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Leslie Markham, Deputy Chief
Coast Area Resource Management
California Department of Forestry and Fire Protection
135 Ridgway Avenue
Santa Rosa, CA 95401

RE: Bohemian Grove NTMP, 1-06NTMP-011SON

Dear Ms. Markham,

I submit the following comments, digital photographs, and digital shapefiles to illuminate various problems found in the acreage determination performed by Kent and Associates for the Bohemian Grove NTMP.

Using the same aerial photography as used by Kent and Associates plus hundreds of supplemental images acquired via helicopter, I found that the timberland boundaries drawn by Kent have been systematically “pulled back” from the edges of the actual forest boundary. In many cases, Class A timber species can be seen clearly growing right up to the edge of a clearing or a chaparral zone, while Kent’s boundary excludes the first 50-100 feet of conifers that border the clearing or non-timbered zone. While these may seem like small and insignificant exclusions, these areas in total represent over 50 acres.

I have mapped an additional 56.75 acres of timberland that is **currently** occupied with Class A timber species, all of which have been excluded as timberland by Kent and Associates. For maximum transparency, each additional area that I mapped is documented with photographs and maps in the attached figures, numbered Figure 1 through Figure 65. I did not perform any analysis of the conservation easement land, as this land is unequivocally covered with large Class A timber species.

Kent’s final assessment of timberland acreage owned by the Bohemian Club is 2322.0 acres. The conservation easements occupy 163 additional acres of heavily forested land. If CalFire determines that these conservation easements count as timberland, then Kent’s calculation would rise to 2485 acres (2322 + 163), which is just 15 acres shy of the 2500 acre limit for an NTMP. According to my analysis and documented evidence, there are **at least** 56.75 acres of additional timberland,

currently growing Class A species, outside both the conservation easement land and Kent's timberland boundaries. Therefore, even if only 1/3 of the acres that I have mapped are determined to be timberland, the Bohemian Club is still ineligible for an NTMP if the conservation easements are deemed timberland.

Below, I have detailed my methods and addressed some issues raised by Kent and Associates in their acreage determination, including the issues of total acreage and soil quality.

IMAGERY and MAPPING: First, I imported the shapefiles provided by Kent and Associates using ArcGIS software. I examined these shapefiles overlaid on orthophotographs from 2005 (NAIP_2005). I found that in many cases, the forest and trees in the orthophotos were obscured by shadows, and that in most situations, the imagery provided by the Google Earth Pro software was superior. I have included samples of the orthophotos for comparison in Figures 5 and 26. Second, I lined up oblique, high, quality images taken from a helicopter in April of 2008 in Google Earth using the tilt and image overlay features. These photographs cover most of the ownership of the Bohemian Club.

Next, I drew the boundaries of my polygons using orthophotos (in ArcGIS) and refined them using Google Earth Imagery (in Google Earth Pro). While drawing polygons in both programs, I used a second computer screen to view and compare the oblique helicopter imagery overlaid on Google Imagery. I drew polygons around only trees that were obviously Class A timber species (either Coast Redwood or Douglas Fir) that were outside the boundary of Kent's polygons. I drew these boundaries as close as possible to the drip-line of these trees.

CALCULATIONS: All acreage calculations and shapefile functions were performed in ArcGIS. First, I clipped all of the polygons to the boundaries of the Bohemian Club ownership (using shapefiles from Sonoma County GIS), ensuring that no areas that I had mapped were outside the boundary of the Bohemian Club parcels. Second, I clipped the boundary of all polygons I had drawn to the boundary of Kent's polygons, ensuring that no overlap exists between our two sets of polygons.

NUMBERED AREAS: In Kent's analysis, 11 areas are defined as not capable or available for growing a crop of trees. In 4 of these areas (Areas 1,2, 6 and 9), I found a significant number of acres (excluded by Kent) that are currently growing Class A timber species. Additional acres have been excluded by Kent on the eastern edge of the property. On the eastern edge, Kent's boundary is simply inconsistent with the actual edge of the Bohemian Club parcels, and all imagery sources clearly show that this area is heavily forested. (Note that the newly surveyed parcel boundaries as described by Kent are on the **western** edge of the property, so the discrepancies on the **eastern** edge do not arise from different understandings of parcel boundaries). The attached figures, and the numbers in Table 1 are labeled according to these 5 areas in which I have found discrepancies with Kent's mapping. For simplicity, I have used the area numbering system established by Kent.

TIMBERLAND not inside NTMP: The shapefiles that Kent provided to CalFire only contain polygon outlines of the timberland Kent claims to exist INSIDE in the NTMP. Kent's shapefiles do not include the 6.2 acres described in his map areas 12, 13, and 14. For simplicity, I kept the boundaries of my polygons away from the areas delineated on Kent's map as areas 12, 13, 14, to ensure that no areas were "double-mapped".

SOIL MAPS: In table 2 of Kent's analysis, he cites "soil not suitable" as the limitation for growing a crop of trees for Areas 1, 2, and 6. I acquired soil maps in GIS format from the USDA's Natural Resources Conservation Service. To my knowledge, these are the most detailed soil maps of this area that are publically available. See figures 64 and 65.

In the proximity of both Area 1 and Area 2, there is a band of different soil type labeled "Henneke Gravelly Loam". However, Kent's acreage boundaries are not at all consistent with the boundaries of this soil type. For example, many acres of Henneke Gravelly Loam are obviously heavily forested, are actually part of the proposed NTMP, and Kent has included them as timberland. Additionally, Kent's "Area 1" and "Area 2" boundaries extend well beyond the boundary of the Henneke Gravelly Loam lens: many acres that Kent has excluded on the basis of their soil type are actually part of the Hugo-Josephine complex which comprises the bulk of the NTMP acreage.

I do not doubt that there **are** some acres within Area 1 and Area 2 where the soil is not suitable for the growth of a crop of trees. However, on the basis of these soil maps and the three sources of aerial photographs used in my analysis, the acres that are not suitable for the growth of a crop of trees are much smaller than the areas delineated by Kent.

TOTAL OWNERSHIP: Regarding total ownership, I agree that the GIS shapefiles provided by the county are the best source of total acreage. I performed my own calculations, and also came up with a total ownership of 2649 acres using this data from Sonoma County GIS. In Kent's acreage analysis, he discusses a new, unrecorded survey of the western boundary performed by Curtis and Associates. Even though he states that these shapefiles are available, these digital files were not provided in response to a Public Records Request, and this survey had not been recorded as of the date of this letter. Therefore, I have no way to evaluate the new western boundary lines. In any case, this new survey seems to have lowered the total acreage owned by the club by 4 acres, which is insignificant. I would like to note that none of the disputed areas I discuss above occur along this boundary.

SUMMARY: Overall, my analysis of the timberland acreage of the Bohemian Club finds that including the conservation easement land, this timberland owner has well over the 2500 allowable acres. In addition, it seems as though Kent's acreage analysis has systematically excluded small bits of acreage that are clearly timberland. If the redwood trees that are 50 feet away from the parking lot count as timberland, why do the same types of trees on the edge of the parking lot NOT

count as timberland? Similarly, if the Redwood and Douglas fir forest 30 feet back from the edge of Russian river counts as timberland, why do the same species of trees that approach the edge of the river NOT count?

This is not simply a disagreement among experts, any reasonable person with the ability to identify a Coast Redwood or Douglas Fir tree can see that heavily forested edges and pockets of timberland have been excluded in Kent's analysis (see Figures 29 and 30 for a good example). However, since these exclusions occur in small amounts all over the property, it is not immediately evident that over 50 acres of forested land have been left out of Kent's timberland map.

In conclusion, I would like to note that I performed a similar analysis on the acreage of land owned by San Jose Water Company in 2008, for an NTMP application that was ultimately rejected on the basis of timberland ownership. At the appeal hearing before the Board of Forestry in October of 2008, the Board unanimously and clearly decided that small pockets of timberland could not be excluded from the total acreage calculation. At this hearing, I presented similar photographs to ones included here, the Board discussed these photographs and clearly decided that my criteria for including timberland was appropriate. While I am not a forester, I am I am an ecologist with a specialty in long-lived tree demography and extensive experience with GIS mapping tools; I was well within my area of scientific competence to complete this mapping.

In the case of the San Jose Water Company NTMP, I had drawn the boundaries of my polygons up to 30 feet away from the drip line of each Class A timber tree. The standards I have applied to mapping of the Bohemian Grove are much more conservative: the boundaries here were drawn close to the drip lines of individual trees. A careful review of the attached figures should make this situation clear to just about anyone: there are well over 15 acres of Class A timber that exist outside the boundaries of Kent's polygons. In my judgment, the information submitted with this report constitutes significant new information, which has not been available for public review.

Thank you for this opportunity to comment,

Sincerely,

Adelia Barber
PhD. Student
Department of Ecology and Evolutionary Biology
University of California, Santa Cruz

Included Data CDs:

Original Helicopter Photographs (DVD -1/2)

Original Helicopter Photographs (DVD- 2/2)

High-Resolution Copy of the Figures

3 Shapefiles (Barber Additions, Parcel Layer, Soil Layer)

TABLE 1: Acres of timberland growing Class A species that have been excluded as timberland per Kent. Also see Figures 1 and 2, and the close-up map of each area for more details

AREA	Acres in each polygon
Area 1	0.73
Area 1	0.75
Area 1	4.57
Area 1	2.48
Area 2	0.38
Area 2	0.41
Area 2	0.87
Area 2	2.53
Area 2	15.38
Area 2	0.54
Area 2	7.4
Area 2	3.44
Area 2	4.78
Area 6	2.41
Area 6	1.86
Area 9	0.45
Area 9	0.48
Area 9	0.97
Area 9	2.63
East Edge	0.47
East Edge	0.18
East Edge	1.77
East Edge	1.28
TOTAL	56.75

TABLE 2: Figure List

Figure 1: Overview of Bohemian Grove Parcels, with timberland boundaries as drawn by Kent and Barber

Figure 2: Overview of Bohemian Grove Parcels, with timberland boundaries as drawn by Kent and Barber, overlaid on Google Earth aerial imagery

Figure 3: AREA 1 Close-up Map

Figure 4: AREA 1 Close-up showing just Kent's boundaries on Google Earth Imagery

Figure 5: AREA 1 Close-up showing just Kent's boundaries on Orthophoto (NAIP 2005) imagery

Figure 6: AREA 1 Close-up showing both Kent's boundaries and Barber's additions (Google Imagery)

Figure 7: Map of Helicopter Views for Area 1 (paired Google Earth and helicopter photographs follow)

Figure 8: Area 1, View 1 (Google Earth Imagery)

Figure 9: Area 1, View 1 (Helicopter Imagery)

Figure 10: Area 1, View 2 (Google Earth Imagery)

Figure 11: Area 1, View 2 (Helicopter Imagery)

Figure 12: Area 1, View 3 (Google Earth Imagery)

Figure 13: Area 1, View 3 (Helicopter Imagery)

Figure 14: Area 1, View 4 (Google Earth Imagery)

Figure 15: Area 1, View 4 (Helicopter Imagery)

Figure 16: Area 1, View 5 (Google Earth Imagery)

Figure 17: Area 1, View 5 (Helicopter Imagery)

Figure 18: Area 1, View 6 (Google Earth Imagery)

Figure 19: Area 1, View 6 (Helicopter Imagery)

Figure 20: Area 1, View 7 (Google Earth Imagery)

Figure 21: Area 1, View 7 (Helicopter Imagery)

Figure 22: Area 1, View 8 (Google Earth Imagery)

Figure 23: Area 1, View 8 (Helicopter Imagery)

Figure 24: AREA 2 Close-up Map

Figure 25: AREA 2 Close-up showing just Kent's boundaries on Google Earth Imagery

Figure 26: AREA 2 Close-up showing just Kent's boundaries on Orthophoto (NAIP 2005)

imagery

Figure 27: AREA 2 Close-up showing both Kent's boundaries and Barber's additions (Google Imagery)

Figure 28: Map of Helicopter Views for Area 2 (paired Google Earth and helicopter photographs follow)

Figure 29: Area 2, View 1 (Google Earth Imagery)

Figure 30: Area 2, View 1 (Helicopter Imagery)

Figure 31: Area 2, View 2 (Google Earth Imagery)

Figure 32: Area 2, View 2 (Helicopter Imagery)

Figure 33: Area 2, View 3 (Google Earth Imagery)

Figure 34: Area 2, View 3 (Helicopter Imagery)

Figure 35: Area 2, View 4 (Google Earth Imagery)

Figure 36: Area 2, View 4 (Helicopter Imagery)

Figure 37: Area 2, View 5 (Google Earth Imagery)

Figure 38: Area 2, View 5 (Helicopter Imagery)

Figure 39: Area 2, View 6 (Google Earth Imagery)

Figure 40: Area 2, View 6 (Helicopter Imagery)

Figure 41: Area 2, View 7 (Google Earth Imagery)

Figure 42: Area 2, View 7 (Helicopter Imagery)

Figure 43: AREA 6 Close-up Map

Figure 44: AREA 6 Close-up showing just Kent's boundaries on Google Earth Imagery

Figure 45: AREA 6 Close-up showing both Kent's boundaries and Barber's additions (Google Imagery)

Figure 46: Area 6, View 1 (Google Earth Imagery)

Figure 47: Area 6, View 1 (Helicopter Imagery)

Figure 48: AREA 9 Close-up Map

Figure 49: AREA 9 Close-up showing just Kent's boundaries on Google Earth Imagery

Figure 50: AREA 9 Close-up showing both Kent's boundaries and Barber's additions

Figure 51: Area 9, View 1 (Google Earth Imagery)

Figure 52: Area 9, View 1 (Helicopter Imagery)

Figure 53: Area 9, View 2 (Google Earth Imagery)

Figure 54: Area 9, View 2 (Helicopter Imagery)

Figure 55: Area 9, View 3 (Google Earth Imagery)

Figure 56: Area 9, View 3 (Helicopter Imagery)

Figure 57: Eastern Edge Close-up Map

Figure 58: The northern portion of the eastern edge showing both Kent's boundaries and Barber's additions on Google Earth Imagery

Figure 59: A close-up of the lower portion of the eastern edge showing both Kent's boundaries and Barber's additions on Google Earth Imagery

Figure 60: Eastern Edge, View 1 (Google Earth Imagery)

Figure 61: Eastern Edge, View 1 (Helicopter Imagery)

Figure 62: Eastern Edge, View 2 (Google Earth Imagery)

Figure 63: Eastern Edge, View 2 (Helicopter Imagery)

Figure 64: Soil Map (USDA NRCS Soil Survey) - Entire Property

Figure 65: Soil Map (USDA NRCS Soil Survey) - Close-up of Areas 1 and 2