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MEMORANDUM

W.O. S4544-A2-SC **DATE:** June 7, 2007
TO: Maria Levario, TCA
FROM: David Skelly and Robert Crisman
SUBJECT: Surfing Resources in the Vicinity of San Mateo Creek and Potential Impacts of the Proposed Toll Road, Orange County, California

This memo responds to the information/testimony received during the public meetings in January 2006. It is important to point out that the comments, including those of the retained experts, have not provided any information to date that demonstrates the project will have any significant impact on the surfing resources.

SURFING RESOURCES

In order to discuss impacts on a surfing resource, it is important to discuss what makes a good (world-class) surf break. Obviously, the surf site needs exposure to waves. As these waves travel into shallower coastal waters, they "feel" the bottom and the wave front bends (refracts). The effect of favorable bathymetry (bottom contours) is to focus (bend) wave energy toward the surf spot. After the offshore bathymetry focuses wave energy to a surf spot, the nearshore bathymetry determines how the wave will break and the actual wave shape. In the case of the surfing resources at San Mateo, the creek delta, composed primarily of large cobbles (mean diameter of about 10 inches), determines the shape of the wave for the most part. The nuances of the wave breaking are influenced by the sand, or sand bars, that form on the cobble delta. In addition to the importance of waves and bottom shape, quality surf breaks are determined by water quality and coastal setting. Clean water and a natural setting contribute to making a surf break world-class. The issue of the setting is addressed elsewhere, and will not be further discussed in this letter.

The surfing resources in the vicinity of San Mateo Creek have changed in the past due to oceanographic, meteorological, and anthropogenic influences. The referenced Phillip Williams and Associates Ltd. (PWA, 2006) report provides a limited discussion of this morphology over the last several thousand years, which illustrates that the delta is an ever changing feature. As further evidence of the dynamic nature of the delta feature on a shorter time scale, Skelly Engineering provides data that shows the delta/shoreline has moved hundreds of feet over a one year period (Skelly Engineering, 2000). The most significant anthropogenic impact to the shoreline is the construction of the railroad bridge, the Highway 101 bridge, and the Interstate 5 (1-5) bridge. These bridges fixed the location of the creek mouth that once meandered from side to side in the river valley.

IMPACT DISCUSSION

With the previous discussion of the components that make a surf spot in mind, the potential impacts of the toll road on surfing resources can be carefully considered based upon previous analysis. The toll road will not impact the incoming waves or the offshore bathymetry because it does not extend to those resources. The I-5 connector will be adjacent to the existing I-5, and will not extend as far west as the existing old Highway 101 bridge on the south. In addition, the impact of the toll road on water quality has been determined by others, and water quality is expected to improve as a result of the project collecting road runoff from a portion of I-5 that presently flows untreated into the creek.

The only time that conditions within the watershed may possibly have any influence on the surfing resources is when the creek mouth is open and sediment (silt, sand, and cobbles) is flowing from the creek into the ocean. It is very important to note that the mouth only opens when the creek flow is sufficient to breach the sand berm across the mouth. It takes between a 2- to 10-year recurrence interval rainfall event for sufficient creek flow to breach the berm (depending upon the width/size of the berm). That is to say that some years the mouth does not open and there is no sediment flowing from the creek into the ocean. Once the berm is breached, the ocean quickly tries to close it off as sand moving along the shore fill in the newly formed channel. The creek mouth is typically only open for a few days to a few weeks per year, depending upon rainfall intensity and duration. Put in a temporal context, the creek is rarely open and communicating with the ocean. Simply said, for the majority of time, the time when the creek is closed, the Preferred Alternative will have no short term impacts on the surfing resources.

In order to discuss the potential influences of the toll road on the surfing resources when the creek is open, it is logical to divide the discussion into two cases. The first case is when the creek is open but the flow is not sufficient to move the cobbles in the stream bed. That is when only silt and sand are moving in the creek, and little, or no, cobbles are moving in the creek bed load. The second case is when the flow is sufficient to breach the berm and to transport cobbles onto the delta. Under both cases, sand and silt will be delivered to the surfing resources via the San Mateo Creek. It is generally agreed that silt plays no role in the formation of the surfing resources because it is too light to be deposited in the nearshore area and influence wave breaking. The sand that is delivered to the shoreline does create the temporary sand bars that have short term influences (breaker type, down the line speed, etc.) on how each wave breaks.

Under both cases, the influence of the project on the delivery of sand will be very small for two reasons. The first reason is that the earth materials along the road alignment are primarily siltstone, which contains very little sand, and when eroded, reduces to silt. The second is that the road alignment is located and designed so that it will not significantly impact the hydrology of the watershed and, therefore, the delivery of sand from other portions of the watershed will not be affected. It is very important to note that any sand from the watershed that does make it to the shoreline is quickly transported away by the waves that are focused on the delta (Skelly Engineering, 2000; and GSI, 2004). The transport potential of the waves moving sand away from the delta is two orders of magnitude greater, or more, than the sand transport potential of the creek and, therefore, the influence of the project on sand movement is likely not measurable.

The delivery of cobbles to the shoreline will not be impacted. There is general agreement

that the cobbles are the foundation material for the surfing resources (PWA, 2006). The cobbles at the delta are rather large, with a nominal mean diameter of about 10 inches. The cobbles originate in the base bedrock materials located in the southeast portion of the watershed, well away from the toll road alignment (GSI, 2006). An examination of California State published regional geology maps confirms this. The cobbles that are already in the watershed system to the west of these cobble-origin materials are within the creek channels, in nearby channel deposits, and in the young stream terrace deposits. It is estimated (personal communication, Scott Taylor) that to move a 10-inch cobble, located just below the confluence of the San Mateo and Cristianitos Creeks, toward the delta, it takes about a 50-year recurrence interval rainfall. In addition, the design includes facilities so that water velocities will not be increased above pre-project velocities. The project will not impact the delivery of cobbles to the shoreline and, therefore, not impact the surfing resources over the long term.

In summary, the potential for the impact to surfing resources in the vicinity of San Mateo Creek in the short term is basically limited to times when the creek is open to the ocean. This is typically on the order of a few weeks per year, at most. At times when the creek is open to the ocean, the project will not impact the delivery of the cobbles. The toll road project may slightly impact the delivery of sand to the shoreline, but this is not considered a significant impact because the change in pre- and post-project sand quantities is very small (not measurable), and any sand that does reach the shoreline is rapidly moved away and does not contribute to the quality of the surfing resources. The toll road will have no long term impacts or cumulative impacts on the surfing resources because the project does not impact the delivery of cobbles to the delta.

LIMITATIONS

The conclusions and recommendations presented herein are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty, either express or implied, is given. Standards of practice are subject to change with time. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place.

APPENDIX

REFERENCES

GeoSoils, Inc., 2006, Preliminary clast (cobble fraction) provenance study, Lower San Mateo Creek, in conjunction with the South Orange County Transportation Project, Orange County, California, W.O. S4544-A-SC, dated February

GeoSoils, Inc. and Skelly Engineering, 2004, South Orange County Transportation infrastructure improvement project impacts to coastal processes in vicinity of San Mateo Creek, dated October 5.

Philip Williams & Associates, Ltd, 2006, Transmittal of "Potential toll road impacts on San Mateo Creek watershed processes, mouth morphology and Trestles surfing area, final report," dated January 11.

Skelly Engineering, 2000, Final report "Impact of Foothill Transportation Corridor-South on surfing resources," dated April 3.