NORFLEET CONSULTANTS

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Hydrogeology
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January 15, 2018

Ventura County Planning Dept
800 S. Victoria Ave
Ventura CA 93009

Proj. No. 131882.3

RE: Geologic/Slope Review
Ojai Quarry
Ojai, CA

Dear Sirs,

At Mr. Mosler's request, We are providing an updated geologic/slope stability review for the Ojai Quarry.

Our scope of work included:

- Review of ground photographs of the quarry taken between February, 2017 and January, 2018 and a revised aerial topographic map of the quarry, dated August 30, 2017.
- Review of our previous geologic and geotechnical documents concerning slope conditions in the quarry.
- Discussions with Mr. Mosler.
- Preparation of this report.

The intent and purpose of this report is to provide a discussion of geologic and slope stability conditions in the quarry as of January 5, 2018.

GEOLOGIC SETTING

The quarry is located on undeveloped land of the Los Padres National Forest within the Topatopa range, and is adjacent to State Highway 33 (Rt. 33) and the north fork of Matilija Creek (Figure 1). It is about 4 miles north of the city of Ojai in Ventura County. Eocene sandstones and siltstones of the Matilija formation are mined in the quarry.

The quarry is located in the core of a large thrust ramp (called the Matilija Overturn by Kerr and Schenck, 1928). The thrust ramp extends diagonally (southeast-to-northwest) across the range, forming a large fold. The ramp fold axis is quasi-vertical, exposing a cross-section of the ramp (in plan view). Ramp development caused rotation, faulting, fracturing, shearing, and bedding plane slip along and across the sandstone/siltstone beds.

The area was mapped in 1928 by Kerr and Schenck and again by Dibblee (1982). Dibblee's structural mapping is general only. It does not show the detailed structural complexities within the ramp zone. The depositional environment of the sandstone was discussed by Link (1975). Squires (1999) did a detailed stratigraphic analysis of the Matilija sandstone at the Matalija Hot Springs with an auxiliary section opposite the quarry.

SITE GEOLOGY

Field descriptions are based on the exposures in the quarry at the time of our site visits in December 5, 2011, on June 5, 2013, and February 2014. See those reports for details of the geology and slope stability. This is an active quarry. As mining progress, features described in this or previous reports may be destroyed while new geologic features will become visible. With a few exceptions, the quarry beds dip steeply (80 to 85 degrees SE) and strike ~N30E. The beds young to the southeast. The quarry face has an approximate bearing of N40W.

The quarry is located on the lower part of a southwest sloping steep ridge. The current quarry (active and reclaimed) is about 650 feet wide and long with an elevation change of about 500 feet. The undisturbed ground above the quarry slopes 33 to 36 degrees (1.54-1.4 to 1) while the ground surface adjacent to the north side of the lower part of the quarry slopes about 45 degrees (1 to 1). There were no obvious indications of large-scale slope failures in the surrounding natural slopes and road cuts.

In the quarry, the Matilija formation consists of interbedded sandstones and siltstones. Sandstone beds vary from a foot or so thick to massive beds more than 30 feet thick. The sandstones are fine- to coarse-grained and contain few obvious depositional features. The siltstones are thin bedded (an inch or less) and form zones a few inches thick to more than 20 feet thick. The sandstones are light brown in color while the siltstones are dark brown (blackish looking). The thicker sandstone beds are hard/strong enough that they have to be blasted. No free/flowing water was observed in the quarry. No indications of long-term, historic water flow was observed in the quarry.

Previous Studies

The previous condition survey of the Ojai Quarry was issued by AGS, Inc., on February 22, 2011 (their report number 8922). That report identified locations of perched boulders and discussed progress on their removal, potential for rock falls, and mining activities within various parts of the quarry. They noted that no rock bolts had been installed and no buttress fills had been constructed. Four landslides were identified. Three were shallow, within colluvium (AGS areas 3 and 9), and the fourth was located at the upper northeast corner of the quarry (AGS area 8). It was unclear from the AGS report in what material the fourth landslide was located. AGS noted that surface erosion from winter rains had reduced the size of those landslides.

Norfleet Consultants prepared a slope stability study (December 5, 2011) as part of the reclamation plan for the quarry. For this study, the quarry geology was re-evaluated, structural

information (joints) was collected and the overall stability of the quarry slopes and proposed fills was evaluated.

A point of contention between the operator and the County is the meaning of notes on the proposed cross-section (C) in the original reclamation plans (Hovell and Piloarski Engineering, September, 1994?), Figure 1. One note read "Quarry Tailings Disposal Area." Below, another note read "Temp. Stockpiling & Loading of Rocks Area." Both notes had arrows pointing to newly cut benches. There no indication that the notes refer to the final, reclaimed slope configuration. The operator believes that the notes allow the temporary storage of tailings on an as needed basis to a maximum depth specified in the notes during mining. The County believes that these notes specify the final, reclaimed configuration of the quarry slope. They believe that all benches must eventually be filled with engineered fill to the configuration shown in the notes.

This quarry has virtually no area for long- or short-term storage of spoils/tailings. The benches are the only locations where material can be stored temporarily or long-term.

Norfleet Consultants prepared an annual slope stability review study (dated July 2, 2013). The focus of this evaluation was the rock fall potential from the active mining at the southeast corner of the quarry. Recommendations were provided to the quarry operator to reduce the potential for rocks leaving the active quarrying area.

The RWQCB was concerned that rocks or soil/silt from the quarry could enter Matilija Creek during large rainfall events. The Norfleet Consultants study (February 3, 2014) evaluated those concerns.

During the winter of 2016-17, we kept in contact with Mr. Mosler to track effects of the heavy El Nino rains on the quarry. We reviewed photographs of the quarry taken by Mr. Mosler during January and February, 2017. The rains cleared the slopes of minor debris and caused some small rocks (up to 1 foot in diameter) to move down the hill. No equipment damage was reported, the roadways/benches were not damaged, no soil or rock landslides were reported, the catchment basins and de-silting operations appeared to work as intended, and no material was reported to have entered the creek. No report was issued.

Current Quarry Conditions

Active mining shifted to the upper part of the southeast area of the quarry in the spring of 2012, and has continued to this day. Mining in other parts of the quarry ceased in late 2011.

The active mining area a ridge of massive, clean sandstone beds that have to be blasted. The ridge was initially about 125 feet long and rose 30 to 40 feet above the existing quarry floor. Prior to mining, parts of this ridge rose 10 to 20 feet above the surrounding natural ground surface. The beds dip about 80 degrees to the southeast and tilt into the quarry. The beds vary in width from 1 to 15 feet. The beds are jointed, and joint spacing correlates with bed thickness. In the thicker beds, joint spacing is 3 to 12 feet. In the thin beds (<2 feet), joint spacing is less than 1 foot. No groundwater or indications of groundwater were observed in or around this area. The quarry was burned by the Thomas fire in late 2017. No equipment damage was reported. There

was no indication that the fire damaged quarrying operations. No mud/soil slides in the quarry were reported during the recent rains (January 10-20, 2018).

Early on, two access roads were cut to access the top of the ridge to allow top down mining. The operator created a level pad at the base of the downhill side of the ridge to catch falling rock. This area has been reduced to a gentle slope. Because it is an active mining area, it has a greater rock fall risk than surrounding area. The operator recognizes this risk and appears to have organized his activities to reduce the rock fall potential.

Existing cut slopes in the northern part of the quarry are higher and steeper. Rock falls have been and will continue to be a concern throughout this area. Seismically induced rock falls could occur. We did not observe obvious areas of incipient large-scale slope failure or areas of noticeable slope changes in other parts of the quarry. We did not observe indications of groundwater flow from the faces/joints of the quarry.

The stability of the quarry slopes were described and analyzed in our report dated December 5, 2011. In our opinion, mining activities since 2011 have not altered the slope stability analyses or conclusions presented in our 2011 report. The conclusions in the 2011 report are still valid.

In our 2011 report we stated that "The addition of a structural buttress [engineered soil fill in the cut benches] adds little to the overall slope stability. In fact, the buttress will have the [sic] lower FS than the adjacent rock cut. Unless extensive sub-surface drainage systems are installed in a buttress, the buttress could have a much higher failure probability than the rock slopes." Cut rock slopes, with benches (but no buttress fills), had factors of safety between 1.8 to 4. Buttress fills increased the slope FS from 0.08 to 0.23 (depending on rock properties and slope configuration). Buttress fill FS was in the 1.23 range.

Placing engineered fills in the benches would provide little additional structural support to the cut slopes. However, because the quarry fill material is sandy/silty with little to no cohesion, increased quarry-wide soil erosion could likely occur during winter rains. This could present significant long-term siltation and water quality problems for Matilija Creek.

The source of fill material need to create the buttresses is unclear. Virtually all mined material is sold. There are no tailing piles on the Ojai quarry property that could be used to create buttress. This suggests that A), fill would have to be brought in from other quarries. This would create a significant increase in truck traffic through Ojai. Or B), material from the Mosler quarry could be crushed to create the volume of needed fill material. A crushing plant would have to be set up, but it is unclear if there is room for such a plant. The plant would likely have to be wet to meet local air quality board requirements. This raises additional problems. There is no room for de-silting ponds, and then there is the problem of silt disposal. Also unknown is the extent of additional mining needed to create the fill.

LIMITATIONS

If the quarry operator observes suspicious/unusual slope movement indicators (an increase in localized rock falls, widening of joints, loud cracking noises, seemingly minor block movement, etc.), he should contact us immediately.

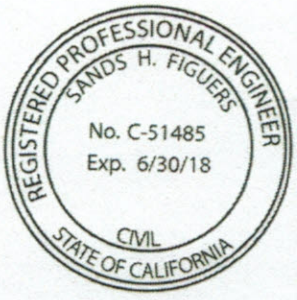
This report was prepared at the request of, and for the exclusive use of the addressee. Release to any other company, concern, or individual is solely the responsibility of the addressee. We have employed generally accepted geological, engineering geology, and civil engineering procedures for this type of study. Our observations, professional opinions and conclusions were made using that degree of care and skill ordinarily exercised, under similar conditions, by engineering geologists, and civil engineers practicing in this area at this time. The opinions and/or recommendations presented in this report could be subject to revision should additional information become available. Norfleet Consultants expressly denies any third party liability arising from the unauthorized use of this report and makes no warranty, either expressed or implied

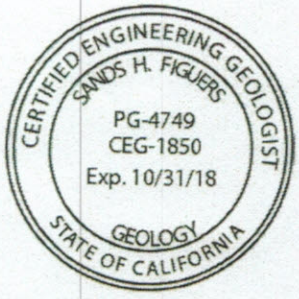
The opinions and/or recommendations presented in this report could be subject to revision should additional information become available. The timing and location of events reported to us by the owners or their representatives were not independently confirmed.

Yours Truly,

S. Figuers

NORFLEET CONSULTANTS
Dr. Sands Figuers, PE, CEG, CHG, PGp
Principal Geological Engineer





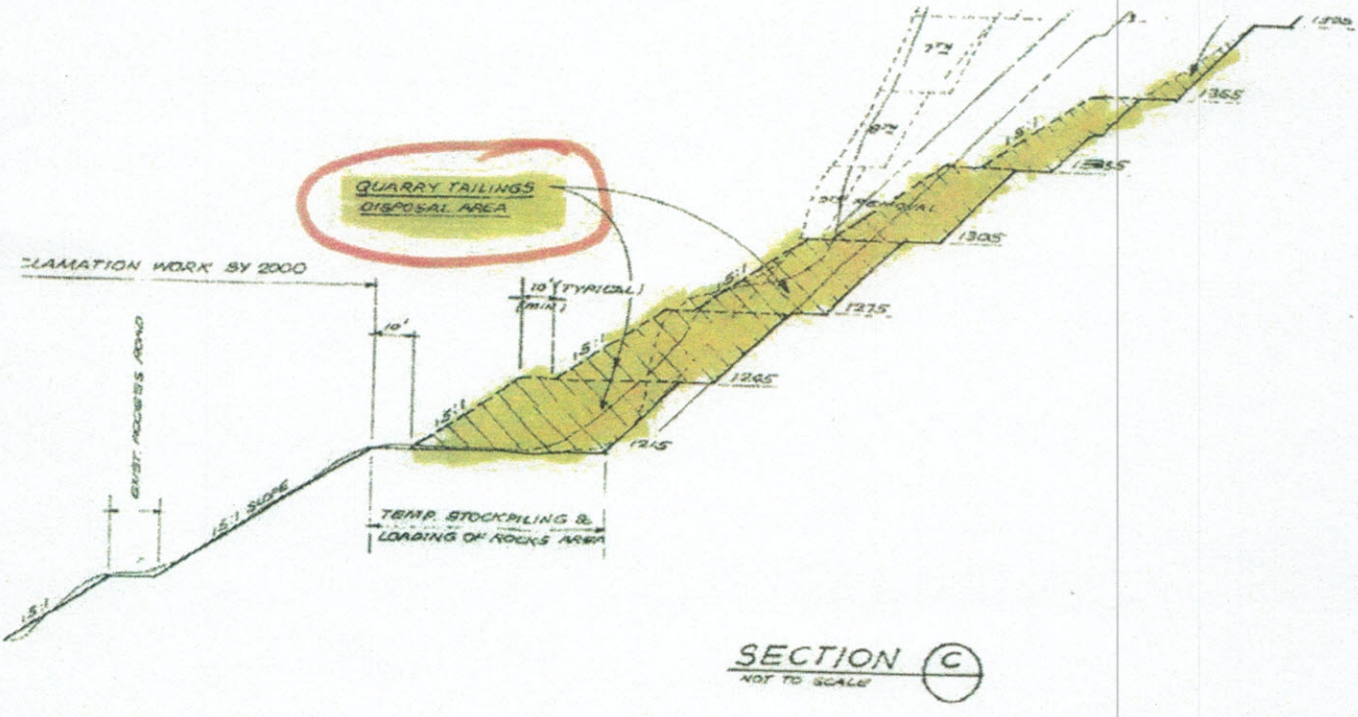
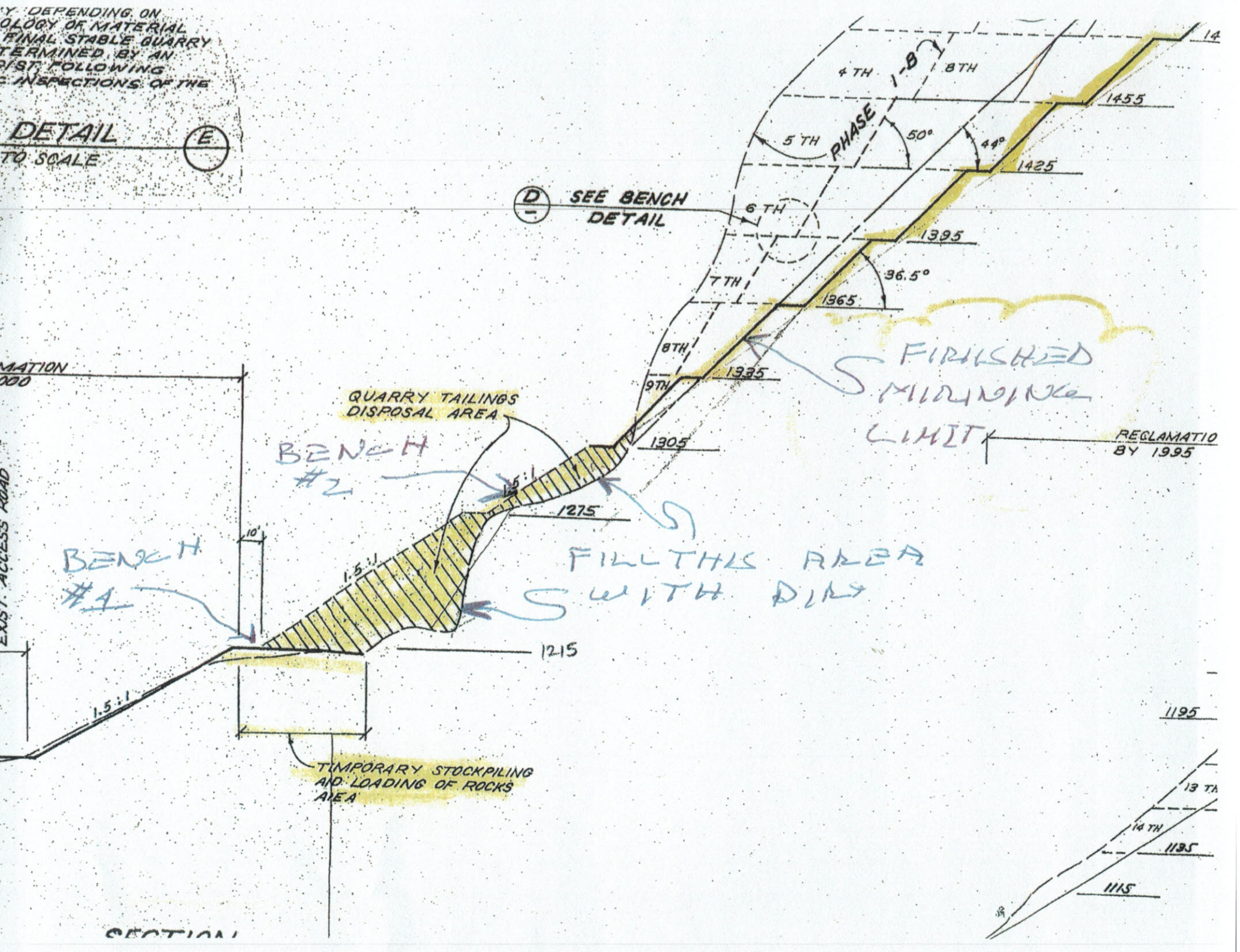


Figure 1: The Hovell and Piloarski Engineering cross-section C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