EP-21-0083 Crystal Park Site S-178R (Miller Residence)

NW¼ SW¼ NE¼ Section 17, T14S, R67W, 6th Meridian

38.8349, -104.9137
…

The applicant proposes a single-family residence at 5050 Neeber Valley Road in the Crystal Park development. With this referral, we received the Site Plan (LGA Studios, April 21, 2021), Elevations (LGA Studios, March 30, 2021), and Soils Report (Geoquest, LLC, stamped December 28, 2017). The Geoquest soils report did not address the geologic hazards associated with the site. Per County code, a soil and geology report is required that identifies geologic hazards and provides appropriate mitigation measures.

I visited the site on May 5, 2021. Site observations and available LiDAR show slopes ranging from 40 to 50 percent upslope and downslope from the proposed residence and existing roadways and residential structures further upslope and downslope. While onsite, I did not observe signs of slope instability, such as soil creep or surface cracking. However, loose weathered material from the bedrock was observed in exposed cuts within the proposed building footprint. CGS offers the following comments and recommendations during the planning and development of this site.

Site Geology. The site is underlain at variable depths by relatively loose material (commonly known as "Grus" or "Colluvium") weathered from the underlying Pikes Peak Granite. Pikes Peak Granite is typically not problematic from a geotechnical or foundation performance perspective. However, the rock is fractured and weathered, sometimes extensively. Both of these rock quality characteristics can impact slope stability and erosion potential. Additionally, Grus is weaker than the bedrock and can be highly variable in depth.

Steep Slopes and Construction-Related Slope Instability. There are risks associated with construction on steep slopes, such as are present at this site. While mapped landslides are not present and no evidence of existing slope instability was observed, there are risks associated with construction on these steep slopes where erosion is also a significant constraint. Presently stable slopes may become unstable as a result of reduced soil strengths if,

1) Modifications are made through the excavation of cuts, the addition of fills, and loading due to structures,
2) Significant moisture is added to the slope through residential irrigation (including infiltration from septic fields) and ample precipitation or snowmelt,
3) The existing drainage pattern is altered through grading, introducing water to previously drier areas.

Also, a natural drainage is located along the south/southwest portion of the site (southwest side of the proposed structure). This steep drainage could be a location of increased runoff and a potential debris flow hazard.

To further reduce potential hazards associated with erosion, construction-related slope instability, shallow failures such as creep and slumping, and increased runoff, the following should be implemented in the design and construction:

- A qualified geotechnical professional should determine maximum allowable, unretained temporary, and permanent cut/fill heights and slope angles.

- All planned cuts exceeding four feet in height should be evaluated for slope stability using proposed slope geometry and considering all foundation and proposed cuts that will affect the slope.

- Driveway retaining walls, building foundations, and upslope walls that will function as retaining walls must be designed by a qualified geotechnical or civil engineer and must include adequate behind-wall drainage.

- The structure should be designed with as much rigidity as possible due to the potential of downslope creep.

- Drainage should be designed to prevent any flows from Crystal Park Road from being directed at the lot, and drainage from the proposed lot from being directed further downslope to the location of existing structures.

- The existing vegetative cover should be left intact to the extent possible, and every effort should be made to restore native vegetation within disturbed areas as quickly as possible. Irrigation beyond the bare minimum required to reestablish native vegetation should not be permitted.

Surface Drainage and Erosion. The onsite soil and colluvium ("Grus") are highly susceptible to erosion. Concentrated, developed flows can cause serious and damaging erosion and rapidly erode the surface material down to hard rock. Site drainage should be designed and constructed to prevent concentrated flows from being developed within the site. Proper maintenance and erosion protection of the slope face within the subject property is critical to the long-term structural integrity of the proposed structure.

Geotechnical Considerations. CGS agrees with Geoquest on page 4 of their report, "*Perimeter drains are required around all walls of the habitable or usable area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement"* and "*an Open Hole Observation must be performed on each individual structure prior to placement of concrete, and preferably prior to the placement of forms in the excavated area*." Block slope failures in the bedrock can occur along concealed fractures and weathered zones anywhere beneath the planned building site. **CGS recommends Geoquest or another qualified geotechnical engineer carefully inspect the foundation excavation for evidence of fractures, discontinuities, and weathered zones during the open hole observations**. Should observed conditions indicate differences from those assumed in the foundation design, the structural engineer should re-evaluate the design.

In summary, based on our observations of the site, CGS recommends that Geoquest or another qualified geotechnical engineer evaluate the geologic hazards and constraints as required by county code and provide appropriate recommendations and mitigation measures. At a minimum, we recommend:

1. The geotechnical engineer provides maximum allowable, unretained temporary, and permanent cut/fill heights and slope angles.
2. All planned cuts exceeding four feet in height are evaluated for slope stability using proposed slope geometry and considering all foundation and proposed cuts that will affect the slope.
3. Foundation excavations are inspected for evidence of fractures, discontinuities, and weathered zones during the open hole observations.

Submitted 5/6/2021 by Amy Crandall, Engineering Geologist, Colorado Geological Survey (303-384-2632 or acrandall@mines.edu)