Appendix F

Storm Water Management Plan

July 8, 2010 Project No. 103-97180

Chuck Unsworth
Teichert Aggregates
3500 American River Drive
Sacramento, CA 95851

RE: STORMWATER MANAGEMENT PLAN, BOCA QUARRY WEST PIT, HIRSCHDALE, CALIFORNIA

Dear Mr. Unsworth:

Golder is pleased to submit this Stormwater Management Plan for the proposed Boca Quarry West Pit located near Hirschdale, California. Our work was completed in accordance with our proposal dated May 24, 2010.

1.0 PROJECT DESCRIPTION AND SITE CONDITIONS

Teichert Aggregates (Teichert) submitted an application for a Use Permit and Reclamation Plan Modification to expand the Boca Quarry to include the proposed West Pit, which has an excavation footprint of approximately 100 acres. The Boca Quarry is located on a south-facing slope on the north side of Interstate 80. For the proposed West Pit, mining will extend to maximum depths of up to approximately 150 to 200 feet bgs. At reclamation, the final grades will form two upper terraces and a lower pit that is 80 to 150 feet bgs. The total elevation difference between the top of the quarry on the upper terrace to the lower pit is approximately 520 feet. Figure 1 shows the proposed mining grades for the West Pit.

In the quarry vicinity, the geology is comprised of relatively thin soil deposits (i.e. less than several feet) that typically overlay volcanic bedrock. The quarry primarily mines basalt. Deposits of locally occurring volcanic cinders and ash are also encountered in the existing quarry highwall for the East Pit. Review of Teichert's drill core confirms that similar geologic conditions exist in the West Pit area. The bedrock is relatively highly fractured and Golder understands that mining does not require blasting.

The average annual precipitation for the area is 22.2 inches and the average annual snowfall is 108.7 inches (Boca Reservoir), of which the majority occurs between November and April. The 100-year, 24-hour storm event is 3.56 inches (Western Regions Climate Center, 2010). The 20-year, 1-hr storm event is approximately 0.58 inches.

The Natural Resource Conservation Service (NRCS) maintains an online database of soils data for NRCS soil surveys completed throughout the United States. An NRCS survey for the Tahoe National Forest Area covers the Boca Quarry[1] and indicates that the quarry site is covered by the following soil and rock units:

- Cinder land-Sierraville-Kyburz complex (CIF) is mapped along the lower and eastern portion of the quarry
- Kyburz-Rock outcrop -Trojan complex (KRF) is mapped along the middle and western portion of the quarry
- Rubble land – Jorge complex (STG) is mapped along the upslope of the quarry

These units are all characterized as consisting of thin soil development and/or rock outcrops that are described as moderately high to highly drained with no frequency of ponding. The infiltration capacities

[1] United States Department of Agriculture, Natural Resources Conservation Services, http://soils.usda.gov/

are listed as 0.2 to 0.57 inches/hour for the CIF and KRF units, and 0.57 to 1.98 inches/hour for the STG unit.

The well-drained capacity of the soils has been also noted by EcoSynthesis[2], which has observed little evidence of surface water run-off in either natural swales or man-made surface water control ditches completed for the East Pit.

As part of the site reclamation, the lower pit will be used to construct a "zero-discharge" stormwater retention pond that will fully retain surface water run-off until it is evaporated or infiltrated. A similar stormwater retention pond is planned for the permitted East Pit. This "zero-discharge" approach provides a robust means to controlling potential sediment discharge from the site. It also maintains high rates of infiltration, which are characteristic of the existing upper soils and bedrock in the quarry vicinity.

Portions of the lower pit may be backfilled with overburden or fines screened from the aggregate processing operations, and/or with imported clean soil and subsoil from regional construction excavations. However, the base of the retention pond will be completed in the bedrock to facilitate infiltration.

2.0 SURFACE WATER MANAGEMENT PLAN

Stormwater will be managed in a zero-discharge detention basin located in the floor of the quarry. During quarry operations, the detention basin may be moved to different locations within the floor of the quarry. However, at closure, the final retention basin will be located in the south corner of the quarry as shown in Figure 1.

To adequately manage design stormwater volumes, the detention basin should be a minimum of 84,000 square feet in area (approximately 2 acres) founded on the bedrock to maximize infiltration. Figure 2 shows the approximate location and a conceptual cross-section of the retention basin.

The basin was sized using conservative assumptions, which is appropriate for a non-discharge stormwater facility. Although the Surface Mining and Reclamation Act (SMARA) requires that stormwater facilities be designed for a 20-year, 1-hour storm event, the design of a zero-discharge basin should be based on a more conservative criterion. Therefore, in sizing the detention basin, Golder conservatively assumed that two 100-year, 24-hour precipitation events occur within a 7-day time interval. This conservative design event(s) would result in 32 percent of the average annual precipitation occurring within one week.

Other key assumptions include:

- Golder assumed that 20 percent of the precipitation will result in surface water run-off for the upland property north-northeast of the quarry. Given the high infiltration capacity of the native soils and rocks, this percentage of surface water run-off is considered to be conservative. The upland area that drains to the quarry measures approximately 200 acres in area.
- Golder assumed that 60 percent and 40 percent of the precipitation will result in surface water run-off for the quarry slopes and quarry floor, respectively. Although the quarry floor is relatively flat, Golder assumed a relatively high run-off percentage to reflect the potential variability in the backfill soil materials as part of the reclamation re-soiling.
- Golder assumed a permeability of 1×10^{-4} cm/s for the sediment layer in the basin, and permeability of 5×10^{-3} cm/s for the native, fractured bedrock. It was assumed that half a foot of sediment would accumulate on the floor of the basin. Golder also assumed a conservatively low hydraulic gradient of 1.0, which could develop under very long infiltration conditions. Considerably higher hydraulic gradients and infiltration rates would develop upon initial filling of the basin.
- Evaporation was assumed to be negligible.

[2] Verbal communication with Mr. Adrian Juncosa (EcoSynthesis) on June 4, 2010

- Infiltration through the sides of the detention basin was conservatively ignored.

For the above conservative assumptions, the basin is estimated to reach a maximum depth of the 10 feet. The minimum depth of the lower pit is approximately 45 feet indicating that the pit has a much larger surface water storage capacity than required to maintain a zero-discharge basin.

3.0 RECOMMENDATIONS AND CONCLUSIONS

The initial sizing of the basin assumed a number of conservative assumptions that Golder considers prudent for the initial reclamation plan. The quarry development will occur over many years and more quantitative data can be collected regarding the volumes of surface water run-off that will be collected in the pit. If Golder's design assumptions prove to be overly conservative, the detention basin can be re-sized in the future based on actual surface water run-off volumes. In addition, once the infiltration rate for the backfill soils are known, it may be possible to found the detention basin within the backfill soils depending on the results of surface water balance calculations.

A temporary detention basin should also be maintained during quarry operations until the final detention basin is established for reclamation. The location of the temporary basin should be below the lowest elevation of quarry mining. For temporary basins, Golder conservatively recommends maintaining a minimum 12-foot deep, 2-acre basin founded in bedrock as recommended for the final reclamation plan. During operation, the detention basin will accumulate sediment and require periodic maintenance. Accordingly, Golder recommends the following Best Management Practices (BMPs) to ensure proper performance and capacity of temporary basins:

- Backfilling of soil (as part of reclamation) should be excluded from the detention basin footprint to ensure maximum infiltration rates unless the basins are resized based on actual run-off volumes that are measured in the future.
- The basin should be inspected annually and excess sediment removed by the start of each rainy season. Normally, this should be performed by October 1st of each year.

For final reclamation, areas with backfilled soil should be stabilized against excessive erosion and scour to minimize sediment accumulation in the basin. At a minimum, temporary erosion and sediment control measures should be put in place until permanent stabilization control measures are appropriate, typically when backfilled soil has revegetated. Straw wattles, silt fences, and hydraulic, straw, or wood mulches could also be used control excessive erosion and sediment transport.

We look forward to assisting Teichert with this project. Please call if you have any questions or need additional information.

Sincerely,

GOLDER ASSOCIATES INC.

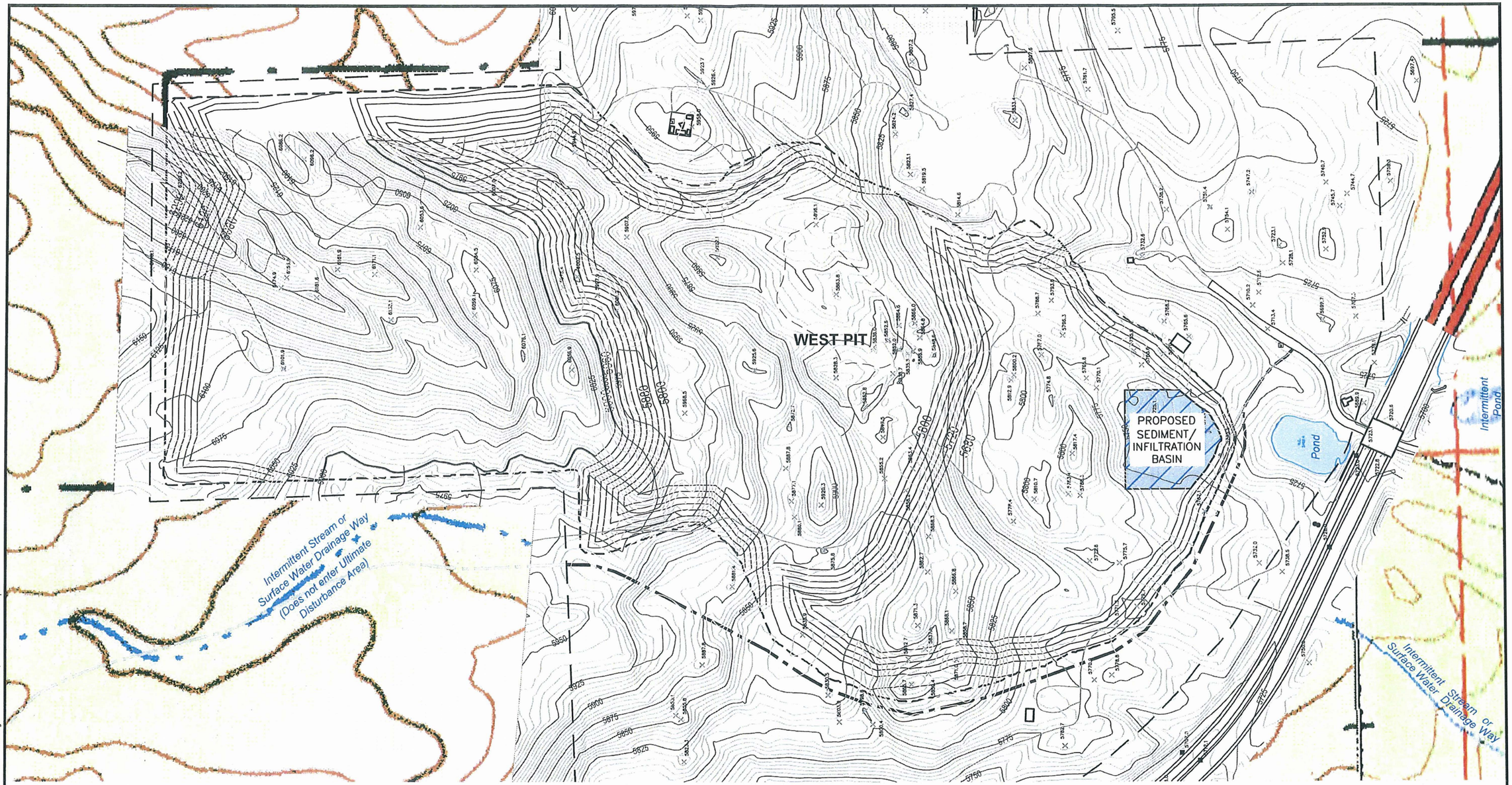
Patrick Grogan, EIT
Engineer

Tim Bauters, PhD, P.E.
Senior Engineer

Kenneth G. Haskell, P.E.
Principal/Practice Leader

Attachments: Figures 1 and 2

FIGURES



NOTES

1. TOPOGRAPHY PROVIDED BY TSI. DATE OF TOPOGRAPHY: APRIL, 2005.
2. BACKGROUND IMAGE OBTAIN FROM USGS 7.5 MINUTE QUADRANGLES:
   - BOCA, CALIF.-NEV.; 1955, PHOTOREVISED 1969
   - MARTIS PEAK, CA-NV; 1992

LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE LIMIT OF WEST PIT
- EXISTING ACCESS ROAD
- PROPOSED ACCESS ROAD

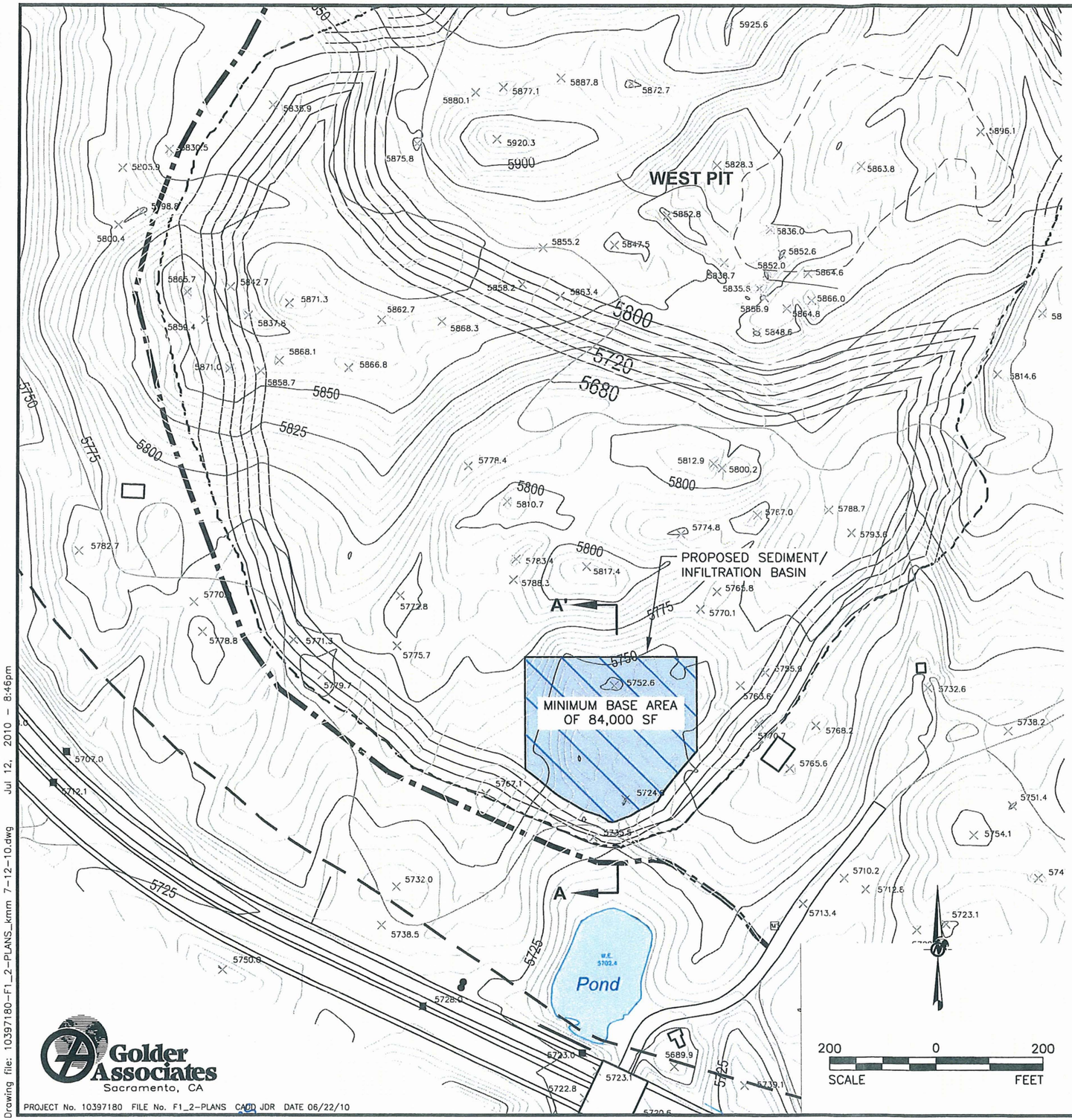
300 0 300
SCALE FEET

Golder Associates
Sacramento, CA

PROJECT No. 10397180 FILE No. F1_2-PLANS CADD JDR DATE 06/22/10

Drawing file: 10397180-F1_2-PLANS_kmm 7-12-10.dwg Jul 12, 2010 - 8:45pm

FIGURE 1
WEST PIT PLAN
BOCA QUARRY



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE LIMIT OF WEST PIT
- PROPOSED ACCESS ROAD

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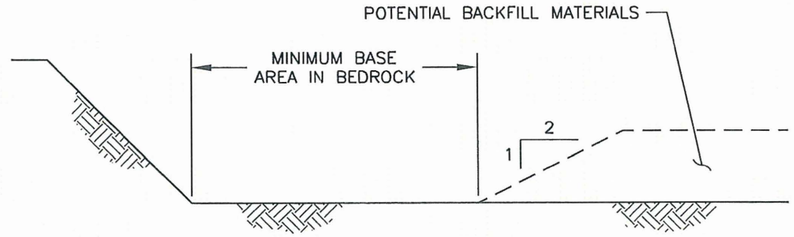

CROSS-SECTION A-A'

(NOT TO SCALE)

Golder Associates
Sacramento, CA

PROJECT No. 10397180 FILE No. F1_2-PLANS CADD JDR DATE 06/22/10

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FIGURE 2
CROSS-SECTION LOCATION
BOCA QUARRY