

COLORADO GEOLOGICAL SURVEY

1801 19th Street
Golden, Colorado 80401
303.384.2655



Karen Berry
State Geologist

February 15, 2017

Michael Turisk

Planner II

Planning and Community Development Department

Land Use Review Division

PO Box 1575, Mail Code 155

Colorado Springs, CO 80901-1575

Location:

SE¹/₄ of SE¹/₄, Section 6,

T15S, R66W of the 6th P.M.

38.7683°, -104.8141°

Subject: The Ridge Proposed Development (File Number AR FP 17-00040; AR DP 17-00039) Colorado Springs, CO; CGS Unique No. EP-17-0031

Dear Michael,

Colorado Geological Survey has received The Ridge proposed development referral. We understand the applicant proposes a 60-unit multi-family housing project in Colorado Springs. According to the referral documents the development would occur on undeveloped but disturbed ground (including retaining walls and fill) to the east of the existing Broadmoor Bluffs Apartments. The existing apartments are located at 4375 Broadmoor Bluffs drive. With this referral, we received, a Request for Review (City of Colorado Springs, February 1, 2017), a Preliminary Drainage Report (R.A. Smith National, January 12, 2017), an Addendum 1 to Original Report (PSI, Inc., December 13, 2016), and a Report of Geotechnical Engineering Evaluation (PSI, Inc., December 1, 2016).

The submitted material includes a geotechnical evaluation but does not include a Geologic Hazard report, a Preliminary Development plan, or a Grading Plan. There are existing retaining walls and fill onsite. The geotechnical report indicates that retaining walls are planned but does not discuss if the existing retaining walls will be removed. There is no stability analysis provided for the planned walls. The referral does not follow the specifications of the city's geologic hazard ordinance and the submitted material is insufficient for us to perform a review.

Thank you for the opportunity to review and comment on this project. If you have questions or require further review, please call me at 303-384-2654, or e-mail jlovekin@mines.edu.

Sincerely,

A handwritten signature in blue ink that reads "Jonathan R. Lovekin".

Jonathan R. Lovekin, P.G.
Senior Engineering Geologist

COLORADO GEOLOGICAL SURVEY

1801 19th Street
Golden, Colorado 80401
303.384.2655



Karen Berry
State Geologist

February 24, 2017

Michael Turisk

Planner II

Planning and Community Development Department

Land Use Review Division

PO Box 1575, Mail Code 155

Colorado Springs, CO 80901-1575

Location:

SE $\frac{1}{4}$ of SE $\frac{1}{4}$, Section 6,

T15S, R66W of the 6th P.M.

38.7683°, -104.8141°

Subject: The Ridge Proposed Development (File Number AR FP 17-00040; AR DP 17-00039) Colorado Springs, CO; CGS Unique No. EP-17-0031_2

Dear Michael,

Colorado Geological Survey has received additional material for The Ridge proposed development referral since our initial letter, dated February 15, 2017. This includes a Geologic Hazard Study, Cheyenne Montana Filing No. 1 (Entech Engineering, Inc., Revised September 29, 2000), Preliminary Engineering Plans (R.A. Smith National, January 12, 2017), and a Final Plat (Compass Surveying & Mapping, LLC, January 10, 2017). We understand the applicant proposes a 60-unit multi-family housing project in Colorado Springs. According to the referral documents the development would occur on undeveloped but disturbed ground (including retaining walls and fill) to the east of the existing Broadmoor Bluffs Apartments. The existing apartments are located at 4375 Broadmoor Bluffs drive.

Site conditions have substantially changed since the submitted geologic hazard report was completed in 2000: Additional information about landslide susceptibility was published in 2003, the site has been extensively graded, retaining walls have been built, a new grading and landscape plan and drainage report have been developed. **An updated geologic hazard report is needed.** This report should follow the city's geologic hazard ordinance and address at least the following:

- **Existing walls and slope stability.** The Colorado Springs Landslide Susceptibility Map, published in 2003, indicates the northern portion of the site is in a landslide susceptible zone. This area includes walls built since the geologic hazard report was completed. Entech's report includes recommendations for wall design. A discussion of the existing walls, their design assumptions, and the resulting global stability should be part of the updated geologic hazard report.
- **Grading and landscape plans and site drainage report.** The updated geologic hazard report should comment on any impacts from geologic conditions to the currently submitted grading and landscape plans and proposed site drainage.
- **Existing fill.** Substantial fill has been placed onsite in conjunction with wall construction. Documentation of fill placement has not been provided. Deleterious material within the fill is reported in the current geotechnical report. Our recommendation is that the fill must be removed and replaced unless documentation for its placement is provided. This issue should be discussed

in the updated geologic hazard report along with a discussion of other debris piles and non-native materials.

- **Proposed detention pond.** The geologic hazard report should discuss potential impacts (if any) of the detention pond on slope stability and underlying expansive bedrock.

Geotechnical Report. The submitted geotechnical report and addendum letter appear to have several discrepancies. For instance, the borings and finished floor elevations are plotted on a figure in the report indicating finished floor elevations will be largely in fill. The report dated December 1, 2016 states on page 2:

“Swell mitigation is not required for the proposed development. The “LOW” swell potential is based on buildings being constructed near existing grades with cuts/fills of less than 4 feet. Should significant or larger cuts/fills be planned, risk of swell may increase as surcharges will change.”

The addendum letter dated December 12, 2016 states:

“Grades within Building #2 range from approximately 5990 in the northwest corner to 5960 in the southwest corner. The building will have a FFE of 5972.6 requiring cuts and fills on the order of 18 feet and 13 feet respectively.”

This apparent discrepancy about depth of cuts and potential impacts to foundation design from natural swelling material needs to be addressed by the geotechnical engineer. Additionally, Entech reported swells of 4.5% in the natural clay soils and swells of 3.6 to 8.7% in the claystone bedrock. This is substantially higher than the swell potential reported by PSI of 0.3 to 1.5%. PSI should confirm, in their report, that finished floor elevations are on sufficient structural fill to mitigate identified swell potential as planned.

The addendum letter provides criteria for fill placement that differs from that provided in the report. The final geotechnical report should be referenced on the development plans and having addendum's and reports with differing criteria can lead to confusion. We recommend that the city require a single revised geotechnical report. This report should address the mitigation of any identified geologic hazards from the updated geologic hazard report. These two reports, the geologic hazard report and the geotechnical report, can be combined, if done by the same office, provided that the final product follows the City of Colorado Springs's Geologic Hazard Ordinance.

Disclosure. For disclosure to future buyers, plat notes should be made concerning identified geologic hazards and the final reports of record.

We believe that this project can be developed as planned. However, we recommend that approval of this project be contingent upon completion of the items outlined in this letter.

Thank you for the opportunity to review and comment on this project. If you have questions or require further review, please call me at 303-384-2654, or e-mail jlovekin@mines.edu.

Sincerely,



Jonathan R. Lovekin, P.G.
Senior Engineering Geologist

COLORADO GEOLOGICAL SURVEY

1801 19th Street
Golden, Colorado 80401
303.384.2655



July 17, 2017

Karen Berry
State Geologist

Hannah Van Nimwegen
Planning and Community Development Department
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PO Box 1575, Mail Code 155
Colorado Springs, CO 80901-1575

Location:
SE¹/₄ of SE¹/₄, Section 6,
T15S, R66W of the 6th P.M.
38.7683°, -104.8141°

Subject: The Ridge Proposed Development (File Number AR FP 17-00040; AR DP 17-00039) Colorado Springs, CO; CGS Unique No. EP-17-0031_3

Dear Hannah,

Colorado Geological Survey has reviewed The Ridge proposed development resubmittal. We previously reviewed this referral in our letters dated February 15, and 24, 2017. We understand the applicant proposes a 60-unit multi-family housing project on about 3.7 acres in Colorado Springs. According to the referral documents the development would occur on undeveloped but disturbed ground (including retaining walls and fill) to the east of the existing Broadmoor Bluffs Apartments. The existing apartments are located at 4375 Broadmoor Bluffs drive.

Included in the resubmittal documents were: Request for Review (City of Colorado Springs, June 20, 2017), Response Letter (PSI, Inc., June 9, 2017), Geological Hazard Study (PSI, Inc., June 7, 2017), Final Drainage Report (R.A. Smith National, May 11, 2017), Retaining Wall Design (Keystone, May 23, 2017), Final Plat (Compass Surveying & Mapping, LLC, June 15, 2017), and Development Plans (R.A. Smith National, June 16, 2017).

Geologic Hazard Report. The geologic hazard report partially meets the specifications outlined in Colorado Springs Geologic Hazard Ordinance, 7.4.5, and discussed in the Subdivision Policy Manual Section 3. However, **the submitted Geologic Hazard Report is insufficient for this project.** This report will be referenced on the Plat in the Disclosure Statement and will be the development document for this project. This report must have a complete discussion of site geology, geologic hazards, mitigation recommendations AND conclusions and recommendations about the intended land use.

As this is third time we have pointed out the City of Colorado Springs requirement for this report and the ordinance that must be followed (which references the Subdivision Manual with guidelines to use). We suggest that the City provide the applicant with an example of a complete geologic hazard report that they can follow preferably one that incorporates the geotechnical engineering recommendations along with the geologic hazard discussion.

At a minimum:

- The report must include an Engineers Statement attesting to the qualifications of the

personnel to be preparing the Geologic Hazard Report. This form should be provided to the applicant by the City.

- The report needs a table of contents, and a bibliography on the references used for the geology and geologic hazards.
- The report must discuss the site geology and include a site specific geologic map that also shows where borings are located. Logs of borings and results of laboratory testing must be included.
- As per Section 3.8.2.b the previous work done at this site needs to be referenced. Specifically, this is Entech Engineering Inc's report "Geologic Hazard Study Cheyenne Montana Filing No. 1 Broadmoor Bluffs Drive Colorado Springs, Colorado" revised September 29, 2000. This report has important laboratory testing results for the claystone bedrock that may influence the design of the retaining walls and detention ponds.
- Geologic hazards listed in the Geologic Hazard Report must include identification and mitigation recommendations and if significant, what constraints may exist to the intended land use.

However, if a geologic hazard has not been identified it does not need to have mitigation suggested. For instance, in the report, mitigation for debris flows and debris fans are given, yet these hazards have not been identified at the site. They do not require mitigation.

Similarly, do deposits with potential collapsible soils even exist on the site? If not, they do not need to be discussed.

However, if a geologic hazard has been identified, i.e. close proximity to a potentially active fault, then mitigation must be addressed. The report states that "the nearest fault is located approximately 2 miles to the west at the base of Cheyenne Mountain". After providing the name of the significant fault, an explanation and/or seismic criteria must be given.

- The closing comments of PSI's geologic hazard report state: "PSI appreciates the opportunity to perform the geotechnical field and laboratory services for this project." This comment should reference their geology work on a geologic hazard report.

The Geologic Hazard Report is not just a list of geologic hazards but a full discussion of the geology and its implications to the intended land use. So the items listed in our letter dated February 24, 2017 must be included in the Geologic Hazard Report, not just in a Response Letter or geotechnical report (unless the geotechnical report with pertinent discussion is included with the geologic hazard report).

In the PSI geologic hazard report, they reference their geotechnical report but do not provide the data (drill hole location, logs of borings, laboratory testing) they are referencing. The Geologic Hazard Report must be a stand-alone report. Therefore, they should either include their geotechnical report as an Appendix or put these figures and data in the geologic hazard report as per Section 3.8.3.e.

Response letter. PSI's letter, dated June 9, 2017, answers specific concerns of our second review letter dated February 24, 2017. Comments, analysis and recommendations provided in a response letter must also be incorporated in the geologic hazard report. Additionally, information in the revised geotechnical report is cited in the letter. This information is required in the geologic hazard report.

These reports, the geologic hazard report and the geotechnical report should either be combined, or the geotechnical report provided as an Appendix in the geologic hazard report or the specific recommendations found in the geotechnical report must be repeated where needed in the geologic hazard report. The geologic hazard report must be a complete, stand-alone report.

We offer the following additional comments:

- Inconsistent report dates. PSI states on page 1: "PSI performed a report of geotechnical engineering evaluation and issued a report entitled (sic), "Report of Geotechnical Engineering Evaluation Proposed The Ridge Apartment Development 4375 Broadmoor Bluffs Drive Colorado Springs, Colorado" PSI Project No. 05321287 dated February 27, 2017 and revised March 30, 2017."

On page 3 they state, "The geotechnical report has been revised to combine the addendum and the original report. The report has been reissued with a revised date of May 25, 2017.

On the first page of the Geological Hazard Study they state that the geotechnical report is "dated March 10, 2017".

We have not received an updated PSI geotechnical report as part of this review and have one dated December 1, 2016. It is confusing to have multiple dates listed in the various documents for the final report by the consultant. Accuracy on the final report date is critical for any references on the development plans and to verify final recommendations and conclusions as they pertain to identified geologic hazards.

- On page 1 & 2: "PSI also performed a geological hazard study entitled (sic): "Geological Hazard Study Proposed The Ridge (Broadmoor Bluffs) 4375 Broadmoor Bluffs Drive Colorado Springs, Colorado" PSI Project No. 05321287 dated June 8, 2017."

The report we have is dated June 7, 2017. As with the geotechnical report, a consistent date for the geologic hazard report must be used.

- On page 2: "Concerns were raised by Colorado Geological Survey (CGS) about the mine subsidence study and the recommendations laid forth in it."

We do not know what they are referencing as we did not discuss a mine subsidence study or make any comment about mine subsidence.

- On page 3: "Any potential impacts caused by the detention pond have been addressed in the geologic hazard study." There is no mention of detention ponds in the geologic hazard study we received. CGS's additional comments on the detention ponds are given in following sections.

- Existing walls and slope stability. The discussion of this in the Response Letter states: “The global and local stability studies will affect the performance of the ponds and their relationship to the retaining walls and vice versa and therefore should be considered when designing the retaining walls in conjunction with the detention pond.”

This discussion needs to be in the geologic hazard report along with recommendations and conclusions about the influence of the detention pond on the retaining walls. Additionally, the retaining wall design cannot be considered complete, or accepted for the project until the relationship between the detention ponds and retaining walls is addressed by the wall design engineer. CGS’s additional comments on the retaining walls are given in following sections.

- Grading and landscape plans and site drainage report. These items are partially discussed in the Response Letter. These items need to be fully addressed in the Geologic Hazard Report. They can be discussed individually or part of the Conclusions or Recommendations sections that are recommended in the Subdivision Policy Manual for this report.

Detention Ponds and Retaining Walls

The response letter states: “...detention basins by definition do not retain water on a long-term basis. Therefore, the cohesive soils in the area should not be saturated by the ongoing operation of these detention basins.”

Shrink-swell behavior of cohesive soils and expansive bedrock can be triggered by wetting, and does not require saturation to exhibit swell. Further, detention ponds can fill and remain full to partially full during times of excessive, ongoing rainfall (such as the rainfall events in Colorado Springs of 2013 and 2015). Should a storm event last over many days, the detention ponds can be expected to be wetting the subsoils for the duration of the storm event and beyond.

The drain time for Excess Urban Runoff Volume (EURV) is calculated at 26 hours for Sand Filter 1 and 24 hours for Sand Filter 2. This is sufficient time to induce shrink-swell behavior in areas of the basins in direct contact with native clay soils and claystone bedrock. This is potentially problematic for the foundations of the proposed and existing retaining walls shown on Sheet 12 that are designed to be part of the detention facilities.

Based on the pond elevations and borings from the PSI geotechnical report provided to us, dated December 1, 2016, infiltration from Sand Filter 1 (pond elevation 5978.69) will directly impact clay soils and fill. Infiltration from Sand Filter 2 (pond elevation 5956.93) will directly impact claystone bedrock. The claystone bedrock is known to have very high swell potential as shown in the Entech report (PSI tested two samples of weathered claystone but did not test the claystone bedrock for swell potential as indicated on the table on page 2 of their geologic hazard report).

The retaining wall design cannot be considered complete, or accepted for the project until the relationship between the detention ponds and retaining walls is addressed by the wall design engineer.

The geotechnical engineer and the wall designer must discuss potential impacts to the walls from expansive soils and bedrock. They must provide recommendations to reduce any impacts from the potential for wetting of the foundations and backfill of these walls from the detention ponds.

Furthermore, the wall designer must analyze any potential impacts from using the proposed and existing retaining walls as key elements in the detention basin design (in direct contact with the pond as shown on sheet 12 of the plans). The original, existing walls were not designed for detention ponds to be placed behind them. This change in their design criteria must be addressed by the geotechnical engineer and/or wall design engineer.

Retaining wall design. The original retaining wall design (Nelson Design, LLC, June 4, 2003) is included in the geologic hazard report by PSI. General Note 6 states; “Soils information was obtained from a Geotechnical Engineering Study prepared by Kumar & Associates, Inc., Project No. 002-211A, dated February 16, 2001. Keystone design note 2 states; “The estimate uses the same soil parameters used in the Nelson Design plans. The parameters were obtained from Kumar Associates geotechnical report dated 2/16/01. *A copy of that report is needed to verify parameters. Copies of new geotechnical reports are also needed.*”

Proposed retaining wall 5 is located on the west side of proposed sand filter 1 (detention pond 1). On the east side are existing walls 13 and 12. Note 10 of Nelson Design for these walls states: “The engineer shall not be held responsible for the retaining wall design when subjected to concentrated drainage due to direct runoff, or broken water, irrigation or sewer lines. It is not recommended that trees be planted within 10 feet of any retaining walls.”

Sheet 14 of the plans shows surface flow directed at existing walls 13 and 12 near sand filter 1. This must be addressed by the engineer and/or redirected away from the walls. The preliminary landscape plan on Sheet 18 indicates trees are anticipated being planted in close proximity to the existing and proposed walls. The trees shown closer than 10 feet from the walls must be removed from the plans unless the wall design engineer verifies and states that this does not impact the long term stability of these existing walls.

Sheet 12 shows these existing retaining walls at sand filter 1 as little as four feet from the pond. It appears that the existing retaining wall is no longer being used to retain the slope, but it is being used to retain the water in the detention pond. The original wall design does not indicate they were intended to detain water on their uphill side. This appears to be a significant design change and must be explicitly addressed by the wall design engineer.

Additionally, proposed wall 5 and 2 form the western side of the detention pond. The engineer must discuss the impacts to walls and design implications (if any) of detention ponds adjacent to them. Keystone states in Note 4 “Walls 2 and 5 surround a detention basin. Clean crushed stone wrapped in filter fabric is recommended up to 1’ above the high water level.” However, no slope stability cross-section is included for wall 5. Wall 2 has a stability cross-section but no piezometric surface is shown being used in the analysis. The impacts to the walls from water in the ponds must be shown in slope stability analysis for both walls 2 and 5. Additional slope stability analysis must be conducted for existing walls 12 and 13 adjacent to the detention ponds. The stability analysis for these walls requires a piezometric surface as part of the analysis.

The Keystone Design should not be approved until their notes indicate they have reviewed all the geotechnical information and they have completed all analysis indicated in this letter. This includes the Kumar report (2/16/01) and the final PSI report (date unknown). They should also be given the Entech Geologic Hazards Report as the laboratory data from that report indicates very high swell potential for the native clay and claystone bedrock. The wall

design must account for a piezometric surface where adjacent to detention ponds.

Geologic Hazards. PSI provides a list of geologic hazards and some discussion of them in their geologic hazard report. We offer the following comments:

- Expansive Soils and expansive rocks. PSI has classified the site as having “Low” swell potential and state “The “LOW” swell potential is based on buildings being constructed near existing grades with cuts/fills of less than 4 feet.” What they appear to be saying, is there is a risk of low swell potential to the buildings based on seven laboratory tests of samples from 5 to 10 feet below existing grade. The site itself does not have a low swell potential, especially the bedrock as indicated in the Hart, 1972 reference and the Entech report. This point needs to be clarified in the geologic hazard report by PSI.

PSI must include a specific section on Site Grading in the Geologic Hazard Report that identifies this clarification. The potential for the bedrock to be highly expansive also must be discussed in a section on Proposed Walls as swell potential has direct implications in the design and construction of the retaining walls especially ones planned as part of the detention ponds. They must state that any construction areas in contact with bedrock may experience much higher swell potential than that reported for near surface soils.

- Landslides. PSI state that the original wall design by Nelson Design includes a slope stability design. The Nelson slope stability analysis does not evaluate for pond water adjacent to their wall system. This additional analysis must be done for the tiered walls adjacent to detention pond 1.

The Keystone stability analysis does not include a piezometric surface for walls 5 and 2 adjacent to the detention ponds. This additional analysis must be done for these walls that will be exposed to water.

- Debris flow and debris fans. It is unclear if PSI has identified these hazards at this site. If they do not exist here, mitigation is not required.
- Rockfall. Stating that there is “a limited risk of rockfall” here implies that this hazard actually exists on this site. PSI should clarify if they think rockfall hazards exist at the site. The sentence “No mining activities have been publicly recorded for this site.” Should be removed from this section.
- Shallow water tables. PSI states “During drilling operations ground water was not apparent with the depths explored; approximately 20 feet below surface grade.” There is a potential for post-development groundwater to become perched on the soil/claystone interface here and for groundwater to exist naturally at this location, as shown in Entech’s report. This needs to be addressed in the geologic hazard report as this has implications for the retaining wall at detention pond 2.
- Collapsible Soils. These types of soils are found in specific geologic deposits and are defined in the Subdivision Policy Manual. PSI should state if such deposits and soils even exist at the site.
- Faults. The report states that “the nearest fault is located approximately 2 miles to the west

at the base of Cheyenne Mountain”. An explanation of what this means for the project must be given, i.e. seismic design criteria.

- Landfills and areas of uncontrolled and undocumented fill. Along with a discussion of the fill at the site, the locations of fill and areas of fill with debris should be shown on the geologic map produced for the project. All engineering statements about the adequacy of the fill and the recommendations for identification and removal of debris and deleterious material must be included in the geologic hazard report.
- Erosion. The potential for serious and damaging erosion exists at this site. This geologic hazard and the mitigation for it must be discussed in the geologic hazard report.
- Radon. This geologic hazard must be discussed in the report.

Disclosure. Plat note 9 refers to the geologic hazard report. Per section 7.4.507 of the geologic hazard ordinance effective April 10, 2017 the disclosure note should refer to the final geologic hazard report and list the geologic hazards identified on the property that require specific mitigation. These hazards to be listed in the disclosure statement include at least: expansive soils and man-placed fill.

CGS cannot recommend approval of The Ridge multi-family housing project at this time. Work is needed on the retaining wall design as related to the detention ponds, and potential for highly expansive bedrock. The Geologic Hazard Report needs to be complete and conform to the rules and guidance of the Geologic Hazard Ordinance and Subdivision Policy Manual.

Thank you for the opportunity to review and comment on this project. If you have questions or require further review, please call me at 303-384-2654, or e-mail jlovekin@mines.edu.

Sincerely,



Jonathan R. Lovekin, P.G.
Senior Engineering Geologist

COLORADO GEOLOGICAL SURVEY

1801 19th Street
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303.384.2655



November 13, 2017

Karen Berry
State Geologist

Hannah Van Nimwegen
Planning and Community Development Department
Land Use Review Division
PO Box 1575, Mail Code 155
Colorado Springs, CO 80901-1575

Location:
SE¹/₄ of SE¹/₄, Section 6,
T15S, R66W of the 6th P.M.
38.7683°, -104.8141°

Subject: The Ridge Proposed Development (File Number AR FP 17-00040; AR DP 17-00039) Colorado Springs, CO; CGS Unique No. EP-17-0031_4

Dear Hannah,

Colorado Geological Survey has reviewed The Ridge proposed development resubmittal. We previously reviewed this referral in our letters dated February 15, February 24, and July 17, 2017. We understand the applicant proposes a 60-unit multi-family housing project in Colorado Springs. According to the referral documents the development would occur on undeveloped but disturbed ground (including retaining walls and fill) to the east of the existing Broadmoor Bluffs Apartments. The existing apartments are located at 4375 Broadmoor Bluffs drive.

Included in the resubmittal documents were: Request for Review (City of Colorado Springs, November 14, 2017), Final Plat (Compass Surveying & Mapping, LLC, 10.30.17), Project Information-Site Plans, (raSmith, 10.30.17), Final Drainage Report (raSmith, 10.30.17), Geotechnical Services Report (PSI, 10.30.17), and a Geologic Hazard Report (PSI, 10.30.17).

The applicant's consultants have satisfactorily resolved our previous concerns. The mitigation and engineering recommendations provided by PSI must be strictly adhered to during construction of this project. We offer the following observations on items we suggest be resolved during final approval process of the proposed development.

Site Drainage: The drainage design for the site is critical to the long-term performance of the retaining walls and detention ponds. This is addressed by the maintenance plan included in the drainage report (Appendix 10: Maintenance of Facilities). The plan includes monthly and yearly site inspection requirements. This requirement is valid. We offer the following questions and recommendations:

- Has it been determined who will be responsible for inspection, maintenance, repairs, and costs associated with the Storm Sewer and two Sand Filters (detention basins): the City, the HOA, or another entity? If responsibility is assigned to the HOA, who would be responsible for the system in the unlikely event that the HOA dissolves?
- An operations manual should describe, at a minimum:
 - why the storm system was constructed and how it works,

- an as-built map of the system, clearly indicating the location, relative to surface features, of every conduit, cleanout, collection and discharge/daylight point, easement, and all other components of the system,
- clear instructions on how (and whom to call) to inspect, maintain and repair the system,
- clear instructions regarding how to identify malfunctions, and whom to call in the event of malfunction or failure, and
- clear instructions regarding how to estimate (and therefore levy assessments and budget for) expenses associated with inspection, maintenance and repairs of the system.
- This document should be recorded with the plat, to ensure that thorough, accurate information about the storm sewer and sand filters is available to the responsible entity (the City, water/sewer/stormwater district, HOA board and Management Company, or other party) in perpetuity.

Retaining Walls: Appendix C of PSI's Geotechnical Report includes Ground Engineering's Retaining Wall Design and Slope Stability Analysis Report and Drawings. Their report states on page 3, "*The estimated soil parameters used in the retaining wall design and evaluation of existing walls are summarized below, and **must** be verified prior to and during the wall construction.*" C-2 1.06 Special Provisions B on page C-2, "*The Geotechnical Engineer shall be responsible for subgrade conditions to meet the specified bearing pressures of the walls.*" These two items must occur prior to construction of the retaining walls. The approved construction documents must clearly state these design verification activities shall precede construction of the retaining walls.

Grounds report includes a list of references that does not include the most recent geotechnical and geologic hazard reports by PSI (October 30, 2017). These recent reports should be referenced in Ground's report.

Disclosure Statement: The report identifies geologic hazards requiring mitigation at this location. These include expansive soils, potentially unstable slopes, undocumented fill, and erosion. To be complete, the disclosure statement provided on the Site Plans per City Ordinance (7.4.507), needs to add erosion to the list of identified geologic hazards at this site.

Provided all engineering and geologic hazard recommendations are followed, and all mitigation measures are properly constructed and maintained, CGS has no objection to the proposed development.

Thank you for the opportunity to review and comment on this project. If you have questions or require further review, please call me at 303-384-2654, or e-mail jlovekin@mines.edu.

Sincerely,



Jonathan R. Lovekin, P.G.
Senior Engineering Geologist

From: Jonathan Lovekin <jlovekin@mines.edu>
Sent: Thursday, December 14, 2017 3:39 PM
To: Van Nimwegen, Hannah
Subject: The Ridge final submittal

Hannah,

I have gone through the documents for The Ridge. I have no additional comments and everything looks in order except:

Disclosure Statement: The report identifies geologic hazards requiring mitigation at this location. These include expansive soils, potentially unstable slopes, undocumented fill, and erosion. To be complete, the disclosure statement provided on the Site Plans per City Ordinance (7.4.507), needs to add erosion to the list of identified geologic hazards at this site.

Response: Updated on the plans

The final plans and plat have not been updated to add erosion to the list of geologic hazards. This still needs to be done.

Please let me know if you have any questions.

Regards,

Jonathan R. Lovekin, P.G.
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303.384.2654

