

January 13, 2016

Ms. Dana Shuler, P.E.  
Weber County Engineering Division  
2380 Washington Blvd., Suite 240  
Ogden, UT 84401

Subject: Geologic Review  
Lot 13, Summit Eden Ridge Nests Subdivision  
7914 East Heartwood Drive, Unit 13  
Eden, Utah  
SA Project No: 15-160

Report: IGES Letter – Response to Additional Review Comments – Geology  
Geotechnical Investigation, The Ridge Nests Development, Powder Mountain  
Resort, Weber and Cache Counties, Utah (IGES Project No. 01628-008), dated  
December 11, 2015: prepared for Summit, LLC, 3632 North Wolf Creek Drive,  
Eden, Utah 84310.

***Geologic Submittal Status: COMPLETE SUBMITTAL***

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Dear Ms. Shuler,

At your request, Simon Associates (SA) reviewed the above referenced December 11, 2015, IGES letter. The December 11, 2015, IGES letter was submitted in response to the following SA review letter:

Geologic Review, Lot 13, Summit Eden Ridge Nests Subdivision, 7914 East Heartwood Drive, Unit 13, Eden, Utah (SA Project No: 15-160), dated November 29, 2015: prepared for Dana Shuler, P.E., Weber County Engineering Division, 2380 Washington Blvd., Suite 240, Ogden, UT 84401.

The purpose of SA's review is to evaluate whether or not the IGES documents adequately addresses geologic conditions at the site, consistent with concerns for public health, safety, and welfare; reasonable professional standards-of-care, and; the Weber County Code of Ordinances (Weber County, 2015).

## Background

1. On October 20, 2015, Mr. Chuck Payton (IGES) contacted Mr. David Simon (SA) to discuss the October 14, 2015, SA review letter<sup>1</sup> (see attached, Chronology of Prior Reports and Letters). During the October 20, 2015, telephone conversation, Mr. Simon noted that response to the following statement on page 6 of the October 14, 2015, SA review letter would be sufficient to address surface-fault-rupture at the property and other items regarding faulting documented at the property in the October 14, 2015, SA review letter would no longer be germane:

"Additionally, SA recommends Weber County suggest IGES consider the following, long established standard of practice, methods for evaluating the potential for surface-fault-rupture along the documented faults:

- Review of aerial photographs and surface observations to identify any fault-related geomorphic features indicative of past surface faulting at or near the property (e.g., fault scarps, vegetation lineaments, gullies, vegetation/soil contrasts, aligned springs and seeps, sag ponds, aligned or disrupted drainages, faceted spurs, grabens, and/or displaced landforms such as terraces, shorelines, geologic units, etc.).
  - The USGS Quaternary Fault and Fold Database of the United States. (<http://earthquake.usgs.gov/hazards/qfaults>)."
2. In the subsequent November 4, 2015, IGES response letter, IGES chose an alternate approach to respond to SA comments regarding surface-fault rupture at the property which resulted in the comments presented in the November 29, 2015, SA letter.
  3. On pages 5 and 6 of the December 11, 2015, IGES response letter (under IGES Response to Comment No. 5), IGES states:

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<sup>1</sup> The November 29, 2015, SA letter incorrectly referenced the date of the telephone conversation between Messieurs Payton and Simon as occurring on October 16, 2015, when in fact the telephone conversation occurred at about 2 PM on October 20, 2015.

- a. "The aerial photographs were examined stereoscopically for the presence of photo-lineaments which might be indicative of faulting, as well as other additional geomorphic features. No photo-lineaments were observed either crossing or projecting toward the subject property. Additionally, no fault related geomorphic features indicative of past surface faulting at or near the property, including fault scarps, vegetation lineaments, gullies, vegetation/soil contrasts, aligned springs or seeps, sag ponds, aligned or disrupted drainages, faceted spurs, grabens, or displaced landforms were observed in either the aerial photograph reviewed or the site reconnaissance (surface observations detailed in the IGES response letter dated September 1, 2015)."
- b. "The absence of lineaments and fault-related geomorphic evidence in the aerial photograph and surface observation investigations constitutes reasonable geologic evidence that the faults observed in the road cut are pre-Holocene age and are to be considered inactive. As a result, from the standpoint of surface-fault-rupture, the area investigated is suitable for the proposed development."

## **SA Conclusions**

Based substantially in and on reliance of the technical documentation and assurances provided by IGES, including their findings and conclusions, it is SA's opinion that IGES Response to Item No. 5 in the December 11, 2015, IGES letter adequately addressed the remaining issue of surface-fault-rupture at the property, consistent with concerns for public health, safety, and welfare, reasonable professional standards-of-care, and the requirements of the Weber County Code of Ordinances (Weber County, 2015).

## **SA Recommendations**

SA recommends Weber County consider the IGES submittals for Lot 13 Summit Eden Ridge Nests Subdivision complete from a geologic perspective.

## **SA Comments**

The following items from the December 11, 2015, IGES response letter are, in SA's opinion, either not germane to the evaluation of potential geologic hazards at the subject property or geologically erroneous.

1. On page 2 (under Response to Comment No. 2) of the November 4, 2015, IGES response letter, IGES states:

"Regardless, it is deemed appropriate that a usable definition for an inactive fault, based upon the accepted definition for an active fault, is 'a fault displaying evidence of equal to or less than four inches of displacement along one or more of its traces during Holocene time (approximately 11,000 years ago to the present),' or '... a fault in which the most recent displacement along one or more of its traces has occurred prior to Holocene time'." This is consistent with other geologic hazard codes in common use, e.g. the Alquist-Priolo Act of 1972 and the Draper City Geologic Hazard Ordinance, among others. For this project, the definition presented in Section 104-27-3 is considered appropriate and reasonable."

It is SA's opinion that:

- a. It is not "...deemed appropriate" to invent a definition for an inactive fault.
- b. IGES's reference to the Weber County definition of active fault being consistent "... with other geologic hazard codes in common use, e.g. the Alquist-Priolo Act of 1972 and the Draper City Geologic Hazard Ordinance, among others," is erroneous.
  - The current definition of active fault in the California Alquist-Priolo Act does not contain a four-inch criteria. Also, the California Alquist-Priolo Act establishes a prescriptive, minimum standard for evaluating surface-fault-rupture in California, not Utah. Reference to the California Alquist-Priolo Act is irrelevant and inappropriate.

- The Draper City geologic hazard ordinance (Draper City, 2010) and the Utah Geological Survey's (Christenson and others, 2003), definitions of active fault do not have a four-inch criteria and define Holocene time as approximately 10,000 years ago to the present.
2. On page 4 (under Response to Comment No. 4b) of the December 11, 2015, IGES response letter, IGES states:

"Application of the principle of uniformitarianism to the Ridge Nests site shows that the slow rate of weathering seen in dolomite in modern environments (see Gauri et al., 1992) is likely to have been slow in the geologic past. Because an active fault would induce 4+ inches of displacement of the dolomite bedrock during Holocene time, and given the known weathering rate of dolomite, an active Holocene-aged fault would still show some surficial geomorphic expression of the fault scarp. Since there is no such fault scarp observed, it can be reasonably concluded that the faults are inactive based upon the definition of an inactive fault provided in the response to Comment 2."

The application of the "principle of uniformitarianism" as presented in the December 11, 2015, IGES response letter is, in SA's opinion, irrelevant and geologically incorrect.

- a. Mechanical and chemical weathering of rock is controlled by many factors such as, fracturing, jointing, bedding planes, soil development, length of exposure, frost wedging, climatic conditions, etc. It cannot be inferred that weathering of any rock type in current climatic and physical settings can be representative of weathering in the past without knowledge of structural characteristics of the particular rock type and the mechanical and chemical processes operating at a specific location in the past.
- b. IGES has apparently assumed "... an active fault would induce 4+ inches of displacement of the dolomite bedrock during Holocene time." The IGES assumption is not supported by data and the assumption that a fault would produce at least four inches of displacement in the Holocene is

fundamentally incorrect (see UGS, 2015, for the various paleoseismicity studies performed in Utah).

3. On page 5 of the December 11, 2015, IGES response letter (under IGES Response to Comment No. 5), IGES states:

"The aerial photographs were examined stereoscopically for the presence of photo-lineaments which might be indicative of faulting, as well as other additional geomorphic features. No photo-lineaments were observed either crossing or projecting toward the subject property. Additionally, no fault related geomorphic features indicative of past surface faulting at or near the property, including fault scarps, vegetation lineaments, gullies, vegetation/soil contrasts, aligned springs or seeps, sag ponds, aligned or disrupted drainages, faceted spurs, grabens, or displaced landforms were observed in either the aerial photograph reviewed or the site reconnaissance (*surface observations detailed in the IGES response letter dated September 1, 2015*)," (italics added for emphasis).

The aforementioned "*surface observations*" were not "*detailed*" in the September 1, 2015, IGES response letter. The September 1, 2015, IGES response letter:

- a. Only provided data for the fault documented on the site from the fault exposure.
- b. Did not reference review of aerial photographs or provide a citation for aerial photographs. Review of aerial photographs<sup>2</sup> was not included in the scope of work of IGES' initial September 16, 2014, report. Review of aerial photographs was not addressed by IGES until the November 4, 2015, IGES response letter and only after being queried by SA.
- c. Did not include findings for the review of aerial photographs.

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<sup>2</sup> Review of aerial photographs and evaluation of geomorphology and lineaments are fundamental and long established standards-of-practice when evaluating surface-fault-rupture (Salt Lake County, 2002; Christenson and others, 2003; Draper City, 2007, 2010; McCalpin, 2009; Morgan County, 2010).

- d. Did not provide an analysis of lineaments and geomorphology.
- e. Used soil development for estimating the age of faulting incorrectly and without providing appropriate data.
- f. Estimated the age of faulting based on conjecture and, in SA's opinion, erroneous geologic interpretations (i.e., "...deformation of Cambrian-age bedrock").


### Closure

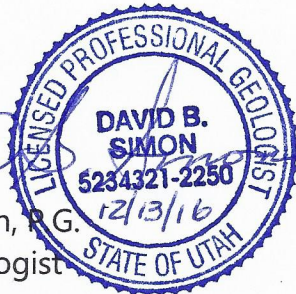
Conclusions and recommendations in this review are based on data presented in the referenced Consultant's reports. SA accordingly provides no warranty that the data in the Consultant's reports or any other referenced reports are correct or accurate. SA has not performed an independent site evaluation. Comments and recommendations presented herein are provided to aid Weber County in reducing risks from geologic hazards and to protect public health, safety, and welfare.

All services performed by SA for this review were provided for the exclusive use and benefit of Weber County; no other person or entity may or is entitled to use or rely upon any of the information or reports generated by SA as a result of this review. Should you have any questions, please feel free to contact the undersigned. The opportunity to be of service to Weber County is appreciated.

Very truly yours,

**SA**

  
David B. Simon, P.G.  
Principal Geologist



DBS/AOT  
Dist. 1/addressee

## References Cited

Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey, Miscellaneous Publication 03-6, 14 p.

[http://ugspub.nr.utah.gov/publications/misc\\_pubs/MP-03-6Guidelines.pdf](http://ugspub.nr.utah.gov/publications/misc_pubs/MP-03-6Guidelines.pdf)

Draper City, 2010, Chapter 9-19 Geologic hazard ordinance of Title 9 Land Use and Development Code for Draper City, adopted December 30, 2003, per Ordinance No. 547; amended December 11, 2007 per Ordinance No. 796; amended June 1, 2010, per Ordinance No. 935.

<http://ut-drapercity.civicplus.com/documentcenter/view/379>

Draper City, 2007, Appendix B, Minimum standards for surface fault rupture hazard studies, Chapter 9-19 Geologic hazard ordinance of Title 9 Land Use and Development Code for Draper City, adopted December 30, 2003, per Ordinance No. 547; amended December 11, 2007 per Ordinance No. 796.

<http://ut-drapercity.civicplus.com/documentcenter/view/379>

McCalpin, J.P., editor, 2009, Paleoseismology (second edition)—International Geophysics Series Vol. 95: Burlington, Mass., Academic Press (Elsevier), variously paginated.

Morgan County, 2010, Morgan County geologic hazard ordinance, adopted June 1, 2010: Chapter 8-51 of the Morgan County Municipal Code.

<http://www.morgan-county.net/Portals/0/Documents/851%20Appendix.pdf>

Salt Lake County, 2002, Minimum standards for surface fault rupture hazard studies, Appendix A, Geologic hazards ordinance, Chapter 19.75 of the Salt Lake County zoning code of ordinances, adopted July 2002: Salt Lake County Planning and Development Services Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, 9p.

<http://slco.org/pwpds/zoning/html/geologicHazards.html>

UGS, 2015, Utah Geological Survey Paleoseismology of Utah series.

<http://geology.utah.gov/hazards/technical-information/paleoseismology-of-utah-series>



Geologic Review  
Lot 13, Ridge Nest Subdivision  
7914 East Heartwood Drive, Unit 13, Eden, Utah

SA Project No. 15-160  
January 13, 2016  
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Weber County, 2015, Weber County, Utah, Code of Ordinances, Supplement 4 Update 1, Online content updated on September 23, 2015, Code Of Ordinances, Weber County, Utah: Codified through Ordinance No. 2015-16, adopted September 8, 2015 (Supp. No. 4, Update 1).  
[https://www.municode.com/library/ut/weber\\_county/codes/code\\_of\\_ordinances?nodeId=14935](https://www.municode.com/library/ut/weber_county/codes/code_of_ordinances?nodeId=14935)

**ATTACHMENT**  
**Chronology of Prior Reports and Letters**

Geologic Review

Lot 13, Summit Eden Ridge Nests Subdivision  
7914 East Heartwood Drive, Unit 13  
Eden, Utah  
January 13, 2013

The chronology of prior SA review and IGES response letters follow:

1. The November 29, 2015, SA letter was submitted in response to the following November 4, 2015, IGES letter:

Response to Review Comments – Geology, Geotechnical Investigation, The Ridge Nests Development, Powder Mountain Resort, Weber and Cache Counties, Utah (IGES Project No. 01628-008), dated November 9, 2015: prepared for Summit, LLC, 3632 North Wolf Creek Drive, Eden, Utah 84310.

2. The October 14, 2015, SA letter was submitted in response to the following September 23, 2015, IGES letter:

Response to Review Comments – Geology, Geotechnical Investigation, The Ridge Nests Development, Powder Mountain Resort, Weber and Cache Counties, Utah (IGES Project No. 01628-008), dated September 23, 2015: prepared for Summit, LLC, 3632 North Wolf Creek Drive, Eden, Utah 84310.

3. The September 23, 2015, IGES letter was submitted in response to the following September 7, 2015, SA review letter:

SA Geologic Review Response, Review of Professional Qualifications – Peter Doumit (IGES), Lot 13, Ridge Crest Subdivision, 7914 East Heartwood Drive, Eden, Utah (SA Project No: 15-160), dated September 7, 2015: prepared for Dana Shuler, P.E., Weber County Engineering Division, 2380 Washington Blvd., Suite 240, Ogden, UT 84401.

4. The September 7, 2015, SA letter was submitted in response to professional qualifications for Peter Doumit provided by IGES in a September 3, 2015, email.
5. The September 3, 2015, IGES email was provided in response to the following September 3, 2015, SA review letter:

SA Request for Professional Qualifications (SA Project No: 15-160), dated September 3, 2015: prepared for Dana Shuler, P.E., Weber County Engineering Division, 2380 Washington Blvd., Suite 240, Ogden, UT 84401.

6. The September 3, 2015, SA letter was submitted in response to the following September 1, 2015, IGES letter:

IGES Letter - Response to Review Comments – Geology, Geotechnical Investigation, The Ridge Nests Development, Powder Mountain Resort, Weber and Cache Counties, Utah (IGES Project No. 01628-008), dated September 1, 2015: prepared for Summit Powder Mountain, 3632 North Wolf Creek Drive Eden, Utah 84310

7. The September 1, 2015, IGES letter was submitted in response to the following August 28, 2015, SA review letter:

SA Geologic Review, Lot 13, Ridge Crest Subdivision, 7914 East Heartwood Drive, Eden, Utah (SA Project No: 15-160), dated August 28, 2015: prepared for Dana Shuler, P.E., Weber County Engineering Division, 2380 Washington Blvd., Suite 240, Ogden, UT 84401.

8. The August 28, 2015, SA letter was submitted in response to the following August 19, 2015, IGES letter:

IGES Letter - Preliminary Response to Geologic Review Comments, The Ridge Nests Development, Powder Mountain Resort, Weber County, Utah (IGES Project No. 01628-005 L11), dated August 19, 2015: prepared for Summit, LLC, 3632 North Wolf Creek Drive, Eden, Utah 84310.

9. The August 19, 2015, IGES letter was submitted in response to the following August 18, 2015, SA review letter:

SA Geologic Review, Lot 13, Ridge Crest Subdivision, 7914 East Heartwood Drive, Eden, Utah (SA Project No: 15-160), dated August 18, 2015: prepared for Dana Shuler, P.E., Weber County Engineering Division, 2380 Washington Blvd., Suite 240, Ogden, UT 84401.

10. The August 18, 2015, SA letter was submitted in response to the following September 16, 2014, IGES geotechnical engineering report:

Geotechnical Investigation, The Ridge Nests Development, Powder Mountain Resort, Weber and Cache Counties, Utah (IGES Project No. 01628-008), dated September 16, 2014: prepared for Summit, LLC, 3632 North Wolf Creek Drive, Eden, Utah 84310 (i.e., initial IGES report).