
Appendix E-2

Paleontological Resources Assessment

MEMORANDUM

To: Brookfield Residential and the City of Irvine
From: Shawna L. Johnson, MSc, Paleontologist, Dudek
Subject: Irvine Gateway Village Project – Paleontological Resources Assessment
Date: January 21, 2025
cc: Rachel Struglia and Sarah Siren, Dudek
Attachments: A – Figures
B – Confidential NHMLA and Cooper Center Paleontological Records Search Results

Dudek has conducted an evaluation pursuant to the requirements of the California Environmental Quality Act (CEQA) and guidelines of the Society of Vertebrate Paleontology (SVP 2010) to determine the presence of and potential for impacts related to paleontological resources associated with construction and operation of the proposed Irvine Gateway Village (project), located in the City of Irvine, Orange County, California (Figure 1, Project Location). This technical memorandum provides the results of the paleontological resources investigation and was prepared by Shawna L. Johnson, MSc with editorial comments by Sarah Siren, MSc and Michael Williams, PhD.

To determine the paleontological sensitivity of the project site, Dudek performed a paleontological resources inventory in compliance with the CEQA and SVP (2010) guidelines. The inventory consisted of a paleontological records search through the Natural History Museum of Los Angeles County (NHMLA) and the Cooper Center of Orange County, and a review of geological mapping and geological and paleontological literature. The results of the paleontological records searches were negative for paleontological resources within the project site.

1 Project Description and Location

Brookfield Homes, partnering with the City of Irvine, presently proposes construction of a new residential village with 1,360 residential units as well as the development of parks, paseos, and an extension of the Jeffrey Open Space Trail (JOST).

The approximately 105-acre project site is located in north Irvine, at the northeast corner of Portola Parkway and Jeffrey Road. The site is bounded by Portola Parkway to the south, Jeffrey Road/Hicks Haul Road to the west, and Bee Canyon Access Road to the east. Hicks Canyon Wash is to the north.

2 Analysis Methodology

The analysis presented here considers the potential environmental impacts of the proposed project relative to existing conditions. Establishment of the project site's existing paleontological conditions have been informed by reviewing published geological maps and published and unpublished reports to identify geological units located on the project site and determine their paleontological sensitivity.

Paleontological records search requests were sent to the NHMLA and Cooper Center on December 18, 2024. The records search area included the project site and a 1-mile-radius buffer. The purpose of the records searches is to

determine whether there are any known fossil localities in or near the project site to aid in determining whether a paleontological mitigation program is warranted to avoid or minimize potential adverse effects of construction on paleontological resources.

3 Paleontological Resources

Paleontological resources are the remains or traces of plants and animals that are preserved in the Earth’s crust, and per SVP (2010) guidelines, are older than written history or older than approximately 5,000 years, which approximates the middle Holocene of Cohen et al. (2024). They are limited, nonrenewable resources of scientific and educational value and are afforded protection under state laws and regulations. This analysis complies with guidelines and significance criteria specified by CEQA and SVP (2010). Table 1, Paleontological Resource Sensitivity Criteria, provides definitions for high, undetermined, low, and no paleontological resource potential, or sensitivity, as set forth in and by the SVP (2010) Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources.

Resource Sensitivity/ Potential	Definition
High	Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rock units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcanoclastic formations (e.g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units that contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units that may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.
Undetermined	Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist (see “definitions” section in this document) to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

Resource Sensitivity/ Potential	Definition
Low	Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g., basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.
No Sensitivity	Some rock units have no potential to contain significant paleontological resources, for instance high grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection nor impact mitigation measures relative to paleontological resources.

Source: SVP 2010.

3.1 Regulatory Framework

The California Environmental Quality Act

This paleontological resources evaluation was completed to satisfy the requirements of the California Environmental Quality Act (CEQA). The CEQA Guidelines require that all private and public activities not specifically exempted be evaluated against the potential for environmental impacts, including effects to paleontological resources. Paleontological resources, which are limited, nonrenewable resources of scientific, cultural, and educational value, are recognized as part of the environment under these state guidelines. This study satisfies project requirements in accordance with CEQA (13 PRC [Public Resources Code], 15000 et seq.).

Paleontological resources are explicitly afforded protection by CEQA, specifically in Section VII(f) of CEQA Guidelines Appendix G, the “Environmental Checklist Form,” which addresses the potential for adverse impacts to “unique paleontological resource[s] or site[s] or ... unique geological feature[s].” This provision covers fossils of significant importance, which include the remains of species or genera new to science, for example, or fossils exhibiting features not previously recognized for a given animal group – as well as localities that yield fossils significant in their abundance, diversity, preservation, and so forth.

California Public Resources Code Section 5097.5

In addition to CEQA’s requirements, Public Resources Code Section 5097.5 (Stats 1965, c 1136, p. 2792) regulates removal of paleontological resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.

The County of Orange General Plan (2012)

The General Plan includes a map of general sensitivity areas and policies in the Resources Element, open space portion, that would protect paleontological resources. The Paleontological Resource Policies for Orange County are as follows:

1. To identify paleontological resources through literature and records research and surface surveys.

2. To monitor and salvage paleontological resources during the grading of a project.
3. To preserve paleontological resources by maintaining them in an undisturbed condition.

3.2 Environmental Setting

Geological Literature, Map, and Geotechnical Report Review

The project site is located within the County of Orange (2012) General Plan's paleontological sensitivity area of the number 7 Northern Santa Ana Mountains (County of Orange 2012). This is located within the Southern Coastline Subprovince within the Peninsular Ranges Geomorphic Province. The Peninsular Ranges Geomorphic Province consists of a series of northwest-trending mountain ranges separated by long valleys, formed from subparallel faults branching from the San Andreas Fault. The southern coastline is superimposed over the landforms of the Peninsular Ranges in this area (CGS 2002).

According to surficial geological mapping by Morton and Miller (2006) at a 1:100,000 scale and the geological time scale of Cohen et al. (2024), the project site is underlain by early Holocene to late Pleistocene (8,200 to 129,000 years ago) young alluvial fan deposits (map unit Qyfa), the early Miocene-late Eocene (15.98 to 41.03 million years ago [mya]) Vaqueros Formation (map unit Tv) and Sespe Formation (map unit Ts).

According to the numerous geotechnical studies that have been conducted within the project site over the years the average depth to bedrock, the Sespe and/or Vaqueros formations, along the northern portion of the project was approximately 20 feet, approximately 50 plus feet through the middle of the project site, and at or near the surface (within 5 feet) along the southern portion of the project site. The Geotechnical studies did not differentiate the Quaternary (Holocene to Pleistocene) deposits that lie above the bedrock, lumping them all in as alluvium (LGC Geotechnical 2024).

Paleontological Literature Review

A search of paleontological literature and online databases produced the following localities previously found near the project area.

From sediments of Pleistocene age, underlying younger surficially mapped sediments:

- LSA Associates discovered a locality, while monitoring the Trabuco Retention basin 186 feet north across Jeffrey Road, that produced horse, gopher, giant camel, American mastodon, rabbit, bison, whale, ground squirrel, mammoth, giant ground sloth, unidentified large mammal (elephantid, e.g., mammoths and mastodons), and oyster 5 feet below ground surface (LSA 1997).
- Jefferson reported that LSA found a locality in Hicks Canyon that produced giant ground sloth, mammoth, tapir, horse, and bison (Jefferson 1991 [2012]).
- At the Irvine Company Dam, locality LACM 1069/LACMIP 69 yielded unidentified mammal fossils (Jefferson 1991 [2012]).
- LSA Associates found a locality during the construction of Park Place that yielded fish, rays, iguana, snakes, pond turtles, raptors, mice, rats, weasel, foxes, coyote, dire wolf, black bear, jaguar, cougar, bobcat, sabertooth cat, ground sloth, Columbian mammoth, horse, giant camel, dwarf pronghorn, llama, and bison (*B. antiquus* and *B. latifrons*) (Jefferson 1991 [2012]).

Localities from the Vaqueros Formation:

- Shark teeth have been found within the project boundary, near the intersection of Portola and Bee Canyon access road as reported by the LSA paleontologist who surveyed that area in the late 1990s (Alexander, pers. comm., 2025).
- Approximately 3 miles north of the proposed project site, Cooper Center O2027 and O2012 document collections that include a fossil ochotonid, hedgehog, and several types of rodents (Mindat 2024).
- Approximately 0.83 miles east, UCMP 2325 and 2341 produced an echinoid and bivalve (UCMP 2024).
- Approximately 0.5 miles north, Cooper Center O2010 produced several fossil rodents and a ground squirrel (Mindat 2024).
- Approximately 2.7 miles southeast, UC-6131 produced barnacles, echinoids, bivalves, gastropods (Mindat 2024).
- Approximately 3.1 miles southeast, UC-2337 produced echinoids, bivalves, gastropods (Mindat 2024).
- Approximately 4.46 miles southwest, UC-A534 and UC-A535 yielded tube worms, barnacles, echinoids, bivalves, gastropods (Mindat 2024).
- Approximately 8 miles northwest, UCMP IP7737 and IP7787 (USGS Cenozoic M3158, USGS Cenozoic M3215) produced invertebrates (UCMP 2024).

Localities from the Sespe Formation:

- Approximately 1.3 miles northeast, LACM 6935, 6938, 6940, 6943, 7326, 7328 yielded oreodonts, mouse deer, small fox-like canids, rabbit-like animal, hedgehog, possum, shrew, rodents, and ground squirrels (Mindat 2024).
- Approximately 3.2 miles southeast, F138 produced bivalves and gastropods (Mindat 2024).

Paleontological Records Searches

The NHMLA paleontological records search results were received on December 21, 2024, and the Cooper Center search results were received on January 17, 2025 (Confidential Attachment B). The NHMLA did not report any fossil localities from within the project site; however, they did report several localities from nearby that are from the same or similar sediments as those that underlie the project site. The Cooper Center did not report any fossil localities from within the project site, but reported 10 localities from within a half mile of the project site. The nearest localities are as follows (Confidential Attachment B):

- Approximately 1.8 miles east, LACM VP 6935–6945 produced dolphins and toothed whales, rodents, an opossum-like marsupial, oreodont, camel, tortoise, and iguana from the Sespe/Vaqueros formations.
- Approximately 2 miles northeast, LACM IP 16508 and 41185 yielded uncatalogued invertebrates from the Vaqueros Formation.
- Approximately 4.2 miles northwest, LACM VP 6624 produced uncatalogued vertebrate fossils from the Sespe Formation.
- Approximately 5.2 miles northeast, LACM VP 3984 and 3985 yielded a whale, shark, and eagle ray from the Sespe Formation.

- Approximately 8 miles southeast, LACM VP 7675–7678 produced a baleen whale, a toothed whale, fish, an eagle ray, and bivalves from the Vaqueros Formation.
- Within 0.5 miles, from older alluvium, OCPC localities 02121 and 02229 produced mammals, birds, reptiles, amphibians, fish, and invertebrates. OCPC localities 02010, 02083, 02084, 02088, 02111, 02265, and 02266, from the undifferentiated Sespe/Vaqueros Formations, yielded mammals, birds, reptiles, sharks, rays, fish, arthropods, bivalves, gastropods, echinoderms, and plants. Lastly, OCPC 03984, from the Vaqueros Formation, produced mammals, whales, fish, cartilaginous fish, arthropods, bivalves, gastropods, plants, and algae.

4 Impact Analysis and Conclusions

4.1 Thresholds of Significance

The thresholds of significance used to evaluate the impacts of the proposed project related to paleontological resources are based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines. A significant impact under CEQA would occur if the proposed project would:

- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

4.2 Impact Analysis

a) ***Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?***

No paleontological resources were identified within the project site as a result of the institutional records search or desktop geological and paleontological review. In addition, the project site is not anticipated to be underlain by unique geologic features. Portions of the project site underlain by early Holocene to late Pleistocene young alluvial-fan deposits have high paleontological sensitivity (sensitivity increases with depth), and the early Miocene to late Eocene Sespe and Vaqueros formations have high paleontological sensitivity. Ground-disturbing activities associated with construction of the proposed project, such as grading during site preparation and trenching for utilities, have the potential to destroy a unique paleontological resource or site. As such, the project site is considered to be potentially sensitive for paleontological resources. Without mitigation, the potential for adverse impacts to paleontological resources during construction associated with the project are considered to be a potentially significant impact. Given the proximity of past fossil discoveries in the surrounding area within the same or similar deposits, the project site is highly sensitive for supporting paleontological resources below the depth of fill. However, upon implementation of **MM-GEO-1**, impacts would be reduced to below a level of significance. Impacts of the proposed project are considered less than significant with mitigation incorporated during construction.

MM-GEO-1 Paleontological Resources Impact Mitigation Program. Prior to commencement of any grading activity on site, the applicant shall retain a qualified paleontologist per the Society of Vertebrate Paleontology (SVP) (2010) guidelines. The paleontologist shall prepare a Paleontological Resources Impact Mitigation Program (PRIMP) for the project. The PRIMP shall be consistent with

the SVP (2010) guidelines and should outline requirements for preconstruction meeting attendance and worker environmental awareness training, where monitoring is required within the proposed project site based on construction plans and/or geotechnical reports, procedures for adequate paleontological monitoring and discoveries treatment, and paleontological methods (including sediment sampling for microvertebrate fossils), reporting, and collections management. The qualified paleontologist shall attend the preconstruction meeting and a qualified paleontological monitor shall be on-site during all rough grading and other significant ground-disturbing activities (including augering) in previously undisturbed, fine-grained Pleistocene alluvial deposits. In the event that paleontological resources (e.g., fossils) are unearthed during grading, the paleontological monitor will temporarily halt and/or divert grading activity to allow recovery of paleontological resources. The area of discovery will be roped off with a 50-foot radius buffer. Once documentation and collection of the find is completed, the monitor will remove the rope and allow grading to recommence in the area of the find.

5 References

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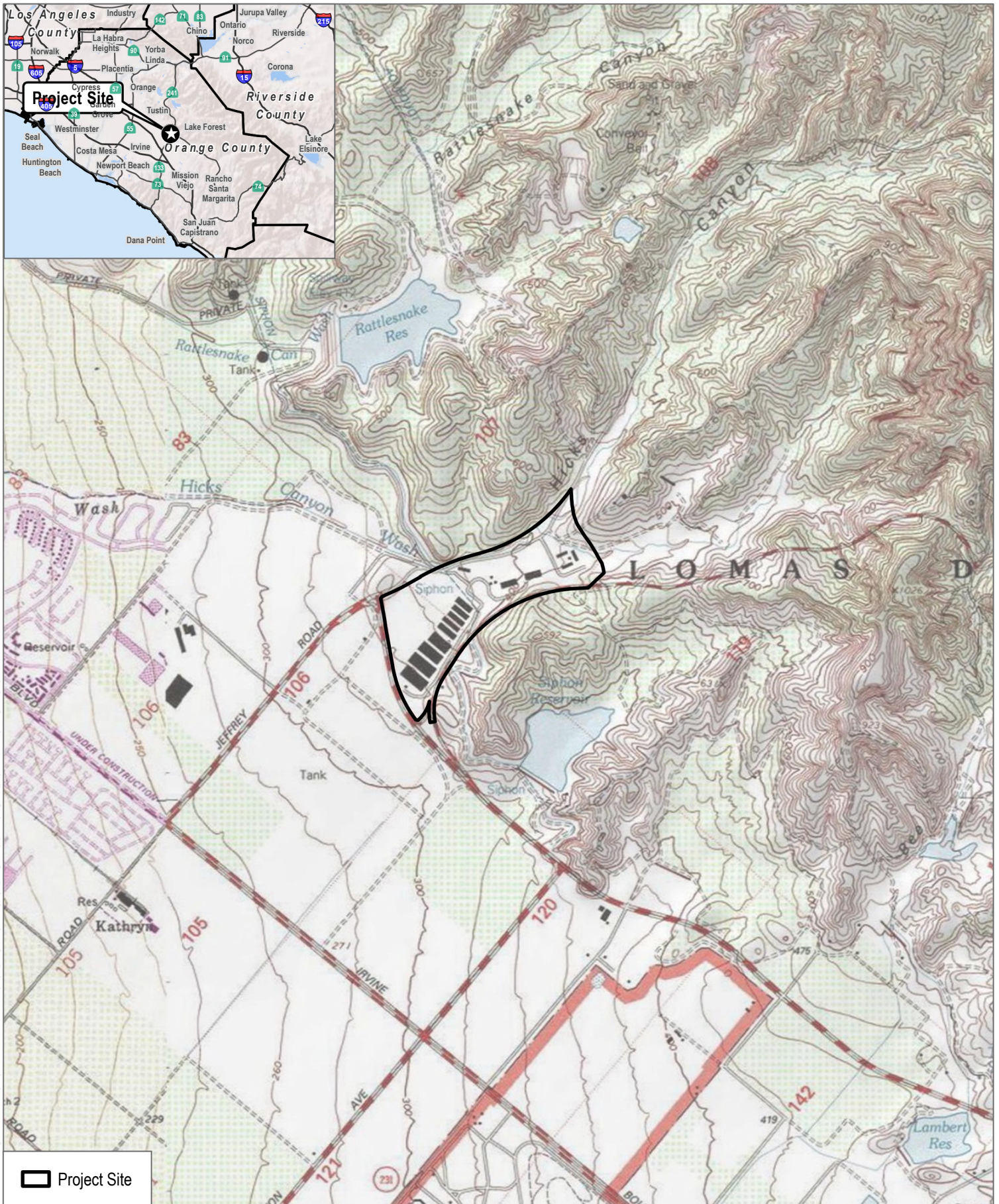
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Attachment A

Figures



SOURCE: USGS 7.5 Minute Series 1:24,000
 Lake Forest Quadrangle - Township 5S Range 8W Sections 20, 21, 29



FIGURE 1
Project Location

Confidential Attachment B

Paleontological Records Search Results

