



Why Geotechnical Data Shapes More Than Foundation Design

Geotechnical data is often first applied during foundation design, but subsurface conditions influence far more than footing size or pile depth. Soil properties, groundwater levels, and site variability affect decisions from early planning through construction and long-term performance.

When those conditions are understood early, teams can adjust layouts, grading, and construction methods before work begins. When they are not, schedule delays, added cost, and performance issues often follow.

For example, soils with limited bearing capacity or high compressibility may restrict where buildings can be placed or require ground improvement, while shallow groundwater can affect excavation depth, dewatering needs, and pavement section design. Knowing this early allows teams to resolve constraints during planning rather than in the field.

Early understanding into soil composition and groundwater behavior helps align design choices, construction methods, and long-term performance expectations with actual site conditions.

Site Planning Starts Below Grade

Geotechnical investigations identify soil types, rock layers, groundwater levels, and how conditions vary across a site. That information directly affects building placement, grading strategies, earthwork quantities, and utility routing.

Subsurface conditions commonly influence early decisions such as:

- Where structures can be placed without extensive ground improvement
- How much imported fill will be required across the site
- Whether temporary shoring or dewatering will be needed
- How utilities and other below-grade systems are designed and constructed

Expansive soils, loose fill, or shallow bedrock can limit excavation depth or require alternative construction approaches. Groundwater conditions affect temporary support systems and construction sequencing. These issues are difficult to correct once construction is underway, which is why subsurface data carries significant weight during early site planning.

Slopes, Retaining Systems, and Load-Bearing Surfaces

Geotechnical conditions influence slopes, retaining systems, pavements, and slabs in several ways:

- Slope stability: Soil strength, layering, and moisture content affect whether slopes remain stable or require reinforcement, particularly on sites with elevation changes or transportation corridors.



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- Retaining systems: Wall type, reinforcement, drainage, and embedment depth are driven by lateral earth pressures and soil characteristics.
- Pavements and slabs: Subgrade strength, compressibility, and moisture sensitivity influence pavement thickness, slab reinforcement, and long-term performance.
- Operational performance: Settlement or cracking can disrupt equipment, racking systems, and daily operations, especially in warehouses and industrial facilities, making site-specific data important for design efficiency.

Construction Methods and Project Risk

Subsurface conditions shape construction means and methods. Excavation support, shoring systems, trench safety plans, and sequencing decisions depend on soil type and groundwater behavior.

When subsurface conditions are not well understood, contractors face higher uncertainty. That uncertainty often leads to delays, change orders, and claims tied to unforeseen conditions. Even when contracts address these risks, time and cost impacts remain.

Integrating geotechnical findings with construction-phase testing and observation helps teams manage risk while work is underway and supports informed decision-making when conditions encountered in the field differ from expectations.

Performance Over the Life of the Asset

Geotechnical considerations extend beyond construction. Soil movement, erosion, and changes in groundwater can affect structures for decades.

Bridges, foundations, tanks, and underground utilities all rely on long-term subsurface stability. Settlement, loss of support, or changes in drainage patterns can affect performance long after a project is completed.

Understanding how soils are likely to behave over time helps owners plan maintenance, manage lifecycle costs, and reduce the likelihood of unexpected repairs.

How Geotechnical Data Supports Project Decisions

Soil strength & stratigraphy

Influences foundation type, slab design, and load distribution

Groundwater depth & fluctuation

Affects excavation, dewatering, and construction sequencing

Compressibility & settlement potential

Affects slab, pavement, and long-term performance design

Lateral earth pressures

Drives retaining wall type, reinforcement, and drainage

How Geotechnical Data Supports Project Decisions

Intertek provides geotechnical engineering and subsurface investigation services that support projects from planning through construction.

Services include:

- Geotechnical engineering and subsurface investigations
- Field exploration and sampling
- Soil and rock laboratory testing
- Engineering analysis and recommendations
- Construction-phase observation and support

By connecting geotechnical data to design and construction decisions, Intertek helps teams identify site-specific risks early, align engineering approaches with measured ground conditions, and reduce uncertainty during project delivery.

More information on Intertek's geotechnical engineering services is available [here](#).

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