Appendix E:
Geology, Soils, and Seismicity Supporting Information

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Kenneth L. Finger, Ph.D.
Consulting Paleontologist

18208 Judy St., Castro Valley, CA 94546-2306 510.305.1080 klfpaleo@comcast.net

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Dana DePietro
FirstCarbon Solutions
1350 Treat Boulevard, Suite 380
Walnut Creek, CA 94597

Re: Paleontological Records Search: South San Francisco General Plan Update (5000.0006), San Mateo County

Dear Dr. DePietro:

As per the request of Madelyn Dolan, I have performed a records search on the University of California Museum of Paleontology (UCMP) database for the proposed South San Francisco General Plan Update. The area of interest is located on the South San Francisco and Cordelia quadrangles (USGS 7.5'-series topographic maps). The proposed General Plan Update will serve as the blueprint for the City of South San Francisco's vision through the year 2040. The General Plan Update revises the approved 1999 General Plan to guide growth and land development of the City, while maintaining its high quality of life, diverse and inclusive community, livable neighborhoods, excellent services, culture of innovation, and environmental leadership to ensure all people have an equitable opportunity to reach their full potential. The General Plan Update anticipates approximately 14,324 net new housing units and approximately 13,344 net new employment opportunities by 2040.

Geologic Mapping

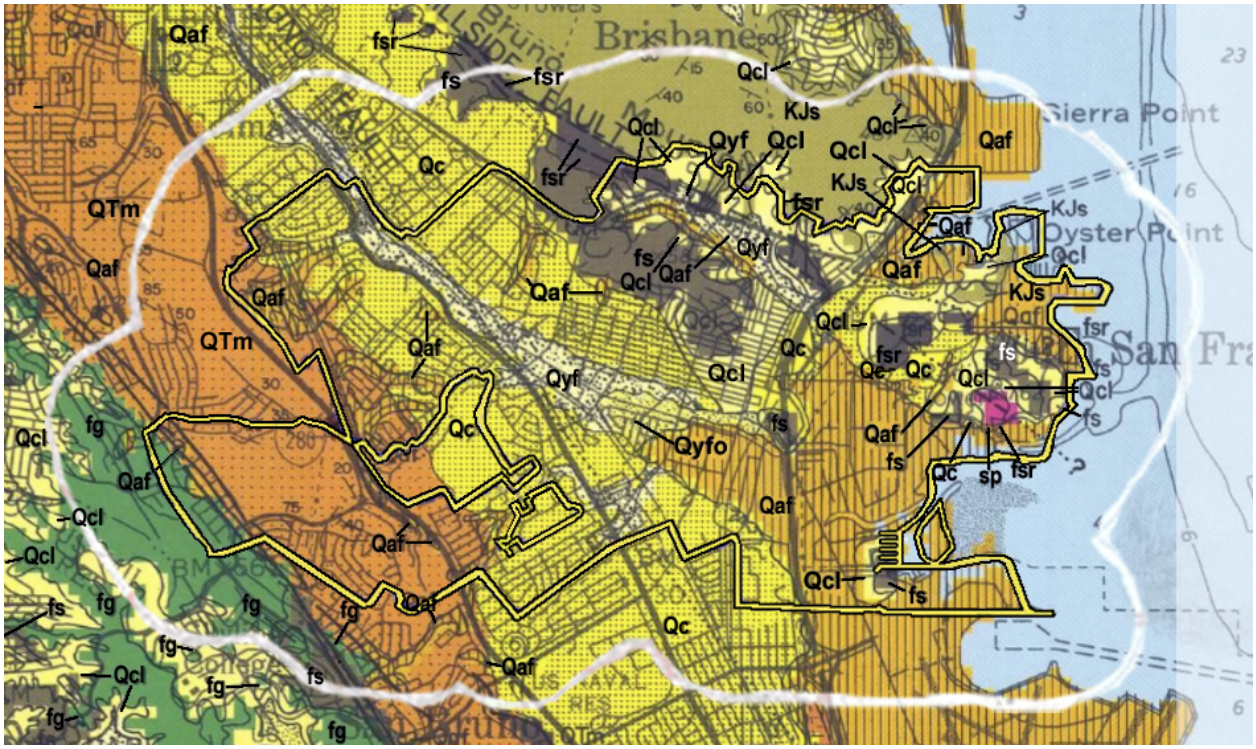
As shown on part of the geologic map by Brabb and Pampeyan (1983) included in this report (see next page), the surface of the project site (yellow outline) and its surrounding half-mile search area (white outline) consists of five Holocene units (Qyf, Qyfo, Qcl, Qal, Qaf), the Pleistocene Colma Formation (Qc), the Plio-Pleistocene Merced Formation (Tms), and five lithologic "members" of the Late Jurassic–Early Cretaceous Franciscan Complex (KJs, fg, fs, fsr, sp). Due to its areal extent and geological complexity, the smaller mapped units can be difficult to decipher on the map, particularly as viewed here. It is therefore advisable that all future paleontological investigations for specific projects within the City of South San Francisco refer to the map at its original (print) size.

MAP LEGEND

Qyf	Qyf	Younger (inner) alluvial fan deposits (Holocene
Qyfo	Qyfo	Younger (outer) alluvial fan deposits (Holocene)
Qcl	Qcl	Colluvium (Holocene)
Qal	Qal	Alluvium (Holocene)
Qaf	Qaf	Artificial fill (Holocene)
Qc	Qc	Colma Formation (Pleistocene)
QTm	QTm	Merced Formation (upper Pliocene & lower Pleistocene)

Franciscan Complex (Jurassic–Cretaceous)

KJs	KJs	Unnamed sandstone
fs	fg	Greenstone
fg	fs	Sandstone
fsr	fsr	Sheared rock
sp	sp	Serpentinite



Paleontological Records Search

Holocene deposits are too young to be fossiliferous; hence, the paleontological records search of the UCMP database focused on the older units. Although the database does not record any fossils of any kind from the Colma Formation, Rodda and Baghal (1993) reported the most abundant collection of Pleistocene vertebrates from San Francisco is from an excavation in this unit at Telegraph Hill, and it includes *Mammuthus* cf. *M. columbi* (Columbian mammoth) and *Bison* cf. *B. latifrons* (bison). The Colma Formation is therefore assigned a high paleontological sensitivity and a low paleontological potential.

For the Merced Formation, the UCMP database records 23 vertebrate localities in San Mateo, San Francisco, Marin, and Sonoma counties, which yielded 172 specimens ranging in assigned age from Pleistocene to Miocene. Stirton and Goeriz (1942) referred to the Merced Formation as late Miocene and Pliocene age; hence, the Miocene assignments of UCMP localities in the Merced went unquestioned for many years. More recently, Ingram and Ingle (1998) used strontium isotope chronostratigraphy to constrain the base of the formation between 2.4 and 4.8 myr, which is younger than the 5.333 myr base of the Pliocene, while pinning down the upper age of the unit to 0.45 myr. Accordingly, the USGS Lexicon of Geological Names defines the age range of the Merced Formation as Pliocene–Pleistocene.

The Appendix of this report is a systematic listing of the taxa recorded from the Merced Formation. The four San Mateo County localities yielded six specimens, including ground sloth, sea otter, mammoth, and whale. There are also 10 plant localities in the Merced Formation: eight in San Mateo County, one in San Francisco County, and one in Sonoma County. Nearest to South San Francisco and about 1.5 miles to the northwest are six localities at Thornton State Beach, west of Daly City. Among the collected plant specimens are cones of spruce or pine. In conclusion, the Merced Formation is assigned a high sensitivity and a moderate potential for significant paleontological resources.

No significant paleontological resources are recorded from the Franciscan Complex. Although radiolarian microfossils have been found in its cherts, and invertebrates in its limestones, the Franciscan lacks any sensitivity or potential for significant paleontological resources.

Paleontological Assessment and Mitigation Recommendations

I recommend paleontological monitoring of all proposed excavations in the Colma and Merced formations, including those area where they are likely to be in the shallow subsurface below Quaternary deposits, due to their high paleontological sensitivity for significant resources. Should significant paleontological resources (e.g., bones, teeth, well-preserved plant elements) be unearthed by the construction crew, their activities should be diverted at least 15 feet from the find until a professional paleontologist has assessed them and, if deemed significant, salvaged them in a timely manner. Collected fossils should be deposited in an appropriate repository (e.g., UCMP, California Academy of Sciences) where they will be properly curated and made available for future research.

Sincerely,

Ken Finger

References Cited

Brabb, E.E., and Pampeyan, E.H., 1983. Geologic map of San Mateo County. U.S. Geological Survey Miscellaneous Investigations Series Map I-1257-A, 1:62,500.

Ingram, B.L., and Ingle, J.C., Jr., 1998, Strontium isotope ages of the marine Merced Formation, near San Francisco, California. Quaternary Research, 50(2): 194-199.

Rodda, P.U., and Baghal, N., 1993. Late Pleistocene vertebrates from downtown San Francisco. Journal of Paleontology 67(6): 1058–1063.

Stirton, R. A., and Goeriz, H. F., 1942, Fossil vertebrates from the superjacent deposits near Knights Ferry, California: University of California Department of Geological Sciences 26: 447–472.

APPENDIX

UCMP Database Records of Vertebrates from the Merced Formation

1= San Mateo County, 2 = San Francisco County, 3= Marin County, 4 = Sonoma County
A = Pleistocene, B = Pliocene, C = Miocene (should be revised to Pliocene)

Class Chondrichthyes (cartilaginous fish)
- Order Batoidea
  - Family Myliobatidae
    - *Myliobatus* cf. *californica* (bat ray) 4C
- Order Hexanchiformes
  - Family Hexanchidae
    - *Hexanchus* (sixgill shark) 4C
- Order Lamniformes
  - Family Cetorhinidae
    - *Cetorhinus* cf. *maximus* (basking shark) 4C
  - Family Lamnidae
    - *Isurus hastalis* (mako shark) 4C

Class Osteichthyes (boney fish)
- Order Beloniformes
  - Family Belonidae? (needlefish) 4C
- Order Clupeiformes
  - Family Clupeidae
    - *Sardinops*? (sardine) 4C
- Order Lophiiformes
  - Family Lophidae (goosefish) 4C
- Order Perciformes
  - Family Anarhichadidae
    - *Anarhichthys ocellatus* (wolf eel) 4C
  - Family Centropomidae
    - *Epinephelus* (grouper) 4C
  - Family Embiotocidae
    - cf. *Damalichthys* (surfperch) 4C
  - Family Scombridae
    - cf. *Sarda* (bonito) 4C
  - Family Serranidae
    - *Stereolepis* (sea bass) 4C
- Order Salmoniformes
  - Family Salmonidae 4C (salmon)
  - Family Scorpaeniformes (rockfish)
    - *Anisotremus* 4C
    - *Sebastes alutus* 4C
    - *Sebastes serviceps* 4C

Class Aves (birds)
- Order Charadriiformes
  - Family Alcidae
    - *Praemancalla* (Lucas auk) 4C
- Order Procellariiformes
  - Family Procellariidae
    - *Fulmarus*? (fulmar) 4C

Class Mammalia
- Order Artiodactyla (odd-footed ungulates)
  - Family Antilocapridae (pronghorn) 2A
  - Family Camelidae (camels)
    - *Hemilauchenia* (llama) 2A
  - Family Cervidae
    - *Odocoileus* (cf. mule deer) 3A
- Order Carnivora
  - Family Mustellidae
    - *Enhydra* (sea otter) 1A
  - Family Odobenidae (walrus) 4C
  - Family Otariidae (eared seals)
    - *Callorhinus ursinus* 4B
    - cf. *Thalassoleon* cf. *mexicanus* 4B
- Order Cetacea
  - Suborder Mysticeti (baleen whales) 1A
  - Family Balaenidae (baleen whales)
    - *Balaenula* (published) 4B
  - Family Delphinidae (dolphins)
    - cf. *Delphinus* 4B
    - *Stenella graffmani* 4C
    - *Stenodelphis* cf. *S. sternbergi* 4B
  - Family Pontoporiidae (dolphins)
    - *Pontoporia sternbergi* 4B
- Order Perissodactyla (even-footed ungulates)
  - Family Equididae (horses)
    - *Equus* 2A
- Order Proboscidea
  - Family Elephantidae
    - *Mammuthus columbi* (Columbian mammoth) 1A
  - Family Mammutidae
    - *Mammut americanum* (American mastodon) 2A
- Order Sirenia (dugongs, manatees)
  - Family Dugongidae 4C
- Order Xenartha (ground sloths)
  - Family Megalonychidae
    - *Megalonyx* 2A
  - Family Mylodontidae
    - *Glossotherium* 1A, 2A

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