



The Sea Ranch Association

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Administration

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Chiron

May 12, 2006

Sonoma County Regional Parks
2300 County Center Drive – Suite 120A
Santa Rosa, CA 95403
Attn: Mr. Mark Cleveland

Re: Bluff Top Trail Public Access Easement

Dear Mr. Cleveland:

I have been asked by The Sea Ranch Association Community Manager to review your letter of February 21, 2006, and I offer the following comments: These comments are based upon a recent field visits done specifically for this project as well as numerous informal observations over the past six years. I have also reviewed the relevant BACE Geotechnical reports and the 1998 report by Dr. Ted Konigsmark. I am a full-time Sea Ranch resident and a California Licensed geologist. A brief resume is attached.

Site 74A (Broad Reach)

The BACE Geotechnical report for this site notes (page 6) the presence of a fault zone. The discussion notes that "This fault zone is characterized by weak, contorted, sheared rock and fault gouge material. This fault zone is more prone to *wave erosion*, and is eroding more rapidly than the surrounding rock." (Italics added)

The discussion on page 7 clearly presents the causes of accelerated bluff erosion at this site. "Long-term erosion along the relatively planar fault zone has formed the arc-shaped feature incised into the bluff..." "In addition to the inherent weak nature of the terrace deposits and sheared bedrock within the erosion area, the mechanism of erosion of the bluff at these sites occurs from: 1) Wave activity on the lower part of the bluff, 2) Incident rainfall and surface runoff from the bluff face, and from 3) Discharge of groundwater seepage from the bluff face, primarily from the lower terrace materials."

Given the above discussion, your conclusion that "...bluff top erosion at this location is primarily being caused by subsurface drainage from the terrace deposits..." seems inconsistent with your consultant's findings. I am therefore concerned that the limited remedy of horizontal drains will not provide a long term solution.

Site 72A, (Rock Cod)

The BACE Geotechnical report for this site notes (page 6) the presence of a fault zone. At this site, there appear to be two subparallel major fractures. The discussion notes that "This fault zone is characterized by weak, contorted, sheared rock and fault gouge material. This fault zone is more prone to wave erosion, and is eroding more rapidly than the surrounding rock." (Italics added)

The discussion on page 7 clearly presents the causes of accelerated bluff erosion at this site. "Long-term erosion along the relatively planar fault zone has formed the arc-shaped feature incised into the bluff..." "In addition to the inherent weak nature of the terrace deposits and sheared bedrock within the erosion area, the mechanism of erosion of the bluff at these sites occurs from: 1) Wave activity on the lower part of the bluff, 2) Incident rainfall and surface runoff from the bluff face, and from 3) Discharge of groundwater seepage from the bluff face, primarily from the lower terrace materials."

Given the above discussion, your conclusion that "...bluff top erosion at this location is primarily being caused by subsurface drainage from the terrace deposits..." seems inconsistent with your consultant's findings. I am therefore concerned that the limited remedy of horizontal drains will not provide a long term solution.

Additionally, there is a fundamental difference in the bedrock geology between sites 72A and 74A. As seen in Plate 3, the apparent reverse faulting has brought up a portion of the German Rancho Formation which is primarily mudstone. As noted on page 6, the mudstone is "...low in hardness..." i.e. soft and weak. The presence of the mudstone is further confirmed in borings B8 and B9.

By proposing the limited remedy of subsurface drains, I feel that you fail to recognize the substantial efforts of your consultants, and are unnecessarily compromising the long-term future of the bluff trail at this location.

Site 69A (Main Sail)

After the BACE Geotechnical Report for this site was prepared, the "cave" appears to have collapsed. However, the near-surface erosion noted on page 5 of the report continues, and the proposed diversion trench appears appropriate. In the meantime, the bluff trail is very close to the bluff edge, yet does not have protective fencing as do the Rock Cod and Broad Reach sites. I am concerned that a potential public safety issue continues.

Additionally, bedrock faulting similar to the Broad Reach and Rock Cod sites appears to exist at this location also. The trench drain should help solve the immediate "cave" problem, but the bluff at this site is fundamentally weakened, and will probably continue to erode at accelerated rates. The shallow drain is most likely not a long term solution.

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Sites 43A and 43B (Sea Pine Reach)

The discussion contained in the BACE Geotechnical report for this site (4.0 - Site Geology and Soils) is very similar to the same section in the other site reports. Additionally, several factors not mentioned, or not emphasized, in the BACE report complicate the geologic setting at Sea Pine Reach:

- A series of roughly E-W trending faults are visible in the field. The faults are more closely spaced than at the other sites, and the rock between the faults is pervasively deformed. This section of the bluff is fundamentally weakened by the structural setting.
- The near-surface bedrock at the sites of maximum bluff erosion, and directly seaward of the two affected houses, is very soft shale with minor interbedded siltstone and sandstone. This is the dark colored rock visible in Plates 3, and in Plates 5 – 8. The rock is described in boring logs as "... intensely fractured, friable to low hardness..." and "...crushed, friable, deeply weathered."
- A NW trending fault appears to intersect the bluff between borings B-2 and B-3. Movement on this fault has apparently removed, from boring B-5 southward, the resistant sandstone ledges which afford some protection from wave action north of Sites 43 A & B.. The difference in beach characteristics north vs. south of B-5 is visible in Plate 3. The difference is more striking when viewed in air photos.
- During my field visits, I saw numerous examples of *flowing*, not seeping, water discharging from within fault zones 10 – 20 feet below the terrace deposits. This water was not coming out at the base of the terrace deposits and flowing down the bluff face, it was coming from within the sheared rock. As recently as May 9, the flows continued, while the overlying terrace deposits and the terrace – bedrock contact, were completely dry.

At Sites 43A and 43B, the complex site- specific geology should be considered in any proposed remedy. A cutoff trench one foot into bedrock is, at best, likely to be ineffective. Information contained in the BACE report contains supporting data. The boring logs without exception show the water table *within* the bedrock, not at the terrace bedrock interface or within the terrace deposits. At worst, a trench dug within 9 feet (see Plate 21) of a fragile bluff edge could promote water infiltration and hasten erosion. A complete review of all relevant data should be conducted before any remedial action is undertaken at these sites.

Respectfully,
Michael A. Lane



Michael A. Lane, Ph.D.

REFERENCES CITED

BACE Geotechnical, 2005, Geotechnical Investigation; Bluff Top Trail Erosion, The Sea Ranch, Site 74A – Broad Reach, Sonoma County California

BACE Geotechnical, 2005, Geotechnical Investigation; Bluff Top Trail Erosion, The Sea Ranch, Site 72A – Rock Cod, Sonoma County California

BACE Geotechnical, 2005, Geotechnical Investigation; Bluff Top Trail Erosion, The Sea Ranch, Site 69A – Mail Sail, Sonoma County California

BACE Geotechnical, 2005, Geotechnical Investigation; Bluff Top Trail Erosion, The Sea Ranch, Sites 43A and 43 B, Sea Pine Reach, Sonoma County California

Konigsmark, T., 1998, Erosion of The Sea Ranch Bluff, A Geologic Overview, Part 1, Summary Report and Part 2, Bluff Erosion Summary Areas.