

5.7 Paleontological Resources

This section discusses the paleontological resources in the study area and explains why they are important to the project. The impacts of the project alternatives on these resources also are evaluated and proposed mitigation measures are discussed to offset any potential adverse effects.

5.7.1 What are paleontological resources and why are they important to this project?

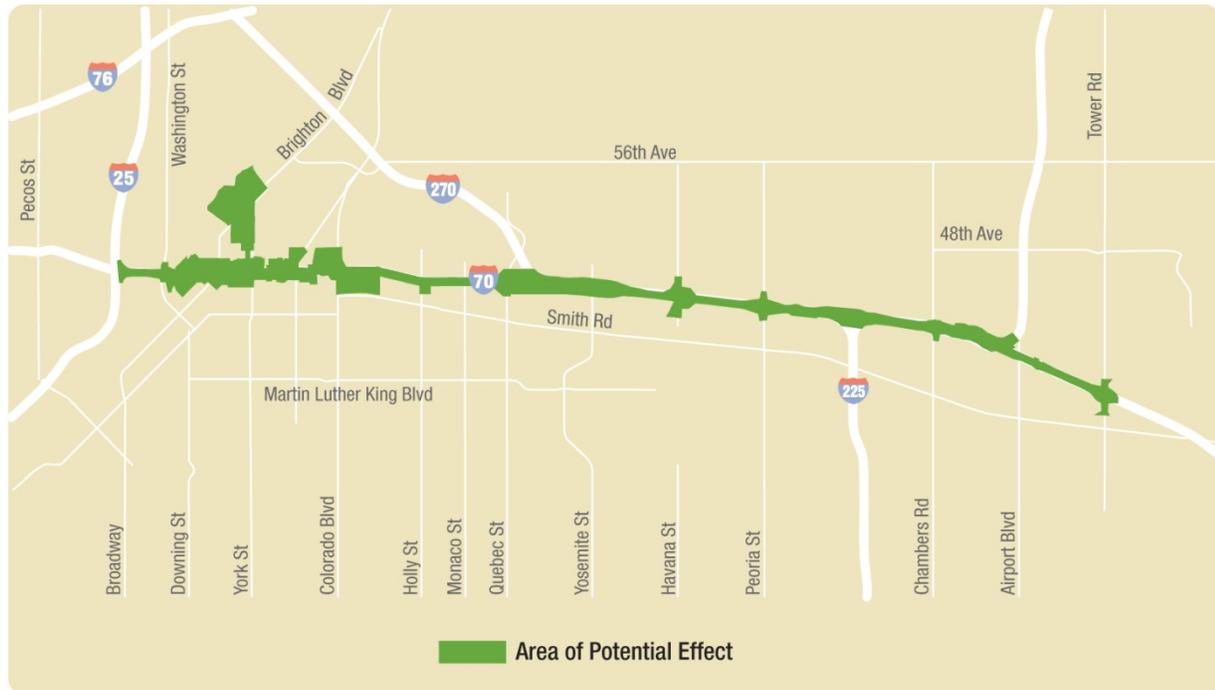
Paleontological resources are the fossilized remains or traces of plant and animal life, or other organisms, which serve the purpose of understanding the history of life on Earth. These differ from archaeological resources, which are focused on past human life and activities. Paleontological resources can include physical remains—such as bones, teeth, shells, and leaves—and trace remains—such as footprints. Paleontological resources are important because they can be used to document the presence and evolutionary history of now-extinct organisms, to expand knowledge of the life cycle of those organisms, and to understand the environment and geographic region in which they lived.

5.7.2 Have there been changes to paleontological resources in the project area or to the analysis process since the release of the 2008 Draft EIS?

The study area for paleontological resources has changed since the 2008 Draft EIS; however, there have been no changes in impacts to paleontological resources. The methodology for identifying these resources and analyzing impacts has remained unchanged, and continues to follow the Society of Vertebrate Paleontology guidelines (1995).

5.7.3 What study area and evaluation process were used to analyze paleontological resources?

The study area for paleontological resources is the same as the APE for historic resources. The change in project alternatives required an update of the existing APE, and a revised APE boundary was developed cooperatively among consulting parties, as documented in Attachment B, *Agency Consultation*. Exhibit 5.7-1 reflects the agreed-upon APE.

Exhibit 5.7-1 Area of Potential Effect

The analysis process had three main objectives: (1) to identify and generally describe fossil locations known to exist in the APE; (2) to identify sub-areas where fossils are likely to be found; and (3) to classify all sub-areas according to their probable significance to paleontological investigations.

The first objective was completed by investigating published literature on the known paleontology and geology of the APE and examining museum collections and databases along with associated unpublished records documenting previous finds.

The second objective was achieved through the use of geologic maps, which provide a link between the geographic positions of known fossil localities (where fossils have previously been found) and the predicted likelihood of future finds in other areas. Two geologic maps were used (Moore et al, 2001; Tweto, 1979) to delineate sub-areas. The significance of these sub-areas then was determined.

The third objective to classify sub-areas was accomplished, with the following results. Sedimentary deposits that are less than 10,000 years old—classified as originating from “recent” or Holocene time—are less likely to contain fossils of paleontological interest and generally can be excluded as non-sensitive. The remaining sediments and sedimentary rocks may

**Newly identified
paleontological
resources**

Since the 2008 Draft EIS, no additional paleontological resources have been identified.

vary considerably in fossil content, but the likelihood of finding fossils correlates closely with the area of surface exposure of specific geologic units, and with the geographic concentration of previous finds in the units.

5.7.4 What are the areas of interest for paleontological resources that are being analyzed and what are their existing conditions?

All of the unconsolidated sedimentary deposits within the APE, which are described further in the 2008 Draft EIS, are relatively youthful Quaternary deposits that date back to the late Pleistocene (between 120,000 and 11,700 years ago) period and overlay the much older geologic deposits of the Late Cretaceous Arapahoe Formation and Late Cretaceous and early Paleocene Denver Formation. Within the APE, the Denver Formation is the only formation that can be considered to be of high significance for the presence of significant fossil finds.

Of the Pleistocene sedimentary deposits, the Broadway Alluvium and the unnamed loess unit are noted to contain remains of Pleistocene mammals. Bison bones are reported to be commonly found in the Broadway Alluvium, as well as the occasional mammoth. The unnamed loess unit has produced a variety of small mammal fossils, as well as fossilized horse and camel remains. Many of these Pleistocene mammal fossils that are identifiable are scientifically significant under the guidelines of the Society of Vertebrate Paleontology (1995). The remaining Quaternary geological units in the APE are considered to have low paleontological sensitivity to produce scattered fossil remains.

The terrain within the APE is topographically flat with previously disturbed surface sediments. These sediments are vegetated and covered with urban development, including buildings, roadways, and railroads. The deposits directly beneath the APE consist mostly of low-sensitivity, Pleistocene- and Holocene-aged surficial sediments. These sediments overlay the paleontologically sensitive bedrock of the Denver Formation, which occurs at varying depths.

For further discussion of paleontological resources, refer to Section 5.7 of the 2008 Draft EIS.

5.7.5 How do the project alternatives potentially affect paleontological resources?

Potential effects to paleontological resources have not changed as a result of the new APE or the alternatives under consideration. Effects can result from the disturbance of surface

What is Broadway Alluvium?

Broadway Alluvium is sediment that was deposited during the late Wisconsinan glaciation period (85,000 to 10,000 years ago). It consists of mixed deposits of sands, clays, and occasional gravels with an average depth of 20 feet. This sedimentary deposit creates the most prominent terraces of the South Platte River.

and subsurface sediments. Direct effects primarily concern the potential destruction of paleontological resources and the loss of information associated with these resources.

The No-Action Alternative and the Revised Viaduct Alternative generally involve minimal deep surface disturbance, with most disturbance occurring at or just below the existing grade (with the exception of bridge pilings).

The Partial Cover Lowered Alternative will construct I-70 below grade, resulting in subsurface excavation to approximately 40 feet. The lowest grade for the Partial Cover Lowered Alternative is located between the UPRR and York Street. Subsurface geotechnical data indicate that roadway excavation will primarily affect Quaternary surficial deposits and minor bedrock excavation. Storm drain pipes and utilities could require bedrock excavation, but effects are expected to be minimal.

5.7.6 How are the adverse effects from the project alternatives mitigated for paleontological resources?

Prior to initiating all earth-moving construction activities in rock units of high paleontological sensitivity, a preconstruction paleontological survey will be required. This will be followed by continuous paleontological monitoring or spot-checking of excavations during all phases of construction, based on the depth of the excavations and the recommendations of the project or staff paleontologist. This monitoring protocol applies to construction activities that occur in the Denver/Arapahoe Formation.

Within the APE, Pleistocene and Lower Holocene-period surficial deposits—including alluvium, eolian sand, and loess—have low paleontological sensitivity. Monitoring will not be required, but spot-checking may be conducted in certain areas at the discretion of the project or staff paleontologist. This also will help to ensure that older underlying sediments known to contain fossils are not being affected. Areas of no paleontological sensitivity within the APE will not require mitigation. Exhibit 5.7-2 lists the impacts and mitigations related to paleontological resources.

Exhibit 5.7-2. Summary of paleontological resources impacts and mitigations

Alternative	Impacts and/or Benefits	Mitigation Measures Applicable to All Alternatives
No-Action Alternative	Minimal deep surface disturbance	<ul style="list-style-type: none"> • Perform a preconstruction paleontological survey • Perform continuous paleontological monitoring during all phases of construction
Revised Viaduct Alternative		
Partial Cover Lowered Alternative	Increased potential for encountering paleontological resources	

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