COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

February 21, 2001
E3359

Ms. Jana Sokale
ENVIRONMENTAL PLANNING
7788 Hazelnut Drive
Newark, California 94560

SUBJECT: **Geotechnical Feasibility Evaluation**
RE: Stevens Creek Trail, Cupertino Segment

Dear Ms. Sokale:

We have completed a geotechnical feasibility evaluation for the construction of a pedestrian/bicycle trail adjacent to geotechnically constrained segments of the Stevens Creek corridor situated within the City of Cupertino. In addition, we have prepared preliminary engineers construction cost estimates for portions of the trail system. Specifically we have evaluated the geotechnical feasibility of:

1) An engineered structure and/or graded trail alignment from Varian Park down to the creek level at Stevens Creek Boulevard;

2) An undercrossing of Stevens Creek Boulevard located immediately northwest of Blackberry Farm Golf Course;

3) Pedestrian bridges across the creek within Blackberry Farm;

4) A trail underpass/overcross at McClellan Road; and

a) Alternative trail alignments to and through the closed quarry located immediately northeast of Stevens Creek County Park.

Various alternative trail design options were considered at Varian Park, Stevens Creek Boulevard, Blackberry Farm and McClellan Road as indicated below. Only the preferred grade-separated options are discussed in detail for this document.

Varian Park Ramp Alternatives
a) 8% Ramp - Preferred Option
b) 10% Ramp
c) 14.8% Ramp - Existing Slope
d) Concrete Column Supported Overpass

Stevens Creek Boulevard Crossing Alternatives
a) Bore and Jack Tunnel with Ramps - Preferred Grade-Separated Option
b) In-Stream Underpass
c) Overpass
d) Signalized Intersection Boulevard Crossing - Preferred At-Grade Option

Northern California Office
330 Village Lane
Los Gatos, CA 95030-7218
(408) 354-5542 • Fax (408) 354-1852
e-mail: losgatos@cottonshires.com

www.cottonshires.com

Southern California Office
5245 Avenida Encinas • Suite A
Carlsbad, CA 92008-4374
(760) 931-2700 • Fax: (760) 931-1020
e-mail: carlsbad@cottonshires.com

Blackberry Farm Alternatives

a) East Bank Alignment - 1 Bridge with Optional Neighborhood Connection at the 'Tank' Bridge - Preferred Option
b) West Bank Alignment - 5 Bridges

McClelland Road Crossing Alternatives

a) Replacement Bridge with Trail Head Clearance and Increased Flood Capacity Preferred Grade-Separated Option
b) Tunnel East of Existing Bridge Abutment with Associated 5% Ramps
c) Channel Deepening Beneath Existing Bridge
d) Roadway Overpass
e) Signalized Intersection - Preferred At-Grade Option

EVALUATION OF GEOTECHNICAL FEASIBILITY

Our evaluation has been based on field reconnaissance and measurement of cross sections completed to portray topographic and engineering geologic conditions at each site noted above. Cross sections were completed using Brunton Compass, measuring tape and hand-level techniques. Collected data was analyzed and conceptual engineering design solutions were identified and illustrated on the field measured cross sections. The following trail elements were determined to be geotechnically feasible.

1.0 VARIAN PARK RAMP/TRAIL CONNECTION

From the elevation of Varian Park, a decent of 38.5 foot is necessary to reach creek grade north of Stevens Creek Boulevard. An existing 14.8 percent ramp descends from the southern terminus of Amelia Court to the creek (SCVWD maintenance access ramp). Approximately 500 lineal feet separates the top of the existing ramp and Stevens Creek Boulevard to the south. This distance constraint limits the length of any proposed ramp. With a length of 500 feet, the minimum achievable ramp slope is roughly 8 percent. An existing house located adjacent to the ramp alignment, combined with locally very steep slopes, will constrain the final ramp design and alignment.

1.1 Cost Estimate

The preliminary engineers construction cost estimate for an 8 percent ramp is $1.5 million. The 8 percent ramp would include a single, downhill retaining wall to approximately 6 feet in height and grading to establish the new ramp surface (Figure 1). Unit costs utilized in the above estimate include grading at $30/cubic yard, retaining wall construction at $120/square foot of wall face, AC paving at $25/square foot, and a protective downslope fence at $10/lineal foot.

1.2 Alternatives

Other design options that were considered included a 10 percent ramp ($1.0 million estimated cost) and minor upgrade of the existing 14.8 percent ramp for trail use ($10,000 estimated cost). In addition, a concrete, cassion supported ramp was evaluated at 8 percent with an engineers construction cost estimate of $2.0 million.

2.0 STEVENS CREEK BOULEVARD TRAIL UNDERPASS

From the existing pavement elevation of Stevens Creek Boulevard, a 5 percent circular ramp combined with a bore and jack tunnel could be constructed to provide a trail connection from the west-bound lane of Stevens Creek Boulevard. The trail would then pass beneath the roadway to an alignment extending south along the creek through the Stocklmeir property. A second 5 percent linear ramp would be needed to bring the trail back up to the top of bank south of Stevens Creek Boulevard in the Stocklmeir property. A vertical elevation drop of 12 feet is necessary from the existing roadway pavement to the bottom of the tunnel to provide an 8-foot diameter tunnel with a minimum of 4-foot of cover (Figure 2).

2.1 Cost Estimate

The preliminary engineers construction cost estimate for this trail element (including tunnel and access ramps) is $800,000 if an 8 percent ramp is constructed from Varian Park down to the creek, and 1.0 million if an 8 percent Varian Park ramp is not constructed. Unit costs utilized for the above cost estimate include $4,000 per lineal foot of bore and jack tunnel (minimum 50-foot tunnel required), $30/cubic yard for grading, $120/square foot of wall face, $30/square foot for concrete ramp surfacing, and an assumption that one third of the circular ramp will require elevated structural support at $3,000 per lineal foot.

3.0 BLACKBERRY FARM PEDESTRIAN BRIDGES

The west bank alignment of the trail through Blackberry Farm would require a total of 5 pedestrian bridges. Because occasional flood events may jump the relatively low, local creek banks, the final design for pedestrian bridges my incorporate a break-away bridge design. This type of design will allow the bridge to detach at one abutment and swing on a hinge at the opposite abutment.

3.1 Cost Estimate

Advancing through Blackberry Farm from north to south, the first (60-foot) bridge would be required to connect the end of the Stocklmeir property with the eighth hole of the Blackberry Farm Golf Course. The preliminary engineers cost estimate for this bridge is $125,000. The second (60-foot) bridge would be required at the east bank maintenance shed with a preliminary engineers construction cost estimate of $125,000 (Figure 3). The third bridge at Horseshoe Bend, the fourth bridge at Scenic Circle and the fifth bridge near an existing above ground water tank (Figure 4), would all have lengths of approximately 45 feet. The preliminary engineers construction cost estimate for each of these 3 bridges is $100,000. The cost estimates for these bridges are based on known costs for other similar bridges in the general bay area, and recent construction cost estimates provided by a commercial pedestrian bridge vendor.

Bridge	Length	Cost
Eighth Hole	60 ft	$125,000
Maintenance Shed	60 ft	$125,000
Horseshoe Bend	45 ft	$100,000
Scenic Circle	45 ft	$100,000
Water Tank	45 ft	$100,000

4.0 McCLELLAN ROAD UNDERPASS AND REPLACEMENT BRIDGE

A cut and cover tunnel to extend the trail beneath McClellan Road to the east of the creek alignment is geotechnically feasible (Figure 5). This design alternative would include 5 percent ramps to the tunnel from the north and south. The southern ramp is estimated at twice the typical length because it must ascend an easement/right-of-way extending to the south of the roadway. This design option would also require measures to pump-out water from the base of the tunnel below the local creek level. Maintenance of a sump pump system would also be required.

Replacement of the existing bridge with one providing additional flood flow capacity, adequate trail head clearance (minimum of 8 feet) and associated trail ramping beneath the bridge is also geotechnically feasible. An existing pedestrian bridge, available right-of-way-width, local slope gradients and the required radius of trail curvature will constrain the final selected trail alignment immediately south of McClellan Road. An existing golf cart bridge will constrain the alignment to the north of the bridge.

4.1 Cost Estimates

The preliminary engineers construction cost estimate is $1.2 million for the tunnel and ramps. The impacts of the tunnel and ramps to existing redwood trees near the east side of the creek should be evaluated by an arborist. Unit costs utilized in the above cost estimate include $2,750/lineal foot of cut and cover tunnel (40 feet length), a total of 720 lineal feet of ramp at $1,375 per lineal foot (includes concrete surfacing), and an estimated $50,000 for necessary drainage measures.

The preliminary engineers construction cost for a replacement bridge and associated trail ramping is $1.0 million. This cost estimate is based on consultation with multiple local contractors who have been involved with similar bridge construction projects. The above estimated cost may increase if there is a need to secure an easement to allow an adequate radius of curvature for the trail south of McClellan Road. The above estimates also do not contain a provision for any costs potentially associated the golf cart bridge to the north of the road.

4.2 Other Alternatives

Other alternatives considered included a roadway overpass (estimated $850,000 cost). In addition, we evaluated a potential option of locally deepening the channel beneath the existing bridge to provide adequate vertical trail clearance. Our preliminary opinion regarding this option is that it may result in adverse downstream erosional impacts due to focusing of channel flow, and that shallow ground water conditions could result in migration of water into the locally deepened channel reducing the annual duration of useable trail conditions.

5.0 QUARRY TRAIL ALIGNMENTS

Geotechnically, expanded use of the quarry is constrained by very steep to precipitous cut slopes and fill slopes which may be unstable under adverse rainfall or seismic conditions. A significant volume of non-engineered fill is present at the base of the quarry which is subject to long-term settlement and erosion. Providing an adequate trail gradient from the quarry fill to the lower drainage basin would require removal,

repositioning and recompaction of approximately 37,000 cubic yards of fill. The preliminary engineers construction cost estimate for this corrective grading is $370,000 (utilizing a grading cost of $10/cubic yard). Potential equestrian or mountain bike use of the quarry area appears feasible if adequate trail width and/or multiple trails are established to allow mixed use of this area.

Access to the quarry across the knoll from Linda Vista Park is currently constrained by precipitous cliffs, very steep slopes and eroding soils. An alternative, undeveloped gulch trail alignment to the quarry from Linda Vista Park is constrained by dense brush, uncertain property ownership and potential habitat impact issues. Additional, more detailed study would be required to develop preferred trail alignments across the knoll or through the local gulch. Either of these routes would bring pedestrians to a topographic saddle where connection to a quarry trail system is possible.

LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology and geotechnical engineering principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.

Depicted designs for the improvements are preliminary and conceptual. Site-specific topographic surveys and investigations will be necessary to finalize improvement designs. Preliminary construction costs have been estimated by roughly calculating quantities based on conceptual design and then applying unit costs to those quantities. It should be understood that these numbers are of only "ballpark" accuracy for comparison purposes and that more precise cost figures should be estimated once final designs are formulated.

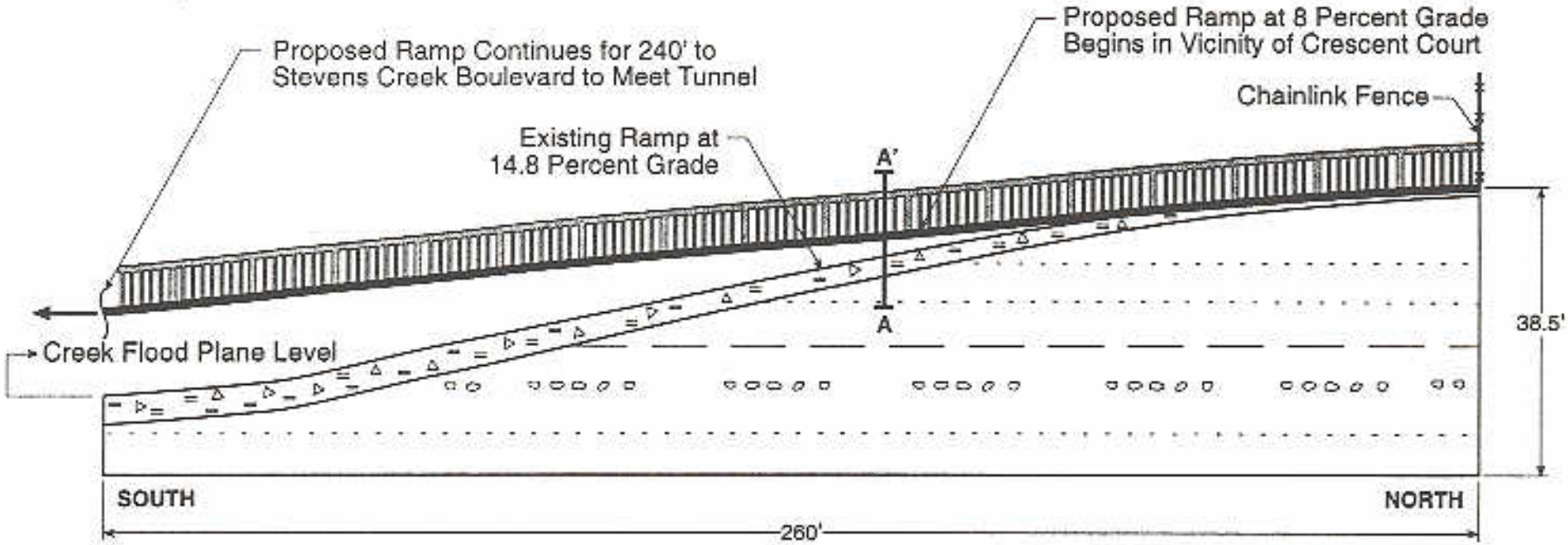
We appreciate the opportunity to have provided you with our geotechnical services on this project. If you have any questions, or need additional information, please contact us.

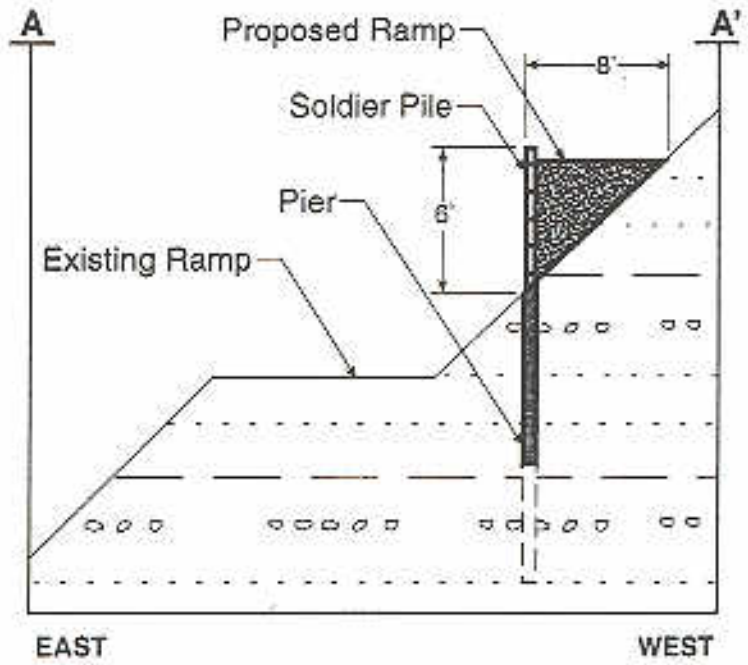
Respectfully submitted,
COTTON, SHIRES AND ASSOCIATES, INC.

Ted Sayre
Senior Engineering Geologist
CEG 1795

David T. Schrier
Senior Geotechnical Engineer
GE 2334

DTS:TS:rb
Attachments: Figures 1, 2, 3, 4, and 5





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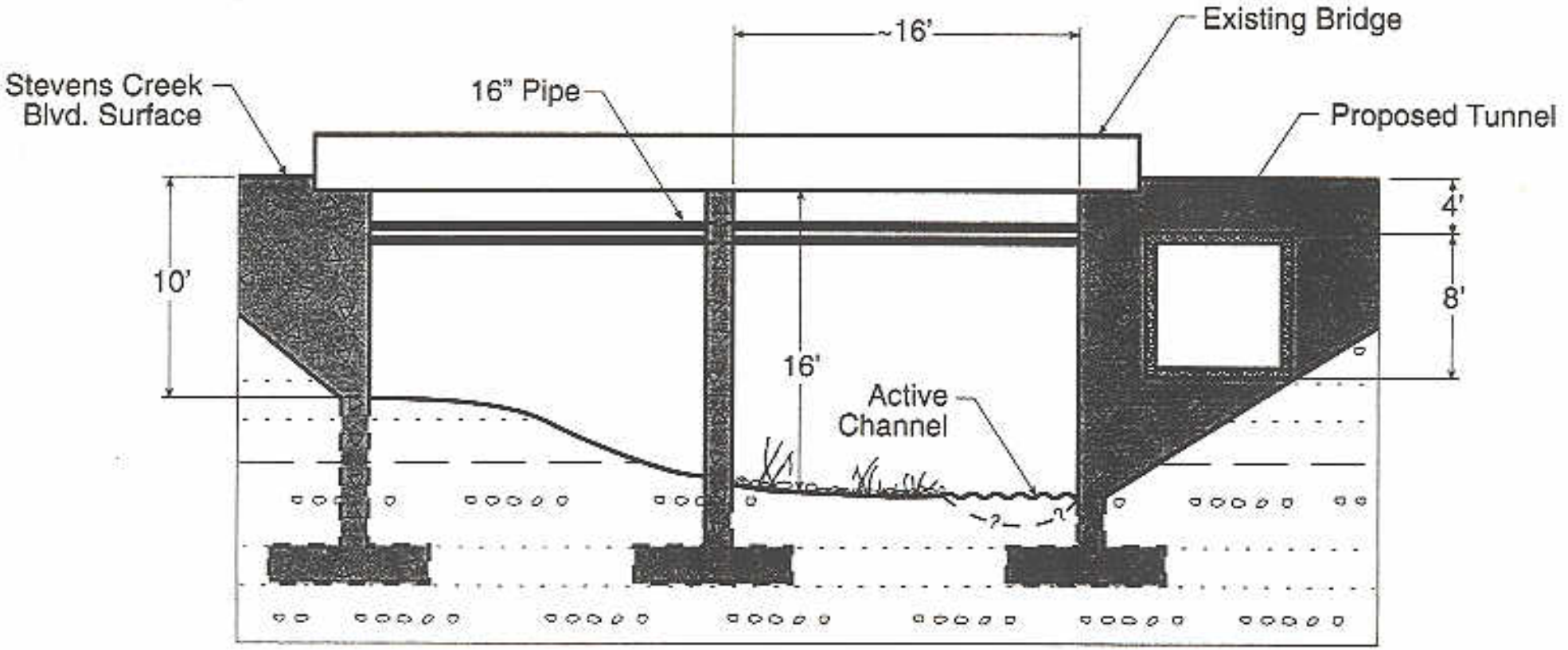
VARIAN PARK ACCESS RAMP to STEVENS CREEK BOULEVARD

CUPERTINO, CALIFORNIA

GEO/ENG. BY	SCALE	PROJECT NO.
TS	1"=10'	E3359
APPROVED BY	DATE	FIGURE NO.
DTS	FEBRUARY, 2001	1



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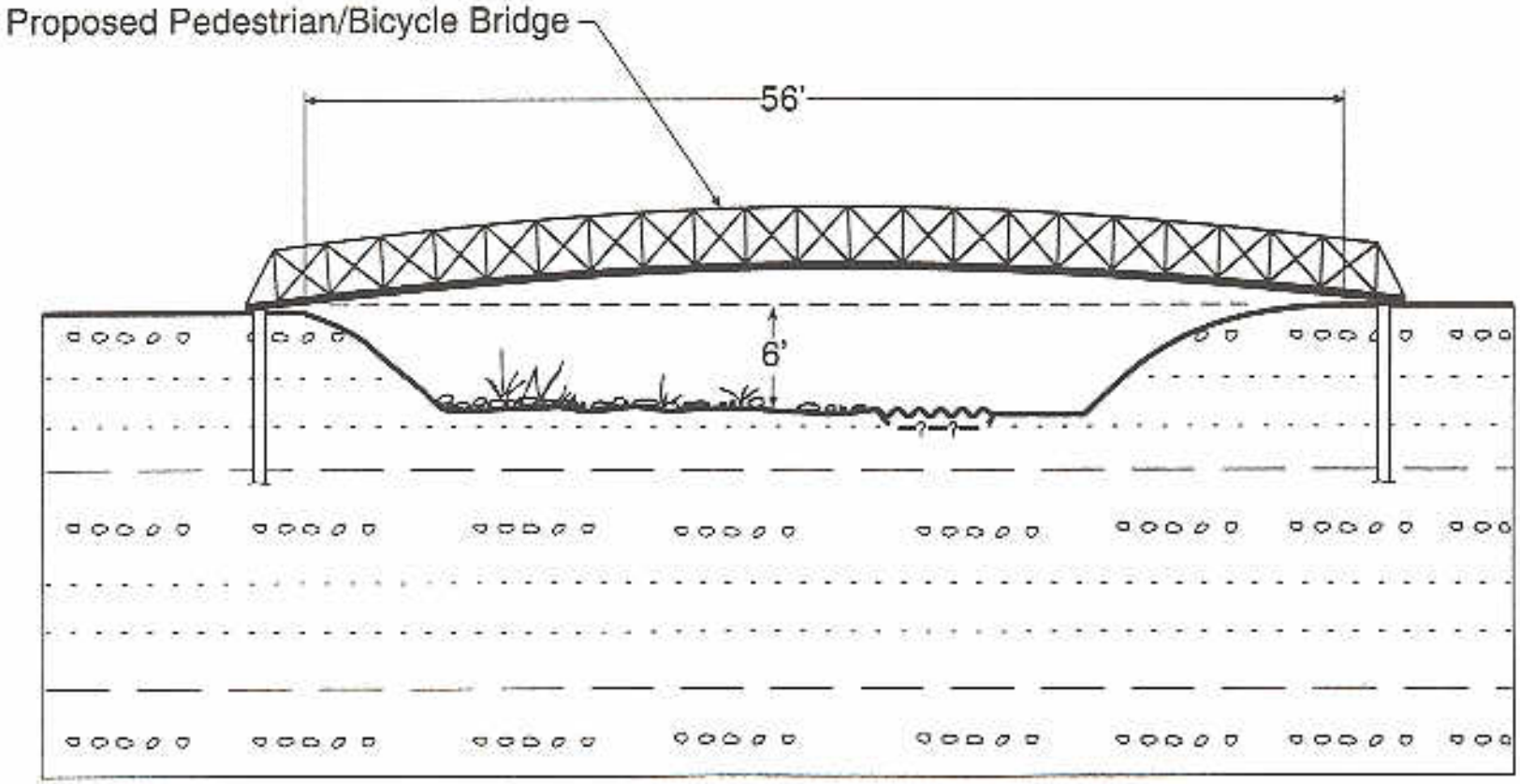
STEVENS CREEK TRAIL TUNNEL
at STEVENS CREEK BLVD BRIDGE
CUPERTINO, CALIFORNIA

GEO/ENG. BY	SCALE	PROJECT NO.
TS	1"=10'	E3359
APPROVED BY	DATE	FIGURE NO.
DTS	FEBRUARY, 2001	2



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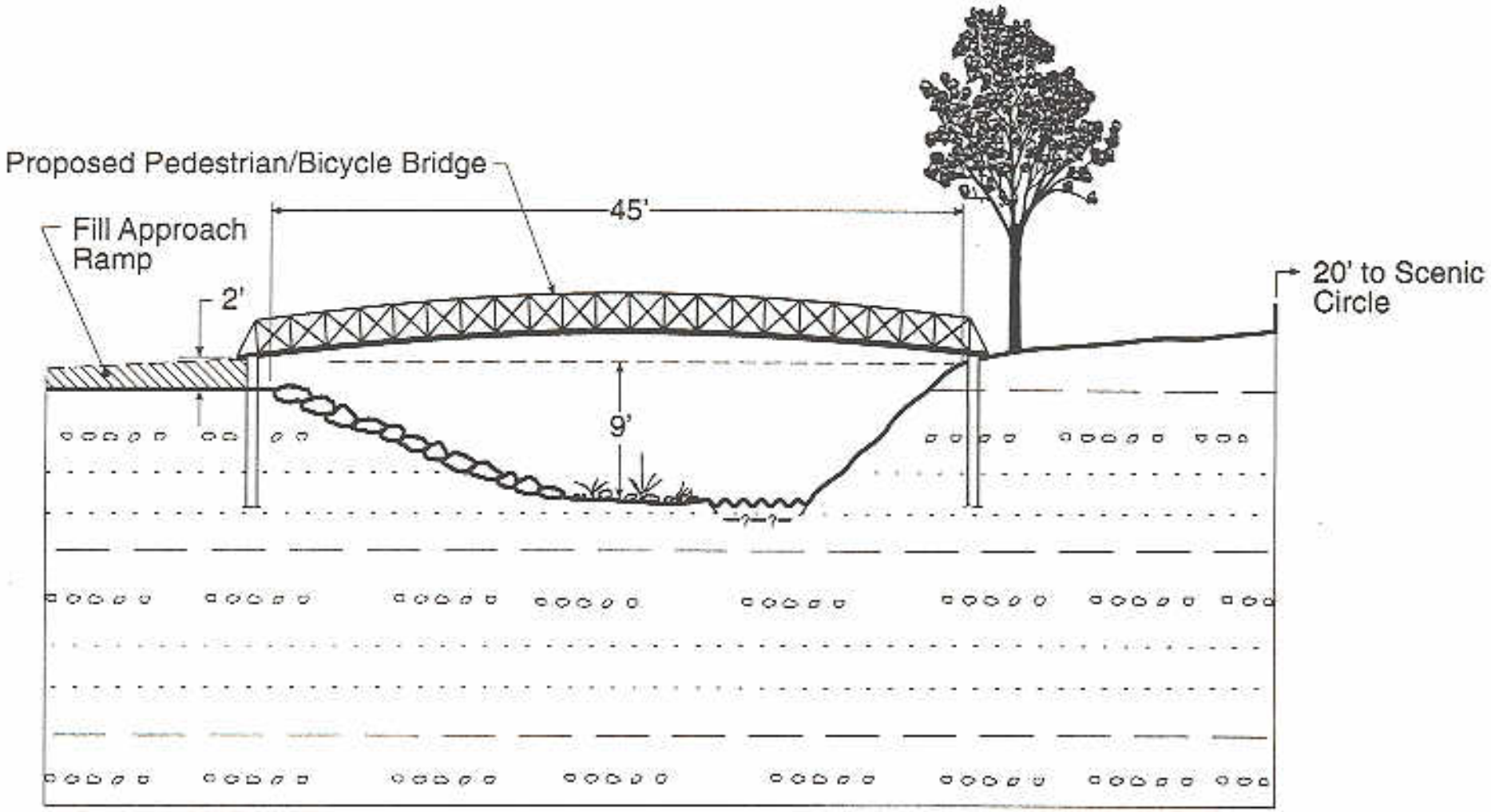
MAINTENANCE SHED PEDESTRIAN/BICYCLE BRIDGE at BLACKBERRY FARM

CUPERTINO, CALIFORNIA

GEO/ENG. BY	SCALE	PROJECT NO.
TS	1"=10'	E3359
APPROVED BY	DATE	FIGURE NO.
DTS	FEBRUARY, 2001	3



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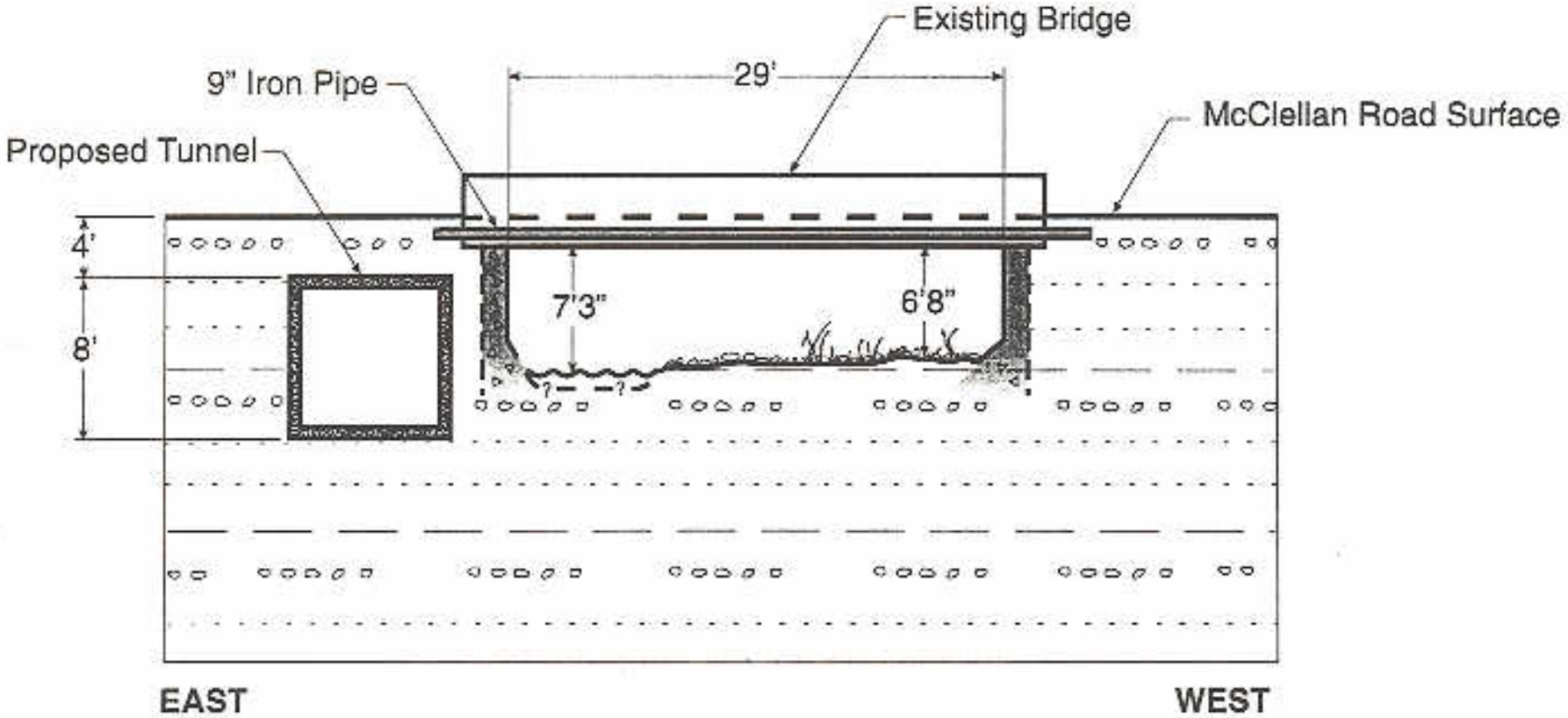
WATER TANK PEDESTRIAN/BICYCLE BRIDGE at BLACKBERRY FARM
CUPERTINO, CALIFORNIA

GEO/ENG. BY	SCALE	PROJECT NO.
TS	1"=10'	E3359
APPROVED BY	DATE	FIGURE NO.
DTS	FEBRUARY, 2001	4



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STEVENS CREEK TRAIL TUNNEL
at McCLELLAN ROAD BRIDGE
CUPERTINO, CALIFORNIA

GEO/ENG. BY	SCALE	PROJECT NO.
TS	1"=10'	E3359
APPROVED BY	DATE	FIGURE NO.
DTS	FEBRUARY, 2001	5