

***ROCK SLOPES
STABILIZATION MEASURES –
ROCK REMOVAL***

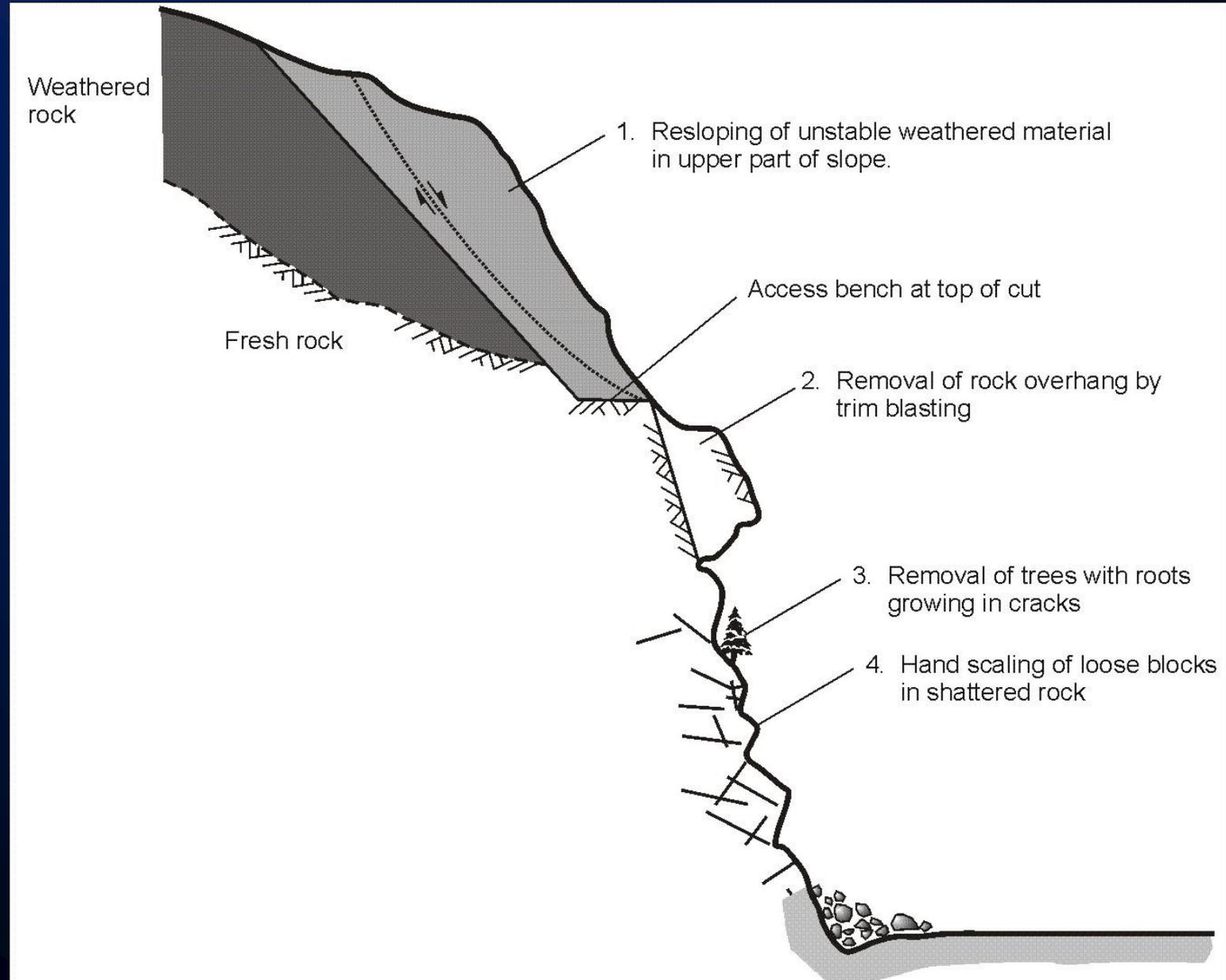
Lesson 8 – Topic C

LESSON 8C – ROCK REMOVAL METHODS

Learning Outcomes -

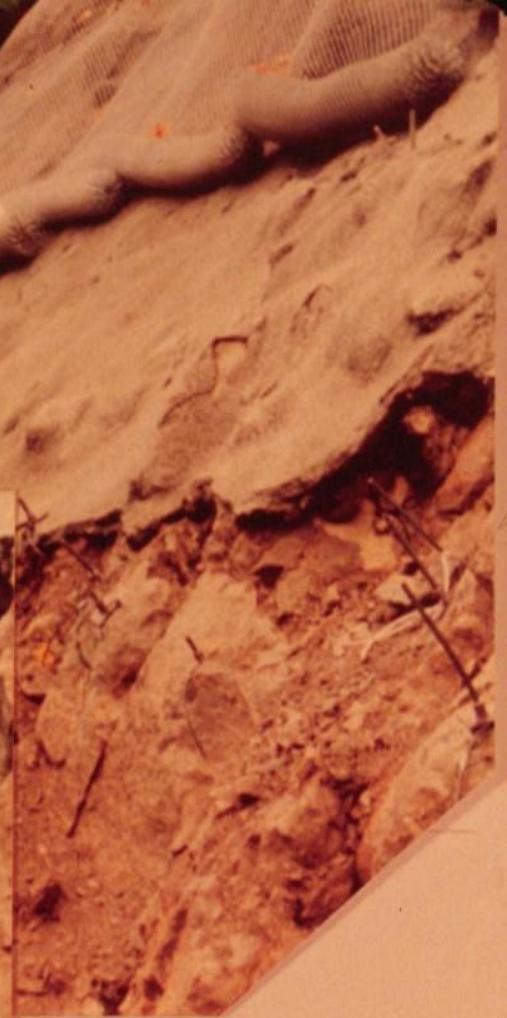
- ***Identify prerequisite rock slope conditions for rock removal;***
- ***List rock removal methods;***
- ***List construction limitations for rock removal methods.***

Stabilization by Rock Removal



***Untensioned steel
dowels with fiber
reinforced shotcrete***

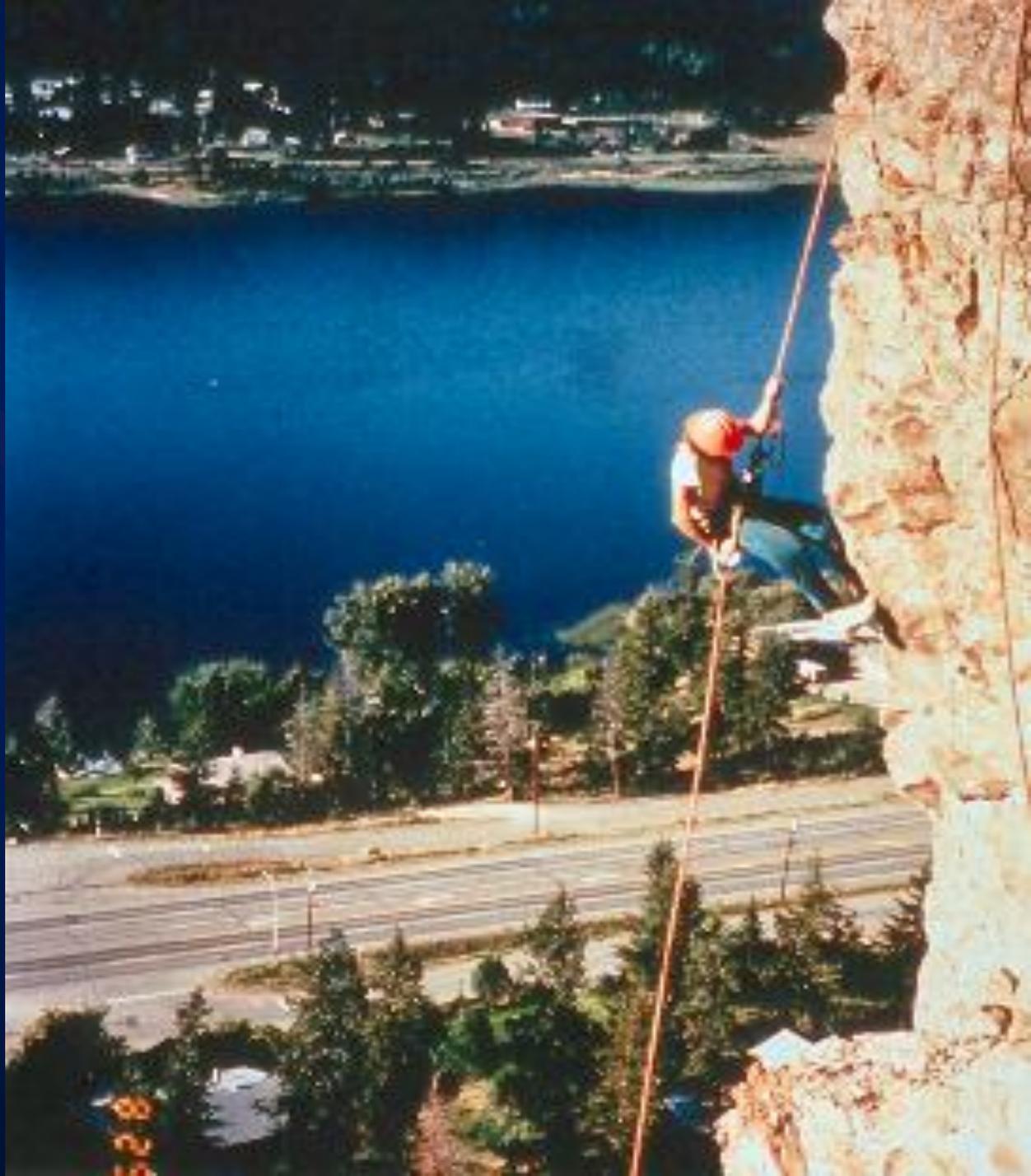
SR410, WA



Stabilization by Rock Removal

- ***Hand Scaling***
- ***Machine Scaling***

Hand Scaling







Hand Scaling with air pillows

Hand Scaling from Basket



Machine Scaling



Machine Scaling



Independence Pass Project, Colorado State Highway 82.

Photo by J. White, CGS

“Spyder” Scaling

Machine Scaling



“Log” Scaling

Machine Scaling





Machine Scaling:

Considerations:

- **Suitable rock**
- **Spotters**
- **Site coordinator**
- **Geotech monitoring**
- **Traffic protection**
 - **net & fence**
- **Dust control**
- **Reach**
- **Last pass “rake”**



Scaling with “Live” Traffic



Trees on Slopes



Long term wedging
Short term prying under wind loading



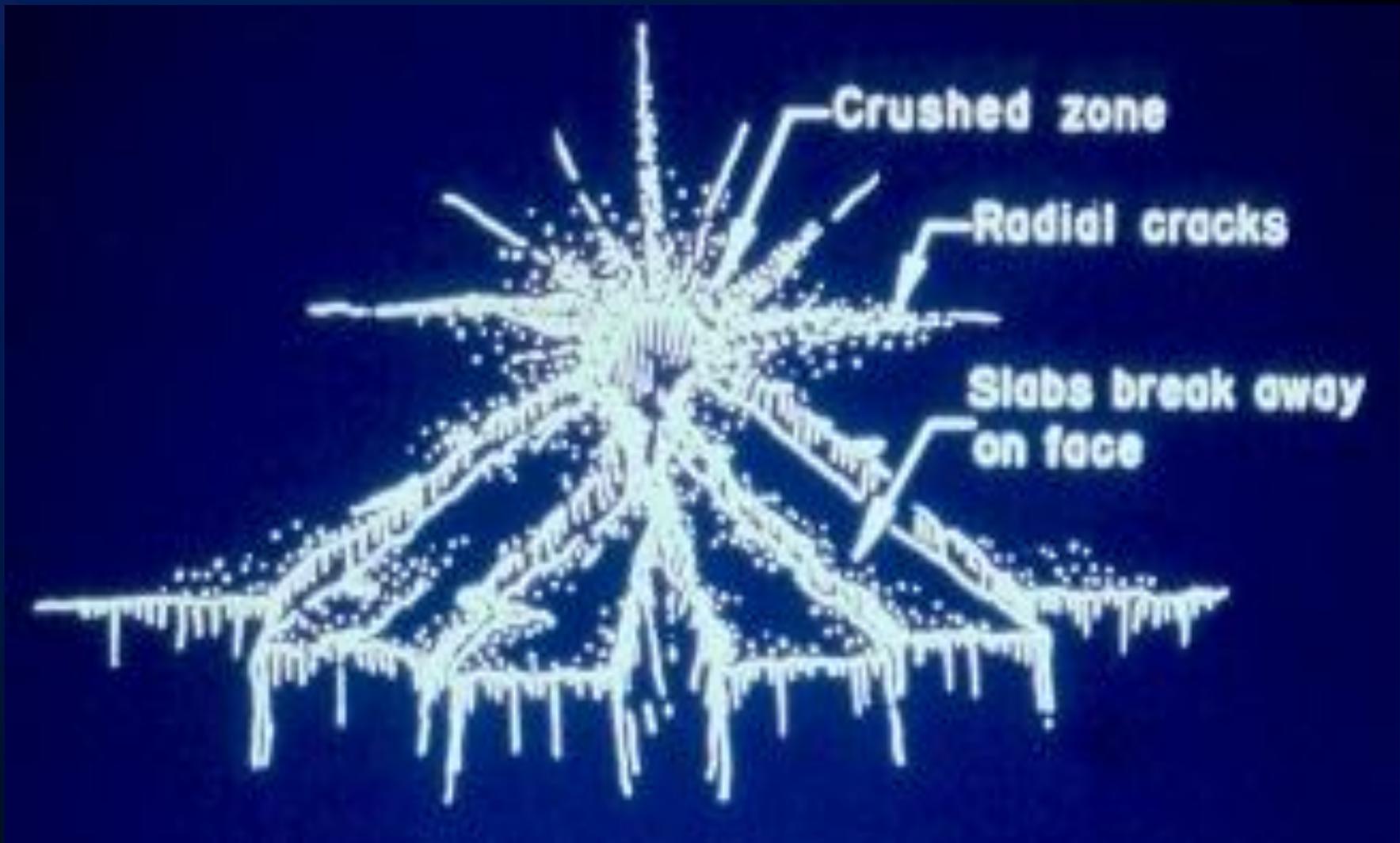
01/3/30 10:58

Stabilization by Rock Removal

- *Trim Blasting*

**Controlled
blasting**





Mechanism of Rock Fracture By Explosive



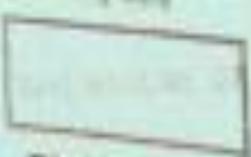
CXA



PRIMAFLEX™

Carbon Gelcoat

Detonating Cord



**EXPLOSIF
DANGEREUX**

**EXPLOSIVE
DANGEROUS**

Detonant Cord



CAUTION
Sensitizing Cord



Stabilization by Rock Removal



Ruby Creek Case Example

*5000 cy block
reinforcement vs removal
single vs incremental blast
blast hole orientation
highway closure time*

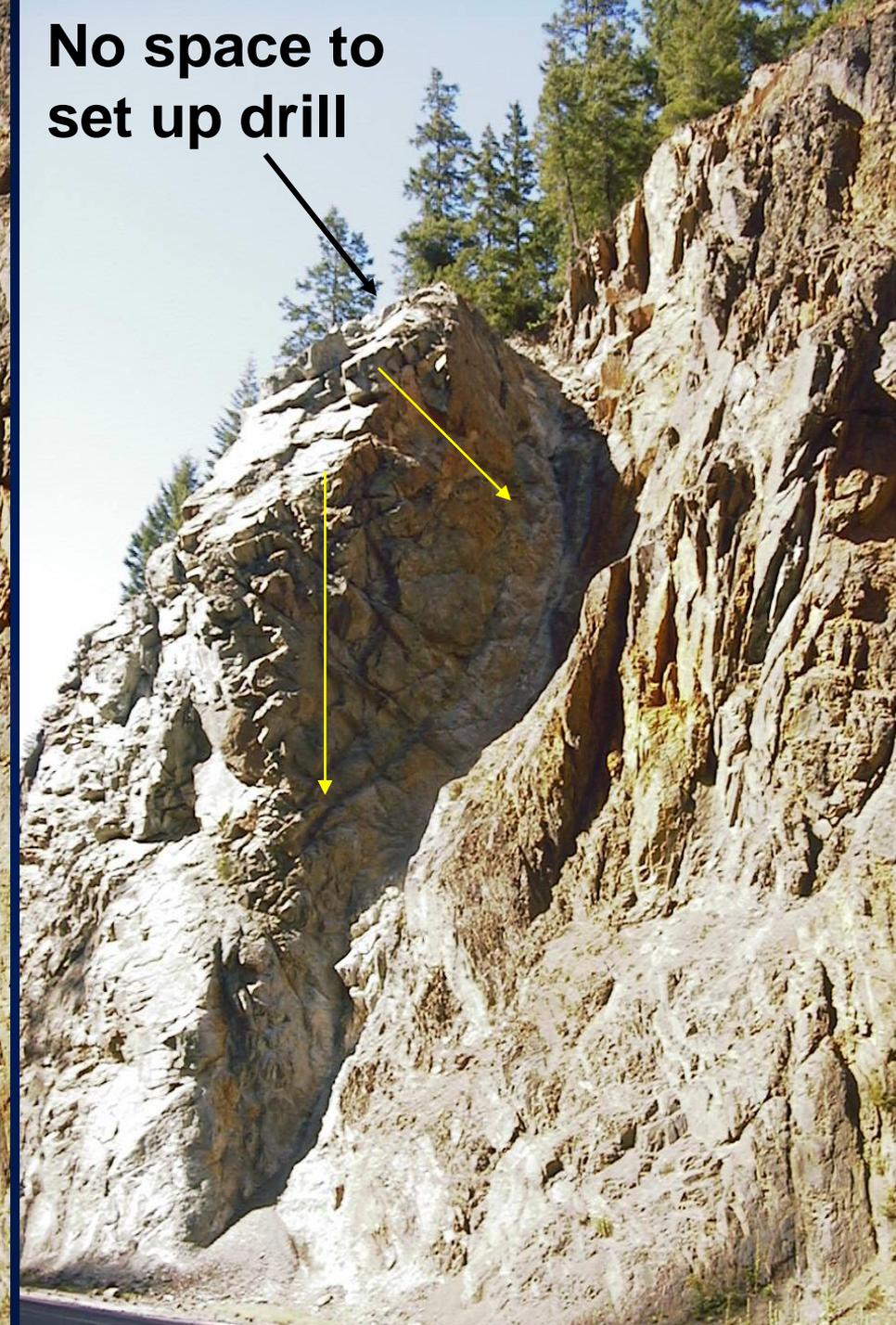


Fish bearing stream

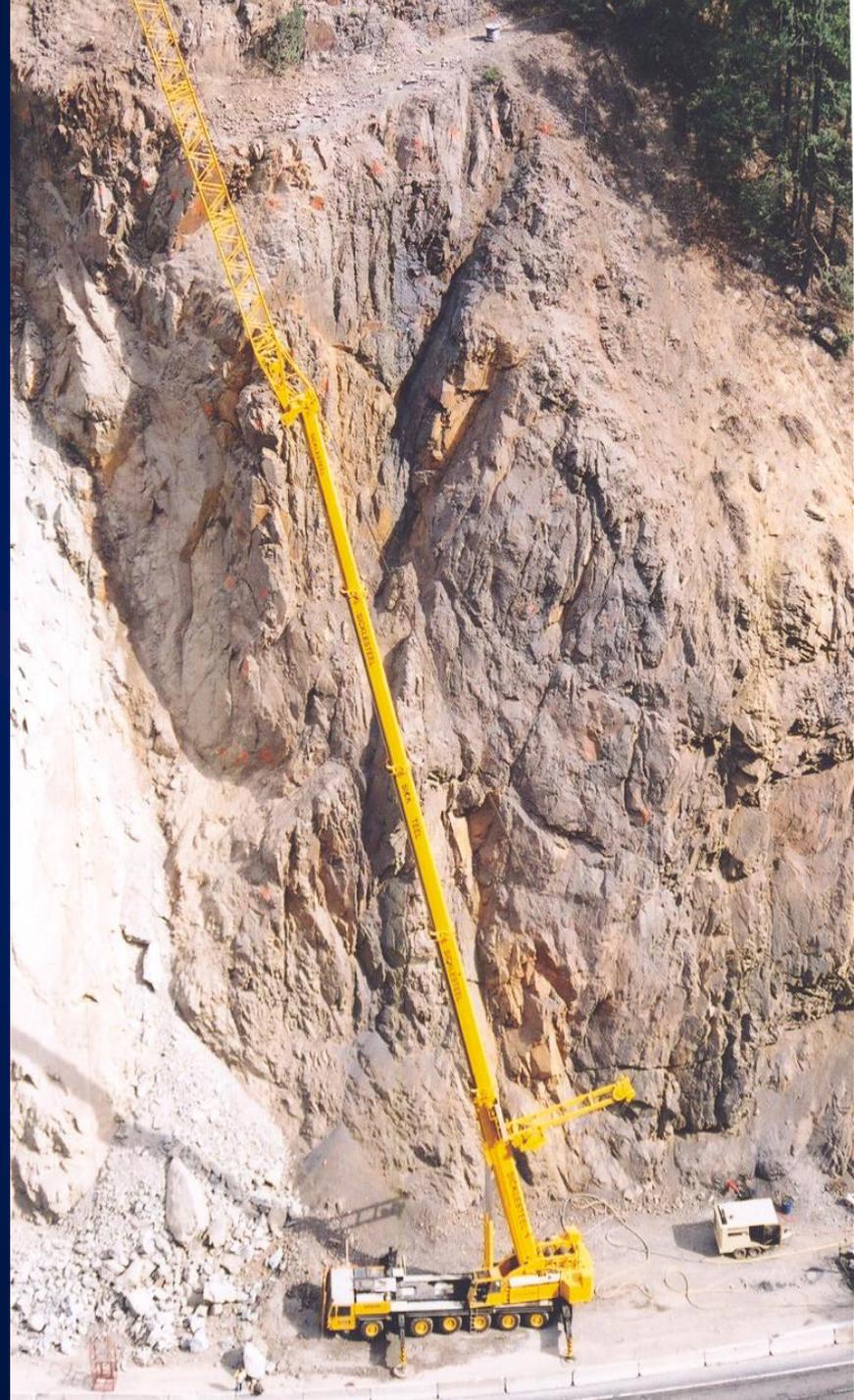


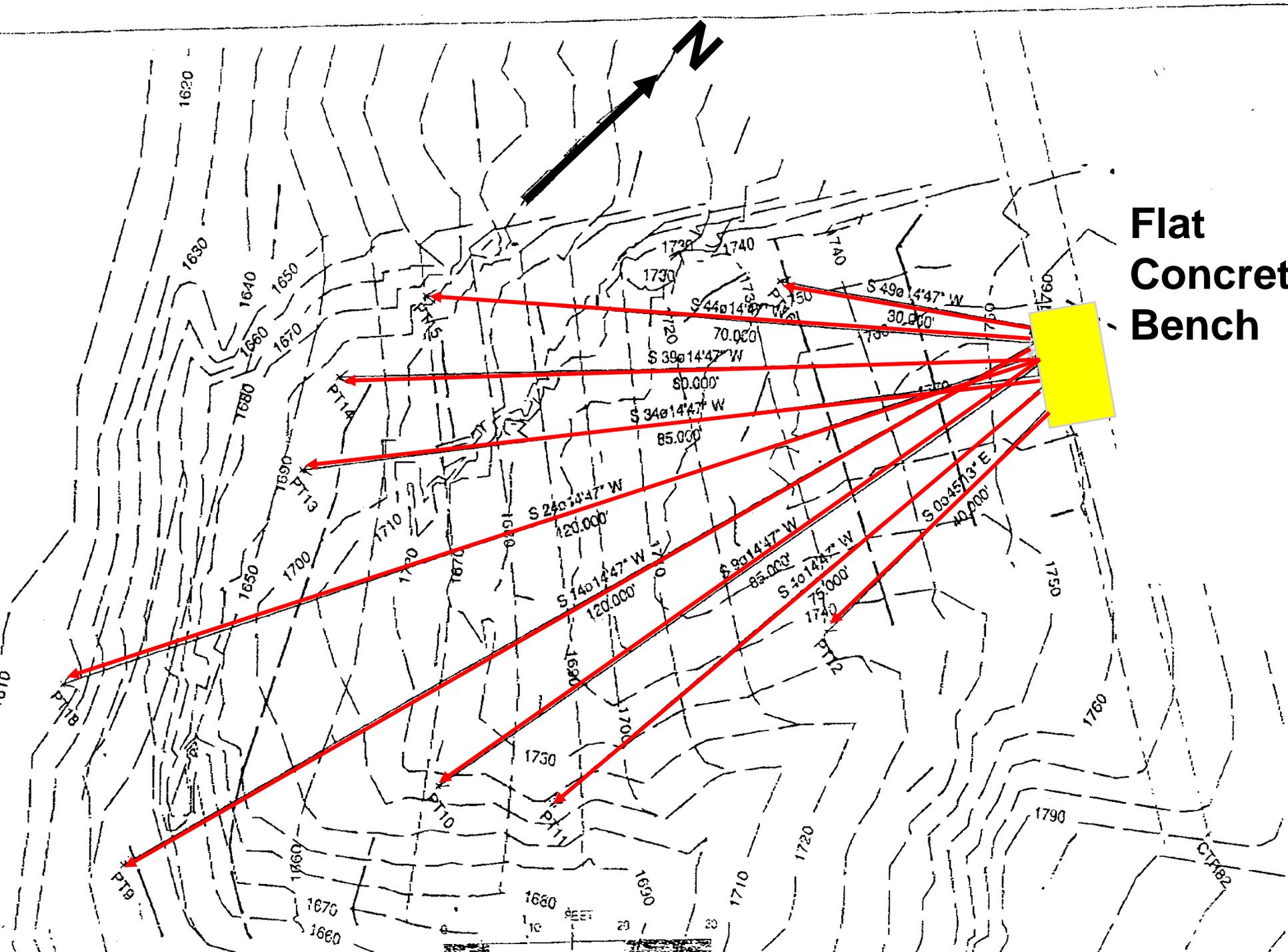


No space to set up drill



Crane with 250-foot reach





**Flat
Concrete
Bench**



Post Blast

***Significant oversize
Fly rock***





Fly Rock: 300 ft horizontal, 150 ft vertical



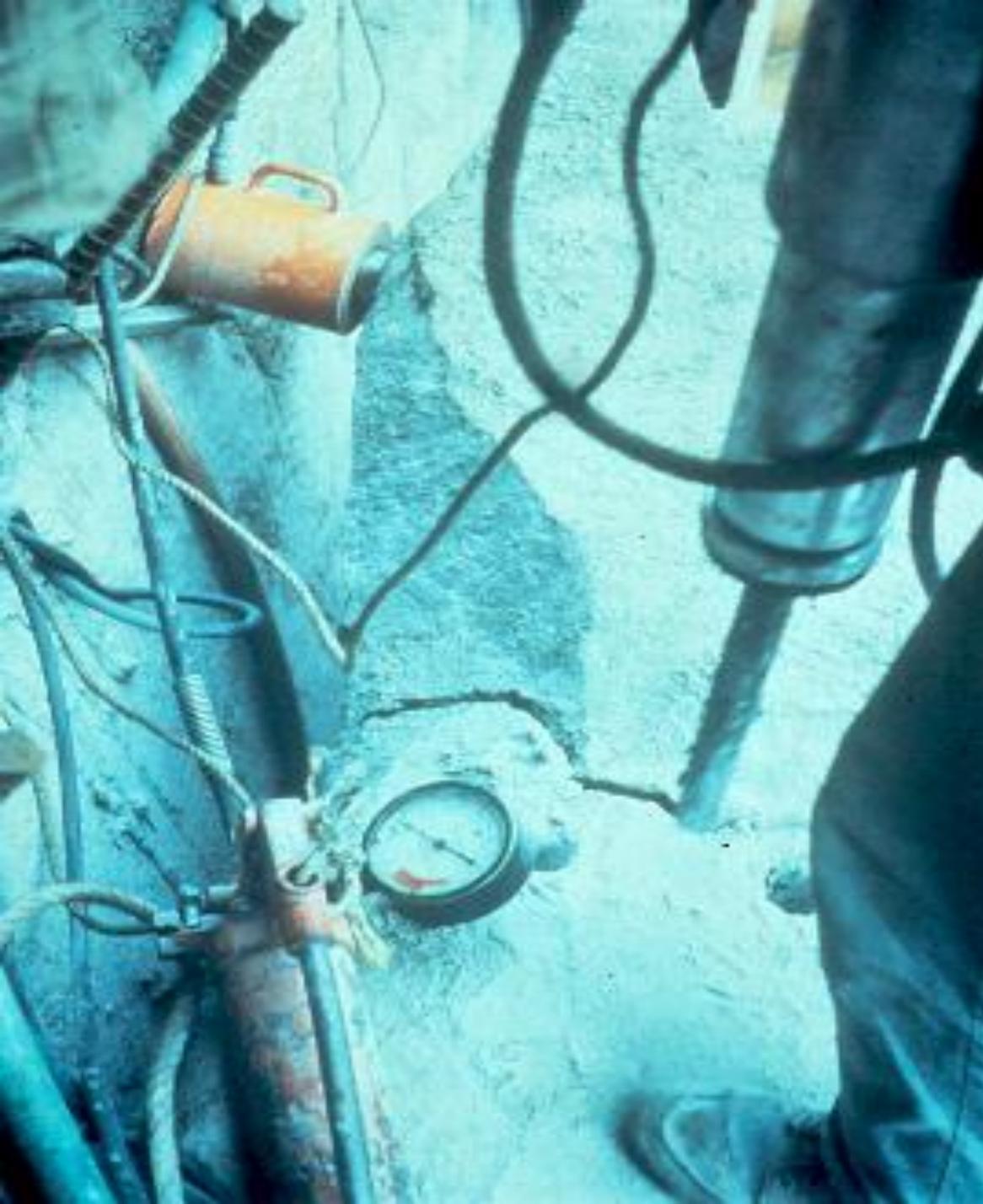
Blasting mats











“Dental Excavation”

***Hydraulic jacks
Splitters***

High unit cost

LESSON 8C – ROCK REMOVAL METHODS

Learning Outcomes –

- ***Identify prerequisite rock slope conditions for rock removal;***
- ***List rock removal methods;***