

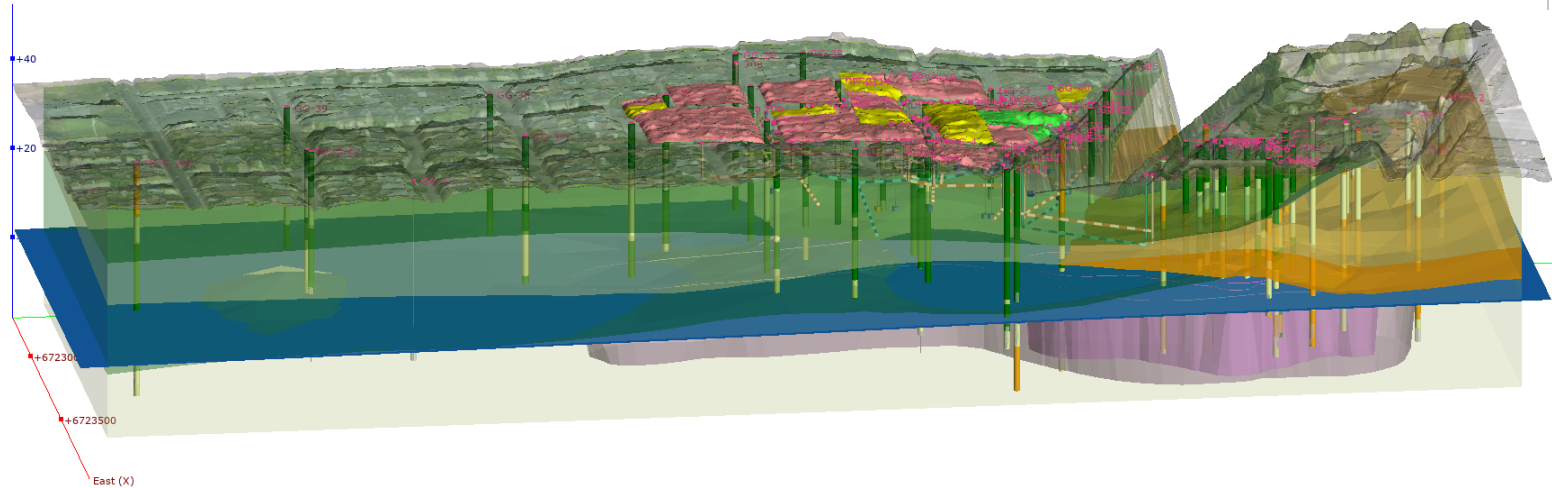
Use of a 3D Conceptual Site Model for Rapid Site Assessment and Communication

BATTELLE

2024 Chlorinated Conference

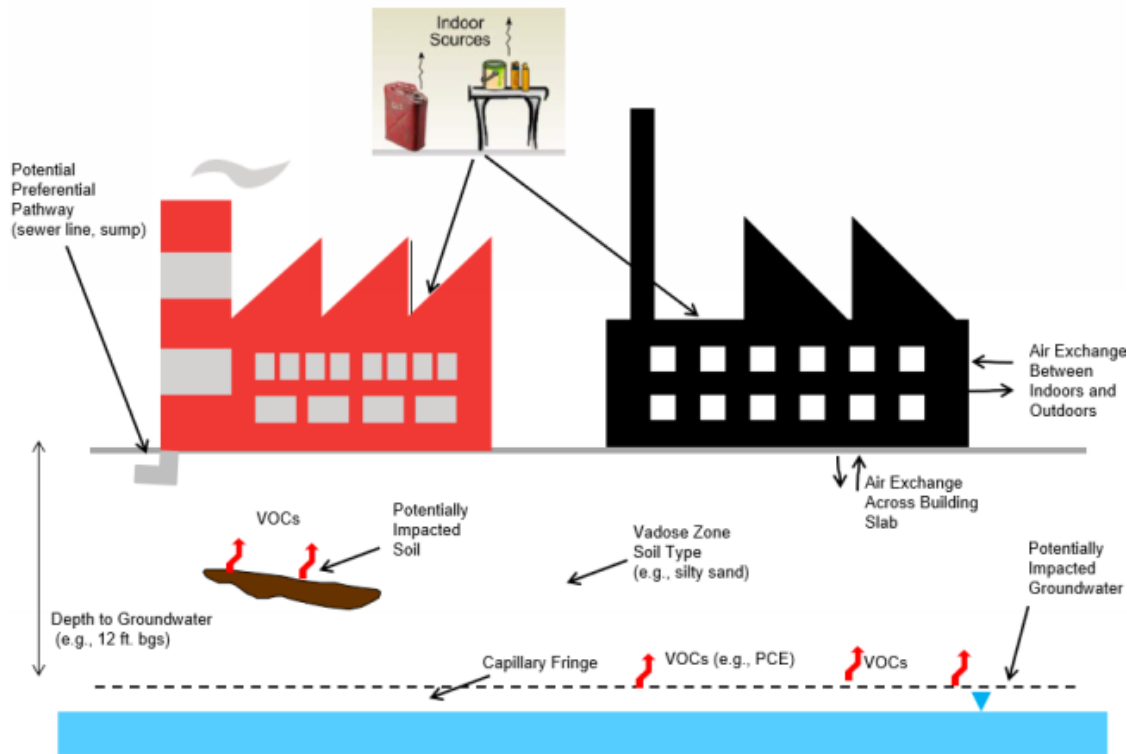
Denver, CO

June 2024



Standard Conceptual Site Model (CSM) is too simplistic

Visual CSM



Narrative CSM

A chemical release occurred at a dry cleaner in a strip mall. The impacted soils in the immediate vicinity of the release have been removed to the extent feasible. The groundwater impacts extend under the strip mall and may have reached nearby residential buildings. Impacted soil and groundwater are potential sources of vapors at the strip mall and impacted groundwater is a potential source of vapors downgradient. The depth to groundwater is about 12 ft. The surface soils are primarily sandy silts. The occupied buildings in the area are primarily one-story, single-family residences. The houses are relatively small (~1,200 ft²) and date to the 1920's. The lots also are relatively small (e.g., one-sixth acre) with small lawns and flower beds. The buildings appear to be slab-on-grade construction. There may be preferential pathways present in the subsurface (e.g., buried pipelines and utility lines in porous fill) that could affect pollutant transport.

Georgia Vapor Intrusion Guidance

Source

Pathways

Receptors

} Foundation for evaluating transport, fate and potential exposure

Project timeline



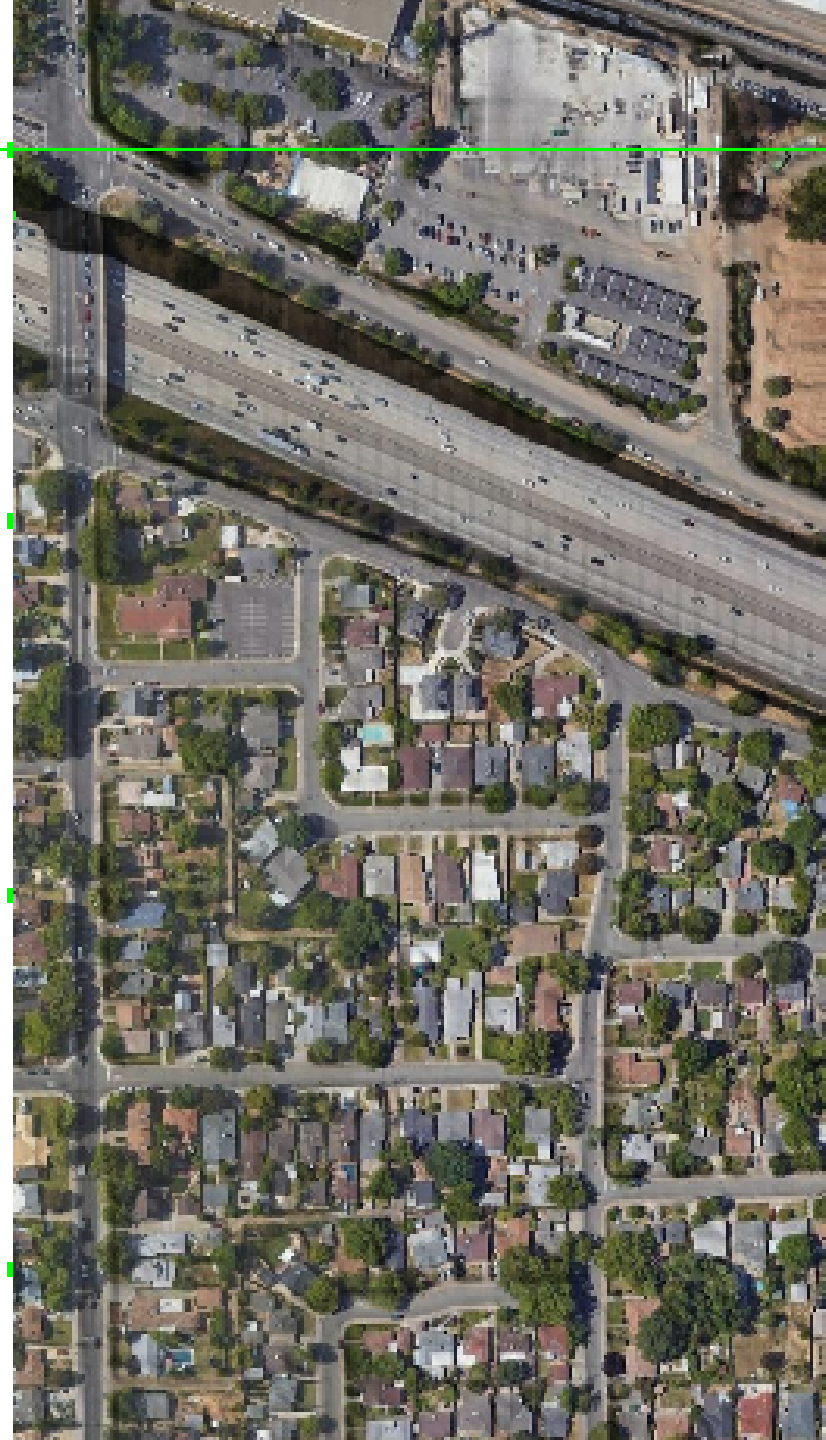
Red Light, Green Light?

- COVID Intervenes
 - Hurry Up and Wait
- In-Person Meetings?
- The show must go on...
 - Development of RAP and Remediation Approach
 - How to best convey our understanding?
 - How to best identify data gaps?
 - Credibility and Simplicity
- 3D Technology



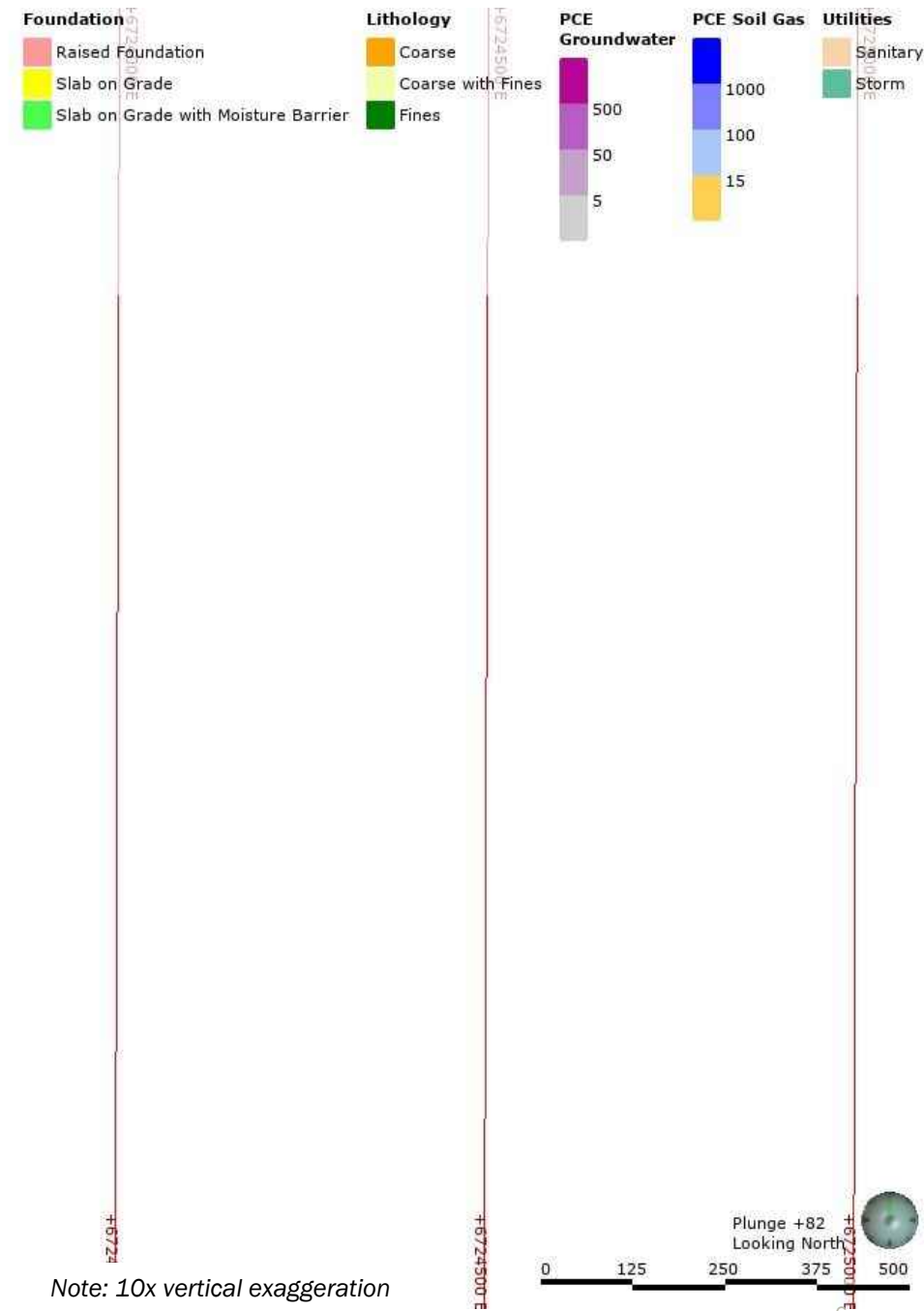
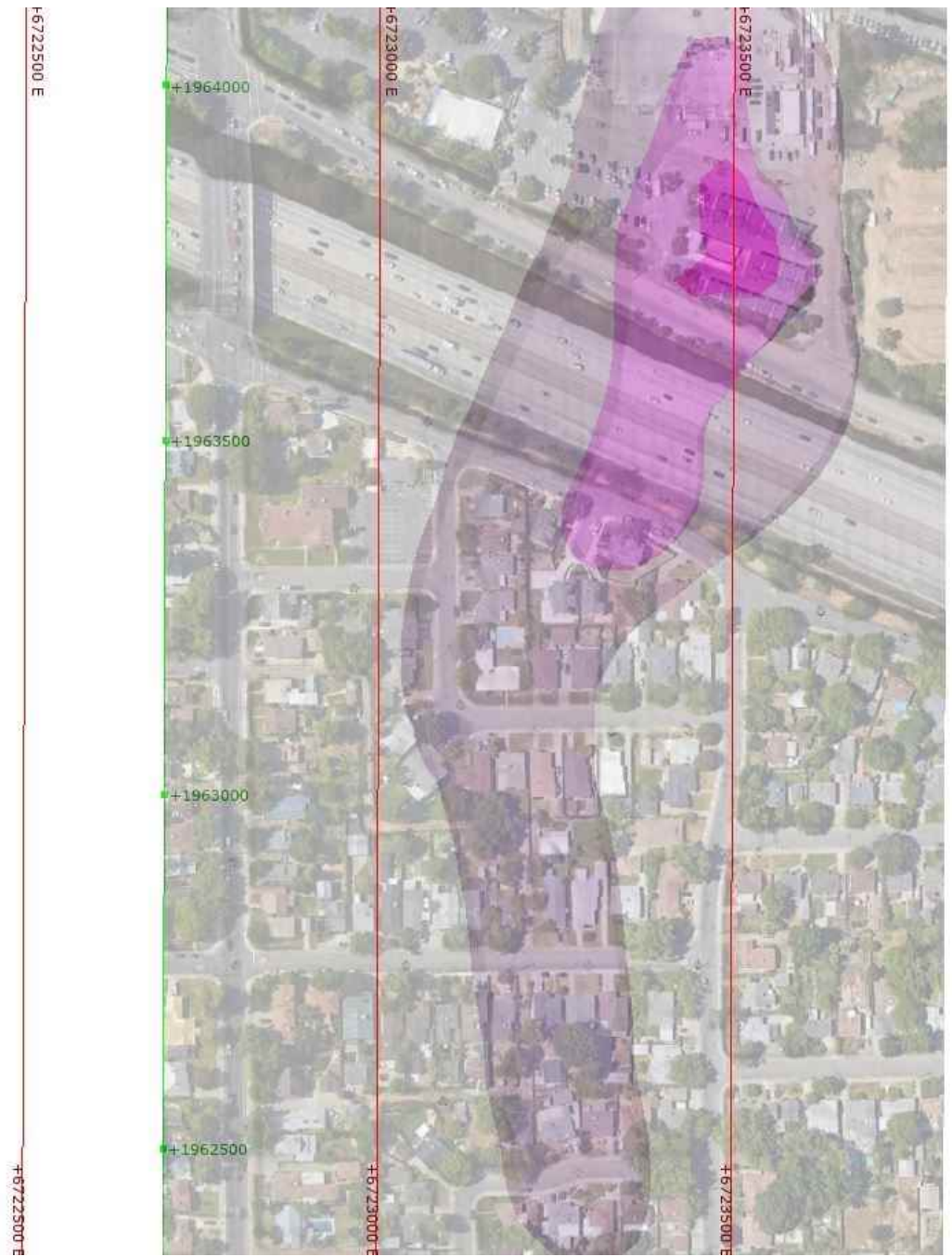
Offsite Soil Gas CSM

Visual 3D CSM was developed using Leapfrog (Seequent Solutions)

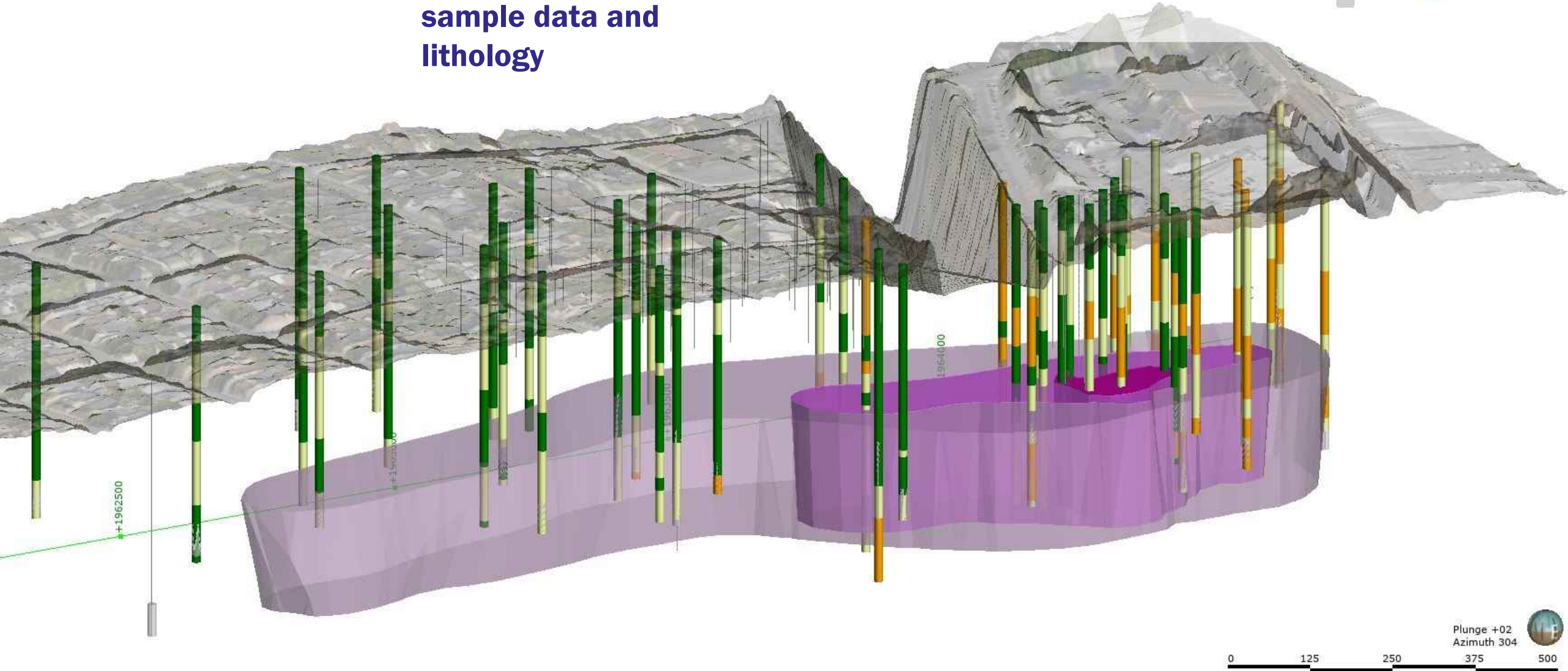
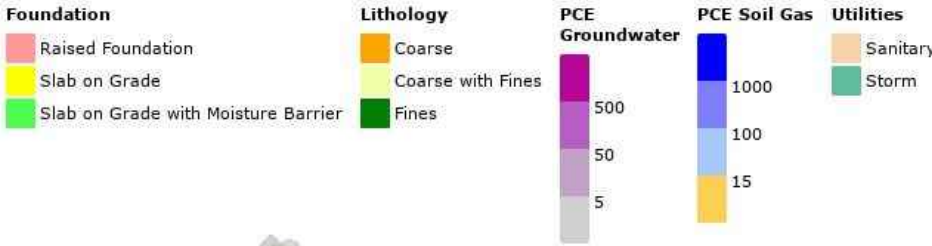


Data Sets

- Ground surface elevation
- Soil borings and lithology
- Groundwater elevation data
- PCE groundwater concentrations
- Offsite soil gas sample elevation and PCE concentrations
- Select Offsite residential building foundation types
- Subsurface utility information



Visual 3D CSM details soil gas sample data and lithology



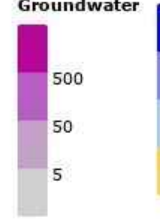
Foundation

- Raised Foundation
- Slab on Grade
- Slab on Grade with Moisture Barrier

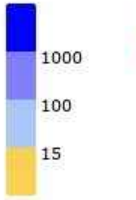
Lithology

- Coarse
- Coarse with Fines
- Fines

PCE Groundwater



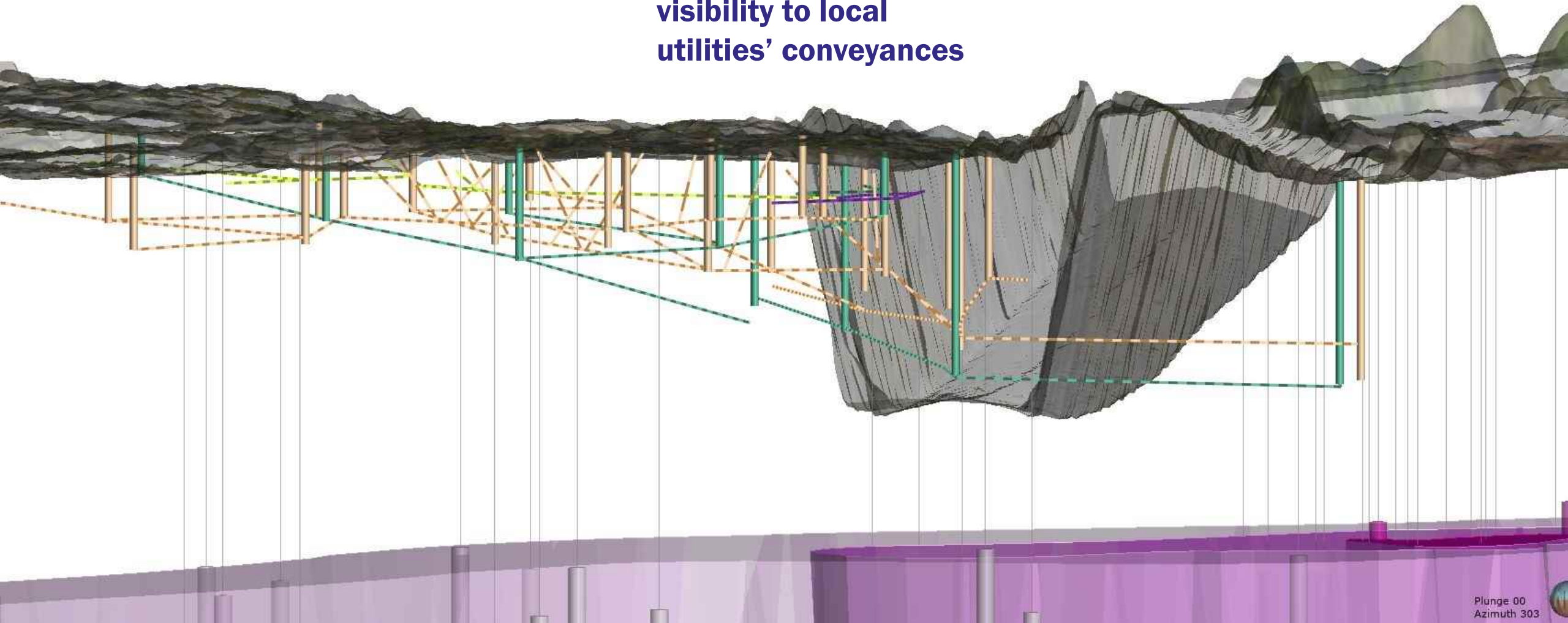
PCE Soil Gas



Utilities

- Sanitary
- Storm

**3D CSM provides
visibility to local
utilities' conveyances**



Foundation

- Raised Foundation
- Slab on Grade
- Slab on Grade with Moisture Barrier

Lithology

- Coarse
- Coarse with Fines
- Fines

PCE Groundwater

- 500
- 50
- 5

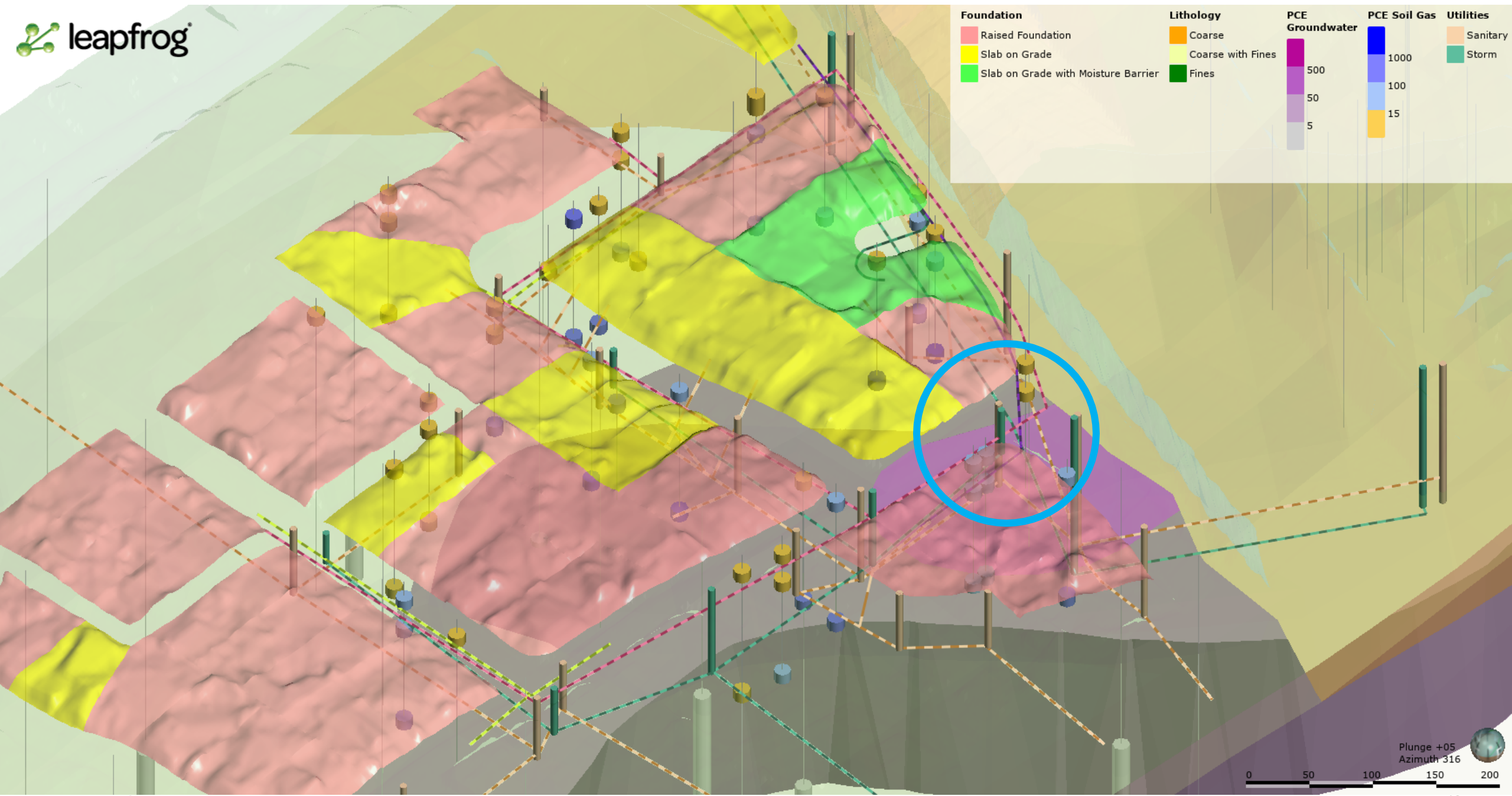
PCE Soil Gas

- 1000
- 100
- 15

Utilities

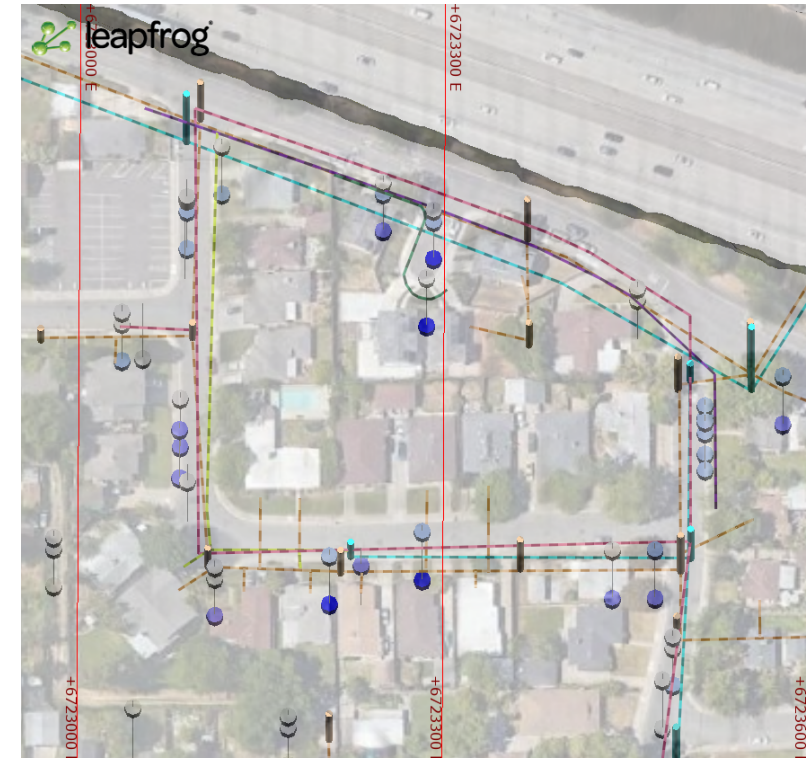
- Sanitary
- Storm





Offsite Soil Gas CSM provided sufficient data that PCE groundwater plume is likely source of offsite soil gas

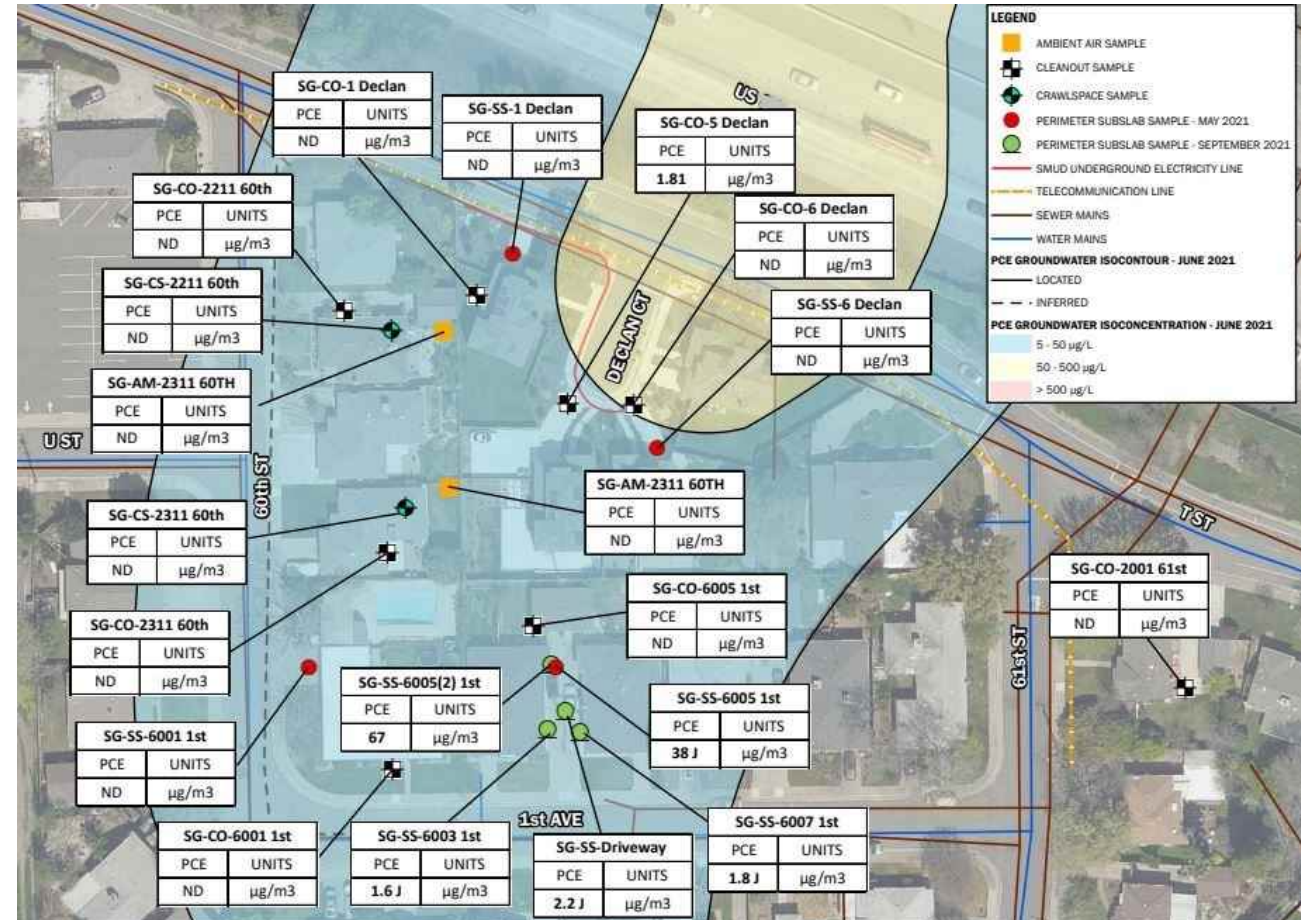
- Extents of soil gas impacts generally defined
- Higher PCE concentrations at 15 feet bgs samples than shallow (2 & 5 ft bgs) samples
- Low permeability fine grained layer at the surface
- Higher PCE concentration soil gas samples at 15 feet bgs are within a more conductive layer
- Storm and sanitary sewers potential conduit
- Building foundation type important consideration



Relatively low-risk – but need to confirm

Offsite Area Private Property Investigation

- Cleanout: One detection
- Crawlspace: Non-detect
- Surrogate Sub-slab
 - Several detections
 - Correlated with plume
- Relatively Low Risk
 - Focused confirmation sampling



3D CSM progressed investigation goals to achieve quicker closure

Communicated reasonably complete understanding of source, migration potential, and focused path forward



Sufficiently supported data to satisfy regulatory agency

Rapid stakeholder “buy-in” on subsequent steps



Confirmed little to no risk

Indoor air sampling was declined



Avoided indoor air sampling

Thank you.

Questions?

Brown AND **Caldwell** :



Brown AND
Caldwell