Rippability Assessment:
Weathered Rock and Bedrock Excavation Volume Study Combining Drilling and Geophysical Methods

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Introduction

- Proposed new campus building.
- Previous nearby construction encountered significant cost overruns from rock.
- Preliminary drilling revealed highly irregular rock and weathered rock.
- Resistivity imaging and shear wave velocity data were collected to supplement drilling data.
- Data were used to estimate soil, weathered rock, and rock excavation volumes.
Approximate Site Location

Metamorphosed quartz diorite and tonalite
Footprint of Proposed Building

FFE: 658 Feet

FFE: 643 Feet
Easy total volume calculation, but...

- ~60,000 yards
- What portion is soil?
- What portion is rippable weathered rock?
- What portion is unrippable rock?
Geotechnical Borings

- 22 Borings.
- Thickness of rippable weathered rock from 7-43 feet.
- Depth to auger refusal from 7-49 feet.

Metamorphosed granitic gneiss

Scale (feet)

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Resistivity Imaging

15 Resistivity lines.
Resistivity imaging provides cross-sectional images.
Typically, soils exhibit low-resistivities and rock high-resistivities.
Thick intervals of weathered rock are gradational.
Resistivity Results with Drilling Correlations

Line 1

Line 2

Elevation (ft)
Distance (ft)

Resistivity Scale (ohm-meters)

B-3 = Boring ID
= Soil
= Weathered Rock
= Auger Refusal

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Spectral Analysis of Surface Waves (SASW)

Earth Model
Shear Wave Velocity (ft/sec)

soil

Weathered Rock (rippable)

Hard Rock (not rippable)
SASW and Resistivity Correlations

Line 1

Line 2

Resistivity Scale (ohm-meters)

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Generating Surface Models

- Surfaces are defined by XYZ data.
- X and Y from GPS or survey.
- Z by digitizing geophysical and drilling data.
Approximately 8,000 yards.
Approximately 1,000 yards.

Rippable Weathered Rock Surface Above Proposed Grade (with mesh lines)
Conclusions

- Geophysical data filled critical gaps between borings.
- Provided better information for estimating.
- Example of the A-Game.