What you Can't See May Hurt You:

A Look at Geotechnical Risk and Reduction Techniques

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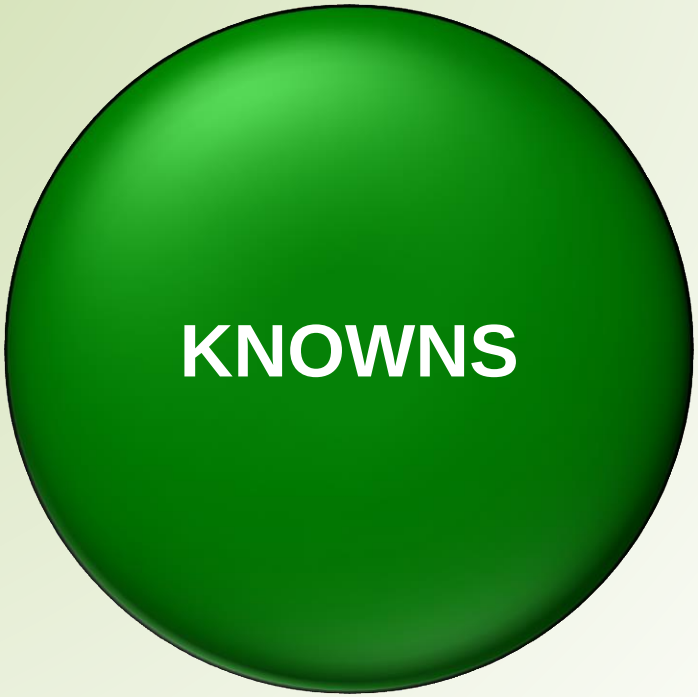
What you can't see could hurt your project

Dr. Elio D’Appolonia (1995)

Classification of Geotechnical Risk

Knowledge Level at Project Start



We know what we know

(at any given point in time, and it ~~may~~ will change)

We don't know what we don't know

Experience tells us that
there's something we *should* know

We don't know what *SOMEBODY* knows

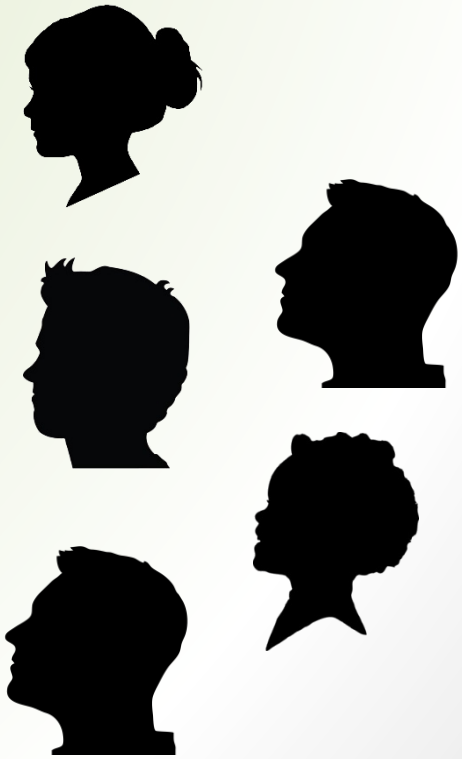
Lane, 2003

Risk Management-A Practical View

Experience

Implicitly manage risk

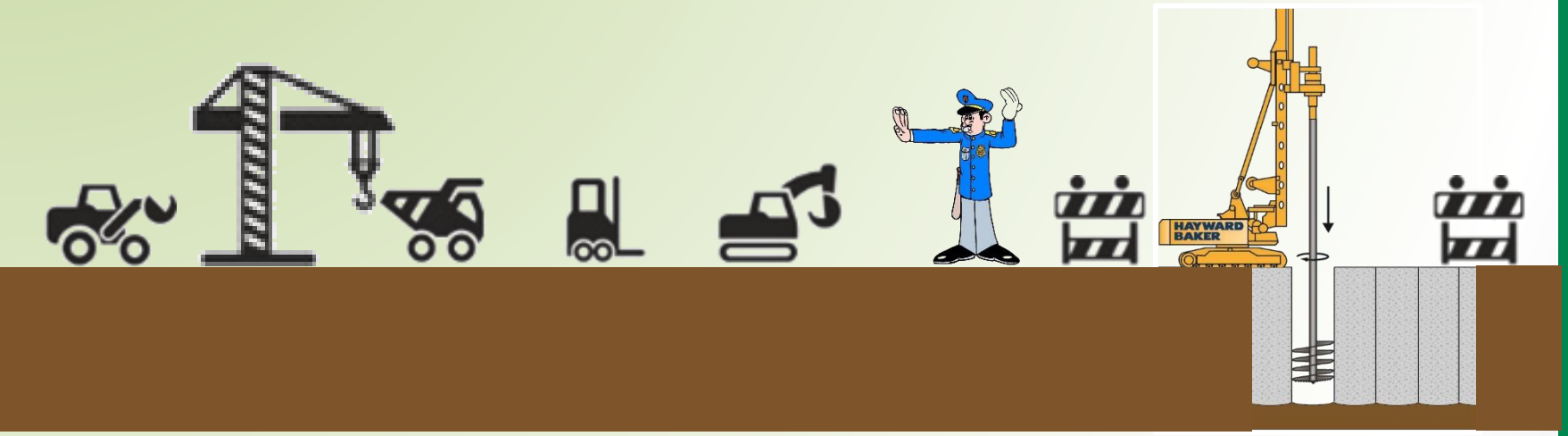
Share



Easy, right?

Trenter, 2003

Understanding and Containing Geotechnical Risk



Earliest on the Job

Methods are faster than ever

Fewer people required to execute the work

Feb 2003 Proceedings of the Institution of Civil Engineers - Civil Engineering

Clayton, 2001

Managing Geotechnical Risk: Time for Change

Typical Challenges:

Below grade construction

Always first on site, problems delay other activities

Variable Conditions

Subsurface changes horizontally and with depth

Groundwater

Pre-existing and out of anyone's control

C. R. I. Clayton, Great Britain. Dept. of the Environment, Transport and the Regions, Institution of Civil Engineers (Great Britain)

So what do you do?

Geotechnical risk exists

What do we really know about it?

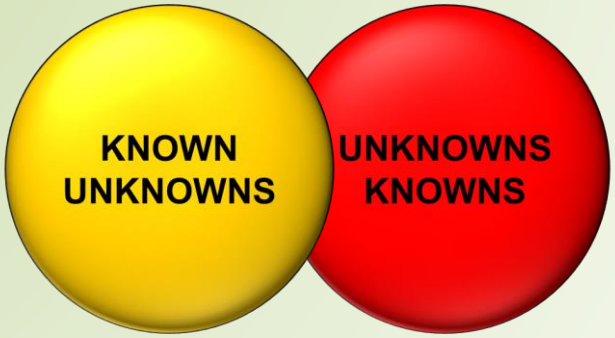
Design must be completed with what we know.

Manage risk through reduction of

Kinds of Construction Risks

- Weather
- Insurance and bonding
- Safety
- Soil and Rock
- Groundwater
- Design
- Performance
- Verification
- Schedule
- Materials
- Resources
- Contract
- Subcontract
- Access
- Experience
- Proximity to sensitive structures or utilities

Do you really understand the subsurface conditions?



Site History

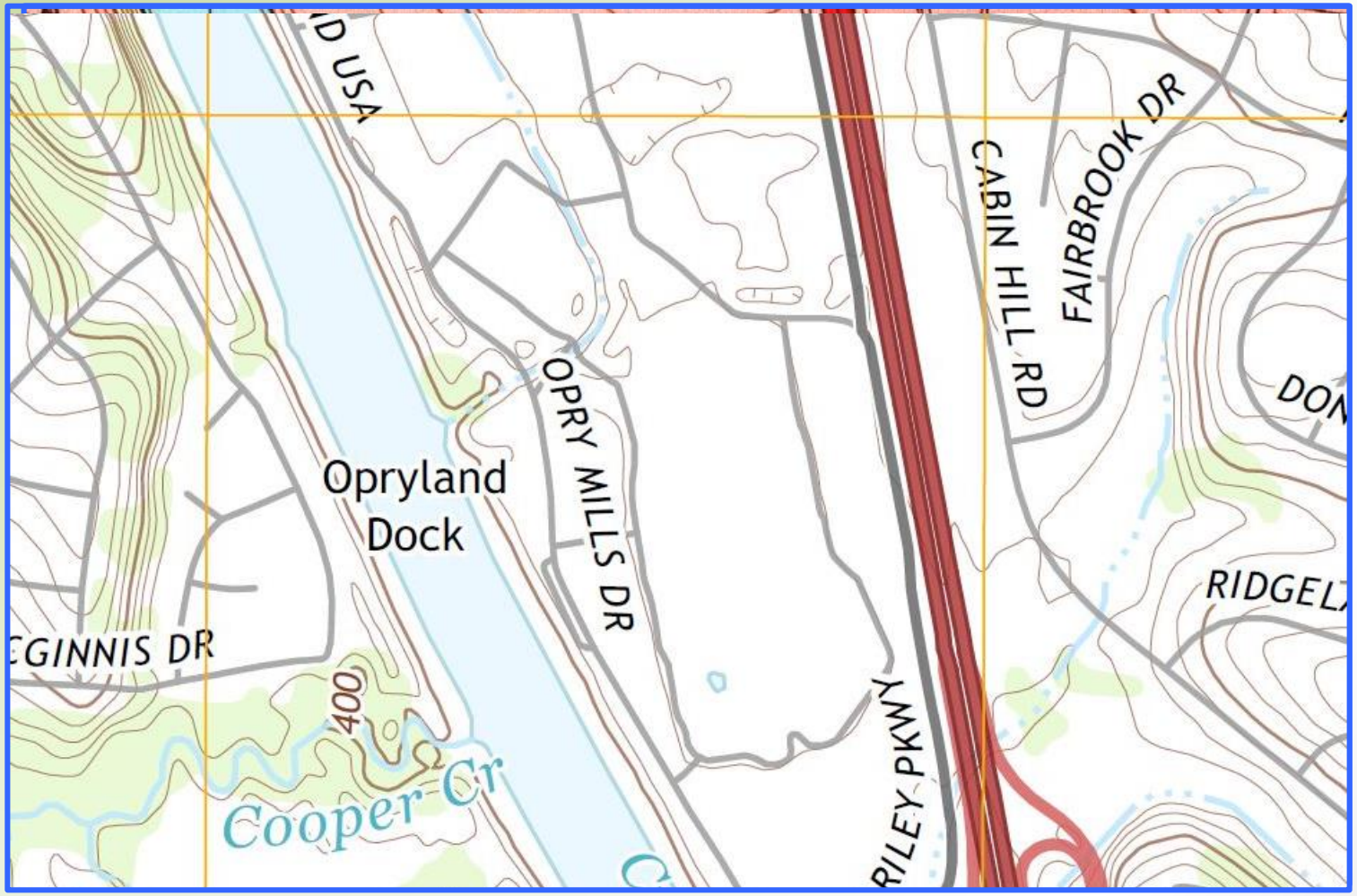
Previous Structures/Utilities

Old Fills or Surcharges

Historic Streambeds or Ponds

Previous Mining or Industrial Activities


12/30/2003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OPRY MILLS DR
CABIN HILL RD
FAIRBROOK DR
Opryland
Dock
GINNIS DR
400
Cooper Cr
RILEY PKWY
RIDGEL

Do you really understand the subsurface conditions?

SPTs

CPTs

Sampling and In situ Testing

Site reconnaissance/observations

"You can observe a lot just by watching.“
(Yogi Berra)

“typical” boring spacing – 100’

SPT interval – 5’ vertical

SPT length, diameter, volume – 12”, 1.375”, 0.0103 cu ft

Total Volume = 100 x 100 x 5 = 50,000 cu ft

% of total volume that standard penetration testing represents:

0.0103/50,000 = 0.000021%

Or 1 / 4,854,400

Do you really understand the subsurface conditions?

Laboratory Testing

Does the testing provide:

Direct design parameters?

Of the correct strata?

To the extent and depth required?

Sample disturbance?

Or are we interpreting the data with indirect methods?

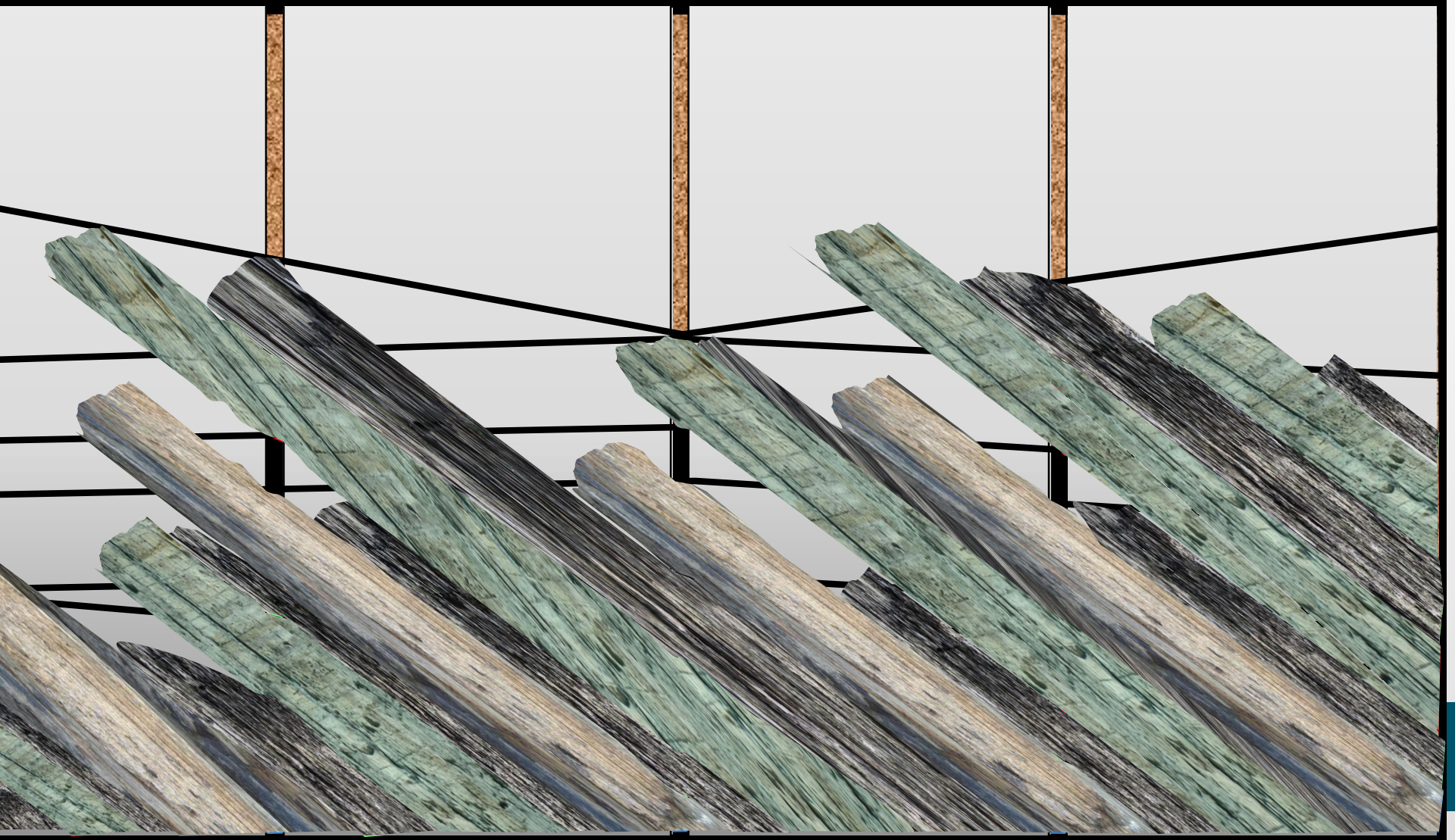
Do you have a good enough understanding of the subsurface conditions?

Interpretations…..

Are they from Investigated sites nearby?

Lab testing from similar materials?

Observed performance from previous construction?



Biggest Challenges
i.e. **Greatest Risks**

Stopping groundwater

Large Forces

Large area loads

“Zero” Movement ERS

How do we manage the risk?