



Project No. S9534-05-04
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VIA ELECTRONIC MAIL

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Subject: GEOTECHNICAL ADDENDUM – ALTERNATE A
SHIFLER MINING AND RECLAMATION PROJECT
YOLO COUNTY, CALIFORNIA

Reference: *Slope Stability Evaluation – Teichert Shifler Mining and Reclamation Project, Yolo County, California*, Geocon Project No. S9534-05-04, May 25, 2016.

Mr. Smith:

As requested, we have prepared this Geotechnical Addendum for the proposed Shifler Mining and Reclamation site located northeast of the intersection of County Roads 22 and 94B in Yolo County, California. The approximate site location is shown on the Vicinity Map, Figure 1.

This Addendum is intended to provide a summary of our additional geotechnical analysis, conclusions, and recommendations for an alternative mining and reclamation operation (“Alternate A”) where the existing Moore Canal would remain in its current location and mining/reclamation would occur on both sides of the canal.

BACKGROUND AND PURPOSE

Geocon previously prepared the referenced *Slope Stability Evaluation* report for the project (Geocon 2016). The purpose of our 2016 study was to evaluate subsurface conditions, evaluate pertinent geotechnical parameters, and to evaluate slope stability for proposed perimeter mining and reclamation slopes under static and dynamic (seismic) conditions with respect to the performance standards outlined in the Yolo County *Off-Channel Surface Mining and Reclamation Ordinances* (YCSMRO) and the California *Surface Mining and Reclamation Act* (SMARA).

The Shifler site occupies approximately 320 acres south of Cache Creek and east of County Road 94B. Teichert proposes to excavate the site for gravel mining operations. The proposed mining operations will require excavation of the site to a maximum pit bottom elevation of -5 feet mean sea level (MSL). Our previous 2016 *Slope Stability Evaluation* was based on the 2016 *Mining and Reclamation Plans* (Cunningham Engineering, 2016), which considered that the existing Moore Canal would be relocated to a newly constructed concrete-lined channel adjacent to the north and west boundaries of the proposed mining/reclamation area.¹ The new canal would be set back approximately 50 feet from the mining area. We understand that Yolo County has decided to include a project alternative (“Alternative A”) where the Moore Canal is not relocated and mining and reclamation occurs on both sides of the existing canal.

¹ For the purposes of this letter, we call the 2016 mining/reclamation operations the “Original Plan.”

The purpose of our additional evaluation was to determine if the “Alternate A” mining operation (leaving the Moore Canal at its existing location and mining on both sides) would result in more adverse slope stability or seepage conditions.

DISCUSSION AND CONCLUSIONS

Table 1 summarizes the slope inclination details of the proposed mining slopes adjacent to the relocated canal (original plan) and adjacent to the existing canal (Alternate A):

**TABLE 1
MINING SLOPE INCLINATIONS**

Mining Slope Area	Original Plan (Relocated Moore Canal)	Alternate A (Existing Moore Canal)
Upper Slope ¹	¾:1	3:1
Transition Slope ²	2:1	2:1
Lower Slope ³	1:1	1:1
<ol style="list-style-type: none"> 1. Upper Slope – From top of slope to Low Groundwater Elevation 2. Transition Slope – From Low Groundwater Elevation to 5 feet below Low Groundwater Elevation 3. Lower Slope – From 5 feet below Low Groundwater Elevation to bottom of pit 		

Reclamation slopes will be constructed using stockpiled overburden soil that is placed and compacted to form new slopes ranging in inclination from 2:1 to 4:1 above 5 feet below Low Groundwater Elevation and 1:1 below this elevation.

As shown in Table 1, the “Alternate A” mining slope inclination of the Upper Slope (from top of slope to Low Groundwater Elevation) is significantly flatter than the Original Plan (3:1 versus ¾:1) and the reclamation slope inclinations are generally the same.

We performed slope stability analyses on the “Alternate A” mining and reclamation slopes and found the factors of safety against failure are generally 10% to 60% higher than the slopes for the Original Plan. This indicates that the “Alternate A” slope configuration has higher resistance against slope instability than the Original Plan. This is consistent with expectations because the upper mining slope inclination for “Alternate A” is significantly flatter.

In addition to slope stability, our 2016 study analyzed for the potential of adverse seepage conditions as a result of the relocated Moore Canal in proximity to mining and reclamation slopes. Our analysis showed that the potential seepage from the canal does not intercept the mining slope at an elevation higher than the average seasonal high groundwater condition, even when sustained indefinitely. Thus subsurface seepage conditions at the mining slope under the design water conditions for the relocated canal are not expected to be more adverse than the normal, average seasonal high groundwater conditions. This analysis considered the steeper mining slope (¾:1). Given that the “Alternate A” mining slope is much flatter (3:1), we do not expect adverse seepage conditions.

Based on our review, the “Alternate A” mining and reclamation option where the existing Moore Canal would remain in its current location and mining/reclamation would occur on both sides of the canal results in less adverse slope stability and seepage conditions compared to the Original Plan. Also, given the flatter upper mining slope inclination for “Alternate A,” we expect that the potential for adverse impacts from vibrations caused by mining excavations would also be less.

CLOSURE

Our professional services are provided in general accordance with generally accepted geological principles and practices used in the site area at this time. No warranty is provided, express or implied.

Please contact us if you have any questions regarding this letter or if we can be of further service.

Respectfully Submitted,

GEOCON CONSULTANTS, INC.



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