

Appendix H

Museum Records Search Results

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Dudek
605 Third Street
Encinitas, CA 92024

Attn: Sarah Siren, Senior Paleontologist

re: Vertebrate Paleontology Records Check for paleontological resources for the proposed Orange County Sanitation District Facilities Master Plan Project, Dudek Project # 11774, Orange County, project area

Dear Sarah:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Orange County Sanitation District Facilities Master Plan Project, Dudek Project # 11774, Orange County, project area as outlined on the portions of the Whittier, La Habra, Prado Dam, Los Alamitos, Anaheim, Orange, Black Star Canyon, Seal Beach, Newport Beach, Tustin, and Laguna Beach USGS topographic quadrangle maps that you sent to me via e-mail on 21 November 2019. We do not have any vertebrate fossil localities that lie directly in the proposed project area boundaries, but we do have localities nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

The great majority of the proposed project area occurs in the lower lying terrain of the Los Angeles Basin where the surficial deposits consist of younger Quaternary Alluvium, with older terrestrial Quaternary sediments occurring at various depths. These Quaternary sediments are derived as alluvial fan deposits from the surrounding elevated terrain of the San Gabriel Mountains, the Puente Hills, the Santa Ana Mountains, and the San Joaquin Hills, via the San Gabriel River, Coyote Creek, the Santa Ana River, Santiago Creek, and smaller drainages. The younger Quaternary Alluvium typically does not contain significant vertebrate fossils in the

uppermost layers, but we have a vertebrate fossil locality, LACM 1652, in Anaheim along Rio Vista Avenue south of Lincoln Avenue between the Orange Freeway (Highway 57) and the Santa Ana River, that produced a fossil specimen of sheep, *Ovis*.

At the proposed project area site along Handy Creek west of the Santiago Reservoir there are surficial deposits of younger Quaternary Alluvium in the north but older Quaternary Alluvium in the south. Just north of Handy Creek the proposed project area site along Santiago Canyon Road has surficial deposits of older Quaternary Alluvium. Our closest vertebrate fossil locality from older Quaternary sediments is LACM 4943, just east of locality LACM 1652 in Orange east of the Santa Ana River along Fletcher Avenue east of Glassell Street, that produced a specimen of fossil horse, *Equus*, at a depth of 8-10 feet below the surface.

At the Pioneer Avenue site in Fullerton near the Orange Freeway (Highway 57) the surficial deposits consist of younger Quaternary Alluvium, but there are exposures of the late Pleistocene La Habra Formation in the elevated terrain of the East Coyote Hills immediately to the west. Further to the west, the site around Brea Creek adjacent to Hillcrest Park in Fullerton probably has younger Quaternary Alluvium at the surface, but the adjacent elevated terrain has exposures of the La Habra Formation, with the lower portion sometimes being recognized as the marginally older Coyote Hills Formation. North of West Coyote Hills, the proposed project area site along Imperial Highway (Highway 90) west of Harbor Boulevard mostly has surficial deposits of younger Quaternary Alluvium, but it crosses some exposures of the La Habra Formation from around Euclid Street westward.

Our closest vertebrate fossil locality in the La Habra Formation to these proposed project area sites is LACM 6472, in the East Coyote Hills west of the Orange Freeway (SR 57) Hills near the intersection of Bastanchury Road and State College Boulevard, that produced a specimen of fossil horse, *Equus*. Our next closest vertebrate fossil locality in the La Habra Formation is LACM 3538, along Imperial Highway west of Beach Boulevard, that produced a fossil specimen of mammoth, *Mammuthus*. This mammoth specimen was mentioned in the scientific literature by R.F. Yerkes (1972. Geology of the Eastern Los Angeles Basin, Southern California. U.S. Geol. Surv. Prof. Paper, 420C.; pg. 25). Also from the La Habra Formation we have locality LACM 1052, immediately west of locality LACM 3538 along Imperial Highway near the Los Angeles / Orange County line, that produced a suite of fossil vertebrates including white shark, *Carcharodon arnoldi*, turkey, *Meleagris californica*, ground sloth, *Paramylodon*, mastodon, *Mammut*, mammoth, *Mammuthus*, horses, *Plesippus* and *Equus*, camel, *Camelops*, deer, *Odocoileus*, and pronghorn antelope, *Antilocapra americana*, at a depth of about 40 feet below the surface. The specimen of the fossil turkey *Meleagris californica* from LACM 1052 was published in the scientific literature by H. Howard in 1936 (A New Record for *Parapavo californicus* (Miller). Condor, 38(6):249-250.) and by D. W. Steadman in 1980 (A Review of the Osteology and Paleontology of Turkeys (Aves: Meleagridinae). Contributions in Science, Natural History Museum of Los Angeles County, 330:131-207). We have many other La Habra Formation localities to the southwest, mostly along Coyote Creek and adjacent West Coyote Hills from north of Rosecrans Avenue to near La Mirada Boulevard.

At the proposed project area site along Beach Boulevard south of Imperial Highway (Highway 90) and north of Rosecrans Avenue, the surficial deposits consist of younger Quaternary Alluvium from along Coyote Creek, but the elevated terrain adjacent to the east has exposures of the marine Pleistocene San Pedro Formation. Our closest San Pedro Formation locality, LACM 3861, occurs in the West Coyote Hills south of Imperial Highway (Highway 90), west of what is now South La Habra Hills Drive. Locality LACM 3861 produced a specimen of the fossil diving duck, *Chendytes milleri*. Our next closest vertebrate fossil localities from the San Pedro Sand are LACM 3536-3537 and 5011-5012, in the south-southwestern part of the West Coyote Hills between Rosecrans Avenue and Beach Boulevard, that produced fossil specimens of salmon shark, *Lamna*, bony fish, Osteichthyes, and whales, Cetacea.

The proposed project area site along Pacific Coast Highway (Highway 1) east of 61st Street in Newport Beach, probably just has surficial deposits of younger Quaternary Alluvium, but the elevated terrain adjacent to the east has nominally marine Quaternary terrace deposits on top of the bluff and possibly the marine Pliocene Niguel Formation or San Pedro Formation in the cliff. The site further east along Pacific Coast Highway (Highway 1) at the intersection with Newport Boulevard likewise probably has just surficial deposits of younger Quaternary Alluvium, but the elevated terrain adjacent to the east has nominally marine Quaternary terrace deposits on top of the bluff. Our closest vertebrate fossil locality from older Quaternary deposits is LACM 6370, west of Newport Boulevard near the intersection of Superior Avenue and the Pacific Coast Highway (Highway 1), that produced a specimen of a fossil horse, *Equus*. Our next closest locality from these deposits is LACM 3267, to the northeast near the intersection of 19th Street and Anaheim Avenue, that produced a fossil specimen of undetermined elephant, Proboscidea, at unstated depth. A little further north, in a roadcut for the Newport Freeway near Santa Isabel Avenue, our older Quaternary locality LACM 4219 produced fossil sea turtle, Cheloniidae, and camel, Camelidae, bones in coarse poorly sorted friable sands about 30 feet below the grade of Newport Boulevard. Further north still, along Adams Avenue near the top of the mesa bluffs east of the Santa Ana River, our older Quaternary locality LACM 1339 produced fossil specimens of mammoth, *Mammuthus*, and camel, Camelidae, in sand deposits that are overlain by shell bearing silts and sands approximately 15 feet below the top of the mesa.

Other nearby older Quaternary localities northwest of the Santa Ana River include LACM 65113, in Huntington Beach along Warner Avenue close to Bolsa Chica Street, that produced fossil specimens of mammoth, *Mammuthus*, between six and eight feet below the soil and specimens of fossil bison, *Bison*, between fourteen and twenty feet below the soil. In the southern part on Huntington Beach, between Lake Avenue and Beach Boulevard, we have a series of older Quaternary localities: LACM 7366, 7422-7425, and 7679. Locality LACM 7366 produced fossil specimens of marine, freshwater, and especially terrestrial specimens including leopard shark, *Triakis*, three-spined stickleback, *Gasterosteus*, garter snake, *Thamnophis*, desert shrew, *Notiosorex*, and most prominently, pocket gopher, *Thomomys*. Localities LACM 7422-7425 produced fossil specimens of mammoth, *Mammuthus*, bison, *Bison*, and horse, *Equus*. Most notably though, locality LACM 7679 produced a rich suite of freshwater and terrestrial fossil vertebrates including three-spine stickleback, *Gasterosteus aculeatus*, western toad, *Bufo boreas*, pacific treefrog, *Hyla regilla*, arboreal salamander, *Aneides lugubris*, slender salamander, *Batrachoseps*, lungless salamander, *Ensatina*, western pond turtle, *Clemmys marmorata*,

southern alligator lizard, *Gerrhonotus multicarinatus*, legless lizard, *Anniella pulchra*, fence lizard, *Sceloporus*, side-blotched lizard, *Uta stansburiana*, ringneck snake, *Diadophis punctatus*, kingsnake, *Lampropeltis getulus*, coachwhip, *Masticophis*, gopher snake, *Pituophis melanoleucus*, long-nosed snake, *Rhinocheilus lecontei*, garter snake, *Thamnophis*, scaled quail, *Callipepla squamata*, virginia rail, *Rallus limicola*, ornate shrew, *Sorex ornatus*, broad-footed mole, *Scapanus latimanus*, brush rabbit, *Sylvilagus bachmani*, meadow vole, *Microtus californicus*, wood rat, *Neotoma*, deer mouse, *Peromyscus maniculatus*, harvest mouse, *Reithrodontomys megalotis*, pocket gopher, *Thomomys*, pacific kangaroo rat, *Dipodomys agilis*, and squirrel, *Eutamias*. The fossil specimens from localities LACM 7366 and 7679 were obtained by screen washing matrix and thus they consist solely of small specimens.

We have numerous vertebrate fossil localities from older Quaternary deposits on the bluff on the east side of Upper Newport Bay, especially including locality LACM 1066. W.E. Miller (1971. Pleistocene vertebrates of the Los Angeles basin and vicinity (exclusive of Rancho La Brea). LACM Science Bulletin, 10:1-124) published on the extensive fossil fauna from locality LACM 1066.

In the eastern-central part of Huntington Beach, along Ellis Avenue east of Beach Boulevard, our vertebrate fossil localities LACM 7657-7659 from well cores at over 100 feet below the surface in the underlying marine Pleistocene San Pedro Sand produced fossil shark and fish specimens including soupfin shark, *Galeorhinus galeus*, skate, *Raja*, ray, *Myliobatis*, angel shark, *Squatina californica*, cusk eel, *Otophidium*, toadfish, *Porichthys notatus*, queenfish, *Seriphus politus*, sculpin, *Leptocottus*, goby, *Lepidogobius lepidus*, and sanddabs, *Citharichthys sordidus* and *Citharichthys stigmaeus*.

Our closest localities from the Niguel Formation occur to the northeast, east of Upper Newport Bay and mostly along MacArthur Boulevard and Ford Road. These localities, 1067, 1729, 2019, 3408, 3802, 3977-3978, 3980, and 3986, produced a composite marine and terrestrial fossil fauna including ratfish, Chimaeroidei, thresher shark *Alopias superciliosus*, extinct giant shark, *Carcharocles*, white sharks *Carcharodon carcharias* and *Carcharodon sulcidens*, bonito shark, *Isurus oxyrinchus*, spiny dogfish shark, *Squalus acanthias*, Pacific hake, *Merluccius productus*, mora, Moridae, queenfish, *Seriphus*, sculpin, Cottidae, and rockfish, *Sebastes*, auklet, *Mancalla californiensis*, shearwater, *Puffinus felthami*, turkey, *Meleagris*, mole, *Scapanus latimanus*, sea lion, Otariidae, pocket mouse, *Perognathus*, horse, *Equus*, and camel, *Tanupolama*. The specimens of *Mancalla californiensis* from locality LACM 1067 were first published in scientific literature by L.H. Miller and H. Howard in 1949 (The Flightless Pliocene Bird *Mancalla*. Carnegie Institution of Washington Publication, 584(7):210-238). The specimens of *Puffinus felthami* from locality 1067 were first published in the scientific literature by H. Howard also in 1949 (New avian records for the Pliocene of California. Carnegie Institution of Washington Publication, 584(6):177-199). The specimens of both the mole *Scapanus latimanus* and the camel *Tanupolama* from locality LACM 1067 were first published in the scientific literature by W.E. Miller in 1971 (Pleistocene vertebrates of the Los Angeles basin and vicinity (exclusive of Rancho La Brea). Los Angeles County Museum Science Bulletin 10:1-124). D.W. Steadman (1980. A Review of the Osteology and Paleontology of Turkeys (Aves: Meleagridinae). LACM Contributions in Science, 330:131-207), published on a fossil specimen of a turkey, *Meleagris*, from locality LACM 3978.

Even further east along Pacific Coast Highway (Highway 1), at the site at the cliff below Kings Road, there are exposures of the marine late Miocene Capistrano Formation. To the northeast, on the east side of Upper Newport Bay, our Capistrano Formation locality LACM (CIT) 580 produced a specimen of a fossil sperm whale, *Physeteridae*. Further east, along Ford Road near MacArthur Boulevard, our Capistrano Formation localities LACM 4911-4912 produced fossil specimens of white shark, *Carcharodon*.

At the site along 5th Avenue in Corona del Mar southeast of intersection of the Pacific Coast Highway (Highway 1) with MacArthur Boulevard, there may be surficial deposits of older Quaternary terraces, as well as exposures of the marine late Miocene Monterey Formation. At the site furthest southeast at Crystal Cove likewise there may be surficial deposits of older Quaternary terraces as well as exposures of the marine late Miocene Monterey Formation. Our closest older Quaternary locality is LACM 4254, just to the north along MacArthur Boulevard, that produced a specimen of the diving duck, *Chendytes*. Our closest Monterey Formation locality is LACM 7290, near Pelican Point in Crystal Cove State Park, that produced a fossil specimen of mackerel, *Scombridae*. To the north, on the east side of Newport Bay along Backbay Drive on both sides of San Joaquin Hills Road, our Monterey Formation localities LACM 1160 and LACM 7139, produced fossil specimens of bony fish, *Osteichthyes*, and baleen whales, *Mysticeti*.

Shallow excavations in the younger Quaternary Alluvium exposed in the great majority of the proposed project area are unlikely to encounter significant vertebrate fossils. Deeper excavations there that extend down into older sedimentary deposits, however, as well as any excavations in the exposures of older Quaternary Alluvium, the La Habra Formation, the San Pedro Sand, the Niguel Formation, the Capistrano Formation, or the Monterey Formation in the proposed project area, may well uncover significant fossil vertebrate remains. Any substantial excavations in the proposed project area, therefore, should be closely monitored to quickly and professionally collect any specimens without impeding development. Sediment samples should also be collected from the sedimentary deposits in the proposed project area and processed to determine their small fossil potential. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,



Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

