

# Geotechnical Monitoring on the Laboratory Levels at Sanford

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# Elements of the geotechnical monitoring program

***Purpose:* To ensure a safe and stable laboratory environment**

- Visual inspections
- Extensometers
- Pillar integrity monitoring
- Water inflow
- Seismic monitoring

# Visual Inspection

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- ◉ Visual inspections of rock most important line of defense
- ◉ Regular inspection program is in place
- ◉ Keep eyes open
- ◉ Everyone's responsibility

# Extensometers – how they work

*Upward  
directed  
borehole*

Snap-Ring Anchor

Borehole in hard  
or competent rock

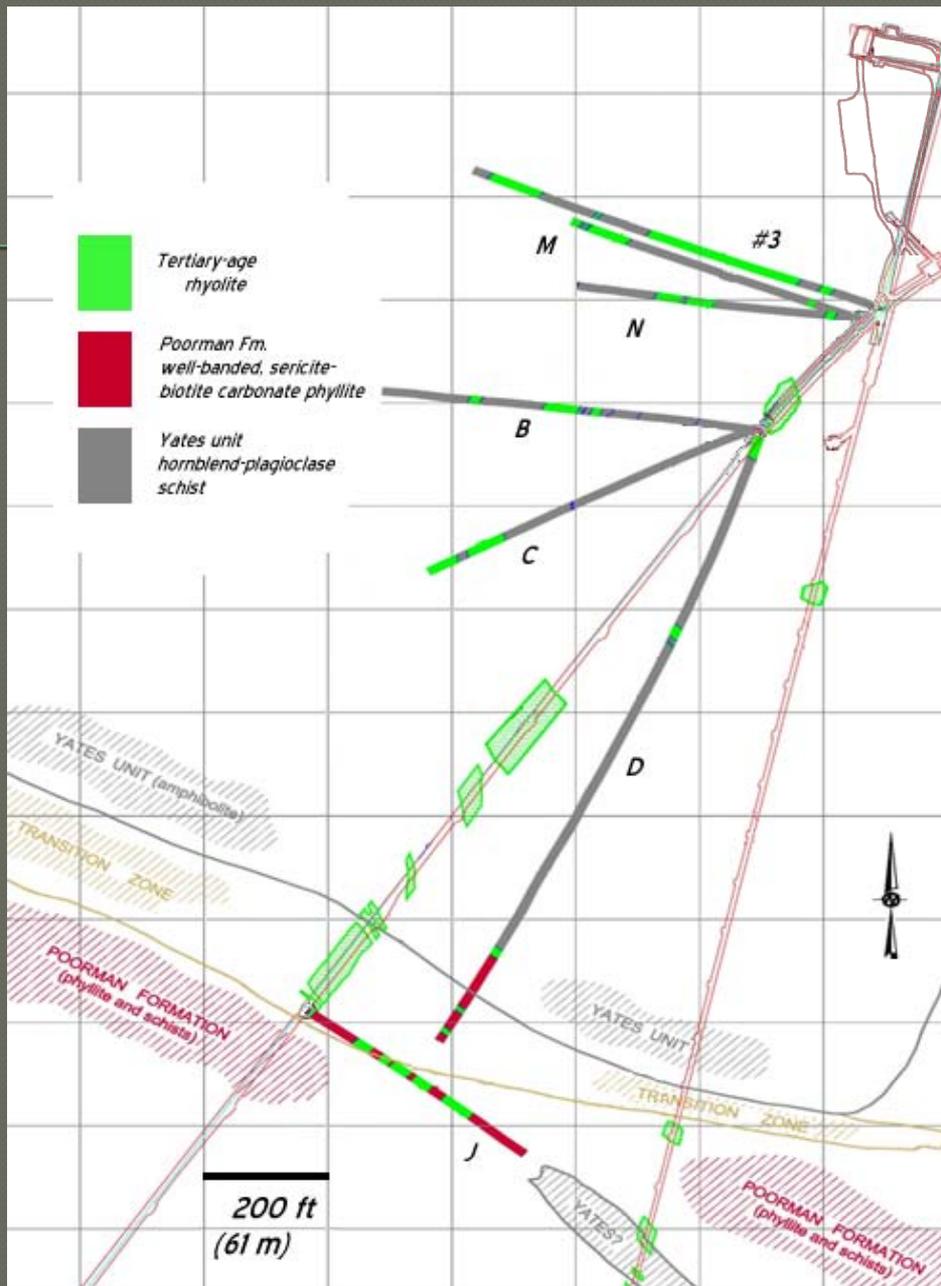
Recessed  
Extensometer  
Head

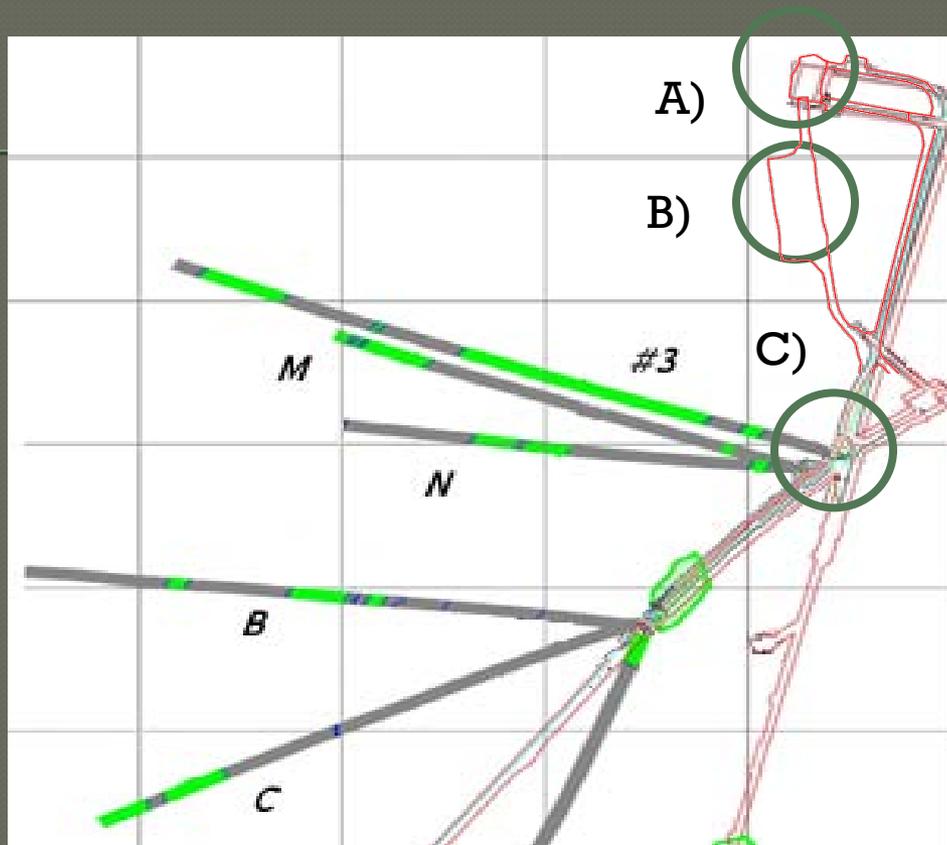
Snap-Ring Anchor

Measurement Rod

Snap-Ring Anchor

- Multi-point anchors are installed at various depths in the rock
- Requires ~8 cm borehole that is 5 – 10m into the rock





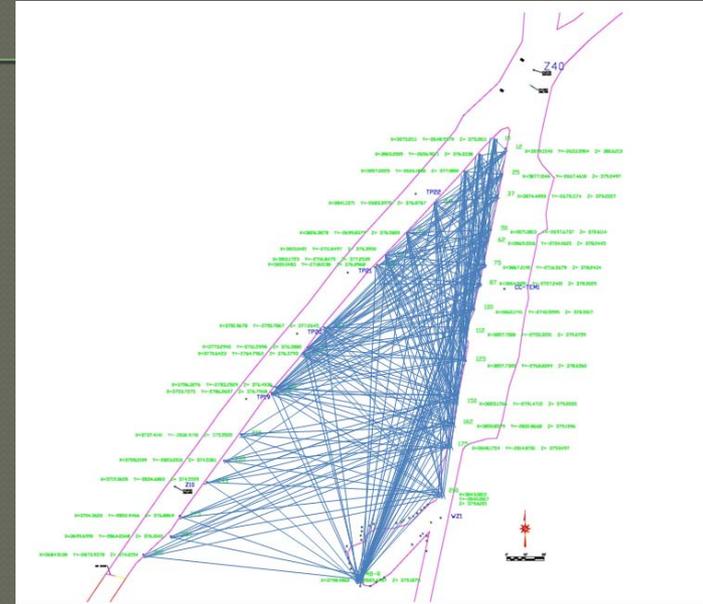
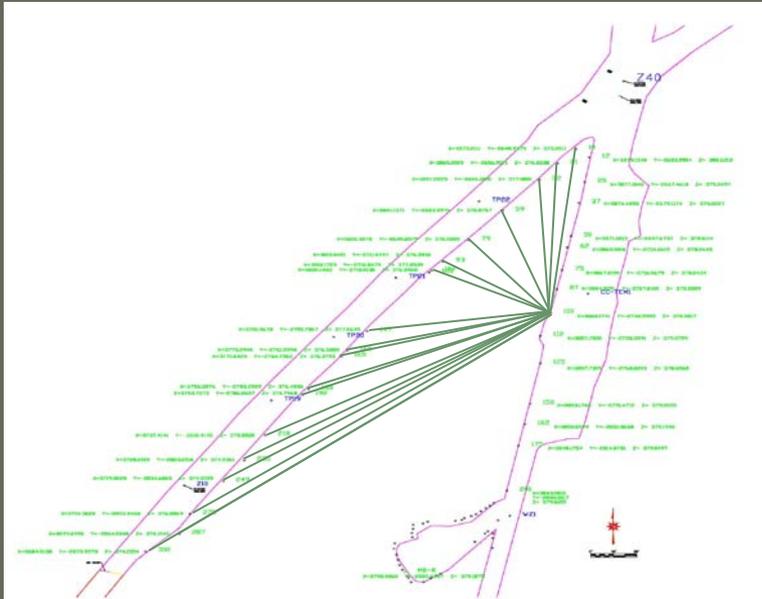
## Extensometer locations on the 4850 Level

**Purpose:** To monitor any rock movement at key laboratory and infrastructure locations

- Data from extensometers report to the surface via optical fiber

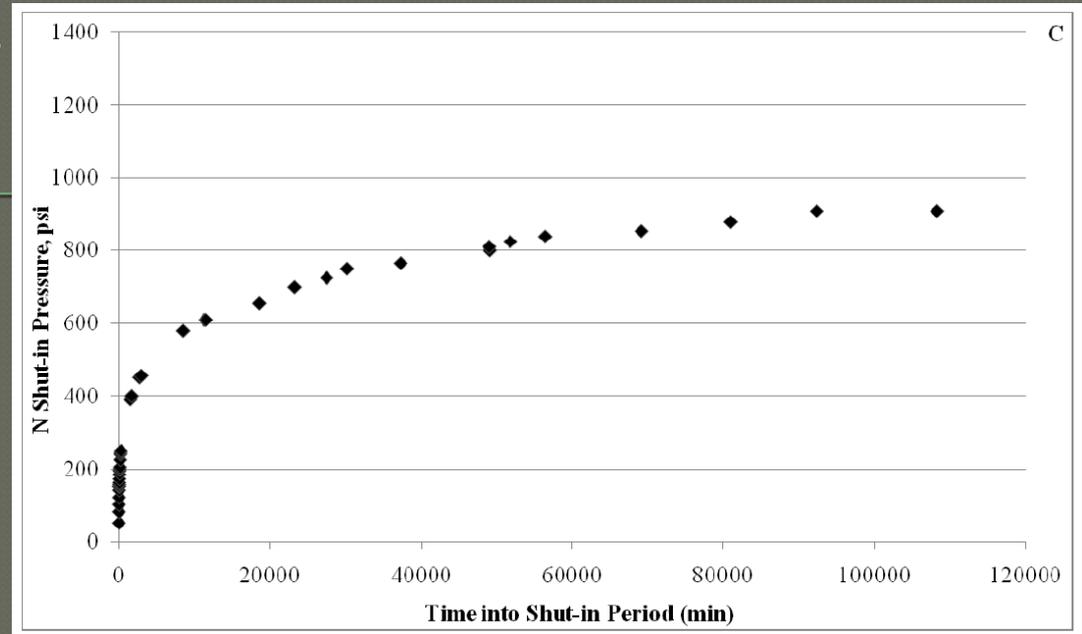
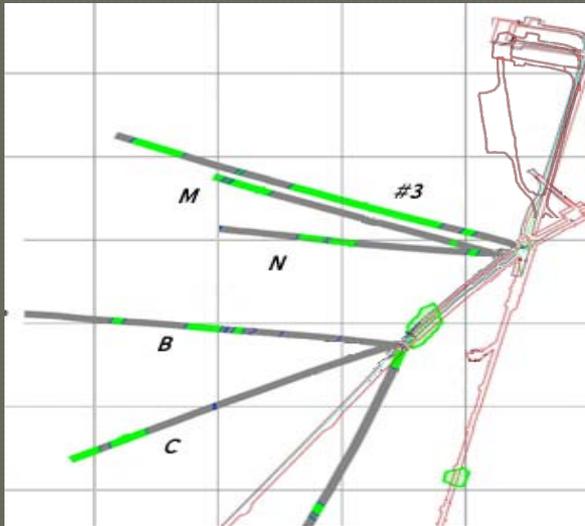
- No measured rock movement to date

# Pillar integrity monitoring



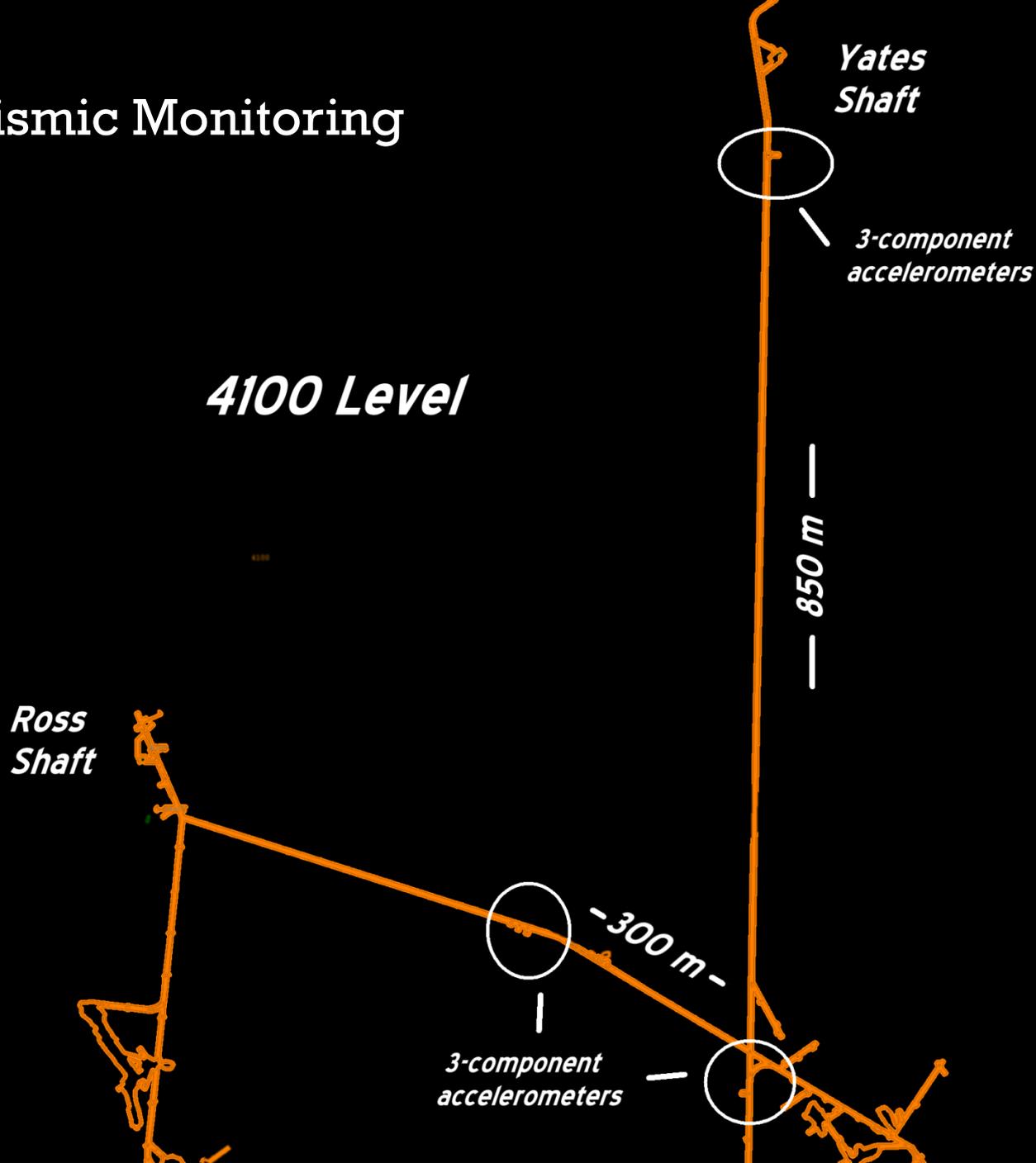
Acoustic velocities are measured along multiple paths in a key pillar adjacent to the laboratory areas

# Water from Fractures



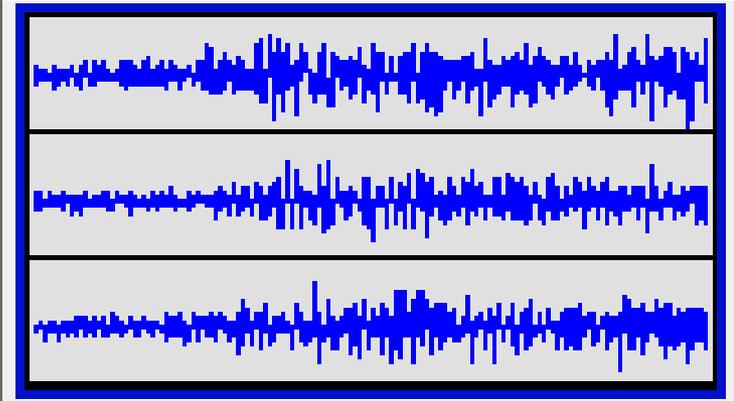
- Boreholes from initial geotechnical characterization are being kept open
- Flow from the boreholes varies between 0 and a few liters/min. (currently being allowed to drain) -- Water does not seem to be a problem in this area of the 4850 Level
- Pressure build-up when the holes are shut indicates:
  - a. pressure increase is slow indicating very low transmissivities
  - b. final build-up pressures show that the fractures are not filled to the surface

# Seismic Monitoring



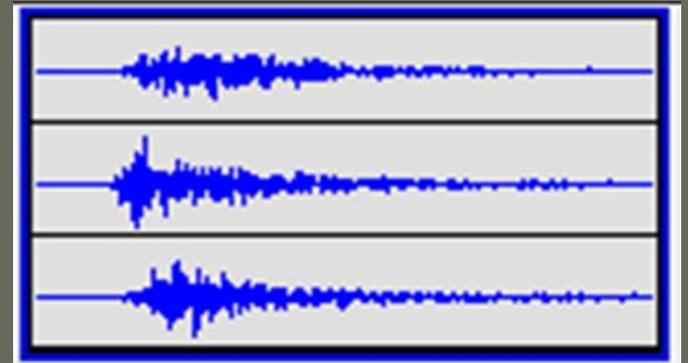
# Example preliminary seismic data from the 4100 L array

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Regional Earthquake

- 300 km (central Nebraska)
- 3.6 magnitude



Blast at Wharf Mine  
~7km distance

# Summary

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- Geotechnical monitoring is a work in progress
- Facility is using a number of different techniques to ensure that the behavior of the rock can be detected on a real time basis
- The rock of the facility is doing very well from a geotechnical standpoint