What does a Professional Geologist do for

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What Does a Professional Geologist Do
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ENGINEERING GEOLOGY

A Professional Geologist (PG) works on various engineering projects as part of the design team to develop a safe, efficient, and effective design by evaluating and understanding the subsurface conditions at a project site.

- Any construction project such as a roadway or bridge structure, new building or residential complex, airport development, or coastal construction, needs a geotechnical evaluation prior to any earth movement to determine subsurface conditions which can vary widely from one project to the next.
- A PG skilled in engineering geology works with the design team during the planning phase to determine what issues need evaluated from a geologic standpoint including soil, bedrock, and groundwater conditions. This may include a combination of drilling, laboratory testing, geophysical evaluations, or remote sensing.
- The PG develops an investigation best suited to the proposed construction, coordinating with the various consultants and contractors, collecting and reviewing the results of the investigation, then provides direction to the structural, highway, environmental, or civil designers to better refine the design.
- A typical investigation usually starts by reviewing geologic and topographic maps, historical publications including underground mine maps, and identifying subsurface conditions for potential hazards.
- The PG may also review current and historical aerial photography to research fracture traces, indications of historical landslides, or identify sinkholes.

Geotechnical drill rig used for slope stability analysis.

- The PG may collect or oversee rock orientation measurements (strike/dip), map the frequency and direction of fractures at outcrops and identify areas with evidence of slope instability.
- Geophysical investigations, including resistivity, seismic refraction, or gravity surveys may be used to identify the depth to and quality of bedrock, the location and orientation of bedrock fractures, or delineate subsurface hazards such as voids associated with karst or mining features.
- The field investigation usually includes test borings and/or test pits to classify the soil, obtain compressive or shear strength measurements, and determine the competence of the underlying rock. Soil and rock core samples are collected for subsequent laboratory testing and in-situ water infiltration tests to support water management designs may also be done.
- Water wells may be installed to monitor groundwater conditions, or inclinometers to monitor ground movement.

Single span bridge replacement in alluvium.

- Laboratory testing may include rock breaks to determine the strength of bedrock, direct shear of soil to determine the bearing capacity, or consolidation testing to assist in calculating the settlement.
- The results of the investigation plan are used to develop the design. Retaining walls, bridge abutments, rock cut slopes, building footings, well pads, or runways will all require designs. Bearing resistance, soil settlement, rock fall, rock topple, embankment stability, pavement, or wall overturning factors are evaluated using design programs and/or hand calculations.
- The PG will then assist the design team in developing their project plans and specifications so that the design is appropriately portrayed for contractors to bid the project.
- The PG applies their professional seal to a report or design plan indicating they have reviewed the plan and are taking ownership of their analysis and conclusions.

The PG typically works with civil engineers, structural engineers, hydrogeologists, construction specialists, soil scientists, drilling crews, and environmental specialists.

Work Resources:

GIS/mapping, various map databases (geologic, topographic, underground mine, and landslide maps), historical reports, aerial photography, modeling and analysis software.

Work Environment:

Office, computers, and field work. Field work is done all year in any weather and may be required during off-peak transportation hours, including weekends or a particular site's off-season.

Helpful Skills & Experience:

Strong technical understanding of the physical properties of soil/rock/water, ability to think about projects in three dimensions, strong understanding of physics, ability to coordinate with multiple disciplines about various design concerns, and an interest in working as part of a team.

Tools of the Trade:

Drill rig, Brunton compass, water/soil sampling equipment, and a good set of hiking boots.