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ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED

Job No. 152427

June 14, 2019

Lorson Ranch Metropolitan District No.1
212 N. Wahsatch Ave, Ste. 301
Colorado Springs, CO 80903

Re: Response to
Colorado Geological Survey Review Comments
Carriage Meadows South at Lorson Ranch, Filing No. 2
El Paso County, Colorado

Dear Jeff Mark:

RMG – Rocky Mountain Group (RMG) prepared the *Preliminary Soils and Geology Report* (RMG Job No. 152427, last dated June 15, 2016) for the proposed development project comprising 234 single-family residential lots and an approximately 13.70-acre commercial area located southeast of the intersection of Marksheffel Road and Fontaine Boulevard in El Paso County, Colorado. The report was reviewed by personnel of the Colorado Geological Survey (CGS). A copy of the review comment from CGS was provided to us by personnel of Thomas + Thomas. This comment appears to have been downloaded from the El Paso County EDARP system, and is included at the end of this document.

The purpose of this letter is to provide RMG's response to the CGS review comment. For clarity and ease of review we have reiterated the CGS comment followed by our response.

Concerning Preliminary Soils and Geology Report (CGS)

➤ **CGS Comment:** *"CGS continues to disagree with RMG regarding the need for and when to perform overexcavation. RMG describes low blow count, very loose, loose, and/or soft, low density soils in all 17 of their Carriage Meadows South borings (this included TB-2). RMG states (page 17) that floor slab movements on the order of one to three inches are possible after mitigation. It is not clear whether RMG is describing total or differential settlement, but three inches of movement (heave or settlement) is considered excessive. The county should require the applicant to describe how foundations, floor systems, and utility connections will be designed to accommodate that much settlement without sustaining damage.*

Alternatively, RMG should develop a mitigation strategy that reduces potential heave and settlement to less than one inch. If overexcavation is proposed, what depth of overexcavation will be necessary to reduce differential settlement to less than one inch, and is overexcavation to this depth feasible at the scale of an individual building? In CGS's experience, it is difficult to achieve adequate compaction within the footprint of an individual structure. Mitigation strategies are discussed on pages 79-91 of CGS publication EG-14, Collapsible Soils in Colorado (White and Greenman, 2007)."

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RMG Response:

This comment was previously addressed in a response letter to CGS dated December 1, 2016, and an updated re-statement of the prior response is presented below:

As stated on page 17 of RMG's report, "Foundation design and construction are typically adjusted for hydrocompactive and expansive soils. Mitigation of expansive soils and bedrock are typically accomplished by overexcavation and replacement with structural fill, subexcavation and replacement with on-site moisture-conditioned soils, and/or the installation of deep foundation systems. However, in this case, a deep foundation system would not be advised based on the lack of competent bedrock and groundwater conditions. Floor slab movements on the order of one to three inches are possible after mitigation. Where movements of this magnitude cannot be tolerated, structural floors may be implemented."

The statement that "*Floor slab movements on the order of one to three inches are possible*" refers to total slab movement. However, CGS's comment that "*The county should require the applicant to describe how foundations, floor systems and utility connections will be designed to accommodate that much settlement without sustaining damage.*" seems to imply that our report is indicating that one to three inches of movement is possible for foundations. This is not the case. The possible one to three inches of vertical movement applies to isolated, non-structural floor slabs only.

Typical construction in this region of Colorado is to provide isolation "slip joints" between the floor slabs and all utility components and framing components (typically steel columns) that penetrate through the slab. The intent of these "slip joints" is to allow the slab to experience the anticipated range of movement without damaging the utility or framing components.

Typical construction in this region of Colorado is also to provide an isolation "slip joint" between the floor slab and the foundation walls. The intent of this "slip joint" is to allow the slab to experience the anticipated range of movement without damaging the foundation.

Finally, typical construction in this region of Colorado is to provide a void (typically a minimum of 1 1/2 inches thick) at the bottom of all interior non-load bearing partitions (commonly referred to as "floating wall" construction). The intent of this void is to allow the floor slab to experience heave or settlement without transmitting the vertical slab movement through the partition walls to the floor system above.

It is common construction practice in this area (especially for typical "tract home" developments such as this one) for the builder to acquire some or all of the lots in a development at one time. They then have the site-specific Subsurface Soil Investigation performed for that entire group of lots at once. As a result of this, it is often unknown at the time of the Subsurface Soil Investigation whether the house on a given lot will have a basement or not. Even on homes that will be constructed with a basement, that basement may not be "finished" until months or years later, if at all. As such, overexcavation to a depth that will reduce differential slab movement to less than one inch is often an excessive and unnecessary cost. The typical construction practices noted above provide for a method of mitigating the slab movement in those cases where it's appropriate (those homes with "finished" basements) without imposing additional costs to those homes where the noted range of vertical movement can be tolerated (those with unfinished basements or structural floor systems that are supported independently of the underlying soil).

Furthermore, page 22 of the report referenced above does provide alternative foundation/framing systems which may be used to reduce or eliminate the need for overexcavation. Those methods include (but are not limited to) post-tension slabs-on-grade, integral stiffened (ribbed) slab foundations, drilled pier (caisson) foundation with or without a structural floor, etc.

It is our understanding that this prior response was considered suitable by El Paso County, as evidenced by acceptance of the provided submittal documents and approval for development and construction within Carriage Meadows South at Lorson Ranch, Filing No. 1. It is reasonable to anticipate that the county's acceptance of our response would (barring any significant changes to the geologic conditions in the subject site) be extended to all current and future filings within the subject site, including the currently proposed Filing No. 2. It is our opinion that no significant geologic changes have occurred within the subject site since completion of the previous documents referenced herein, and that all previous conclusions and recommendations presented within those documents remain valid for the currently proposed Filing No. 2.

If we can be of further assistance in discussing the contents of the *Preliminary Soils and Geology Report*, this response document, or analysis of the proposed development (from a geologic/geotechnical engineering point-of-view) please feel free to contact our office.

Cordially,

Reviewed by,

RMG – Rocky Mountain Group

RMG – Rocky Mountain Group



Kelli Zigler
Project Geologist

Tony Munger, P.E.
Geotechnical Project Manager

Colorado Geological Survey CGS reviewed the overall Carriage Meadows South at Lorson Ranch project at PUD and preliminary plan, including the same Carriage Meadows South Geology and Soils Report included with the current referral documents (RMG, amended October 7, 2016). No new or updated geologic or geotechnical information was included with the available referral documents. Only one of RMG's borings, TB-2, is located within the subject site, near the southern end of the proposed Rubicon Trail road alignment. If an updated geotechnical investigation and recommendations for the proposed multi-family development are available, CGS would like to review. Otherwise, our previous Carriage Meadows South comments remain valid:

CGS continues to disagree with RMG regarding the need for and when to perform overexcavation. RMG describes low blow count, very loose, loose, and/or soft, low density soils in all 17 of their Carriage Meadows South borings (this includes TB-2). RMG states (page 17) that floor slab movements on the order of one to three inches are possible after mitigation. It is not clear whether RMG is describing total or differential settlement, but three inches of movement (heave or settlement) is considered excessive. The county should require the applicant to describe how foundations, floor systems, and utility connections will be designed to accommodate that much settlement without sustaining damage.

Alternatively, RMG should develop a mitigation strategy that reduces potential heave and settlement to less than one inch. If overexcavation is proposed, what depth of overexcavation will be necessary to reduce differential settlement to less than one inch, and is overexcavation to this depth feasible at the scale of an individual building? In CGS's experience, it is difficult to achieve adequate compaction within the footprint of an individual structure. Mitigation strategies are discussed on pages 79-91 of CGS publication EG-14, Collapsible Soils in Colorado (White and Greenman, 2007).