

# **Paleontological Resources Technical Memorandum**

## **New Pueblo Freeway**

CDOT Project No. IM 0251-156

Project Control No.12831

**Colorado Department of Transportation**

Revised June 2004

In some cases, information in this Environmental Technical Report may have been refined or updated as preparation of the DEIS advanced. In such cases, the information and conclusions presented in the DEIS supersede all previous background material included in this Technical Report.

# STATE OF COLORADO

## DEPARTMENT OF TRANSPORTATION

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**DATE:** June 7, 2004

**TO:** Judy DeHaven

**FROM:** Steven M. Wallace *SMWallace*

**SUBJECT:** Paleontological clearance for project IM 0251-156, I-25 Thru Pueblo [New Pueblo Freeway EIS]

Attached are two copies of the paleontological assessment report for project IM 0251-156, I-25 Thru Pueblo [New Pueblo Freeway EIS], submitted April 28, 2004, by Dr. Emmett Evanoff for Centennial Archaeology, Inc.. I have read the report and found it acceptable. As a result of the negative findings in Dr. Evanoff's report, I am recommending paleontological clearance with no attached mitigation stipulations for project IM 0251-156, and for any future construction projects permitted by the approval of the New Pueblo Freeway EIS. If paleontological resources are uncovered during project construction, I should be notified immediately.

SMW:smw  
cc: RF, CF, Wallace

# PALEONTOLOGIC RESOURCES OF TRANSPORTATION PROJECT IM 0251-156, PUEBLO FREEWAY EIS, PUEBLO COUNTY, COLORADO

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## SUMMARY

Road realignment of I-25 through Pueblo, Colorado, should proceed with no additional paleontological mitigation. Of the seven surficial units and three bedrock units mapped in the area, only the bedrock units and one surficial unit contain fossils. These fossils are poorly preserved and are of taxa that are both abundant and well known.

## AREA OF STUDY

The Colorado Department of Transportation (CDOT) proposes a realignment of Interstate 25 along a 6.6 mile long corridor through the city of Pueblo, Colorado (Figs. 1 & 2). The southern boundary is at Mile Post (MP) 94.1 in unplatted Pueblo County at approximately the UTM coordinates of 532600mE, 4228940mN, while the northern boundary is at MP 100.7 in the N $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$  section 24, T. 20 S., R. 65 W. The study area is covered by the Northeast Pueblo (1974), Southeast Pueblo (1974) and Southwest Pueblo (1994), Colorado, 7.5 minute quadrangle maps. The study corridor extends along I 25 and along the proposed road alignments (Figs. 1 & 2), essentially at a distance of as much as 500 m on either side of the existing right-of-way of I-25. The geology and the paleontology of the area has been described by Scott (1964, 1969a, b) and Scott and Cobban (1964, 1986).

## METHODS

A pedestrian field survey of the right of way on both sides of US 160 was made on 25 April 2004. The corridor is within an urban area with much of the outcrops covered by construction projects or by vegetation. However, exposures of the underlying bedrock (Figures 3 & 4) occur primarily in roadcuts and behind buildings. These bedrock exposures and anthills associated with these outcrops were examined for fossils. Fossil localities and information about paleontologic resources were gathered from existing publications and the fossil locality data bases at the University of Colorado and the Denver Museum of Nature and Science.

## GEOLOGIC SETTING

Scott (1969a, b) recognized 7 surficial deposits overlying 3 bedrock units in the study corridor (Table 1). The surficial deposits range from middle Pleistocene to modern in age, and include, from oldest to youngest: Slocum Alluvium, Louviers Alluvium, Broadway Alluvium (all of Pleistocene age), aeolian sand, colluvium, post Piney Creek alluvium, and artificial fill (all of Holocene age). The older Pleistocene gravel deposits contain pebble to boulder gravel composed of quartz monzonite, quartzite, pegmatite, dark gray fine-crystalline porphyry, medium gray coarsely crystalline porphyry, biotite-quartz gneiss, granite gneiss, quartz, black mafic finely crystalline rock, and yellowish brown jasper clasts derived from the Arkansas River. The Holocene deposits include a wide variety of materials such as dune and aeolian sheet sands, slope-wash material, alluvium and artificial fills. I 25 rests on these surficial deposits for most of the length of the study corridor. The surficial deposits are largely covered by vegetation or pavement throughout the area, except in a few roadcuts, especially on the terraces south of the Arkansas River. The descriptions of these surficial deposits are given in Table 1.

The bedrock on which the surficial deposits rest include the upper part of the Smoky Hill Shale Member of the Niobrara Formation and the basal beds of the Pierre Shale, both of late Cretaceous age. The descriptions of these bedrock units are given in Table 1. The outcrops of these bedrock units are restricted to artificial cuts on the south side of the Arkansas River in the SW $\frac{1}{4}$  section 6, T. 21 S., R. 64 W., and the SE $\frac{1}{4}$  NE $\frac{1}{4}$  section 1, T. 21 S., R. 65 W. (Fig. 3). Bedrock outcrops occur north of the Arkansas River on and south of Goat Hill centered in the W $\frac{1}{2}$  NW $\frac{1}{4}$  section 36, T. 20 S., R. 64 W. (Fig. 4).

#### PALEONTOLOGIC RESOURCES

No fossil localities are known from the study corridor, in published reports of the US Geological Survey, or the locality data files of the University of Colorado Museum and the Denver Museum of Nature and Science. The closest fossil localities are the USGS localities 15753 and 15754 (1.6 km to the west) and 1280 (2 km to the east). All three of these localities are in the lower Pierre Shale, and include baculite and inoceramid shells. The only fossils found during the current survey were fragments of inoceramid shells in the transition member of the Pierre Shale in the cut in the NW $\frac{1}{4}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$  section 6, T. 21 S. R. 64 W. (Fig. 3).

Scott (1964a) discusses the fossil resources in the north Pueblo area. Fossils are locally abundant, though generally poorly preserved as impressions in the upper Smoky Hill Shale Member and in the transition member of the Pierre Shale. The upper chalky shale unit of the Smoky Hill Shale Member (Fig. 4), contains scattered scales and bones of Cretaceous marine fish and inoceramid clam shells. The upper chalk of the Smoky Hill Shale Member contains numerous inoceramid shells, less common baculite and barnacle shells. The lower transition member of the Pierre Shale contains scattered fish scales and bones, baculite shells, inoceramid shells, and plant fragments. In all three of these Cretaceous units, the fossils are poorly preserved, typically occurring as flattened impressions. The Louviers Alluvium of Pleistocene age has produced isolated bones of *Bison* sp. None of the other surficial units are known to contain fossils.

#### RECOMMENDATIONS

The fossil resources along the I-25 corridor in Pueblo, Colorado, are either nonexistent in many of the surficial deposits, or include fossils in the bedrock that are relatively abundant and well-known (the inoceramids and baculites). The fossil fish bones and scales reported by Scott (1969a) in the upper chalky shale unit of the Smoky Hill Member are scattered and are not well preserved. As a result, construction on the I-25 corridor through Pueblo should proceed with no additional paleontologic mitigation.

#### REFERENCES CITED

- Scott, G.R., 1964, Geology of the northwest and northeast Pueblo Quadrangles, Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-408, scale 1:24,000, 1 sheet.
- Scott, G.R., 1969a, General and engineering geology of the northern part of Pueblo, Colorado: U.S. Geological Survey Bulletin 1262, 131 p., 1 plate, 1 map.
- Scott, G.R., 1969b, Geologic map of the southwest and southeast Pueblo Quadrangles, Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-597, scale 1:24,000, 1 sheet.

Scott, G.R., and Cobban, W.A., 1964, Stratigraphy of the Niobrara Formation at Pueblo, Colorado: U.S. Geological Survey Professional Paper 454-L, 30 p., 11 plates.

Scott, G.R., and Cobban, W.A., 1986, Geologic and biostratigraphic map of the Pierre Shale in the Colorado Springs-Pueblo area, Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1627, scale 1:100,000, 1 sheet.

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**TABLE 1. GEOLOGIC UNITS ALONG THE I-25 ALIGNMENT PROJECT IN PUEBLO, COLORADO. UNITS ARE AFTER SCOTT (1969A, B).**

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Artificial fill (af) – unsorted sand, silt, clay, and in some cases debris. Includes artificial road embankments, iron smelting waste dumps of slag in the south, and abandoned waste dumps.

Post Piney Creek Alluvium (Qpp) – Silty sand and gravel in two terraces as high as 6 m above the modern streams and river. Includes lower yellowish gray to yellowish brown pebble to cobble gravel and upper gray brown, well-stratified humic silt and sand. Holocene in age and as much as 6 m thick. No fossils are known from this unit in the study area.

Colluvium (Qc) – Highly variable sediment sizes and compositions. On the Pierre Shale in the southern area, includes compact noncalcareous silty clay with fragments of sandstone and ironstone. Derived from gravity movement of unconsolidated material on slopes, and slope wash. Holocene in age and along the corridor is as much as 3 m thick. No fossils are known from this unit in the study area.

Aeolian sand (Qes) – Yellowish brown to yellowish grey, fine to coarse sand, slightly compacted and weakly cemented. Contains faint cross-stratification. Capped by a soil containing a pale yellowish brown B horizon, 20 cm thick, with some clay mineral accumulation, and weak carbonate accumulations below the B horizon. Early Holocene in age and is as much as 6 m thick. No fossils are known from this unit in the study area.

Broadway Alluvium (Qb & Qba) – Sand and gravel deposits on terraces 12 m above the modern streams and river. Includes yellowish gray calcareous silt beds that are well stratified with limestone fragments, and sandy cobble gravels along the river. Capped by a soil containing a pale yellowish brown, weakly developed Bt horizon, 20 cm thick, with some translocated clay, and weak carbonate accumulations below the B horizon. Late Pleistocene in age and is as much as 7.6 m thick. No fossils are known from this unit in the study area.

Louviers Alluvium (Qla) – Coarse and fine gravel in terraces 21-24 m above the modern streams and river. Along the corridor include yellowish brown, poorly sorted but stratified pebbly to cobble gravel with scattered boulders. The lower 10 centimeters are typically well cemented by calcium carbonate. Capped by a soil containing a dark yellowish brown Bt horizon, 46 cm in maximum diameter, with a moderate amount of translocated clay and a moderate prismatic structure. Below the Bt horizon are streaks or spots of calcium carbonate. Pleistocene in age and contains scattered isolated bones of *Bison* sp. Typically is 6 m thick.

Slocum Alluvium (Qsa) – Dark yellowish brown cobble gravel with boulders as much as 46 cm in maximum diameter. Stratification evident only in thin lenses of sand and pebble-sized sediment. Gravel deposits are on terraces 33.5 to 37 m above the modern streams and river. Capped by a strongly developed soil, with a brown to red Bt horizon as much as 1.2 m thick, containing abundant translocated clay and strong columnar structure. Below the Bt horizon is a dense accumulation of calcium carbonate. Middle Pleistocene in age, and the deposits are typically 7.6 m thick. No fossils are known from this unit in the study area.

Lower transition member of the Pierre Shale (Kpt) – calcareous clay-rich shale that is dark olive gray in fresh exposures but is light brown where weathered. Lower 15 m contains dark gray chalk that weathers yellowish gray. Middle 30.5 m dark olive gray, calcareous, blocky shale with calcium carbonate specks. Upper 24 m dark olive gray, noncalcareous, blocky shale with thin siltstone beds and concretions. Entire unit contains 17 thin yellow, soft bentonite beds, 1.5 to 15 cm thick. Late Cretaceous (Campanian) in age. Fossils are typically impressions on bedding planes and include fish scales, the shells of smooth baculites and inoceramids, and rare plant fragments. The member is 69.5 m thick.

Upper chalk unit of the Smoky Hill Shale Member of the Niobrara Formation (Ksuc) – Olive black, blocky to platy chalks and soft limestones containing specks of calcium carbonate (coccolithospheres), clay clasts and foraminifera tests. Weathers dark yellowish orange and blocky to platy to even bedded. Late Cretaceous (Campanian) age with abundant fossils that are poorly preserved impressions on bedding planes. Fossils include the shells of smooth baculites, inoceramids, and barnacles. The thickness of the unit is 2.4 m thick.

Upper chalky shale unit of the Smoky Hill Shale Member of the Niobrara Formation (Ksus) – Hard platy calcareous shales that weather dark yellowish orange, grayish orange, or pale yellowish brown and become soft and fissile. Interbedded with dark gray chalk that weather yellowish gray and platy; soft dark yellowish orange beds of limonite with selenite gypsum vein-fills; and soft, dark yellowish orange soft bentonite beds. Bentonites range from 1.3 to 9 cm thick, with 17 bentonite beds scattered between 55 m and 73 m above the base of the unit. Dark gray hard limestone concretions occur in the shales between 55 m and 76 m above the base of the unit. Late Cretaceous (late Santonian and earliest Campanian) in age, with fossils of fish and inoceramids. Fossils are poorly preserved as flattened impressions. The thickness of the unit is 81 m.

**TABLE 2. FOSSIL TAXA REPORTED BY SCOTT (1969A) FROM THE GEOLOGIC UNITS OF THE STUDY CORRIDOR IN THE NORTHERN PUEBLO AREA.**

Upper chalky shale unit of the Smoky Hill Shale Member, Niobrara Formation.

<i>Enchodus</i> sp.	Marine fish
<i>Ichthyodectes</i> or <i>Gillicus</i> sp.	Marine fish
<i>Xiphactinus</i> sp.	Marine fish
<i>Endocostea simpsoni</i> (Meek)	Inoceramid clam
<i>Sphenoceras</i> sp. cf. <i>S. patootensis</i> de Loriol	Inoceramid clam
<i>Platyceras</i> <i>platinus</i> (Logan)	Inoceramid clam
<i>Haresiceras placentiforme</i> Reeside*	Ammonite
<i>Scaphites</i> cf. <i>S. hippocrepis</i> (DeKay)*	Ammonite
<i>Baculites</i> cf. <i>B. haresi</i> Reeside*	Ammonite

Upper chalk unit of the Smoky Hill Shale Member, Niobrara Formation

<i>Baculites</i> sp., smooth form	Ammonite
<i>Endocostea simpsoni</i> (Meek)	Inoceramid clam
<i>Stramentum haworthi</i> Williston	Barnacle

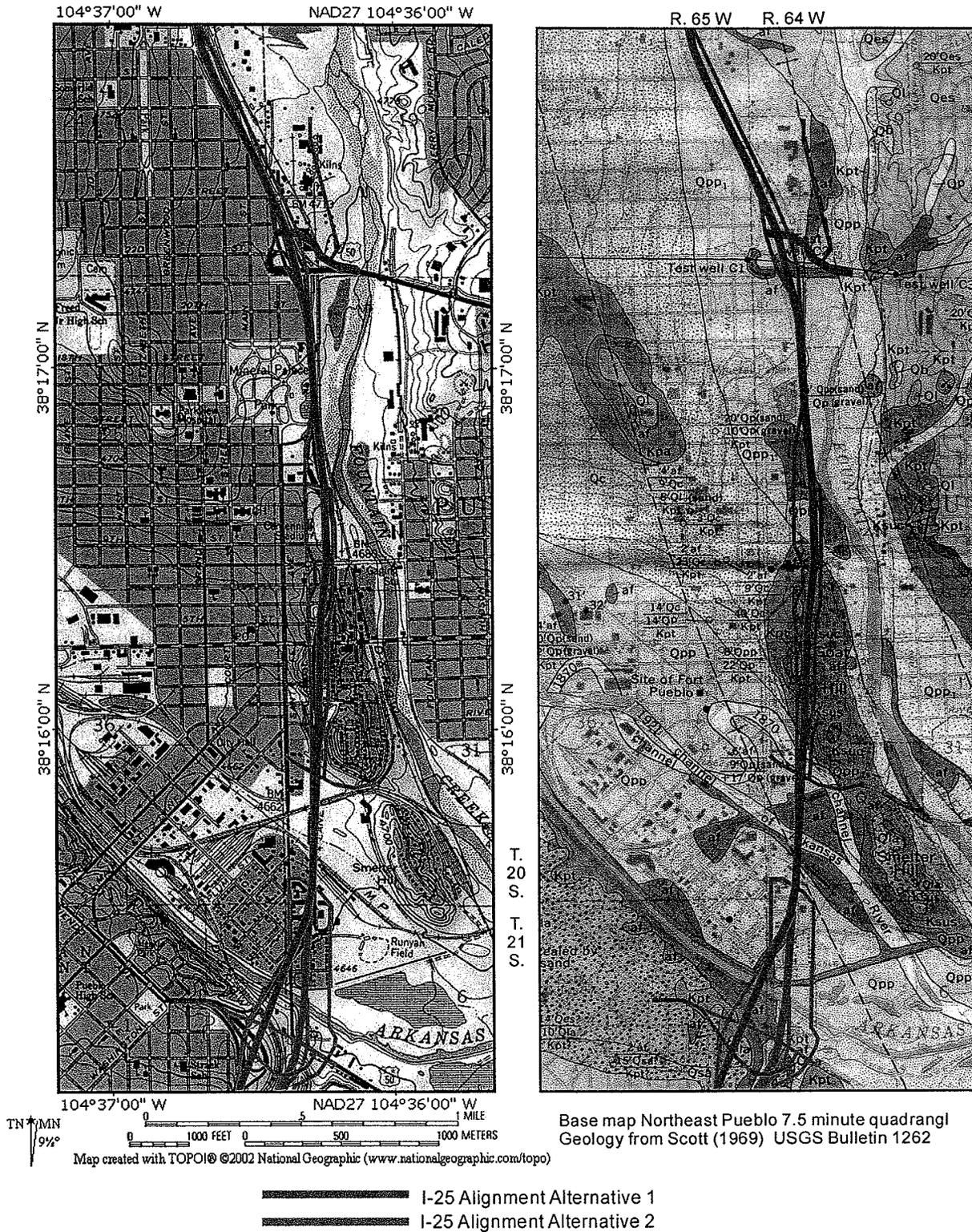
Lower transition member of the Pierre Shale

<i>Ichthyodectes</i> sp.	Marine fish
<i>Baculites</i> sp., smooth form	Ammonite
<i>Baculites</i> sp. aff. <i>B. obtusus</i>	Ammonite
<i>Endocostea simpsoni</i> (Meek)	Inoceramid clam
<i>Inoceramus</i> sp. aff. <i>I. cycloides</i> Wegner	Inoceramid clam
Plant fragments	

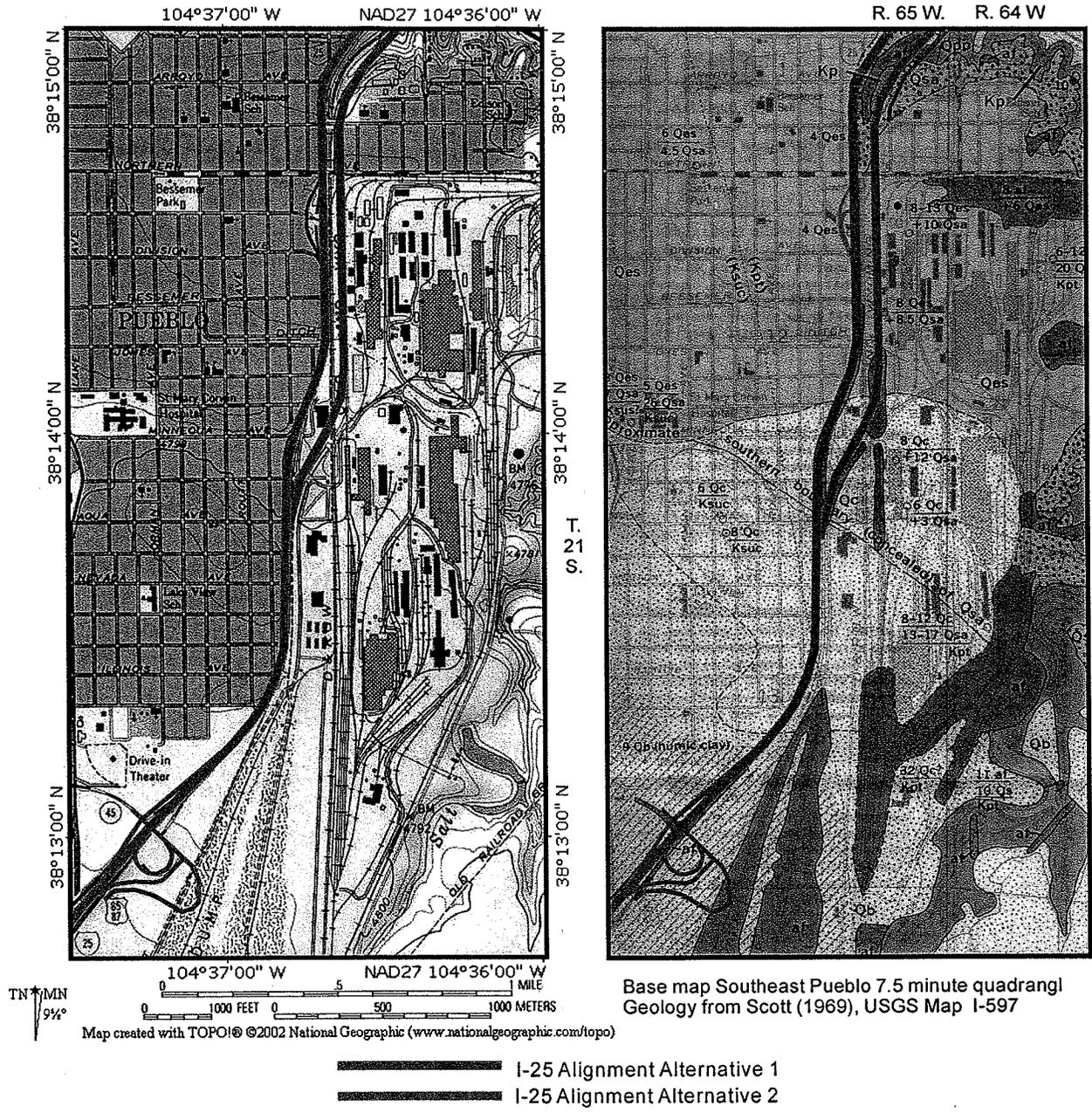
Louviers Alluvium

<i>Bison</i> sp.	Isolated bones.
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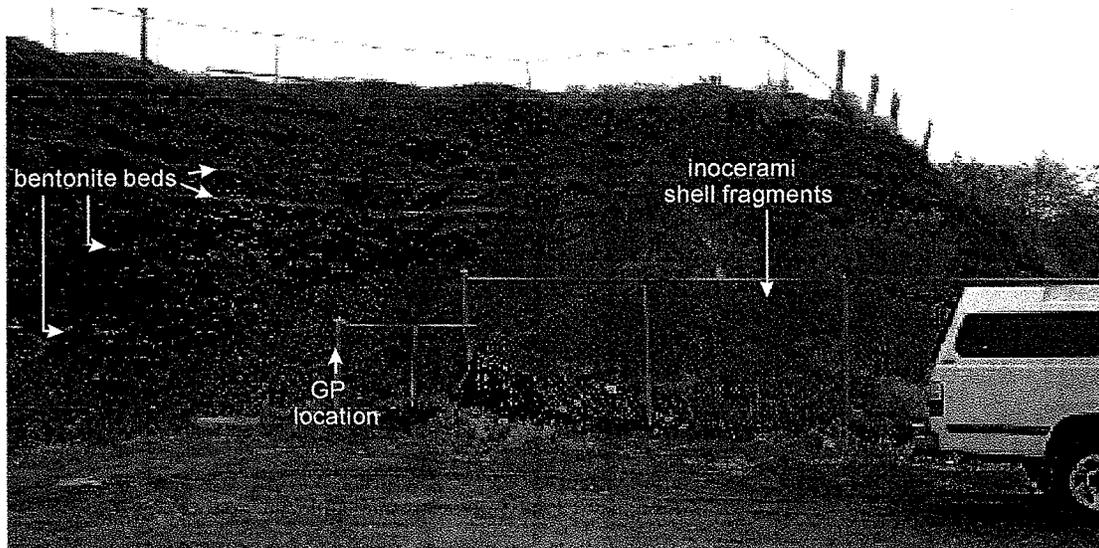
\*From south of the Pueblo area along the Apishapa River.



**Figure 1.** Location map and geologic map of the northern part of the proposed I-25 realignment through Pueblo, Colorado. The descriptions of the geologic units are given in Table 1.



**Figure 2.** Location map and geologic map of the southern part of the proposed I-25 realignment through Pueblo, Colorado. The geologic units are described in Table 1.



**Figure 3.** View to the southwest of black shales and bentonite beds of the lower transition member of the Pierre Shale in a cut between Santa Fe Avenue and Trail Street, south of Santa Fe Drive. Also shown are the location of scattered shell fragments of an inoceramid clam. The GPS location shown is in zone 13, 534515mE, 4233604mN (NAD 27).



**Figure 4.** View to the northeast of a road cut along Kelly Street exposing the upper chalky shale unit of the Smoky Hill Member, Niobrara Formation. The orange ledges are chalk units, and the top of the hill is supported by chinks of the upper chalk unit. Taken from the UTM location 534642mE, 4235163mN (zone 13, NAD 27).