CGI TECHNICAL SERVICES INC.

December 31, 2014
CGI: 14-2194.01

Mr. Eddie Axner
**EDDIE AXNER CONSTRUCTION, INC.**
5249 Old Oregon Trail
Redding CA 96002

**Subject:** **Slope Observations**
**APN 041-300-035**
**Baker Ridge Road**
**Shasta County, California**

Dear Mr. Axner,

CGI Technical Services, Inc. (CGI), is pleased to provide recommendations and opinions to Eddie Axner Construction for slopes graded at the subject property. This letter addresses, specifically and exclusively, only the cut and fill slopes along the existing pads and fire break. No other geotechnical or geological issues were evaluated.

## SITE OBSERVATIONS

We understand that recently two pads and a fire break were graded on the subject property. The pads are located just above and west of Baker Ridge Road and encompass about 0.7 and 0.2 acres. Both pads were constructed using cuts and fills. The cut slopes at the pads are inclined at 2:1 (horizontal to vertical) inclinations or flatter. Fill slopes are also inclined at 2:1 or flatter. Fill materials were derived from the Shasta Bally Batholith (Dupras, 1997) and granitic rocks of that batholith are exposed in cut slopes. Berms that are approximately four feet tall are constructed along the western, southern, and eastern margins of the lower pad, and the western and southern margins of the upper pad. Runoff on the lower pad is towards the northwest and for the upper pad, towards the east. Cut slopes at both pads were covered with straw at the time of our visit. Fill slopes were covered with straw or brush removed during grading. Minor to moderate erosion had locally occurred on fill slope faces.

The pads are accessed by an unpaved access road ascending from Baker Ridge Road. That access road was constructed using cuts and fills. Slopes along that road are generally inclined at 2:1 or flatter, except where the road forks to the south into the lower and larger pad. At that location, the fill slope is inclined at about 1:1.

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Extending northwest from the upper pad is a graded fire break that extends towards the west then loops back to the east. A number of spurs extend off the fire break. The total length of the fire break is about 5,400 lineal feet. The fire break was constructed by making cuts and fills, except where the alignment is located on ridgelines. Cuts are near vertical to 1:1 and up to 12 to 14 feet tall with most cuts being less than 5 feet tall. Rock materials exposed in the cuts consist of granitic rocks of the Shasta Bally Batholith (Dupras, 1997). Those materials consist of moderately to slightly weathered, moderately to well indurated, moderately to slightly fractured granite. The tallest cuts are designated on Plate 1 as Sites A and B. At those locations, the cuts are vertical to near vertical except at the upper two to three feet where portions of the cuts that are weathered regolith (soil byproducts of original rock materials) have locally sloughed.

Fill slopes along the fire break are inclined as steep as about ¾:1 and are locally up to about 20 feet tall, with most fills being less than 5 feet tall. The fills are composed of rock and soils of the Shasta Bally Batholith derived from cuts made along the fire break. In most areas, it appeared that the fill materials were side-cast over the slope with little or no preparatory or compactive effort. The toes of fill slopes at Sites A and B were located within seasonal drainages. Erosion has locally rilled and incised those slopes and transported sediment into those drainages.

## DISCUSSION & RECOMMENDATIONS

For easier discussion, information within this letter has been segregated into slopes at the pad areas and slopes along the fire break.

### SLOPES AT THE PAD AREAS

#### Cut Slopes

Cut slopes observed at the two pad areas and along the access road leading to the pads from Baker Ridge Road were graded in 2013 and were observed to be constructed at 2:1 (horizontal to vertical) inclinations or flatter. Those cut slopes meet the 2013 California Building Code (CBC) and, in our opinion, are grossly stable.

Cut slopes at both pads and along the road were covered with straw at the time of our visit. Some erosion could occur over time on these cut slopes. We recommend that best management practices (BMP) be implemented to reduce erosion on those pads. The project engineer is best to provide those recommendations.

#### Fill Slopes

Fill slopes surrounding the pads are also inclined at 2:1 or flatter. It is our opinion that those fill slopes are grossly stable.

Fill slopes along the access road are generally inclined at 2:1 or flatter, except where the road forks to the south into the lower and larger pad. At that location, the fill slope is inclined steeper than 2:1. It is our opinion based, on the slopes past performance, that those fill slopes are grossly stable. Fill slopes were covered with straw or brush removed during grading. Minor to moderate erosion had

locally occurred on fill slope faces. We recommend that BMPs be implemented to reduce erosion on those slopes. The project engineer is best to provide those recommendations.

## SLOPES ALONG THE FIRE BREAK

### Cut Slopes

Extending northwest from the upper pad is a graded fire break that extends towards the west then loops back to the east. A number of spurs extend off the fire break. Cuts along the fire break are near vertical to 1:1 and up to 12 to 14 feet tall with most cuts being less than 5 feet tall. Exposed rock materials consist of moderately to slightly weathered, moderately to well indurated, moderately to slightly fractured granite. The tallest cuts are designated on Plate 1 as Sites A and B. At those locations, the cuts are vertical to near vertical except at the upper two to three feet where portions of the cuts that are weathered regolith (soil byproducts of original rock materials) have locally sloughed.

Under static conditions, those slopes appear to be grossly stable. The upper two to three feet of those slopes will likely continue to slough until they reach that soil's angle of repose then become grossly stable. The sloughed material from cut slopes will be deposited on the fire break surface, which has plenty of catchment area. Because the fire break is not a commonly used surface, it is our opinion that those slopes can remain in place, as is, and the fire break maintained periodically throughout wet weather seasons to remove sloughed materials deposited on the fire break surface. To reduce future maintenance, if desired, the upper two to three feet of the slopes at Sites A and B can be laid back to an inclination of 2:1.

### Fill Slopes

Fill slopes along the fire break are inclined as steep as about ¾:1 and are locally up to about 20 feet tall, with most fills being less than 5 feet tall. The fills are composed of rock and soils of the Shasta Bally Batholith derived from cuts made along the fire break. In most areas, it appeared that the fill materials were side-cast over the slope with little or no preparatory or compactive effort. The toes of fill slopes at Sites A and B were located within seasonal drainages. Erosion has locally rilled and incised those slopes and transported sediment into those drainages.

Relatively low fill slopes along the fire break show some signs of settlement and erosion, especially where water drains over the outboard edge of the fire break. We recommend that drainage be controlled and channeled to areas where runoff is designed to flow downhill. At those locations, BMPs should be implemented to reduce erosion on the relatively low fill slopes. The project engineer is best to provide those recommendations. Alternatively, the low fills can be removed and replaced with engineered fill materials, properly compacted and tested. Because of the nature of the granitic soils, erosion will still likely occur and BMPs needed. It might cause less environmental disturbance to allow the materials to remain in place and follow the engineer's recommendations of drainage improvements and erosion control.

Relatively taller fill slopes observed at Sites A and B pose a more difficult problem. Those fill slopes are loose, were apparently placed on the natural slope with no keying or benching (and locally on top of brush), and show signs of significant erosion. Furthermore, the slopes are tall enough that a conventional excavator cannot reach the slope bottom, which is located in a seasonal drainage,

without pioneering a road to make access. Cracks observed within the fire break surface indicate that settlement of those fills is locally occurring and local failures of the fill prism could occur. There are a number of theoretical alternatives that can be applied to help stabilize the fill materials; however, many of those alternatives could cause greater sedimentation and environmental damage, some would likely help stabilize the fills somewhat but not completely, and many are cost prohibitive to a private land owner.

At a minimum, installation of BMPs to reduce erosion should be implemented. If only BMPs are installed then there is a risk of continued erosion and potential slope failures. Because of the loose nature of those fill materials, it is likely that these BMPs will reduce some erosion but rilling, gullying, and settlement should be anticipated to continue and some fill slope failures occur. To reduce the sedimentation within the seasonal drainages, check dams can be installed downstream from the fill slopes to capture fugitive soils washed downstream. Those check dams will have to be maintained to ensure adequate catchment capacity. The project engineer is best to provide BMPs and check dam design.

## CLOSURE

CGI appreciates the opportunity to be of assistance with this project. If you have any questions pertaining to this letter, or if we may be of further service, please contact us at (530) 244-6277.

Regards,

**CGI TECHNICAL SERVICES, INC.**



James A. Bianchin, P.G., C.E.G.
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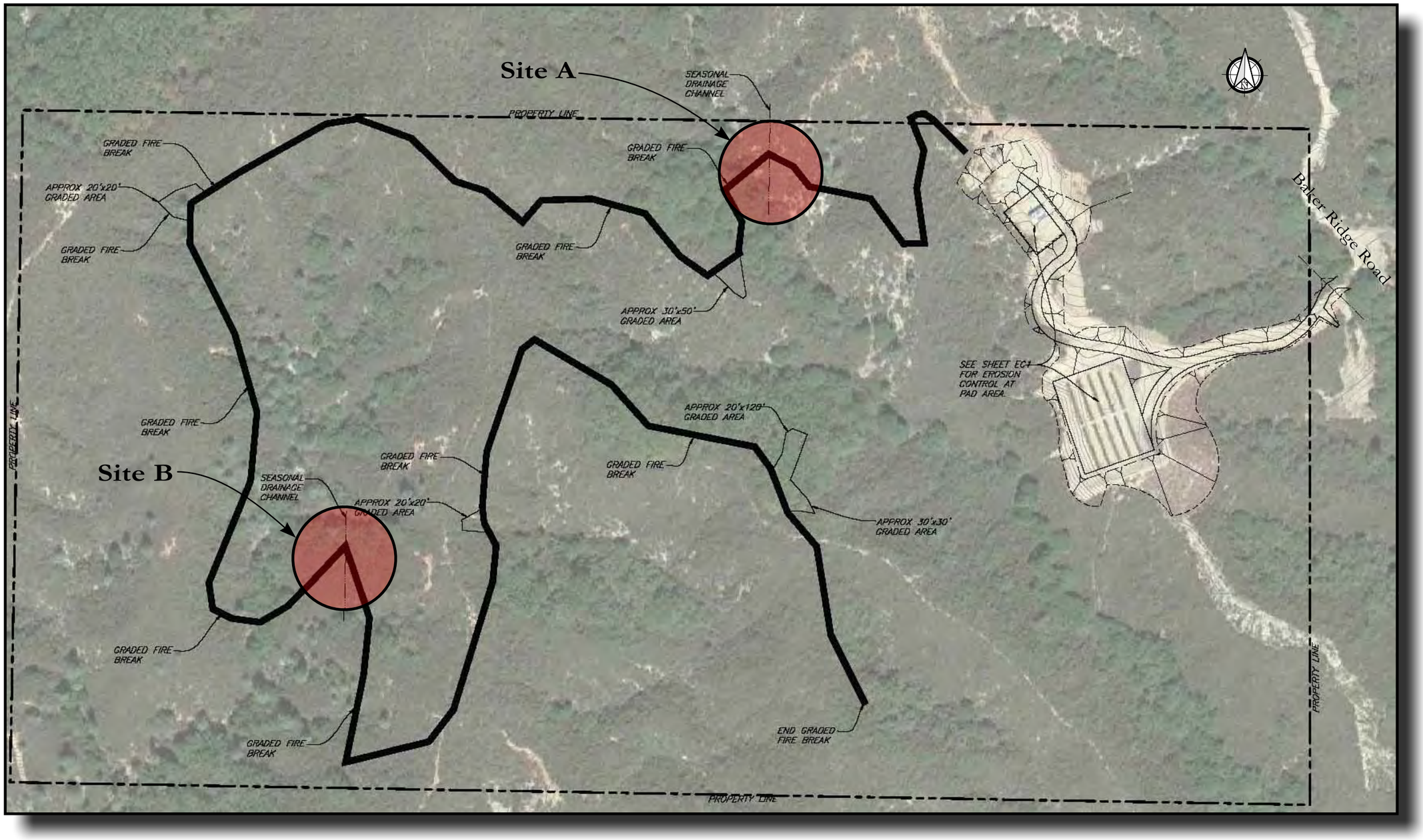
Senior Geotechnical Engineer

## REFERENCE

Dupras, D. (1997), Mineral Land Classification of Alluvial Sand and Gravel, Crushed Stone, Volcanic Cinders, Limestone, and Diatomite within Shasta County, California, California Division of Mines and Geology Open File Report 97-03, 186 p.




Base map provided by SHN Consulting Engineers & Geologists, Inc. (2014)

Scale not Determined

CGI Technical Services Inc.

Project No.: 14-1980.12

BAKER RIDGE
CUT & FILL SLOPES EVALUATIONS
APN 041-300-035
SHASTA COUNTY, CALIFORNIA

Plate

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