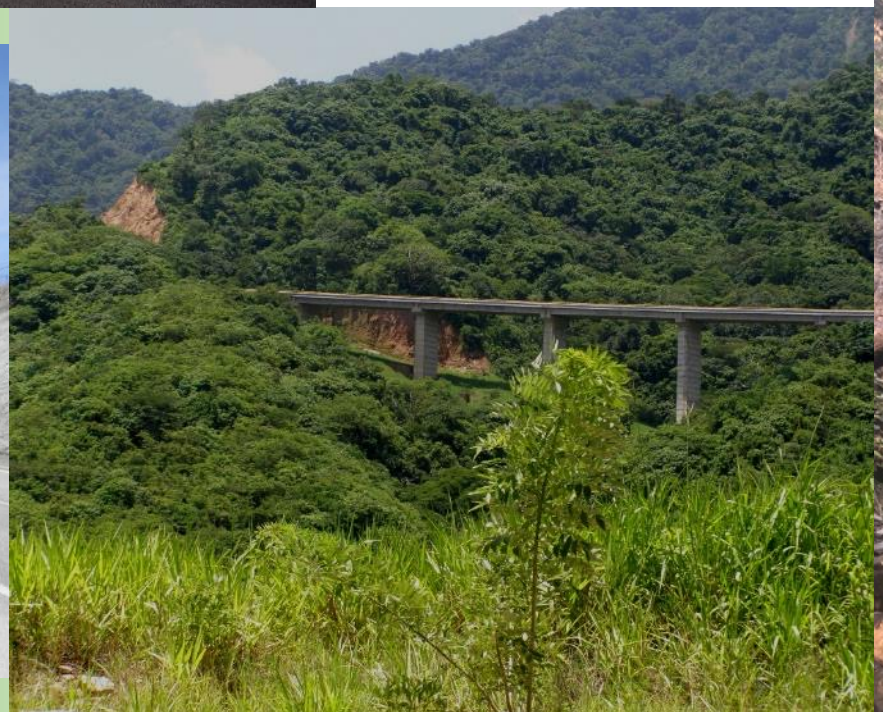
Protecting Soil/Erosion Control

Gully Protection & Stabilization

Protecting Wildlife

Wildlife Crossings/Connectivity





Use of Materials Sources

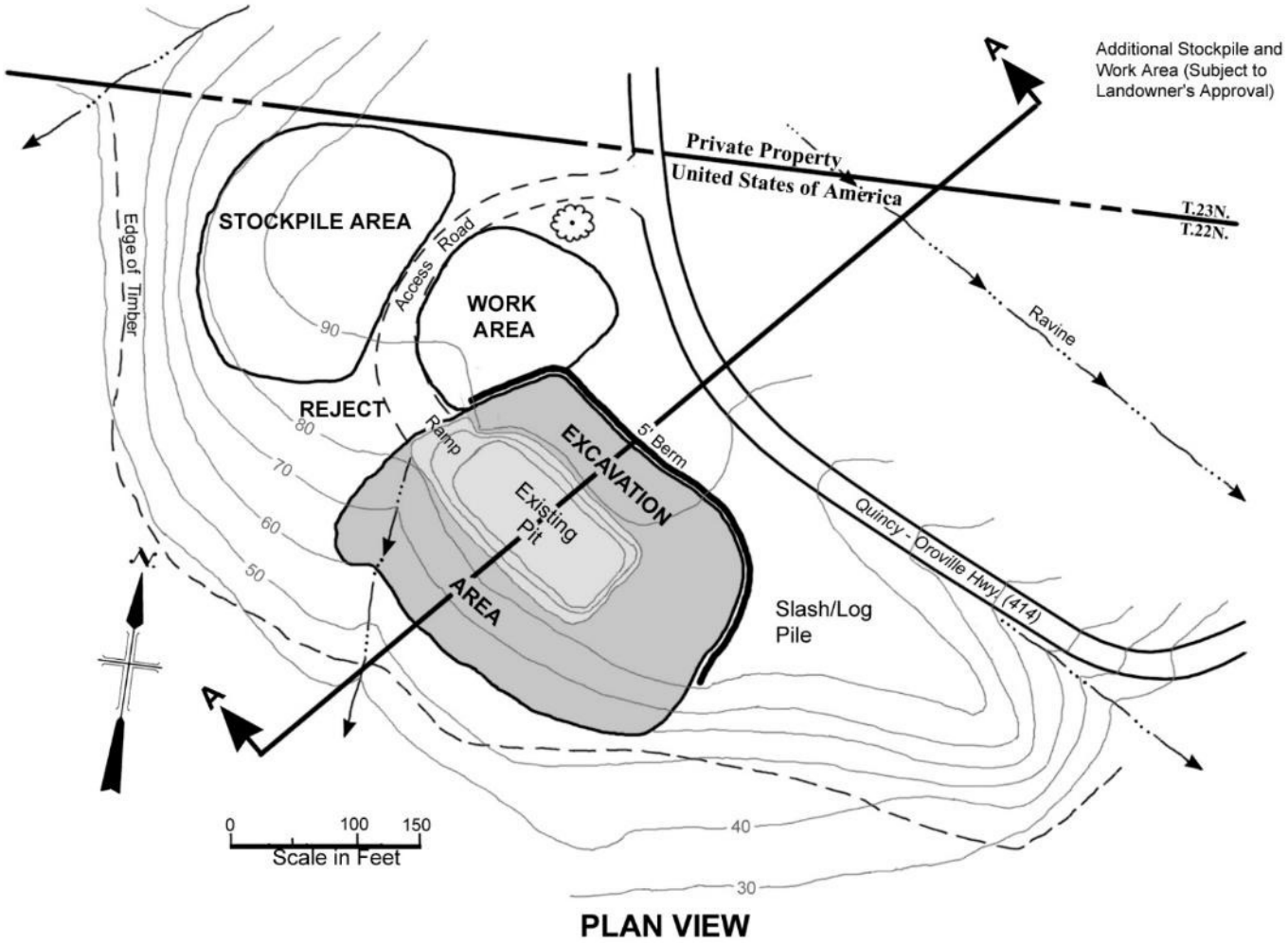
Use of Materials Sources

Storm Damage Repair

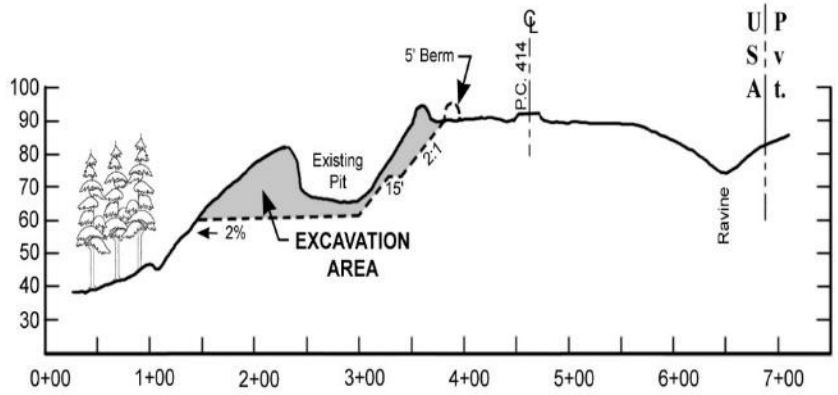
Highway Construction

Materials Source Reclamation

Materials Source Development/Reclamation Plan



PLAN VIEW



SECTION A - A

A PIT DEVELOPMENT PLAN

CHECK DRAWING
07-05-06

Summary

Highway projects need to support and take advantage of Natural Capital, as well as build in resilience against climate change.

More…

THANK YOU!!

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