

EP-22-0034 Tix Residence (Crystal Park Site S-306R)

N½ SW¼ SW¼ Section 17, T14S, R67W, 6<sup>th</sup> Meridian

38.8278, -104.9211

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The applicant proposes a single-family residence at 345 Earthsong Way in the Crystal Park development. With the original referral, we received the Site Plan Drawing (Mountain Valley Engineers Inc., July 31, 2021), Elevation Plans (Paramount Homes, May 26, 2021), and Geologic Hazards Study (Rocky Mountain Group, October 29, 2021). RMG's report references a soils report prepared by Geoquest, LLC, dated May 26, 2021. However, this report was not provided with the referral documents. Additionally, the site plan with proposed grading was also not included with the referral documents.

The lot consists of approximately 0.7 acres and is located on a south-facing slope with 30 to 70 percent slopes. A cut-in driveway and on-site wastewater treatment system exist on-site.

CGS offers the following comments and recommendations during the planning and development of this site.

**Site Geology.** RMG references Geoquest's report in which two test borings were drilled on April 29, 2021. The test borings extended to 15 feet below grade and encountered decomposed granite (classified as silty sand-SM). The decomposed granite in this area is weathered from the underlying Pikes Peak Granite and consists of relatively loose material (commonly known as "Grus" or "Colluvium"). Grus is weaker than the bedrock and can be highly variable in depth. Pikes Peak Granite is typically not problematic from a geotechnical or foundation performance perspective. However, granite that has been fractured and weathered can impact slope stability and erosion potential.

**Rockfall.** A rockfall hazard is mapped to the east of the site. The risk of rockfall was first recognized and mapped at this site in the geologic hazard mapping conducted for El Paso County in the 1970s according to House Bill 1041 concerning geologic hazards in Colorado. Even a low probability rockfall can have significant risk to permanent structures even after many decades without previous rockfall resulting in considerable property damage and fatalities.

As previously stated, the bedrock at the site is the Pikes Peak Granite, forming outcrops directly upslope and adjacent to the proposed building footprint and scattered throughout the site. The existing rocks and boulders are likely to be disturbed during construction activities and/or freeze/thaw, resulting in an increased potential for a rockfall hazard. The RMG geohazard study states (page 5), "The slope to the north does have large boulders, but it is our understanding that they are to be removed during the construction phase of the site development." It will be prudent to remove such rocks during construction. **CGS recommends appropriate rockfall mitigation measures be noted on the project plans.** CGS agrees with RMG's assessment, "Once the proposed mitigation has been implemented, the subject property is not considered to be prone to rockfall."

**Steep Slopes and Construction-Related Slope Instability.** There are risks associated with construction on steep slopes, such as those present at this site. While mapped landslides are not present and RMG observed no evidence of existing slope instability (page 4), 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.

CGS recommends the following be implemented in the design and construction:

- **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. The geotechnical engineer should be provided with the construction plans and grading information to verify proposed slopes.
- Retaining walls, building foundations, and upslope foundation walls that will function as retaining walls must be designed by a qualified geotechnical, structural, or civil engineer and must include adequate behind-wall drainage.

Also, block slope failures in the bedrock can occur along concealed fractures and weathered zones anywhere beneath the planned building site. The foundation excavation should be carefully inspected for evidence of fractures, discontinuities, and weathered zones.

**Downslope Creep.** Bent trees were visible in the area. CGS agrees with RMG (page 5), “the structural design of the residence should consider its placement on the hillside and the additional surface pressures that could be generated by downslope creep and by retaining upslope materials” and with their recommendation “that the foundation be designed with additional rigidity to help reduce the effect of potential lateral movement of subsurface soils.” RMG’s recommendations should be incorporated in the foundation design for the structure.

**Surface Drainage and Erosion.** As noted on page 5 of RMG’s report, “The permeability of the decomposed granite at the site is generally considered to be high. Surface runoff could also be rapid and the potential for rapid erosion of unvegetated slopes could be high.” CGS agrees with RMG’s recommendation that “**Long-term slopes should not be steeper than 3:1 (horizontal:vertical) in both cut and fill areas.**” RMG’s recommendations for proper surface grading and landscaping should be incorporated in the project design and construction.

**Geologic Hazard Disclosure Statement.** CGS recommends the geologic hazards and constraints be included in the site plan.

**Summary.** In summary, the geologic hazards identified on the site are not considered unusual for the area. CGS has provided the following recommendations:

- Rockfall mitigation measures should be noted on the project plans.
- All planned cuts exceeding four feet in height should be evaluated for slope stability and retaining walls designed by a qualified geotechnical, structural, or civil engineer.
- The geologic hazards and constraints should be included in the site plan.
- RMG’s recommendations should be strictly adhered to during design and construction.

Submitted 11/30/2021 by Amy Crandall, Engineering Geologist, Colorado Geological Survey (303-384-2632 or [acrandall@mines.edu](mailto:acrandall@mines.edu))