

Lithology and palynology of the Beluga and Sterling Formations exposed
near Homer, Kenai Peninsula, Alaska

by

W. L. Adkison, J. S. Kelley, and K. R. Newman

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nomenclature.

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Plate 1. Stratigraphic sections of Beluga and Sterling Formations near Homer, Kenai Peninsula, Alaska (In pocket on the inside back cover)
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Introduction

This report provides detailed lithologic descriptions and lists palynomorph assemblages of the Beluga and Sterling Formations, Kenai Group, of Tertiary age at selected exposures in the southern part of the Kenai Lowland near Homer, Alaska (pl. 1). A preliminary report on the heavy minerals in these rocks is being prepared by K. T. Biddle. This work is part of a study to provide stratigraphic control to aid in the search for oil and gas in the Cook Inlet basin.

The work was done under a cooperative agreement between the U.S. Geological Survey and the Division of Geological and Geophysical Surveys, Department of Natural Resources, State of Alaska. The writers gratefully acknowledge the assistance of W. C. Fackler, Deputy Commissioner, Department of Natural Resources, and D. C. Hartman, former State Geologist. Discussions of the geology near Homer with C. E. Kirschner were very helpful.

Field work for this report was done in the summer of 1972 by Adkison and Kelley and in late May and June 1973 by these writers and E. R. Landis and K. T. Biddle. Sections measured by Landis and Biddle are designated by the letter "L". The palynomorphs were identified by Newman who was assisted by Linda Lewis.

In the field the rocks in each measured section were described from bottom to top, and this order is used here to summarize the descriptions. The detailed descriptions, starting on page 27, are in downward order for each section. The section numbers (1a-i2, L1-L18) are field numbers and indicate the order in which the sections

were measured by the two field parties. The field descriptions commonly included, for each rock type, the color, staining, weathering characteristics, bedding, induration, grain size, accessory particles, fossils, and the contact with the overlying rock unit. Thicknesses were generally measured with a steel tape and hand level, but an Abney level and Jacob's staff were used for parts of some sections. Concurrently with the field description, Adkison and Kelley collected representative lithologic samples of all rock units; Landis and Biddle took selected lithologic samples. The samples were briefly studied later by Kelley and Biddle, using low-power binocular microscopes, in order to check and amplify the field descriptions.

The Rock Color Chart (Goddard and others, 1948) was used to describe the rock colors, and the Wentworth grade scale was used to describe the grain size. Clastic rocks composed chiefly of particles smaller than coarse silt were generally termed "shale" by Adkison and Kelley, although the bedding of these rocks is commonly obscure or poorly developed. Similar rocks were called "claystone" by Landis and Biddle. The term "siltstone" is used for clastic rocks composed of coarse-silt particles. Bedding is classified according to thickness as follows:

fissile, less than 1/16 in.	thin, 2 - 4 in.
platy, 1/16 - 1/2 in.	medium, 4 - 12 in.
very thin, 1/2 - 2 in.	thick, 12 - 36 in.
massive, more than 36 in.	

The palynological samples were collected from the finer grained clastics (shale, claystone, and siltstone) that commonly form the floor,

partings, or the roof of coal beds (pl. 1). Efforts were made to get relatively fresh samples uncontaminated by pollen and spores from modern vegetation. The samples were placed in plastic bags that were closed with tie wires and then placed in tagged cloth bags.

The palynological samples were treated with acids to remove minerals and concentrate acid-resistant organic-walled microfossils (palynomorphs). Nearly all samples had numerous to abundant palynomorphs, chiefly spores and pollen, and these were generally well preserved. Organic residues from the samples were mounted on slides and examined qualitatively to determine the stratigraphic succession of palynomorphs. The taxa found in this study are listed in tables 1-4.

Tertiary Rocks

The name "Kenai" has been applied to the Tertiary coal-bearing rocks along the northwest shore of Kachemak Bay since the early work of Dall and Harris (1892). The Kenai Formation was mapped and described by Barnes and Cobb (1959) in a study of the geology and coal resources of the Homer district, and their report was used extensively during field work for the present report. Plant fossils in the Kenai were studied by Wolfe, Hopkins, and Leopold (1966), who proposed three new provincial time-stratigraphic units -- the Seldovian, Homerian, and Clamgulchian Stages -- for much of the Kenai Formation exposed in the Cook Inlet region.

Drilling by the petroleum industry since 1957 showed the thickness of the Kenai Formation greatly exceeds the total thickness of surface exposures. As pointed out by Calderwood and Fackler

Palynological sample no. (see Plate 1)		1P-112	1P-94	1P-72	1P-68	1P-63	1P-59	1P-41	1P-35	1P-32	1P-21	1P-6	1P-2	1P-1
Palynomorph taxa	<u>Alnus</u>	x		x	x	x	x	x	x	x	x	x	x	x
	<u>Pterocarya</u>	x			x	x		x	x	x	x	x	x	x
	<u>Sigmopollis psilatus</u>	x			x			x				x	x	x
	Bisaccate pollen	x	x	x	x	x		x	x	x	x	x	x	x
	Triporate, psilate pollen	x		x	x	x		x	x	?	x	x	x	x
	<u>Lycopodium</u>				x	x			x			x		x
	Ericaceae			x	x	x			x	x				x
	<u>Tsuga</u>	x		x	x	x		x	x	x	x	x	x	x
	<u>Osmunda</u>	x		x	x	x		x	x	x	x	x	x	x
	<u>Laevigatosporites</u>	x	x	x	x	x	x	x	x	x	x	x	x	x
	<u>Taxodiaceapollenites</u>	x			x	x	x	x	x	x	x	x	x	x
	cf. <u>Diervilla</u>	?				x		x	x			x	?	x
	Trilete, verrucate spores				x	x			x	x		x		x
	<u>Polypodiidites</u>					?			x				?	
	<u>Sphagnum</u>				x	x			x			x		x
	<u>Deltoidospora</u>	x	x	x	x	x						x		
	cf. <u>Fagus</u>									x	x			
	<u>Ilex</u>					?			?			x		
	<u>Ulmus</u>										x		x	
	Tricolporate, psilate, 20 μ			?							?			
	Fungal spores	x	x	x	x				x	x				
	<u>Carya</u>									?	?			
	<u>Sigmopollis hispidus</u>									?				
	<u>Lycopodium foveolites</u>								x					
	<u>Tilia</u>									x				
	Trilete, psilate, rounded								x				x	
	Tricolpate, spinate, 22 μ								x					
	<u>Selaginella sinuities</u>						x							
	Gramineae			x	?									
	cf. Bryophyte spores			x										
Tricolpate?, striate, 40 μ			x											
cf. <u>Typha</u>		x												

Table 1. - Checklist of palynomorph taxa in measured section 1a, Kenai Group, west of Homer, Alaska

Palynological sample no. (see Plate 1)	Palynological taxa																													
	Alnus	Pterocarya	Stigmopollis psilatus	Bisacate pollen	Triporate, psilate pollen	Lycopodium	Urticaceae	Fungus	Compositae	Laevigatosporites	Uromyces																			
7P-55	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
7P-28	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7P-21	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7P-13	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7P-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
10P-4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
9P-13	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-96	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-73	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-83	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-69	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-76	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-57	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-68	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-59	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-58	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-46	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-51	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-41	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-32	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-39	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-22	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-32	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6P-7	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-28	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11P-28	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-23	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11P-21	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-16	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11P-13	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8P-3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11P-2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
12P-33	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
12P-8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
12P-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 4. - Checklist of palynological taxa in measured sections 6-12, Kenai Group, on Selkirk and Fox Creeks near level of Pachekak Bay, Alaska

(1972, p. 741), the name "Kenai Formation" is inadequate to describe the gross sequence of Tertiary rocks, and accordingly, they formally proposed: (1) the Kenai Formation be elevated to Kenai Group and (2) this group be divided into five formations named, in upward order, the West Foreland Formation, Hemlock Conglomerate, Tyonek Formation, Beluga Formation, and Sterling Formation. This stratigraphic nomenclature is widely accepted by geologists working with the subsurface stratigraphy in the Cook Inlet basin, and it is used in this report.

All formations of the Kenai Group have subsurface type sections, and it is generally difficult to trace these units to surface exposures. In the Homer area Kenai rocks of the Homeric Stage (Wolfe and others, 1966) were correlated with part of the Beluga Formation by Calderwood and Fackler (1972, p. 748). These writers (p. 751) stated that parts of the Sterling Formation crop out along the western margin of the Kenai Peninsula where Wolfe, Hopkins, and Leopold (1966, p. A20) designated the type section for the Clamgulchian Stage. According to an isopach map by Hartman, Pessel, and McGee (1972), the Sterling is absent in six wells (Nos. 1, 2, 7, 8, 9, 10, pl. 1) located in the southern part of the Kenai Lowland; in these wells the youngest Kenai strata were assigned to the Beluga Formation. Exposures of the Beluga and Sterling Formations in the southern part of the Lowland are mapped in a general way by Kirschner and Lyon (1973, fig. 11).

Kenai Group

The Kenai Group exposed in the Homer area consists of nonmarine moderately well indurated clastic rocks that are assigned to the Beluga and Sterling Formations. This subdivision is based on lithology, subsurface stratigraphy, palynology, and heavy-mineral study. The approximate areal extent of these formations in the southern part of the Kenai Lowland (south and east of Anchor River) is shown on the location map on plate 1. The location of the contact between the Beluga and Sterling, not mapped in the field, is sketched using the measurements of structural attitude shown on the geologic map by Barnes and Cobb (1959, pl. 18) and the estimated altitude of the contact below measured section 5.

The total thickness of the exposed Beluga and Sterling Formations is estimated at 6,100 feet; Barnes and Cobb (1959, p. 225) estimated the thickness at 5,000 feet or more. The thickness is difficult to determine because a lack of marker beds makes correlations only approximate across large covered areas and also across two concealed or inferred faults of unknown displacement (location map, pl. 1). In the southern part of the Kenai Lowland, the greatest thickness of the combined Beluga and Sterling, including Quaternary strata if present, is 6,940 feet in well 5 (location map, pl. 1), according to Hartman, Pessel, and Mc Gee (1972).

For ease of description, measured sections 1a through 5 are designated the Homer Section, and measured sections L1 through L18 plus 6 through 12 are designated the Kachemak Section (pl. 1).

Both sections extend over considerable distances, and as described below, the rocks are broken by numerous faults. A major concealed fault probably separates the Homer and Kachemak Sections.

Beluga Formation

At the south end of the Kenai Lowland, the Beluga Formation crops out in the sea cliffs northwest of Homer, along the Homer Escarpment, and in the sea cliffs on the north side of upper Kachemak Bay. The base of the formation is not exposed. The total thickness of the exposed beds, 3,080 feet, is only approximate because of difficulties in correlating beds across covered areas. In the southern part of the Lowland (location map, pl. 1), the thickness of the Beluga is as much as 3,690 feet in well 4 (Hartman and others, 1972). The continuity of the formation in the Homer Section probably is broken by a concealed fault at the mouth of Diamond Creek, and the lower and upper parts are described separately.

Lower part of Beluga Formation. -- The lowermost part of the Homer Section includes the oldest rocks of the Beluga Formation. This seacliff exposure, measured section 1a (pl. 1), extends from a point about 0.7 mile southeast of the mouth of Travers Creek (Mutnaia Gulch) southeastward to Diamond Creek. The strata lie in the lower part of the type section of the Homeric Stage as defined by Wolfe, Hopkins, and Leopold (1966, p. A17). Rocks of this stage are at least partly late Miocene in age, but the youngest part may be of early Pliocene age (Wolfe and others, 1966, p. A20).

Rocks in measured section 1a generally show a gentle apparent dip to the southeast, although beds in the middle part appear nearly flat lying. The total thickness is about 865 feet, but some beds may be missing as a result of faulting. Rocks of section 1a are bounded on the northwest by a fault zone about 200-300 yards wide. On the southeast side, sections 1a and 1b probably are separated by a fault that is concealed by colluvial and alluvial deposits at the mouth of Diamond Creek. Rocks in the lower and middle parts of section 1a probably are cut by a few faults of apparently small displacement, but these are generally concealed by Pleistocene deposits.

The Beluga Formation in section 1a consists of sandstone interbedded with siltstone, shale, and coal. These rocks, except for the coal, are mostly medium gray and partly iron stained. Bedding in the finer clastics is commonly obscure. The sandstone is dominantly very fine to fine grained, silty, and clayey. A few sandstone bodies are friable. Basal parts of some sandstone units are medium to coarse grained and locally pebbly. These units, probably channel deposits, generally have sharp bases, show cross bedding, and become finer grained and increasingly silty upward. Calcite locally cements parts of many sandstone bodies into hard concretionary forms. Some sandstone beds include scattered coal fragments and stringers. The siltstone varies from sandy to clayey, and locally it is partly limy and concretionary. Some thin siltstone beds, commonly partings in coal beds, are brown or brownish gray and contain clear angular

sandsize fragments of feldspar. These fragments appear relatively unweathered and probably are of pyroclastic origin. The shale and claystone are silty to sandy and, for the most part, are poorly bedded or nonbedded. Dark-gray to black carbonaceous shale occurs in many thin beds that generally lie in close proximity to coal beds. The carbonaceous shale is fissile to platy bedded, and it commonly includes very thin coal stringers. Ironstone occurs mainly as nodules, as much as 0.6 foot thick, in fairly regular courses; the ironstone is found chiefly in gray shale and siltstone.

Coal beds are abundant in the Beluga Formation in section 1a, and several are 3 to 5 feet thick. The coal is well indurated and commonly weathers blocky. It is more resistant to weathering than most of the other rocks, and it forms ledges and waterfalls at many places along the seacliffs. The color is mostly dull black, but bright bands are fairly common in fresh exposures. Small fragments of amber are scattered in numerous coal beds in the lower half of section 1a but were noted in only one bed in the upper half. Almost all the thicker coals include one or more partings of clastic rock. Many of the partings contain crystal fragments of probable pyroclastic origin.

Fossils in the rocks of section 1a consist entirely of plant fragments and palynomorphs. The fragments vary considerably in size and are more commonly present in shale, siltstone, and ironstone. Plant fragments appear to be in growth position in some beds, and in other beds they are randomly oriented. Leaf impressions were

found in a sandstone in the lower part of the section and in a siltstone in the upper part (pl. 1). The siltstone might be the same bed that was sampled at U.S.G.S. Paleobotany locality 9366 (Wolfe and others, 1966, p. A26), but this cannot be determined.

The pollen assemblage from section 1a (table 1) appears to be younger than pollen assemblages from the Iyonek Formation exposed near the toe of Capps Glacier and along part of Chuitna River on the northwest flank of Cook Inlet basin (Adkison and others, 1975). This age relationship is in agreement with studies of the megaf flora in Kenai strata by Wolfe, Hopkins, and Leopold (1966). These writers included the rocks in the Capps Glacier-Chuitna River area in the type section of the Seldovian Stage. They determined that the Seldovian Stage is older than the Homeric Stage, the type section of which includes strata of section 1a. There are similarities between the pollen assemblage from section 1a and those found by Newman (written commun., 1975 and Adkison and Newman, 1973) in cuttings and cores from the upper part of the Iyonek Formation (between approximate depths 7,100-8,000 ft.) in the Standard Oil Co. of Cal. 1 Deep Creek Unit well, located about 25 miles north of Homer.

The heavy-mineral suites in five sandstones from section 1a were studied by K. T. Biddle (in preparation). He found the principal heavy minerals are, in order of decreasing average percent, siderite, sphene, epidote, garnet, andalusite. According to Kirschner

and Lyon (1973, p. 404), a predominance of epidote in the heavy minerals from the Beluga indicates an eastern source area in the Kenai and Chugach Mountains.

As noted above, section la probably is separated from section lb by a normal fault that is concealed at the mouth of Diamond Creek. Rocks in the uppermost part of section la dip southeast toward Diamond Creek; beds on the southeast side of the creek, the basal part of section lb, appear almost flat lying in the seacliff. The southeast block probably is downthrown, but the amount of displacement is unknown.

Upper Part of the Beluga Formation.- The upper part of the Beluga Formation in the Homer Section, about 2,215 feet thick, includes the rocks in sections lb, 2, 3, and most of section 4. Correlation of these sections follows Barnes and Cobb (1959, pl. 19). Rocks in these sections are, for the most part, very similar lithologically to those in section la, but there are some differences as discussed below.

The lower part of section lb includes a medium-gray very silty shale unit, 53 feet thick, that has a pronounced conchoidal fracture. This uncommonly thick shale unit, marked at the base by sample 1P-134 (pl. 1), weathers distinctively because of the conchoidal fracture. Iron staining is generally abundant on joints and fractures. The lower part of the shale contains scattered fine to coarse sand grains and granules. A sample of the shale was examined by G. W. Andrews, U.S. Geological Survey (written commun., 1974). He found

common to abundant diatom debris, mostly too finely broken for meaningful study, but he identified four nonmarine taxa- Melosira islandica ssp. helvetica O. Müller, Coscinodiscus lacustris Grunow?, Melosira granulata (Ehrenberg) Ralfs, and Tetracyclus sp.

In the upper part of the Beluga Formation (sections lb-4), coal beds a foot or more in thickness (including thin partings) are stratigraphically much more widely spaced than those in section la. Fragments of amber were noted only in the Cabin coal bed in section 3. Grains of probable pyroclastic origin seem much less common in the partings of coal beds, although the brownish-gray color of some partings suggests pyroclastic material may be included. Leaf impressions and large coalified wood fragments, including flattened logs, are more numerous in the upper part of the formation. At least 11 beds in the middle and upper parts of section 3 contain leaf impressions (pl. 1).

Beds of friable sandstone are more common in the upper part of the Beluga Formation, and the sandstone is generally less clayey than that in section la. Thin limy concretionary zones in the sandstone and siltstone are almost as numerous in section lb as in la. Limy zones are scarce in section 3, and none were seen in section 4.

The upper part of the Beluga Formation in the Homer Section, described above, cannot be traced directly to exposures in the seacliffs of the Kachemak Section. Quaternary deposits cover the formation in a northeast-trending lowland band, about a mile wide, that separates the Homer Escarpment from the seacliffs of the Kachemak Section (Barnes and Cobb, 1959, pl. 18). In addition, a major concealed fault probably passes

northeastward through this covered area (Beikman, 1974). The fault probably passes between two wells in T. 4 S., Rs. 11 and 12 W. (wells 5 and 6, location map, pl. 1). Well logs indicate the northwest side is downthrown or, if there is little or no displacement on the fault, the pre-Tertiary erosion surface dips rather steeply toward the northwest. Near the Homer Escarpment, the displacement of the near-surface rocks along the fault is unknown.

Rocks of the upper part of the Beluga Formation in the Homer Section are tentatively correlated with generally similar strata in the Kachemak Section (pl. 1). The correlation is based primarily on rough similarities in the sequence of pollen taxa (tables 2, 3). Some taxa occur rather consistently in the sections, but many others occur erratically. The lowest stratigraphic occurrence of a few taxa in the exposed rocks are indicated on plate 1. These limits are only approximate and are not necessarily applicable to the entire Kenai Group.

In the Kachemak Section located in the seacliffs northeast of Homer, the Beluga Formation includes rocks in measured sections L18-L8, L1-L3, and parts of L4 and L5 (pl. 1). Correlation of these sections follows Barnes and Cobb (1959); they measured additional strata below section L18. The rocks are mostly well exposed, have a low generally north dip, and are broken by numerous normal faults with displacements as much as 77 feet (Barnes and Cobb, 1959, pl. 18, p. 228). J. A. Wolfe (1975, oral commun.) assigns the lower and middle parts of these beds to the Homeric Stage and the upper part (above coal bed B) to the Clamgulchian Stage.

The Beluga Formation in the Kachemak Section consists of sandstone, claystone (mostly termed "shale" in preceding description), siltstone, shale, and many coal beds. The thickness of the described beds is about 1,325 feet. As illustrated by Barnes and Cobb (1959, pl. 19), stratigraphically lower rocks are present southwest of section L18, but time was insufficient to study them. The clastic rocks are chiefly medium gray to medium dark gray, and bedding of the finer clastics is generally obscure or poorly developed. Most sandstone is thick to massive bedded, soft, very fine to fine grained, silty, and clayey. Much of the sandstone is friable. Numerous sandstone bodies may be channel deposits; these seem more abundant in the lower half of the exposures. The channel deposits are generally similar to those described above. One sandstone in the lower part (section L17) contained pebbles and scattered cobbles. Claystone in the Beluga is generally silty, and the siltstone is mostly clayey. The distinctive conchoidal-weathering shale, with included diatom debris, in the lower part of section 1b was not recognized in the seacliff exposures northeast of Homer. The tentative palynological correlations suggest that, if this shale is present in the Kachemak Section, it lies a few hundred feet below sea level. Limy concretionary bodies are found in siltstone, sandstone, and claystone; these bodies are more common between coal beds A and D. Thin beds of carbonaceous or coaly shale are generally associated with coal beds. Although the formation includes many coal beds, the thicker beds are restricted to the upper half of the rocks studied for this report. No amber fragments were noted in the coal.

Partings of clastic rock are present in most of the thicker coal beds; grains of probable pyroclastic origin seemingly are rare in the partings or in other beds.

The only fossils found in the Beluga Formation in sections L18-L5 consist of carbonaceous plant fragments and palynomorphs. In these sections, the palynomorph taxa (table 3) occur much more erratically than in sections of the Beluga described above, and the average number of taxa per sample is considerably less than for other large parts of the Kenai strata described in this report. No leaf impressions were noted, and large woody carbonaceous plant fragments are rare.

The top of the Beluga Formation in section L5 (pl. 1) is tentatively placed at the base of a thick sandstone unit that probably is a channel deposit. The position of this contact is broadly determined by an upward change in the heavy-mineral suites as generally outlined by Kirschner and Lyon (1973, p. 404). According to K. T. Biddle (in preparation), the heavy minerals from a sandstone near the middle of section L3 consist mainly of epidote and small amounts of zircon, garnet, sphene, and several other minerals. Biddle found the heavy-mineral suite from the basal sandstone of the Sterling Formation (section L5) is dominated by hypersthene and hornblende. The top of the Beluga in section L4, about 2.4 miles to the southwest, is placed at the base of a sandstone and siltstone sequence about 12 feet thick.

In the Homer Section (section 4, pl. 1), the top of the Beluga Formation is tentatively placed at the base of a thick sandstone unit that appears to be a channel deposit. The contact, probably a minor

local disconformity, is determined in general accordance with the palynological correlations. The top of the Beluga in the Homer Section is not marked by the change in heavy minerals found in the Kachemak Section. The study by Biddle (in preparation) showed that the upward change from a suite dominated by epidote to one composed mainly of hypersthene and hornblende occurs at a lower stratigraphic position in the lower-middle part of section lb. The lack of parallelism between the tentative palynological correlations and the heavy-mineral correlation cannot be explained with the available data. The heavy-mineral samples in the Homer and Kachemak Sections are, for the most part, rather widely spaced stratigraphically. Study of additional samples might indicate the change in heavy-mineral suites occurs at a different stratigraphic position in either or both sections. Also, an interfingering relationship, wherein the contact between the suites rises stratigraphically northeastward, might be interpreted from additional study.

Sterling Formation

The Sterling Formation of the Kachemak Section crops out in the seacliffs in the upper (northeastern) part of Kachemak Bay and in the valley walls of several streams that flow generally southward into the bay. In this area Wolfe, Hopkins, and Leopold (1966, p. A20, A21) designated a reference section for the Clamgulchian Stage and explained the evidence indicative of a Pliocene age for this stage. In the Homer Section the lower part of the formation is also exposed in the upper parts of several canyons cut into the Homer Escarpment. Rocks of the Sterling Formation of both sections generally dip northwest at about 3°-5°.

The youngest beds are unconformably overlain by Pleistocene deposits about 1.2 mi. south of Caribou Lake (location map, pl. 1).

Rocks of the Sterling Formation measured in the Kachemak Section are traceable for considerable distances along parts of the valley walls of Swift, Moose, and Fox Creeks, but extensive covered areas, especially between the lower parts of these streams, prevent direct tracing of beds from one drainage to another. An exposure including both coal beds M and N (sections L6, 12) was not found. The interval between these coal beds was roughly calculated at 600-800 feet, but it might be somewhat greater.

The rocks exposed in the upper half of Swift Creek (sections 12, 11, 6) are tentatively correlated with those on Fox Creek (section 8) about 2.5 miles to the northeast and approximately along regional strike. The correlations are based mainly on the presence and relative position of several fairly thick coal beds, especially beds O, P, Q, S, and T, and to some extent on general lithologic similarities of the other rocks. No distinctive marker beds were found in this part of the Sterling Formation.

On Fox Creek the uppermost coal unit at section 8 (same as locality 172 of Barnes and Cobb, 1959, pls. 18, 19) was traced northeastward to section 9 by walking the line of outcrop. This work showed the coal unit correlates with two coal beds, each 2 feet thick, that lie in the interval 59-68 feet below the top of locality 173 of Barnes and Cobb (1959, pls. 18, 19). From section 9 a distinctive thin bed of tuff was similarly traced northeastward to section 10 where the bed locally thickens

to 5.5 feet. A short distance upstream from this location, the northwest-dipping tuff bed is covered by alluvium in the narrow valley of Fox Creek. Correlation between sections 10 and 7 (pl. 1) is based mainly on a very impure coal bed, about a foot thick, and partly on the stratigraphic position of the coal in relation to the tuff bed in the bottom of the valley.

The Sterling Formation consists mainly of sandstone and siltstone, but it includes shale, claystone, and many coal beds (pl. 1). The total thickness approximates 3,000 feet. Except for the upper part (section 7), rocks of the Sterling closely resemble those of the Beluga. The dominant color is medium gray, although lighter and darker shades of gray are fairly common. Many beds in the upper 500 feet are medium dark bluish gray. Ironstaining is widespread.

The sandstone is chiefly platy to very thin bedded, partly cross bedded, friable, very fine to fine grained, silty, and partly clayey. In the upper part of the formation (sections 9, 10, 7), much of the sandstone is obscurely bedded, cross bedding is less common, and beds of fine- to coarse-grained sandstone are more numerous. Many of the sandstone bodies probably are channel deposits; good examples include the basal sandstones of the Sterling in sections 4 and L5. The siltstone is obscurely bedded to platy bedded, generally clayey, and partly sandy. Much of the shale and claystone are also obscurely bedded to poor platy bedded and silty. Thin beds of dark-gray to black carbonaceous shale generally occur close to or within coal beds. Ironstone nodules are found in many beds of the clastic rocks. The lower part of the formation,

nearly 500 feet thick, includes several thin limy concretionary zones in beds of siltstone or shale. A thin limy siltstone bed occurs about 250 feet below the top of the Sterling.

Pyroclastic detritus is incorporated in many of the strata in the middle and upper parts of the Sterling Formation. The detritus, generally of sand size or smaller, includes crystal fragments of plagioclase, devitrified pumice and glass (?), volcanic ash, and tuff. At least one thin tuff bed in the upper part is a good marker bed locally. It was used to correlate sections 9 and 10 (pl. 1).

Coal in the Sterling Formation, except for the upper part, closely resembles that in the upper part of the Beluga. Numerous coal beds locally are 3 to 5.5 feet thick, including partings. The upper 580 feet of the Sterling includes only a few impure coal beds that, with partings, are as much as 1.1 feet thick. Coal in the formation is hard, tough, and more resistant to weathering than the other rocks. At many places the thicker coals support waterfalls. Many beds weather platy and show woody textures. Flattened coalified logs are abundant, and stumps are present in some beds. Parts of many coal beds appear bony, impure, or shaly. No amber fragments were found. Partings of shale or siltstone are common, and many of the partings contain fragments of probable pyroclastic origin.

Fossils in the Sterling Formation include leaf impressions, other carbonaceous plant fragments of widely varying size, and palynomorphs. The leaf impressions were found in a relatively few beds near the base (sections 4, 5) and in the upper part (sections 6, 8, 7). Plant fragments

are generally present in the shale and siltstone and are found in much of the sandstone. In some beds the fragments appear to be in growth position, and in other beds the orientation appears random. The palynomorph taxa are listed in tables 2-4. Many of the taxa occur erratically in the Sterling. The few specimens of Carya (?) in section 4 may be redeposited, and the specimens of Ilex, Carya, and Tilia in sections 12, 11, and 6 probably are redeposited. The assemblage in sections 12-7 appears to be an upward continuation of the assemblages in sections 1b-5 and L18-L6.

Stratigraphic sections

Detailed descriptions of the Beluga and Sterling Formations of the Kenai Group are given starting on page 27. These are primarily field descriptions supplemented by brief microscopic study of representative samples. In the descriptions, the palynological sample numbers immediately follow the rock type that was sampled.

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Measured section 1a

Location: Sea-cliff and hillside exposures along shore of Kachemak Bay from mouth of Diamond Creek, SW corner SE 1/4 NW 1/4 sec. 8, T. 6 S., R. 14 W., northwestward to a point about 0.7 mile south-east of mouth of Travers Creek (Mutnaia Gulch), NW 1/4 SE 1/4 NW 1/4 sec. 27, T. 5 S., R. 15 W., Seldovia C-5 quadrangle. This measured section includes localities 77-87 of Barnes and Cobb (1959, pl. 18).

Note: Measured section 1a probably is separated from section 1b by a fault of unknown but possibly large displacement.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (lower part)	
Shale, dark-gray, fissile, carbonaceous; abundant plant fragments; upper contact mostly covered by slumped material-----	0.5+
Coal, bony in lower half; blocky- and platy-weathering in upper half-----	1.
Siltstone, medium-gray, hard, tough, not limy, clayey; upper 1 ft. concretionary and iron-stained with abundant plant fragments; poorly exposed-----	5.
Coal, bony; includes near middle a 0.2-ft. parting of medium-brown pyroclastic(?) siltstone with abundant carbonaceous laminations-----	0.6
Siltstone and interbedded shale; siltstone, medium-gray, partly iron-stained, slabby- to uneven-weathering, obscurely bedded, clayey; no plant fragments seen; includes a 0.5-ft. bed of medium-gray iron-stained fine-grained subangular sandstone about 4.5 ft. above base; unit becomes less clayey in upper 3 ft.-----	10.3
Coal, bony; includes black to dark-brownish-gray carbonaceous shale; upper 0.3 ft. mainly carbonaceous shale-----	0.6
Siltstone and interbedded sandstone; siltstone, medium-gray, iron-stained, clayey; abundant plant fragments; becomes sandy above lower 1 ft.; includes limy concretions up to 1 ft. thick; a 1.5-ft. medium-gray fine-grained sandstone bed 5.6 ft. above base; lower contact gradational-----	8.3

Shale, dark-gray, fissile, carbonaceous-----	0.3
Shale, medium-brown to dark-brownish-gray, sandy; abundant coaly plant fragments; pyroclastic(?) feldspar grains-----	0.3
Coal, bony; interbedded with black carbonaceous shale; includes a carbonaceous shale bed at base-----	0.4
Shale, medium-gray, hackly-weathering (small pieces), obscurely bedded, silty; no plant fragments; lower contact gradational-----	0.8
Sandstone, medium-gray, slabby-weathering, obscurely bedded, fine-grained, subangular; no plant fragments; lower contact fairly sharp-----	2.2
Shale, medium-gray, slightly iron-stained, slabby- to uneven-weathering, obscurely bedded; carbonaceous woody fragments-----	3.
Ironstone, light-brownish-gray, nodular; abundant plant fragments-----	0.3
Shale, dark-brownish-gray, sandy, carbonaceous; abundant laminations of bony coal-----	0.4
Sandstone, medium-gray, slabby-weathering, very fine grained, subangular, silty, clayey; includes an iron-rich zone 1 ft. below top-----	2.7
Siltstone, medium-gray, partly iron-stained, hackly-weathering, soft, very clayey; no plant fragments seen; contains interbeds of silty shale; includes a 0.1-ft. bed of bony coal with abundant woody structure about 2 ft. below top-----	6.
Coal, platy-weathering; interbedded with dark-brownish-gray carbonaceous shale and bony coal-----	0.4
Shale, medium-gray, hackly-weathering, silty in part; breaks to small pieces-----	0.5
Siltstone, medium-gray, slabby-weathering, thin-bedded, cross-bedded, clayey; lower contact gradational-----	4.
Shale, medium-gray, partly slabby-weathering, thin-bedded, silty in part; includes a few thin carbonaceous laminations and some plant fragments-----	5.

Shale, dark-brownish-gray, platy-weathering; abundant plant fragments; interbedded with thin bony coal stringers-----	0.3
Sandstone, medium-gray, slabby-weathering, obscurely bedded, fine- to medium-grained, subangular, clayey; no plant fragments; grades upward to medium-gray sandy siltstone and silty shale in upper 1.5 ft.-----	4.
Coal, bony in basal 0.5 ft. and upper 0.4 ft.; includes a 0.3-ft. medium-gray shale parting 0.3 ft. above base; a 0.65-0.9-ft. medium-gray shale parting 1.1 ft. above base; a 0.1-ft. deeply weathered brown shale parting 0.4 ft. below top; some very thin lenticular medium-brown pyroclastic(?) partings near middle-----	3.5
Shale, dark-gray, partly iron-stained, hackly-weathering; basal 0.5 ft. deeply weathered; plant fragments common; includes carbonaceous and coaly stringers; a 1-ft. medium-gray very fine grained sandstone bed 1 ft. above base-----	3.1
Coal, very bony, platy-weathering-----	0.25
Shale, medium-gray, deeply weathered-----	0.5
Coal, blocky, very bony in basal 0.2 ft.; includes a lenticular 0.1-ft. parting of medium-brown siltstone 1.1 ft. above base and 2 similar lenticular partings in upper 0.5 ft.-----	2.4
Siltstone, medium-gray, light-gray hackly- to uneven-weathering, obscurely bedded, clayey; many carbonaceous plant fragments; lower contact probably gradational-----	4.2
Sandstone, medium-gray, partly iron-stained, thin-slabby-weathering, obscurely bedded, very friable, medium-grained, scattered coarse grains, subangular, slightly clayey; becomes very fine grained and clayey in upper 3 ft.-----	12.
Coal, bony; includes a 0.1-ft. parting of medium-brown deeply weathered siltstone-----	1.1
Shale (1P-112)*, medium-gray; includes scattered carbonaceous stringers, plant fragments and coal stringers; contains large coalified wood fragments at an angle to bedding-----	2.7

*Palynological sample

Coal, bony-----	0.05
Shale, medium-gray, hackly-weathering, silty; some plant fragments; slight green tint near top-----	0.6
Sandstone, medium-gray, locally iron-stained, fine-grained, subangular, clayey; locally includes hard probably iron-rich concretionary bodies up to 0.5 ft. thick; lower contact sharp-----	3.3
Siltstone, medium-gray, hackly- to sub-platy-weathering, obscurely bedded, clayey; few carbonaceous plant fragments; includes thin stringers of dark-gray carbonaceous shale near middle and top; lower contact sharp; unit poorly exposed-----	4.5
Shale, brownish-gray, poor platy-bedded, slightly silty; some carbonaceous plant fragments; top 0.1 ft. bone coal-----	0.7
Siltstone, dark-brownish-gray, finely sandy, clayey, pyroclastic(?) grains; includes a few thin coal stringers-----	0.4
Coal, bony-----	1.1
Sandstone, medium-gray, partly iron-stained, obscurely bedded, fine-grained, subangular, clayey; lower contact sharp-----	1.7
Shale, medium-gray, obscurely bedded, silty; includes at base a 0.1-ft. dark-brownish-gray siltstone with carbonaceous fragments; at 0.5 ft. above base a 0.05-ft. black carbonaceous shale; at 0.8 ft. above base a 0.3-ft. ironstone bed with common plant fragments-----	3.4
Sandstone, medium-gray, locally iron-stained in lower 12 ft., thin-slabby-weathering, obscurely bedded at base, very friable, medium- to very coarse grained (basal 0.3 ft.) grading upward to fine-grained near top, subangular to subrounded, clayey; includes a few medium-gray iron-stained platy-weathering siltstone beds in a 0.5-ft. zone 3.8 ft. above base; 3 brown-gray to olive-gray siltstone lenses or beds 8.3 ft.-9 ft. above base; a concretionary limy cross-bedded ironstone-bearing zone 12-16 ft. above base; dominantly well sorted and even textured near top-----	32.4

Siltstone, medium-gray, iron-stained, laminated to thin-bedded, very finely sandy, clayey; few plant fragments-----	0.3
Shale, medium- to dark-gray, deeply weathered; abundant plant fragments-----	0.4
Ironstone, medium-gray, iron-stained, nodular-weathering; abundant plant fragments-----	0.2
Claystone, light-brown, shard-like-weathering, obscurely bedded; plastic when wet; distinctive-----	0.3
Coal, blocky; includes at least 5 dark-brownish-gray iron-stained pyroclastic(?) siltstone partings up to 0.15 ft. thick-----	2.5
Shale, medium-gray, hackly-weathering, obscurely bedded, silty; some carbonaceous plant fragments; includes a 0.1-ft. black carbonaceous shale bed about 2.5 ft. above base; a 0.7-ft. bed of medium-gray fine-grained sandstone about 2.9 ft. above base; at 4.8 ft. above base a 0.2-ft. bed of medium-gray siltstone overlain by 0.3 ft. of black carbonaceous shale and bony coal; about 0.8-ft. bed of medium-gray fine-grained sandstone 0.6 ft. below top-----	9.7
Coal, bony; interbedded with carbonaceous shale; includes thin brown pyroclastic siltstone partings near top-----	0.3
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; common plant fragments-----	6.5
Coal, blocky, appears bony in large part; includes a 0.25-ft. parting of brownish-gray sandy pyroclastic siltstone about 0.8 ft. above base; a 0.25-ft. parting of dark-gray carbonaceous shale with coal stringers 1.3 ft. above base; upper part of unit contains 3 medium-brown lenticular siltstone partings up to 0.1 ft. thick; top 0.4 ft. of coal bed very bony-----	2.8
Sandstone, medium-gray, slabby-weathering, obscurely bedded, medium-grained, subangular, slightly silty; becomes siltstone in top one-half; includes ironstone concretions up to 0.4 ft. thick in upper part; lower contact sharp-----	3.

Siltstone, medium-gray, slabby- to uneven-weathering, thin-bedded, obscurely cross-bedded, clayey, very clayey in upper part; few plant fragments; includes a 2 ft. medium-gray concretionary hard limy siltstone with abundant plant remains in upper part; lower contact gradational-----	3.
Sandstone, medium-gray, slabby-weathering, obscurely bedded, medium-grained, subangular to subrounded, slightly clayey; few carbonaceous plant fragments-----	8.5
Siltstone, medium-gray, light-gray-weathering to horizontal plates up to 0.1 ft. thick, laminated, clayey; no plant fragments seen-----	2.
Shale, dark-brownish-gray to black, carbonaceous; basal 0.2 ft. mainly dark-brownish-gray siltstone-----	1.5
Siltstone, medium-gray, partly lightly iron-stained, hackly- to slabby-weathering, obscurely bedded, clayey; includes at base a medium-gray hard limy siltstone concretion zone, up to 2 ft. thick, with abundant plant fragments and leaf impressions; 3 beds of medium-gray slabby-weathering very thin bedded fine-grained clayey sandstone about 1 ft. thick separated by about 0.3-ft. beds of siltstone; very small ironstones in the upper 1 ft. of unit-----	11.
Shale, medium-gray, light-brown-weathering, iron-stained, carbonaceous; abundant plant fragments-----	0.4
Siltstone, medium-gray, slabby- to irregular hackly-weathering, obscurely bedded, clayey; scattered small coaly fragments; lower contact gradational-----	4.
Sandstone, medium-gray, locally lightly iron-stained, slabby-weathering, obscurely thin-bedded, very fine grained, subangular, silty, clayey-----	5.
Shale, medium-dark-gray, fissile; abundant coaly plant fragments-----	0.3
Shale, medium-gray; scattered carbonaceous fragments-----	0.7
Coal, bony-----	0.6
Shale, medium-dark-gray, partly iron-stained, platy- to flaky-weathering, silty, carbonaceous-----	0.3

Coal, blocky-----	2.5
Shale (1P-94)*, medium-gray, hackly-weathering, slightly plastic; some carbonaceous plant fragments-----	0.8
Coal, platy-weathering, bony-----	0.4
Siltstone, medium-gray, partly iron-stained, uneven- to slabby-weathering, obscurely thin-bedded; includes local concretionary bodies up to 2 ft. thick; some interbeds of medium-gray silty shale; upper 1 ft. harder and more iron-stained than lower part and contains common coalified plant fragments-----	6.3
Coal, platy-weathering, bony; interbedded with dark-gray fissile carbonaceous shale with abundant plant fragments-----	0.5
Siltstone, medium-gray, uneven slabby-weathering, thin-bedded, soft, very clayey; plant fragments; lower contact gradational-----	1.5
Sandstone, medium-gray, slabby-weathering, thin-bedded, fine-grained, subangular, silty, clayey; includes stringers of carbonaceous material; lower contact gradational-----	2.2
Siltstone, medium-gray, slabby- to blocky-weathering, thin-bedded, soft, very clayey, finely sandy-----	1.
Siltstone, medium-dark-gray, partly iron-stained, obscurely bedded, sandy, carbonaceous; some plant fragments; includes sandy siltstone concretions-----	1.
Sandstone, medium-gray, slabby-weathering, massive-appearing, fine-grained, subangular, silty, clayey; no plant fragments-----	3.4
Siltstone, medium-gray, partly iron-stained, hackly-weathering, massive-appearing; includes 0.3-ft. bed of medium-gray slabby-weathering fine-grained sandstone 0.9 ft. above base-----	3.5

- Coal, blocky; upper 1 ft. fissile to platy-weathering and bony; includes 0.2-ft. carbonaceous shale parting 1 ft. above base; lenticular parting, up to 0.2 ft. thick, of medium-brown siltstone containing scattered fine-grained spheroids of hydrous iron oxide 1.5 ft. below top; lower contact sharp----- 5.
- Sandstone, medium-gray, good slabby-weathering, thin-bedded, cross-bedded, laminated with carbonaceous plant material, very fine grained, silty, clayey; some coaly wood fragments; includes at base concretionary hard limy siltstone with many plant fragments----- 4.
- Siltstone, medium-gray, partly iron-stained, hackly- to slabby-weathering, obscurely bedded, soft, very clayey; includes 0.3-ft. bony coal 2 ft. below top----- 5.1
- Coal, blocky- to platy-weathering, bony; includes at 0.3 ft. above base a 0.4-ft. parting of medium-gray soft slightly plastic (when wet) clayey shale with coaly wood fragments; at 1.2 ft. above base a 0.7-ft. bed of medium-dark-gray fissile carbonaceous shale with coal stringers----- 2.3
- Siltstone, medium-gray, hackly-weathering, obscurely bedded, soft, clayey; no plant fragments; includes ironstone nodules up to 0.3 ft. thick about 1 ft. below top----- 4.5
- Sandstone, medium-gray, slabby-weathering, obscurely bedded, soft to well indurated, fine- to medium-grained, subangular, silty, clayey; includes hard limy concretions locally in lower 6 ft.; large coaly wood fragments in lower 6 ft.----- 11.8
- Coal, blocky- and platy-weathering; includes near middle 0.2-ft. parting of medium-dark-gray fissile carbonaceous shale with many plant fragments; near top 0.2-ft. parting of medium-brown fine-grained pyroclastic sandstone with abundant coal stringers and plant fragments----- 1.
- Siltstone, medium-gray, hackly- to slabby-weathering, obscurely bedded, clayey; no plant fragments----- 3.
- Shale, dark-gray, fissile, carbonaceous; some large woody plant fragments; includes interbeds of bony coal----- 0.4

Siltstone, medium-gray, partly iron-stained, slabby-weathering, very thin bedded, cross-bedded, partly very finely sandy, clayey; includes at base a 1.5-ft. concretionary hard limy siltstone with common plant fragments-----	2.
Siltstone, medium-gray, slabby-weathering, very thin bedded, clayey; interbedded with medium-gray slabby-weathering very thin bedded cross-bedded very fine grained sandstone; includes 3-ft. bed of medium-gray slabby-weathering very silty shale at base-----	11.5
Sandstone, medium-gray, slabby-weathering, thin-bedded, cross-bedded, fine-grained, subangular, silty, clayey; few coaly wood fragments-----	2.6
Sandstone, medium-gray, obscurely bedded, soft, fine-grained, silty, clayey; becomes medium-gray hackly-weathering thin-bedded cross-bedded siltstone in upper half-----	4.1
Shale, medium-gray, hackly-weathering, obscurely bedded, very silty; some carbonaceous plant fragments-----	0.7
Sandstone, medium-gray, slabby-weathering, obscurely bedded, fine- to medium-grained, subangular, silty, clayey-----	2.
Shale, medium-gray, hackly-weathering, obscurely bedded, very silty; some carbonaceous plant fragments-----	1.3
Sandstone, medium-gray, slabby-weathering, obscurely bedded, fine- to medium-grained, subangular, silty, clayey-----	0.7
Shale, medium-gray, hackly-weathering, obscurely bedded, very silty; lower 0.4 ft. hard limy concretionary shale with abundant plant fragments; lower contact sharp-----	2.2
Coal, blocky, bony at base and in upper 0.2 ft.; contains scattered fragments of arber; includes 0.2-ft. parting of medium-dark-gray to brownish-gray platy-weathering carbonaceous silty shale at 0.5 ft. above base; partings up to 0.05 ft. thick of medium-brown pyroclastic claystone, siltstone, and black carbonaceous silty shale in 0.3-ft. zone 0.8 ft. below top; lower contact sharp-----	3.3

Sandstone, medium-gray, slabby-weathering, thin-bedded, locally prominently cross-bedded, friable, fine- to medium-grained, subangular, silty, clayey; near middle becomes iron-stained, hard, limy, and concretionary (concretions up to 0.8 ft. thick by 2 ft. long); lower contact fairly sharp-----	2.9
Siltstone, medium-gray, partly iron-stained, hackly- to slabby-weathering, thin-bedded, clayey; few scattered large coal fragments randomly oriented; includes 0.2-ft. bed near top of medium-dark-gray laminated to fissile carbonaceous shale with abundant small plant fragments-----	2.3
Coal, platy, bony; upper part becomes medium-dark-gray platy carbonaceous shale; lower contact wavy-----	0.6
Shale, medium-dark-gray, partly iron-stained, blocky- to hackly-weathering, thin-bedded, silty; abundant plant fragments-----	0.6
Shale, black, carbonaceous; includes bony coal-----	0.2
Sandstone, medium-gray, partly iron-stained, slabby-weathering, cross-bedded, limy, very fine to fine-grained, silty, clayey; becomes more silty and weathers blocky to hackly with some iron-staining in upper 0.8 ft.; includes local concentrations of large coaly plant fragments; interlaminae of carbonaceous material in lower 1 ft.-----	4.1
Siltstone, medium-gray, light-gray slabby-weathering, obscurely bedded, subconchoidal-fracturing; some large plant fragments; includes fine-grained sandstone interbeds in upper part-----	2.
Shale, medium-light- to medium-gray (wet), hackly- to slabby-weathering, obscurely thin-bedded, mostly carbonaceous, slightly silty; becomes very carbonaceous in lower half; includes at base 0.1-ft. bed of bony coal; at top 0.25-ft. zone of bony coal and interbedded carbonaceous shale with stringers of medium-brown pyroclastic siltstone-----	1.3
Siltstone, medium-gray, partly iron-stained, ledge-forming (single bed), limy, clayey; abundant plant fragments randomly oriented-----	1.4

- Shale, medium-gray, obscurely bedded; includes 0.1-ft. bed of bony coal or coaly carbonaceous shale 0.4 ft. below top----- 1.4
- Sandstone, medium-gray, slabby-weathering, massive-appearing, probably thin-bedded, fine-grained (base) grading upward to very fine grained (top), sub-angular, silty, clayey; carbonaceous plant fragments; includes 1-ft. bed of medium-gray silty shale about 3 ft. above base; scattered ironstone concretions up to 0.1 ft. in diameter in middle; 0.5-ft. bed of medium-gray hackly-weathering silty shale 1.5 ft. below top----- 8.2
- Coal and interbedded shale; coal beds up to 0.7 ft. thick; shale, medium- to dark-gray, iron-stained, obscurely to platy-bedded, partly carbonaceous; plant fossils; 0.1-ft. lenticular parting of medium- to light-brown-weathering siltstone (pyroclastic?); 0.5-ft. lense of brownish-gray to medium-gray hard nonlimy ironstone with abundant plant fragments 1 ft. below top----- 5.
- Sandstone, medium-gray, partly iron-stained, slabby-weathering, obscurely thin-bedded, friable, fine-grained; becomes very fine grained in upper part; includes coaly wood fragments in lower part----- 2.6
- Coal, blocky; bony in basal 0.3 ft. and 0.2-ft. bed 1.7 ft. above base; upper 2.2 ft. includes interbedded medium-dark- to dark-gray partly carbonaceous shale, with plant fragments and coal stringers, and 4 bony coal beds up to 0.2 ft. thick----- 4.1
- Sandstone, medium-gray, slabby-weathering, obscurely thin-bedded and cross-bedded, massive-appearing, partly limy, even-textured, medium- to very fine grained, subangular, clayey, silty; becomes finer grained toward top and grades to sandy clayey siltstone in top 1 ft.; scattered coal fragments; abundant carbonaceous material near middle; includes limy concretions in lower 3 ft.----- 14.2
- Shale, medium-dark-gray, platy- to very thin bedded; basal 0.6 ft. carbonaceous with bony coal stringers in upper 0.2 ft.; includes 0.5-ft. coal bed 1.35 ft. above base; a limy concretionary siltstone with abundant large plant fragments in upper 0.8 ft.----- 2.65

- Sandstone, medium-gray, slabby-weathering, thin-bedded, indistinctly cross-bedded, fine- to very fine grained, silty, clayey, micaceous; few carbonaceous plant fragments; grades to medium-gray sandy clayey siltstone with weathering characteristics of shale in upper 2 ft.----- 8.
- Siltstone, medium-gray, hackly-weathering, massive-appearing to obscurely laminated (mostly laminated in basal part), very clayey; grades to medium-gray shale in upper 3 ft.; includes light-brownish-gray ironstone nodules up to 0.2 ft. in diameter about 4.5 ft. above base; 0.6-ft. ironstone zone 0.3 ft. below top----- 8.6
- Sandstone, medium-light-gray, slabby- to massive-weathering, obscurely thin bedded, fine-grained, silty, clayey; grades upward to siltstone; lower contact sharp----- 4.3
- Sandstone, medium-light-gray, light-brownish-gray-weathering, thin-bedded, prominently festoon cross-bedded, friable to moderately indurated, locally limy, medium-grained, locally coarsely sandy to pebbly, subangular, silty; contains large coal fragments; includes common light-brown to light-olive-brown clay grains (volcanic?); locally forms limy concretionary bodies up to 3.7 x 15 ft.; forms massive rounded ledges----- 3.7
- Coal; includes 0.1-ft. parting of brownish-black very carbonaceous shale (almost bone coal) 0.8 ft. above base; 0.3-ft. parting of brownish-gray siltstone 1.3 ft. above base; 0.3-ft. parting of dark-gray carbonaceous shale 0.35 ft. below top; few bony coal partings up to 0.1 ft. thick----- 4.7
- Shale (1P-72)*, dark-gray to black, platy-bedded, plastic when wet in upper 0.2 ft.; some plant fragments; includes a 0.1-ft. coal bed 0.3 ft. above base----- 0.6
- Shale, medium-light- to medium-gray (wet), locally iron-stained, hackly-weathering, massive, locally limy, silty; few plant fragments; includes at top 0.3-ft. bed of brownish-gray-weathering nodular siltstone with abundant plant fragments----- 5.7

*Palynological sample

Coal, blocky, mostly bright; scattered white medium-grained pyroclastic(?) particles; includes 2 lenticular partings, up to 0.05 ft. thick, of brown siltstone near middle; upper contact poorly exposed; lower contact covered----- 2.3

Note: Beginning at the exposure of the coal described above, near the center of the SW 1/4 sec. 6, T. 6 S., R. 14 W. and extending northwest for nearly 2 miles, Pleistocene deposits cover the Seluga Formation discontinuously for distances as great as 1/2 mile. These deposits may conceal a fault in the Seluga near the coal exposure described above, but conclusive proof is lacking. The coal described below is exposed along the beach near the west line of sec. 36, T. 5 S., R. 15 W.

Coal, blocky, bright in part; basal 0.15 ft. dark-brownish-gray sandy siltstone (IP-68)* with abundant carbonaceous material; includes 0.3-ft. parting of dark-gray to black platy-weathering carbonaceous shale (IP-68)* 1.5 ft. above base; lenticular partings, up to 0.1 ft. thick, of medium-brown platy-bedded very fine grained sandstone 1.4 ft. below top; upper contact covered by slumpy Pleistocene sediments----- 4.

Sandstone, medium-gray, slabby- to blocky-weathering, obscurely thin-bedded, cross-bedded, very fine to medium-grained, subangular, silty, clayey; becomes very fine grained and more silty and clayey in upper half; locally includes limy concretions up to 3 x 15 ft.----- 28.5

Coal, bony----- 0.3

Shale, dark-gray to black; abundant carbonaceous wood fragments----- 0.6

Coal, woody; interlaminated with black platy-weathering fissile carbonaceous shale----- 0.4

Sandstone, medium-gray, slabby-weathering, thin-bedded, cross-bedded, very fine to fine-grained, subangular to subrounded, silty, clayey; abundant small carbonaceous plant fragments----- 1.5

Shale, medium-gray, platy-bedded; abundant very thin coaly wood fragments parallel to bedding----- 0.8

*Palynological sample

Shale, medium-gray, poor slabby-weathering, obscurely bedded, clayey; abundant coaly plant fragments-----	2.1
Shale, dark-gray, fissile, carbonaceous; lower contact gradational-----	0.2
Coal, mostly blocky; includes few stringers of brown sandstone up to 0.01 ft. thick-----	1.8
Shale, dark-gray, fissile, carbonaceous; many plant fragments; includes near middle a 0.4-ft. bed of brownish-gray concretionary siltstone with abundant plant fragments-----	2.4
Coal, platy at top and base; scattered white medium-grained pyroclastic(?) particles; includes at 0.6 ft. above base a 0.4-ft. parting of medium-brown very fine grained pyroclastic sandstone interbedded with many thin coal stringers-----	1.5
Note: A slump block or channel fill of Pleistocene deposits, possibly 300 yd. wide, separates the rocks described above from those described below and may conceal a fault.	
Coal; includes 1-ft. parting of medium-gray to pale-brown pyroclastic(?) shale about 0.5 ft. above base; poorly observed-----	about 5.
Sandstone, medium-gray, massive-appearing, mostly fine-grained, locally medium-grained and coarse- to very coarse grained in basal 1 ft., subangular, silty, clayey; locally forms limy concretions containing many large woody coal fragments; includes few carbonaceous shale stringers up to 0.1 ft. thick; upper half becomes medium-gray slabby-weathering massive-appearing siltstone (<u>1P-63</u> -- from top 1 ft. of unit)* with scattered plant fragments-----	about 13.5
Coal, blocky; includes several medium-brown fine-grained pyroclastic sandstone partings, up to 0.1 ft. thick, in lower 1.5 ft. and upper 2 ft.; a 0.6-ft. parting of medium-grained siderite spheroids, altering to hydrous iron-oxide, in dark-gray clay matrix at 1.5 ft. above base-----	4.5
Claystone, medium-gray, hackly-weathering; obscurely bedded; scattered plant fragments-----	0.6

*Palynological sample

Siltstone, medium-gray, thin-bedded; some carbonaceous plant fragments; lower contact gradational-----	1.
Sandstone, medium-gray, slabby-weathering, very thin bedded, cross-bedded, soft, very fine to fine-grained, subangular, silty, clayey; includes few carbonaceous laminations-----	2.
Shale, black, fissile, carbonaceous; includes coal stringers-----	0.4
Shale, medium-gray, slabby-weathering, very thin bedded; abundant plant fragments on bedding planes; lower contact somewhat gradational-----	2.
Coal, mostly bony; forms beds up to 0.5 ft. thick; contains amber grains; includes numerous partings of dark-gray to brownish-gray fissile carbonaceous shale with abundant woody coal and small plant fragments; a lenticular bed (up to 0.7 ft. thick) of brownish-gray very fine grained very clayey sandstone with carbonaceous plant fragments near middle of unit; a 0.6-ft. bed of medium-light-gray hackly-weathering shale with scattered plant fragments near top-----	3.
Shale (<u>1P-59</u> -- from top 0.5 ft. of unit)*, medium-gray to brown, partly iron-stained, hackly-weathering, obscurely bedded; brown and carbonaceous at top; lower contact gradational-----	0.6
Sandstone, medium-gray, partly iron-stained, slabby-weathering, obscurely bedded, probably thin bedded, very fine grained, silty, clayey; no plant fragments seen-----	2.2
Shale, medium-dark- to dark-gray (wet), carbonaceous; lower contact gradational-----	0.3
Shale, medium-gray, locally iron-stained, hackly-weathering, obscurely bedded, silty, slightly plastic (wet)-----	1.
Siltstone, medium-light- to medium-gray (wet), slabby-weathering, obscurely thin-bedded, clayey-----	3.
Siltstone, medium-light- to medium-gray (wet), locally iron-stained, hackly-weathering, obscurely bedded, clayey; no carbonaceous fragments seen-----	1.3

*Palynological sample

Sandstone, medium-gray, hackly- to slabby-weathering, massive-appearing, probably very thin bedded, very fine to fine-grained, silty, clayey; few carbonaceous plant fragments; lower contact gradational-----	4.
Shale, medium-gray, locally iron-stained (on fractures), hackly-weathering, obscurely bedded-----	2.
Coal, fissile, bony; almost a carbonaceous shale; lower contact gradational-----	0.2
Clay, medium-gray, obscurely bedded, plastic; small randomly oriented carbonaceous plant fragments-----	0.4
Sandstone, medium-gray (wet), locally iron-stained, poor slabby-weathering, mostly soft, fine-grained, sub-angular; many plant fragments (probably roots); iron-stained zone in middle contains concretions up to 0.5 ft. thick-----	2.
Shale, dark-gray, fissile, carbonaceous; some woody plant fragments-----	0.3
Shale, medium-light- to medium-gray (wet), hackly-weathering, obscurely bedded; some carbonaceous fragments-----	2.6
Sandstone, medium-gray (wet), partly iron-stained, slabby-weathering, probably thin-bedded, very fine grained, silty, clayey; some carbonaceous plant fragments; lower contact sharp-----	2.
Shale, black to brownish-gray, laminated, carbonaceous; includes coal stringers; grades in upper part to blocky bony coal; lower contact gradational-----	1.2
Siltstone, medium-gray (wet), blocky-weathering, locally obscurely laminated, soft, clayey; includes black coaly shale, 0.1 ft. thick, at 0.5 ft. above base (probably pinches out laterally); clayey zone at 3.8 ft. above base containing nonlimy ironstone concretions up to 0.3 ft. thick-----	6.5
Siltstone, medium-dark-gray, obscurely bedded, conchoidal-fracturing, hard, dense, limy, very finely sandy; few carbonaceous plant fragments-----	1.8

Sandstone, medium-gray, obscurely thin-bedded, fine-grained, very silty, clayey, locally partly concretionary; interbedded with siltstone and shale; includes at base 0.1-ft. bed of black bony carbonaceous shale overlain by 2-ft. bed of medium-gray silty shale; poorly observed-----	12.
Sandstone, medium-gray, slabby-weathering, massive, fine- to very fine grained, subangular, clayey; very clayey and hackly-weathering in upper half-----	3.7
Shale, medium- to medium-dark-gray (wet), silty; carbonaceous in upper part-----	1.5
Siltstone, medium-gray, slabby-weathering, massive, finely sandy, clayey; abundant small carbonaceous fragments in lower 1 ft.-----	4.2
Coal, blocky; includes several stringers of medium-brown pyroclastic siltstone; laterally unit changes to medium-dark-gray shale 1.3 ft. thick-----	0.7
Shale, dark-gray, carbonaceous; includes bony coal stringers in lower part-----	0.3
Sandstone, medium-gray, slabby-weathering, massive-appearing, very fine to fine-grained, subangular, silty, clayey; includes 1-ft. bed of medium-gray silty shale at base; scattered coal stringers and 0.3-ft. coal lense at 1.5 ft. below top; locally this unit becomes medium-light-gray fine- to coarse-grained subangular silty sandstone, at least 8 ft. thick, and fills a channel cut in the underlying units-----	3.9
Coal, blocky, bony in basal 0.2 ft.; some amber blebs; cut by channeling locally-----	1.7
Sandstone, medium-gray, slabby-weathering, irregular platy- to thin-bedded, locally cross-bedded, very fine to fine-grained, silty, clayey; grades upward to siltstone in upper 2 ft.; includes 0.2-0.3-ft. bed of medium-dark-gray claystone at top; large randomly oriented coal fragments; lower contact gradational-----	4.6

- Shale, medium-dark-gray to black, slabby-weathering, very thin bedded; includes carbonaceous fragments and many thin coal stringers at base; becomes black and carbonaceous near middle; lower contact uneven and wavy----- 3.
- Coal, blocky; includes dark-gray carbonaceous shale partings 0.1 ft. thick at 0.6 ft. above base and 0.4 ft. thick at 1.1 ft. above base; 0.25-ft. lenticular bed of medium-brown pyroclastic siltstone with many coal fragments at 2.6 ft. above base----- 4.5
- Siltstone and interbedded sandstone; siltstone, medium-light- to medium-gray (wet), slabby-weathering, laminated to very thin bedded, cross-bedded (very small scale), clayey; small carbonaceous plant fragments; sandstone, medium-gray (wet), slabby-weathering, laminated to very thin bedded, cross-bedded, very fine grained, silty; includes interbeds of medium-gray silty shale; numerous coal stringers in lower 1 ft.; scattered ironstone concretions up to 0.3 x 0.5 ft. near middle and upper 1 ft.----- 7.5
- Coal; includes at base 1.25-ft. blocky coal bed with common blebs of amber; at least 4 partings of medium-dark-gray thin-bedded shale up to 0.6 ft. thick (mostly in upper part); lenses and partings of medium-brown obscurely bedded very silty claystone with numerous randomly oriented coal fragments at 1.25 ft. above base----- 5.
- Sandstone, medium-light- to medium-gray (wet), slabby-weathering, massive-appearing, probably very thin bedded, obscurely thin-bedded near top, fine- to very fine grained, subangular, silty, clayey; includes few large contorted lense-shaped coaly fragments; shale stringers up to 0.1 ft. thick in lower part; clayey shale bed, 0.2 ft. thick, at 1.1 ft. above base; lower contact sharp----- 4.7
- Shale, medium- to medium-dark-gray (wet), massive, silty; includes 0.5-ft. bed of medium-gray hard noncalcareous siltstone with abundant small carbonaceous fragments at 0.9 ft. below top; coal stringers and dark-gray platy carbonaceous partings in upper 0.9 ft.----- 3.2

Coal, blocky; includes pale-brown to medium-dark-gray lenticular shale parting, up to 0.5 ft. thick, of pyroclastic origin at 0.9 ft. above base; dark-gray shale parting 0.2 ft. thick at 0.1 ft. below top-----	1.8
Shale, medium-gray, slabby-weathering, obscurely thin bedded, uneven fracturing, silty; very silty in upper part; grades at top to 0.7-ft. bed of brownish-gray plastic (when wet) claystone (IP-41)* with many carbonaceous fragments-----	9.
Claystone, medium-gray, hackly-weathering, obscurely bedded, plastic (when wet), silty-----	1.
Sandstone, medium-gray, slabby-weathering, massive to thin-bedded, tight, compact, soft, fine-grained, subangular to angular, silty, clayey; grades upward to sandy siltstone (thin bedded in upper part); locally includes limy concretionary bodies up to 5 x 15 ft.-----	14.5
Note: Northwest of the sandstone described above, a slide area about 100-150 yards wide shows much distorted and slumpy Beluga rocks. A fault may be concealed in this area, but no definite evidence was found.	
Coal, weathered, bony; includes a few thin partings of gray shale; locally overlain by Pleistocene deposits-----	1.
Siltstone, medium-gray (wet), massive-appearing, clayey; interbedded with shale; few carbonaceous laminations; few coal beds up to 0.1 ft. thick in lower 3 ft.-----	11.5
Coal, mostly bony; poorly observed-----	3.
Sandstone, medium-light-gray (wet), massive, soft, friable, fine-grained, subangular, clayey in top 1 ft.; no plant fragments; includes thin interbeds of medium-gray soft very clayey siltstone-----	32.
Shale, medium-gray, blocky-weathering, massive, very silty-----	3.8
Coal, blocky, partly bony-----	1.
Claystone, medium-brown, hackly-weathering, lenticular, plastic; abundant small plant fragments-----	0.3

*Palynological sample

Coal, blocky-----	0.6
Siltstone, medium-brown, platy-bedded, finely sandy; may be pyroclastic; abundant carbonaceous material and plant fragments-----	0.7
Coal, blocky; some impure bony beds in basal part-----	1.7
Claystone (1P-35)*, medium-gray, hackly- to uneven-weather- ing, obscurely bedded, silty; small carbonaceous frag- ments; includes 0.2-ft. bony coal bed near middle-----	1.4
Coal, blocky-----	2.
Siltstone, medium-gray to light-greenish-gray, hackly- to slabby-weathering, thin-bedded, soft, tight, very clayey; upper 3 ft. includes large randomly oriented plant fragments; partly covered-----	20.
Siltstone and interbedded sandstone; siltstone, medium- gray, hackly- to slabby-weathering, obscurely thin- bedded, tight, compact, clayey; sandstone, medium- gray, hackly- to slabby-weathering, obscurely thin- bedded, tight, compact, fine-grained, silty; unit contains few carbonaceous fragments; upper 1-2 ft. locally concretionary; lower contact sharp and wavy-----	20.
Coal, blocky; few amber blebs; includes 0.2-ft. brownish- gray shale parting (1P-32)* with many carbonaceous fragments at 0.7 ft. above base; light-brown pyro- clastic clayey sandstone with many carbonaceous plant fragments in several thin partings and lenses up to 0.2 ft. thick; several thin black carbonaceous shale partings; partings become more common in upper 1 ft.; lower contact sharp-----	3.5
Sandstone, medium-gray, locally light-brownish-gray, slabby-weathering, obscurely bedded, tight, fine- to very fine grained, subangular, silty, clayey; includes randomly oriented thin coal stringers and fragments; lower contact sharp-----	2.2
Coal, blocky; blebs of amber; includes few light-brown pyroclastic partings, up to 0.05 ft. thick, be- coming more numerous in top 0.5 ft.; lower contact sharp-----	2.

*Palynological sample

Shale, medium-gray, hackly- to uneven-weathering, massive, silty; some coalified plant fragments; locally becomes brownish-gray claystone with common plant fragments----- 6.

Note: Northwest of the shale described above, a large slide area or channel fill of Pleistocene sediments covers the Beluga Formation. A fault probably cuts the Beluga on the southeast side of this area, but the displacement is unknown.

Siltstone, medium-gray, blocky-weathering, massive, not limy, clayey; no plant fragments; top of unit inaccessible and covered by Pleistocene sediments; poorly observed-----estimated 10.

Shale, medium-dark-gray, blocky-weathering, massive, very silty; includes 2 black carbonaceous shale beds (locally becoming bone coal), up to 0.5 ft. thick, at top and base of unit; poorly observed-----estimated 6.

Sandstone, light-gray, partly iron-stained, blocky-weathering, thin- to medium-bedded, soft, friable, partly limy, fine- to medium-grained, subangular, silty, clayey; poorly observed-----estimated 15.

Sandstone, medium-light-gray, prominatly cross-bedded, soft, very friable to well indurated, locally partly limy, fine- to medium-grained (some coarse grains), subangular to subrounded; includes scattered pebble-conglomerate lenses, up to 0.1 ft. thick, in bottoms of festoon cross-bed sets; limy concretionary bodies up to 5 x 20 ft.; few lenses and fragments of coal up to 0.1 ft. thick; includes at base conglomerate lenses, up to 0.5 ft. thick, of pebbles and well rounded cobbles (up to 0.4 ft. in diameter) and lenses, up to 0.3 ft. thick, of medium-gray locally iron-stained obscurely bedded shale with carbonaceous stringers and a few pebbles; lower contact disconformable----- 47.5

Coai, common blebs of amber; includes 0.25-ft. bed of medium-dark-gray carbonaceous sandy siltstone at 1.7 ft. above the base; some thin partings of brown pyroclastic material----- 3.1

Sandstone, medium-gray, blocky-weathering, obscurely thin- to platy-bedded, very fine grained, subangular, silty, clayey; includes 0.5-ft. beds of shale at base and top; at 0.8 ft. above base a 0.5-ft. coal lense underlain by a thin bed of claystone (1P-21)*-----	4.4
Coal, mostly bony; some bright streaks; includes 0.05-ft. parting of brownish-gray siltstone at 0.15 ft. above base-----	0.6
Shale, medium-dark-gray, hackly-weathering, obscurely bedded, silty; some plant fragments; lower contact gradational-----	1.
Sandstone, medium-gray, slabby-weathering, obscurely thin-bedded, massive-appearing, cross-bedded, soft, partly slightly limy, fine- to very fine grained, silty, clayey, very "dirty"; includes "wisps" of carbonaceous material; grades upward to sandy silty shale; lower contact gradational-----	10.7
Shale, medium-dark-gray, obscurely bedded, silty; no plant fragments-----	0.4
Siltstone, medium-gray, obscurely bedded, very limy; abundant carbonaceous plant fragments; forms single bed; lower contact sharp-----	1.1
Shale, medium-dark-gray, carbonaceous-----	0.2
Coal, bony-----	0.6
Shale, medium-dark-gray, obscurely bedded; some carbonaceous fragments-----	0.6
Coal, mostly bony; few amber blebs; includes 0.2-ft. parting of fine-grained silty carbonaceous sandstone-----	2.7
Sandstone, medium-gray, obscurely thin-bedded, soft to well indurated, locally partly limy, very fine to coarse-grained, subangular to subrounded; locally forms limy concretions up to 5 x 20 ft.; lower 2 ft. grades to very silty shale with plant fragments-----	9.5
Shale, medium-dark-gray, carbonaceous, partly very clayey; includes 0.1-ft. impure coal bed at base and brown pyroclastic lenses up to 0.2 ft. thick; unit probably becomes more coaly laterally-----	1.8

*Palynological sample

Sandstone, medium-gray, massive, soft, fine- to medium-grained, subangular, silty, clayey; leaf impressions in part; includes medium-gray shale lenses, up to 1 ft. thick, with minor amounts of coal; upper 2.5 ft. fine grained, more silty, clayey, and poorly laminated-----	10.5
Shale, dark-gray, platy- to thin-bedded, slightly silty; abundant carbonaceous plant fragments; includes 0.1-ft. coal bed at base; coal stringers at top-----	1.
Sandstone, medium-gray, blocky-weathering, laminated, cross-bedded, massive-appearing, soft, tight, very fine to fine-grained, subangular, silty, clayey-----	2.8
Shale, medium-dark-gray, massive, silty; carbonaceous plant fragments and grains of amber-----	1.7
Coal; includes claystone parting, 0.05 ft. thick at 0.5 ft. above base; very thin brown partings of possible pyroclastic origin in upper 0.5 ft.-----	3.
Claystone, medium-gray, hackly-weathering, obscurely bedded, silty; some carbonaceous plant fragments-----	0.9
Sandstone, medium-gray, slabby-weathering, massive-appearing, locally indistinctly cross-bedded, poorly indurated, fine- to very fine grained, subangular, silty, clayey; becomes more silty and finer grained in upper half; includes carbonaceous laminations in lower 1 ft.-----	3.
Shale, medium-gray, partly iron-stained, obscurely bedded, silty; carbonaceous plant fragments-----	1.4
Coal, common amber blebs; medium-brown lenses of pyroclastic origin, up to 0.05 ft. thick, in upper 0.5 ft.-----	1.5
Shale, medium-dark-gray, locally iron-stained, loose shard-like weathering, lenticular; some carbonaceous plant fragments; includes discontinuous coal bed, 0.05 ft. thick, at base-----	0.2-0.5
Shale (1P-6)*, medium- to dark-gray, blocky-weathering, obscurely bedded, silty; many randomly oriented very thin carbonaceous stringers, coal stringers, and coal films; lower contact gradational-----	1.6

*Palynological sample

Sandstone, medium-light-gray, obscurely cross-bedded,
 coarse- to fine-grained, subangular to subrounded,
 silty, clayey; becomes finer grained toward top----- 1.5

Note: The rocks described above probably are separated
 from those described below by a fault of unknown
 displacement.

Sandstone, medium-light-gray, slightly iron-stained,
 slabby-weathering, massive to locally very thinly
 cross-bedded, fine- to medium-grained, subangular
 to subrounded, silty; becomes very fine grained
 and silty at top; includes scattered coal lenses;
 overlain by inaccessible coal bed----- 13.

Shale, brownish-gray, blocky-weathering, obscurely bedded,
 silty; some carbonaceous plant fragments----- 0.4

Shale, medium- to dark-gray, fissile to platy-bedded;
 carbonaceous plant fragments----- 1.

Coal, platy, bony----- 0.3

Clay, light-brownish-gray to olive-gray (wet), soft,
 plastic (wet), silty; some small plant fragments----- 0.4

Sandstone, medium-light-gray, slabby-weathering, massive
 to locally faintly cross-bedded, soft, fine- to
 medium-grained (few small lenses of coarse grains),
 silty; includes coal lenses, up to 0.1 ft. thick,
 in shaly zone 2-3 ft. above base; lower contact
 sharp----- 10.5

Shale (1P-2)*, medium-light-gray to slightly brownish-gray,
 obscurely bedded, soft, slightly silty; includes
 0.1-ft. bed of black carbonaceous shale (1P-2)*
 with very thin stringers and films of coal at base;
 locally forms limy concretions that contain plant
 remains; unit includes carbonaceous plant fragments----- 0.5-0.9

Coal, blocky, weathered; no partings----- 3.

Siltstone (1P-1)*, medium-gray to brownish-gray, massive,
 soft, very finely sandy, clayey; few small plant
 fragments; lower contact covered----- 2.

Bottom of measured section at base of sea cliff on south-
 east side of fault zone (about 200-300 yards wide).

*Palynological sample

Measured section 1b

Location: Hillside and sea-cliff exposures below Bluff Point 2, near center NE 1/4 sec. 16, T. 6 S., R. 14 W., generally northwestward to mouth of Diamond Creek, SW corner SE 1/4 NW 1/4 sec. 8, T. 6 S., R. 14 W., Seldovia C-5 quadrangle. This measured section includes localities 88-90, and lies near locality 107, of Barnes and Cobb (1959, pl. 18).

	Feet
Pleistocene gravel	
Unconformity	
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Sandstone, medium-gray, iron-stained in part, obscurely bedded, friable, fine-grained, subangular, silty; includes 3 interbeds, 0.1 ft. thick, of medium-gray sandy siltstone in lower 2 ft.-----	3.5+
Siltstone, medium-gray, obscurely bedded, sandy, clayey; some carbonaceous plant fragments; includes irregular dikes and masses of interconnected sandstone similar to overlying unit-----	1.7
Sandstone, medium-gray, iron-stained, slabby-weathering, obscurely bedded, friable, fine-grained, subangular; poor cliff former-----	3.5
Siltstone, medium-gray, deeply iron-stained, weathered, obscurely bedded, clayey; many plant fragments; includes limy siltstone concretions up to 0.4 ft. thick-----	0.5
Coal, blocky, weathered-----	1.4
Siltstone, medium-gray, brownish-gray (upper 0.3 ft.), iron-stained, hackly-weathering, obscurely bedded, clayey; includes 0.05-ft. bed of dark-gray very carbonaceous shale about 0.5 ft. above base; ironstone nodules up to 0.2 ft. thick at 10 ft. above base; interlamination of siltstone and very fine grained sandstone at 10-11 ft. above base and coal stringers 0.05 ft. thick at 11 ft. above base-----	15.6

Sandstone, medium-light-gray, iron-stained, obscurely bedded, very fine grained, subangular to subrounded, clayey; contact fairly sharp-----	1.1
Siltstone, medium-gray, partly iron-stained, hackly-weathering, very clayey; carbonaceous plant fragments; includes thin interbeds of medium-gray silty shale; ironstone nodules up to 0.2 ft. thick at 2 and 9 ft. above base-----	12.
Sandstone, medium-gray (wet), slabby-weathering, obscurely bedded, very friable, very fine grained, subangular to subrounded, slightly silty-----	2.7
Ironstone, medium-gray, nodular(?); many plant fragments-----	0.5
Siltstone, medium-gray, locally very iron-stained, hackly-weathering, obscurely bedded, clayey; carbonaceous plant fragments; lower contact sharp-----	4.8
Sandstone, medium-gray, slightly iron-stained, slabby- to massive-weathering, very friable, fine- to medium-grained, subangular to subrounded; lower contact sharp-----	4.
Sandstone, medium-gray to olive-gray, blocky- to platy-weathering, hard, very fine grained, subangular to subrounded, very silty, clayey; abundant plant fragments; lower contact sharp-----	0.65
Sandstone, medium-light-gray, partly very iron-stained, thin-bedded, prominently cross-bedded (bedding appears contorted in upper half), friable, medium-grained (basal part) becoming finer grained upward, subangular to subrounded; locally includes concretionary sandstone bodies up to 2 ft. thick near middle-----	20.3
Coal, blocky; bony at base and top-----	0.5
Sandstone, medium-gray, bluish-gray slabby-weathering, probably very thin bedded, even-textured, very fine to fine-grained, subangular to subrounded, very clayey; some carbonaceous plant fragments-----	8.9
Shale, dark-gray; abundant plant fragments; includes large coalified logs at top-----	0.4

Coal, weathered; includes some bony coal partings; locally appears to have one lenticular parting above middle (not accessible)-----	4.25
Siltstone, medium-gray, partly iron-stained, platy- to hackly-weathering, obscurely bedded, hard, clayey; carbonaceous plant fragments; includes ironstone nodules up to 1 ft. thick about 3 ft. below top; lower contact gradational-----	5.
Sandstone, medium-gray, slabby- to hackly-weathering, laminated to very thin bedded, partly friable, very fine to coarse-grained, subangular to subrounded, clayey; very fine grained and very clayey in upper half; includes coal stringers and carbonaceous laminations in lower 0.2 ft.; lower contact sharp-----	3.
Siltstone, medium-gray, platy- to hackly-weathering, poor platy- to very thin bedded, clayey; many carbonaceous plant fragments; lower contact fairly sharp-----	2.7
Sandstone, medium-gray, slabby-weathering, mostly thin-bedded, very fine to fine-grained, subangular to subrounded, clayey; includes near middle few thin beds of medium-gray siltstone with carbonaceous plant fragments; lower contact sharp-----	4.
Siltstone, medium-gray, partly iron-stained, platy- to hackly-weathering, poor platy-bedded, clayey; carbonaceous plant fragments-----	2.
Shale, black, fissile to platy-bedded, carbonaceous; abundant plant fragments and bony coal stringers; medium-gray ironstone lense up to 0.4 ft. thick; lower contact gradational-----	0.5
Coal, mostly blocky, weathered; probably bony at top and base; no partings-----	1.3
Shale (1P-206)*, medium-gray, obscurely bedded, silty; many randomly oriented carbonaceous plant fragments; few thin coal stringers near middle and top; includes lenticular bed (0.05 ft. thick) of medium-gray very fine grained sandstone and 0.1-ft. bed of dark-gray carbonaceous shale at top-----	1.

*Palynological sample

- Sandstone, medium-gray, very iron-stained (lower 1 ft.), slabby-, platy-, and hackly-weathering, locally cliff-forming, obscurely very thin to thin-bedded, cross-bedded, friable, medium- to coarse-grained (lower 1 ft.) grading upward to very fine to fine-grained (upper 6.7 ft.), subangular to subrounded, silty, clayey; becomes more silty and clayey upward; includes 0.05-ft. bed of sandy siltstone 2.5 ft. above base; interbeds of medium-gray siltstone in upper 6.7 ft.; few ironstone nodules (0.3 ft. thick) at 0.3 ft. below top; lower contact sharp and uneven----- 14.7
- Siltstone, medium-gray, platy- to blocky-weathering, poor platy-bedded, very finely sandy, clayey; many randomly oriented plant fragments; probably cut out by overlying sandstone locally; lower contact sharp----- 0.8
- Sandstone, medium-gray, hackly- to blocky-weathering, obscurely very thin to thin-bedded, very fine grained, subangular to subrounded, mostly micaceous and very clayey; mostly abundant randomly oriented plant fragments----- 2.3
- Shale, medium-gray, slightly iron-stained, hackly- to platy-weathering, silty; few carbonaceous plant fragments; includes ironstone concretions at about 5 ft. above base; lower contact gradational----- 11.3
- Sandstone, medium-gray, laminated, friable, very fine grained, subangular to subrounded; carbonaceous plant fragments; lower contact gradational----- 3.
- Siltstone, medium-gray, platy-bedded, clayey; few carbonaceous plant fragments; lower contact gradational----- 1.
- Siltstone, medium-gray, platy-weathering, thin-bedded, clayey, sandy; interlaminated with medium-light-gray very fine grained clayey sandstone; carbonaceous plant fragments; lower contact sharp----- 4.

Sandstone, medium-gray, medium-light-gray-weathering, cliff-forming, slabby-weathering (upper part), very thin to thin-bedded, prominently cross-bedded (sets 1-3 ft. thick), friable, fine- to coarse-grained (lower part) grading upward to very fine grained (upper 4.6 ft.), subangular to subrounded; few large coalified wood fragments; includes thin (up to 0.1 ft.) iron-stained clayey siltstone beds or lenses at about 10 ft. above base, locally concretionary at 10 ft. above base; lower contact sharp and possibly disconformable-----	15.6
Shale, medium-gray to medium-brown, hackly-weathering, very silty, very finely sandy; abundant carbonaceous plant fragments; coal stringers at base and top; includes in upper part hard limy siltstone concretions with abundant small plant fragments-----	4.6
Sandstone, medium-gray, partly iron-stained, poor platy-weathering, very thin bedded, partly laminated, cross-bedded, very fine grained, clayey; lower contact sharp-----	4.2
Shale, dark-gray, fissile to platy-bedded, very carbonaceous; abundant plant fragments; lower contact gradational-----	0.8
Siltstone, medium-gray, hackly-weathering, obscurely bedded, partly laminated to very thin bedded, clayey; abundant carbonaceous plant fragments except in upper 2 ft.; lower contact gradational-----	8.
Siltstone, medium- to light-gray, platy-weathering, laminated, clayey; carbonaceous plant fragments; lower contact gradational-----	2.7
Sandstone, medium-gray, iron-stained, probably thin-bedded and cross-bedded, friable, even-textured, very fine grained, subangular to subrounded; includes laminations of carbonaceous very fine grained sandstone in upper 1 ft.; lower contact sharp and uneven (possibly a disconformity)-----	3.8
Shale, brownish-gray, platy- to uneven-weathering; abundant plant fragments; locally contains ironstone nodules-----	0.5
Coal, bony-----	0.7
Shale, black, platy-bedded, carbonaceous; many coal stringers-----	0.3

Siltstone, medium-gray, hackly-weathering, obscurely laminated, clayey; carbonaceous plant fragments; upper part appears concretionary; lower contact gradational-----	2.2
Shale, dark-brownish-gray, fissile to platy-bedded, carbonaceous; abundant plant fragments-----	0.4
Coal, blocky- to platy-weathering; abundant soft plant fragments-----	0.8
Shale, dark-gray, fissile, carbonaceous; abundant plant fragments-----	0.5
Sandstone, medium-gray, very fine grained, subangular to subrounded; abundant carbonaceous fragments; thinly interbedded and laminated with medium-gray siltstone-----	1.2
Shale, medium-gray, slightly iron-stained, hackly-weathering; carbonaceous plant fragments; lower contact gradational-----	2.
Siltstone, medium-gray, iron-stained, hackly-weathering, obscurely bedded, clayey, finely sandy; carbonaceous plant fragments and leaf impressions-----	3.8
Sandstone, medium-gray, slabby- to platy-weathering, thin-bedded, friable, very fine grained, subangular to subrounded, clayey; many coalified logs-----	3.5
Sandstone, medium-gray, iron-stained, uneven-weathering, tough, very fine grained, subangular to subrounded, clayey; abundant carbonaceous plant fragments; many coalified logs-----	2.3
Coal; good wood texture-----	0.1

<p>Sandstone, medium-gray, iron-stained (especially in lower part), cliff-forming, very thin to thin-bedded, prominently cross-bedded (sets about 1 ft. thick), medium-grained (basal part) grading upward to dominantly fine-grained (upper 35 ft.), subangular to subrounded; basal part may include coarse grains and pebbles locally; includes thin beds (0.1 ft.) of clayey iron-rich carbonaceous sandstone; scattered woody coal fragments; at about 13 ft. above base lens (0.2 x 2 ft.) of iron-replaced wood(?) material; at 26 ft. above base one small subrounded cobble of hard metamorphic(?) rock; gray shale pebbles about 35 ft. above base; at 42.5-43.5 ft. above base 2 beds (0.2 ft. thick) of medium-gray very silty shale with abundant large coaly plant fragments; upper 1 ft. includes large flattened coalified logs; lower contact sharp and disconformable-----</p>	50.
<p>Shale, medium-gray, iron-stained; may include ironstone concretions; locally cut out by overlying sandstone; not accessible-----estimated</p>	1.
<p>Coal, blocky; no partings-----</p>	1.05
<p>Sandstone and interbedded siltstone; sandstone, medium-gray, fine-grained, subangular to subrounded, clayey; limy (lower 0.5 ft.); many carbonaceous laminations; forms beds up to 0.5 ft. thick; siltstone, medium-gray, hackly- to platy-weathering, thin-bedded; some plant fragments; includes few interbeds of medium-gray iron-stained very silty shale-----</p>	5.
<p>Coal; interbedded with dark-brownish-gray carbonaceous shale-----</p>	0.25
<p>Siltstone, medium-gray, partly iron-stained, slabby- to hackly-weathering, obscurely bedded, clayey; some plant fragments; lower contact gradational-----</p>	1.1
<p>Sandstone, medium-gray, slabby-weathering, obscurely bedded, friable, fine- to medium-grained, clayey, slightly silty; becomes very fine grained at top; includes few sandy siltstone beds and coal fragments in upper half; lower contact sharp-----</p>	2.2
<p>Shale, medium-gray, obscurely bedded; includes thin coal stringers at 0.5 ft. and 0.7 ft. below top-----</p>	1.7

Shale, dark-brownish-gray to black, very carbonaceous, hard-----	0.5
Sandstone, dark-brownish-gray, very fine to fine-grained, subangular to subrounded, very carbonaceous-----	0.1
Siltstone, dark-brownish-gray, obscurely platy-bedded, hard, sandy, clayey, very carbonaceous-----	0.3
Sandstone, medium-gray, partly iron-stained, thin-slabby- weathering, obscurely bedded, very friable, fine- grained, subangular to subrounded; many carbonaceous laminations and thin coal stringers in upper 0.1-0.2 ft.; lower contact sharp-----	2.5
Siltstone, medium-gray, light-gray-hackly-weathering, ob- scurely bedded, very finely sandy (lower part), clayey; some carbonaceous plant fragments; includes in upper 0.6 ft. irregular stringers and thin lenses of very fine grained sandstone and many randomly oriented plant fragments; lower contact gradational-----	3.7
Sandstone, medium-gray, slabby-weathering, obscurely bedded, soft, friable, fine-grained, subangular to subrounded, slightly silty; becomes very fine grained at top; lower contact sharp-----	1.3
Shale, medium-gray, hackly-weathering, obscurely bedded; some carbonaceous plant fragments-----	2.9
Coal, bony; interbedded dark-gray carbonaceous shale-----	0.2
Siltstone, medium-gray, hackly- to slabby-weathering, ob- scurely bedded, clayey; carbonaceous plant fragments in upper half; lower half includes approximately 1 ft. of medium-gray very fine grained clayey sandstone; 0.2-ft. bed of dark-brownish-gray fissile to platy- bedded carbonaceous shale with abundant plant frag- ments about 1.4 ft. below top-----	4.
Shale, medium-dark-gray, platy-weathering, poorly fissile, carbonaceous; coal stringers-----	0.2
Coal, blocky, weathered-----	0.3
Siltstone, medium-light-gray, hackly- to slabby-weathering, obscurely bedded, hard, very finely sandy, clayey; small carbonaceous plant fragments in upper 0.2 ft.; lower contact gradational-----	2.8

Shale, medium-gray, hackly-weathering, obscurely bedded; lower contact probably gradational-----	2.7
Sandstone, medium-gray, slabby-weathering, obscurely bedded, very fine grained, subangular to subrounded, silty, mostly very clayey; lower contact sharp-----	2.
Siltstone, medium-gray, hackly-weathering, mostly obscurely bedded, partly laminated to very thin bedded, clayey; some small-scale cross bedding: includes few beds of medium-gray very fine grained sandstone 1-2 ft. thick near middle-----	10.
Coal and interbedded dark-gray carbonaceous shale; carbo- naceous plant fragments on bedding planes; lower contact sharp-----	0.2
Sandstone, medium-gray, obscurely bedded, friable, fine- grained, subangular to subrounded, silty, clayey; lower contact sharp-----	1.1
Siltstone, medium-gray, hackly- to slabby-weathering, obscurely very thin to thick-bedded, clayey; inter- bedded with very fine grained clayey sandstone; unit about three-fourths siltstone-----	4.7
Shale, medium-gray, obscurely bedded; includes at top 0.05 ft. coal-----	2.4
Coal, blocky, partly bony-----	0.5
Shale, medium-gray; abundant carbonaceous plant frag- ments and coaly stringers at base; lower contact sharp and slightly irregular-----	0.4
Sandstone, medium-gray, poorly very thin bedded, locally limy and hard, very fine to fine-grained, subangular to subrounded; abundant carbonaceous plant fragments in top 0.1 ft.; locally forms resistant ledge; lower contact sharp-----	2.4
Shale, medium-gray, obscurely bedded, very silty (basal part); some carbonaceous plant fragments; includes 0.1-ft. bed of coal and dark-gray carbonaceous shale at 1.6 ft. above base; 0.2-ft. bed of dark-gray carbonaceous shale and coal stringers 2.2 ft. below top; 0.5-ft. bed of medium-gray partly iron-stained very fine to fine-grained sandstone 0.3 ft. below top; lower contact gradational---	4.1

Sandstone, medium-gray, slabby-weathering, partly laminated to thin-bedded, fine-grained, subangular to subrounded; becomes very fine grained and clayey in upper 1 ft.; few carbonaceous plant fragments in upper part; lower contact sharp-----	3.5
Siltstone, medium-gray, partly iron-stained, platy-weathering, very thin to thin-bedded; sandy in lower part, clayey; carbonaceous plant fragments on bedding planes in lower part; includes 0.05-ft. bed of dark-gray very carbonaceous siltstone at 0.6 ft. above base; poorly exposed-----	4.2
Coal, blocky-----	0.7
Siltstone, dark-brownish-gray, very thin bedded, laminated, clayey; abundant small carbonaceous plant fragments; lower contact gradational-----	0.5
Sandstone, medium-gray, thin-slabby-weathering, very fine grained, subangular to subrounded, silty, clayey-----	1.5
Shale, dark-gray, fissile, carbonaceous; abundant small plant fragments-----	0.2
Shale, medium-gray, slabby- to hackly-weathering, probably very thin bedded, very silty; includes 1 pebble near middle-----	4.8
Shale, carbonaceous; includes some bony coal-----	0.4
Siltstone, medium-gray, slabby-weathering, obscurely bedded, sandy, clayey; no carbonaceous plant fragments seen; lower contact gradational-----	1.3
Sandstone, medium-gray, mostly thin-slabby-weathering, friable, soft, very fine grained, subangular to subrounded, clayey in lower part; lower contact probably gradational-----	5.6
Shale, medium-gray, hackly-weathering; small carbonaceous plant fragments-----	1.
Coal, Cooper bed, blocky, no partings-----	2.4
Shale (1P-183)*, medium-gray, hackly-weathering, platy-bedded; ironstone nodules about 0.2 ft. thick at 0.2 ft. above base-----	1.5

*Palynological sample

Coal, blocky, mostly dull; much woody texture on bedding planes-----	0.5
Shale (IP-183)*, medium-gray, hackly-weathering, platy-bedded; few carbonaceous plant fragments; includes near middle 2 beds of dark-gray to black carbonaceous shale (0.1 ft. thick) with coal stringers in lower bed-----	1.8
Coal, blocky-----	0.5
Shale, medium-gray; poorly observed-----	0.1
Covered interval-----	30.
Shale, medium-gray, slightly iron-stained, hackly-weathering, obscurely bedded; no plant fragments seen; includes abundant ironstone nodules about 0.5 ft. thick at 1.5 ft. above base; 1.5-ft. bed of siltstone 3.5 ft. above base-----	9.6
Coal, bony; includes a 0.1-ft. bed of dark-brownish-gray carbonaceous shale at base-----	0.4
Siltstone, medium-gray, thin-bedded, hard, finely sandy; abundant coalified plant fragments; lower contact sharp-----	0.7
Sandstone, medium-gray, commonly iron-stained, thin-bedded, prominently cross-bedded (sets about 2 ft. thick); bedding locally contorted (load structures), friable, mostly medium-grained, subangular to subrounded, silty; basal 1 ft. coarse grained; locally includes pebble-conglomerate beds up to 1 ft. thick; large coaly wood fragments up to 1 ft. long; some claystone clasts (0.7 x 0.2 ft.); interlaminaions of carbonaceous material in beds up to 0.1 ft. thick; becomes less cross-bedded and finer grained 8 ft. above base; locally limy and concretionary in a 2-ft. zone 18 ft. above base; lower contact sharp and wavy-----	34.
Siltstone, medium-gray, iron-stained (on joints), medium-light-gray-hackly- to platy-weathering, obscurely bedded, hard, tough, slightly limy, clayey; abundant plant fragments; includes medium-gray ironstone concretions up to 0.5 ft. thick with abundant plant fragments; unit locally cut out by overlying sandstone-----	2.2
Coal, blocky-----	0.3
*Palynological sample	

Shale, medium-gray, mostly hackly-weathering, slabby-weathering (upper 1 ft.), probably platy-bedded (obscure); no plant fragments seen; includes numerous ironstone concretions up to 0.5 ft. thick in a 2-ft. zone 1.5 ft. above base-----	7.8
Coal, bony; includes medium-gray poorly platy-bedded carbonaceous shale with abundant plant fragments-----	0.8
Claystone (1P-180)*, medium-gray, slight green tint, hackly-to poorly conchoidal-weathering, obscurely bedded; scattered plant fragments-----	1.2
Coal, bony, platy-weathering; lower contact sharp-----	0.6
Shale (1P-179)*, medium-gray, hackly-weathering, obscurely platy-bedded, silty; few carbonaceous plant fragments; includes a 0.2-ft. bed of medium-gray fine-grained sandstone with scattered plant fragments at 5.5 ft. above base; 2-ft. bed of medium-gray very fine grained sandstone at 2 ft. below top; lower contact sharp-----	11.8
Sandstone, medium-gray, iron-stained, slabby-weathering, friable, fine-grained, subangular to subrounded, slightly silty; rhythmically interbedded with siltstone beds up to 0.05 ft. thick about 0.4 ft. apart-----	3.9
Sandstone, medium-gray, locally very iron-stained, slabby-weathering, prominently cross-bedded (sets about 3 ft. thick), medium-grained, subangular to subrounded; clayey ironstone nodules 0.3 ft. thick at 3 ft. above base; includes at 2 ft. below top a 2-ft. zone containing angular claystone clasts (up to 0.3 ft. long) with leaf impressions; upper 2 ft. includes laminations of iron-rich clay and carbonaceous material; top marked by 0.5-ft. bed of platy-bedded hard limy sandstone with abundant laminations of carbonaceous plant material; lower contact gradational-----	12.3
Sandstone, medium-gray, thin-bedded, very fine to fine-grained, subangular to subrounded; interbedded with some sandstone similar to below; includes at about 1 ft. below top a 0.5-ft. bed of sandstone containing small ironstone concretions and overlain by a 0.05-ft. coal stringer; lower contact sharp-----	8.4

*Palynological sample

<p>Sandstone, medium-gray (wet), poor-slabby-weathering, very thin bedded, very fine grained, subangular to subrounded, very silty; plant fragments on bedding planes and large leaf impressions near base-----</p>	3.6
<p>Sandstone, medium-gray, locally ledge-forming, hard, limy, very fine grained, subangular to subrounded, very silty, concretionary; abundant small carbonaceous plant fragments-----</p>	0.7
<p>Sandstone, medium-gray, locally very iron-stained, cliff-forming, very thin to thin-bedded, prominently cross-bedded (sets up to 3 ft. thick), very friable, fine- to medium-grained, subangular to subrounded; includes at base round pebbles and cobbles of crystalline rocks up to 0.2 ft. in diameter; lenses of limy sandstone, up to 0.8 ft. thick, with abundant carbonaceous plant fragments, coal stringers, and scattered ironstone pebbles; lower contact sharp. Sandstone dikes from this unit extend upward into the overlying 0.7-ft. and 3.6-ft. sandstone units-----</p>	19.5
<p>Siltstone, medium-gray, slabby-weathering, laminated to very thin bedded, clayey; abundant carbonaceous plant fragments on bedding surfaces; includes many laminations of very fine grained sandstone; a 0.5-ft. bed of medium-gray friable sandstone at 0.8 ft. below top; lower contact sharp-----</p>	2.9
<p>Sandstone, medium-gray (wet), obscurely bedded, very friable, fine grained, subangular to subrounded, silty; lower contact sharp-----</p>	0.8
<p>Shale, medium-gray to dark-brownish-gray at base, iron-stained, hackly-weathering, poor platy-bedded; few carbonaceous plant fragments; includes an 0.8-ft. bed of medium-gray very thin bedded sandstone at 3 ft. below top; this unit wedged out to the immediate northwest by a massive sandstone-----</p>	6.3
<p>Coal, mostly blocky, poorly observed; includes near middle at least 2 shale partings about 0.3 ft. thick and 0.5 ft. apart; shale weathers medium light gray and contains abundant carbonaceous plant fragments and leaf impressions; coal may include other partings less than 0.05 ft. thick-----</p>	5.

Note: The 0.3-ft. partings increase in thickness south-eastward to about 2.5-3 ft. in a distance of about 200 yd.

Siltstone, medium-gray, partly iron-stained, hackly- to subconchoidal-weathering, obscurely bedded, very clayey; abundant plant fragments; few thin coal stringers; unit wedges out in less than 50 ft.; maximum thickness about 3 ft.; lower contact gradational----- 1.3

Sandstone, medium-light-gray, cliff-forming, platy- to thin-bedded, cross-bedded, fine-grained, subangular to subrounded, silty; includes many carbonaceous laminations in 1.5-ft. zone 3 ft. above base and in upper 6 ft.; upper 3 ft. becomes very fine grained and very silty with many siltstone interbeds; lower contact sharp----- 16.5

Shale, medium-gray, hackly- to shard-like-weathering, probably platy- to very thin bedded, silty; abundant plant fragments; includes silt-filled worm burrows(?) in lower half; upper half locally limy, fairly hard, and concretionary; lower contact sharp and slightly undulatory; unit absent about 400 yd. to northwest----- 5.3

Sandstone, medium-light-gray, partly iron-stained, massive-weathering, cliff-forming, thin- to platy-bedded, prominently cross-bedded (sets about 1 ft. thick), friable, mostly fine-grained (some medium grains), subangular to subrounded; scattered pebbles of shale and metamorphic rocks at base; includes coal stringers up to 0.1 ft. thick about 0.5 ft. above base; abundant carbonaceous laminations about 1 ft. above base; locally iron-stained laminated carbonaceous beds, up to 0.2 ft. thick, in lower part of unit; several brown-weathering beds and lenses of laminated siltstone, up to 0.1 ft. thick and 0.5-1 ft. apart, in upper 5.3 ft.; lower contact sharp and undulatory----- 18.8

Shale, brownish-gray, partly iron-stained, shard-like-weathering, obscurely bedded, probably thin-bedded; common plant fragments; thins southeastward (about 400 yds.) to 0.8 ft.----- 2.5

Coal, mostly blocky; thickens southeastward (about 400 yd.) to 2.4 ft. including 2 partings----- 1.2

Siltstone, brownish-gray, platy-bedded, partly sandy, carbonaceous; few plant fragments-----	0.2
Sandstone, medium-light-gray, thin-bedded, friable, very fine grained, subangular to subrounded; becomes very silty and clayey toward top; interlaminated with siltstone similar to underlying unit in upper 1 ft.-----	3.
Siltstone and interbedded sandstone; siltstone, medium-gray, platy-bedded to laminated, clayey, partly carbonaceous; sandstone, medium-light-gray, friable, very fine grained, subangular to subrounded; forms beds 0.1-0.3 ft. thick; top of unit carbonaceous siltstone including vitreous asphalt(?); lower contact sharp-----	6.
Sandstone, medium-light-gray, cliff-forming, slabby-weathering, massive (basal 3 ft.) to thin-bedded, cross-bedded, friable, fine- to medium-grained (basal part), finer grained upward, subangular to subrounded, silty, slightly clayey; includes at 2.5 ft. above base a 0.2-ft. bed of iron-stained carbonaceous sandstone; upper 5.5 ft. includes laminations of carbonaceous material, siltstone, and iron-cemented sandstone; lower contact sharp-----	12.
Shale, dark-gray, fissile, carbonaceous; abundant plant fragments; lower contact sharp-----	0.1
Siltstone, medium-gray, slightly iron-stained, hackly-weathering, obscurely bedded, clayey; some plant fragments; partly interbedded with medium-gray uneven-weathering very fine grained sandstone; includes in middle 0.5-ft. zone of interbedded siltstone and dark-gray fissile shale with abundant plant fragments-----	11.
Coal, bony-----	0.5
Shale, medium-gray, shard-like- to hackly-weathering, obscurely bedded; few carbonaceous plant fragments; includes near middle ironstone concretions 0.2 ft. thick-----	2.
Siltstone, medium-light-gray, clayey; some carbonaceous plant fragments; thinly interbedded with medium-gray very fine grained sandstone-----	3.5
Sandstone, medium-light-gray, slabby- to rounded massive-weathering, thin-bedded, cross-bedded (small scale), very fine grained, subangular to angular, silty; concretionary and limy in lower 2 ft.; interbedded with siltstone in upper 3 ft.; lower contact sharp-----	5.5

- Sandstone, medium-light-gray, thin-bedded, friable, very fine grained, subangular to subrounded; becomes very silty and clayey toward top; interlaminated with siltstone similar to underlying unit in upper 1 ft.----- 3.
- Siltstone and interbedded sandstone; siltstone, medium-gray, platy-bedded to laminated, clayey, partly carbonaceous; sandstone, medium-light-gray, friable, very fine grained, subangular to subrounded; forms beds 0.1-0.3 ft. thick; top of unit carbonaceous siltstone including vitreous asphalt(?); lower contact sharp----- 6.
- Sandstone, medium-light-gray, cliff-forming, slabby-weathering, massive (basal 3 ft.) to thin-bedded, cross-bedded, friable, fine- to medium-grained (basal part), finer grained upward, subangular to subrounded, silty, slightly clayey; includes at 2.5 ft. above base a 0.2-ft. bed of iron-stained carbonaceous sandstone; upper 5.5 ft. includes laminations of carbonaceous material, siltstone, and iron-cemented sandstone; lower contact sharp----- 12.
- Shale, dark-gray, fissile, carbonaceous; abundant plant fragments; lower contact sharp----- 0.1
- Siltstone, medium-gray, slightly iron-stained, hackly-weathering, obscurely bedded, clayey; some plant fragments; partly interbedded with medium-gray uneven-weathering very fine grained sandstone; includes in middle 0.5-ft. zone of interbedded siltstone and dark-gray fissile shale with abundant plant fragments----- 11.
- Coal, bony----- 0.5
- Shale, medium-gray, shard-like- to hackly-weathering, obscurely bedded; few carbonaceous plant fragments; near middle ironstone concretions 0.2 ft. thick----- 2.
- Siltstone, medium-light-gray, clayey; some carbonaceous plant fragments; thinly interbedded with medium-gray very fine grained sandstone----- 3.5
- Sandstone, medium-light-gray, slabby- to rounded massive-weathering, thin-bedded, cross-bedded (small scale), very fine grained, subangular to angular, silty; concretionary and limy in lower 2 ft.; interbedded with siltstone in upper 3 ft.; lower contact sharp----- 5.5

- Siltstone, medium-gray, hackly-weathering, probably thin-bedded (obscure), hard, sandy to very sandy, clayey; no plant fragments seen; includes near middle one prominent concretionary ironstone bed (0.2 ft. thick) with abundant plant fragments and leaf impressions; lower contact probably gradational----- 12.7
- Sandstone, medium-gray (wet), massive-appearing, friable, soft, very fine grained, subangular to subrounded, silty, clayey; lower contact sharp and regular----- 3.3
- Siltstone, medium-gray, hackly-weathering, obscurely thin-bedded, hard, partly sandy, clayey; ironstone nodules 0.05 ft. thick; includes 2 beds of laminated very fine grained sandstone, 0.7 and 0.3 ft. thick, at 3 and 1.4 ft. below top, respectively----- 6.5
- Note: The siltstone described above is underlain by a thick coal unit that includes two partings each about 3 ft. thick. The partings thin rapidly northwestward. This coal unit is readily traceable in the cliffs northwestward, for about 1/4-1/2 mile, to near the center of NW 1/4 NW 1/4 sec. 16, T. 6 S., R. 14 W., where the following description was made.
- Coal, blocky; bony in upper 0.2 ft.; includes 4 lenticular partings (0.2 ft. thick) of dark-gray fissile clayey carbonaceous shale, with abundant bony coal stringers, at 1.5, 2, 3, and 3.5 ft. above base; at 0.2 ft. below top a 0.3-ft. lenticular parting of brownish-gray platy-weathering sandy clayey carbonaceous siltstone with abundant plant fragments----- 5.
- Shale (IP-164)*, medium-gray, poor platy-bedded (obscure), silty; includes 0.2-ft. bed of dark-gray carbonaceous shale about 1.1 ft. above base; lower contact probably gradational----- 4.
- Siltstone, medium-gray, obscurely thin-bedded, clayey; few carbonaceous plant fragments; includes some fine-grained subangular sandstone near middle----- 3.4
- Coal, bony; includes dark-gray carbonaceous shale in lower part----- 0.4
- Siltstone, medium-gray, soft, clayey; few carbonaceous plant fragments----- 0.7

*Palynological sample

Sandstone, medium-gray, iron-stained, fine-grained, sub-angular to subrounded; few carbonaceous plant fragments; ironstone nodules up to 0.4 ft. thick-----	0.6
Shale, medium-gray, hackly-weathering; lower contact probably gradational-----	6.1
Siltstone, medium-gray, obscurely bedded, hard, clayey; few carbonaceous plant fragments-----	3.3
Sandstone, medium-gray, partly iron-stained, slabby-weathering, probably cross-bedded, soft, friable, fine-grained, subangular to subrounded; upper half includes several beds of sandy siltstone-----	12.4
Shale, medium-gray, obscurely thin-bedded, silty; scattered carbonaceous plant fragments; includes in middle 3 beds of ironstone nodules up to 0.3 ft. thick; grades to siltstone in upper 2 ft.-----	8.5
Sandstone, medium-gray, partly iron-stained, obscurely very thin bedded, friable, fine-grained, subangular to subrounded, silty; some carbonaceous plant fragments; includes ironstone nodules, 0.2 ft. thick, about 0.1 ft. below top; lower contact sharp-----	2.7
Shale, medium-gray, platy-weathering, platy-bedded, partly silty; some carbonaceous plant fragments on bedding surfaces; includes a 0.2-ft. bed of dark-gray to black carbonaceous shale at 2.5 ft. above base; lower contact sharp and uneven-----	4.2
Sandstone, medium-light-gray, partly iron-stained (particularly in lower 2-4 ft.), rounded-cliff-forming, cross-bedded (large scale), partly friable, fine-to medium-grained, subangular to subrounded, partly silty; scattered coal fragments; scarce pebbles; includes 0.1-ft. lenses of medium-gray shale with abundant plant fragments; 3 limy concretionary beds (up to 2 ft. thick) in lower half; lenses and thin beds of brown sandy siltstone, up to 0.2 ft. thick, at about 27 ft. above base; unit becomes progressively finer grained upward and very fine grained at top; lower contact sharp, uneven, and unconformable-----	41.

Note: Farther northwest along the sea cliffs, near the northeast corner of sec. 17, T. 6 S., R. 14 W., a 4.5-ft. coal bed overlies a 23-ft. sandstone unit that is correlated with the lower and middle parts of the 41-ft. sandstone unit described above. This coal includes, at 1 ft. above base, a 0.1-ft. parting of brownish-gray siltstone containing pyroclastic(?) grains and another parting, 0.3 ft. thick and about 2 ft. above base, of deeply weathered reddish-brown fissile shale with abundant plant fragments.

Coal, bony; locally cut out by channeling at base of overlying sandstone----- 0.2

Siltstone, medium-gray, hackly-weathering, obscurely thin-bedded, hard, clayey; some carbonaceous plant fragments; scattered very large coalified tree(?) remains; ironstone nodules in basal part; upper 0.5 ft. becomes brownish-gray with abundant plant fragments; upper part locally cut out by channeling----- 5.5

Coal, mostly blocky; bony in lower and upper 0.2 ft.----- 0.9

Shale, medium-gray, partly dark-brownish-gray to dark-gray, hackly-weathering, platy- to very thin bedded, hard, partly silty; abundant carbonaceous plant fragments on some bedding surfaces in lower part; includes at about 3-4 ft. above base a slumpy 2-ft. bed of iron-stained fine-grained subangular sandstone overlain by 0.5-ft. bed of brown clayey siltstone containing plant fragments; zones of clayey ironstone nodules, 0.2 ft. thick, near middle of unit and 1.2 ft. below top; several very thin beds of friable very fine grained subangular to subrounded sandstone in upper-middle part----- 17.

Coal, blocky; no partings----- 0.65

Note: The coal described above is tentatively correlated with a 0.3-ft. bony coal bed, beneath a cliff-forming sandstone about 10 ft. thick, in a large deeply eroded gully near the northeast corner of sec. 17, T. 6 S., R. 14 W. The rocks described below are exposed in the lower part of the gully and northwestward along the beach to the mouth of Diamond Creek.

Shale, medium-gray, partly iron-stained, hackly- to subconchoidal-weathering, hard; includes concretions and bony coal stringers----- 2.6

Coal, bony-----	0.2
Shale, medium-gray, partly iron-stained, hackly- to subconchoidal-weathering, hard; includes concretions and bone-coal stringers up to 0.02 ft. thick-----	2.3
Coal, bony; includes carbonaceous shale-----	0.4
Shale, medium-gray, hackly- to subconchoidal-weathering; includes at base a 0.4-ft. iron-rich bed ; at about ft. above base a medium-gray fine-grained sandstone, 0.4 ft. thick, overlain by dark-gray carbonaceous shale; at top a 1-ft. bed of sandstone with a sharp irregular base; lower contact probably gradational-----	8.5
Sandstone, medium-gray, slabby-weathering, thin-bedded, cross-bedded, fine-grained, subangular to angular, slightly clayey; includes laminations of carbonaceous sandstone; a 0.2-ft. bed of siltstone at 0.3 ft. below top; lower contact sharp-----	2.2
Siltstone and interbedded shale and sandstone; siltstone, medium-gray, poor blocky-weathering, laminated to very thin bedded, clayey; some small carbonaceous plant fragments on bedding surfaces; shale, medium-dark-gray, laminated to very thin bedded; includes at top a 0.4-ft. bed of medium-dark-gray blocky-weathering clayey siltstone-----	5.5
Siltstone, medium-gray, obscurely bedded, clayey; few carbonaceous plant fragments; includes an iron-rich nodular zone in lower 0.3 ft.-----	1.5
Sandstone, medium-gray, slabby-weathering, very fine grained, subangular, clayey; probably includes siltstone laminations in thin beds; poorly observed, particularly in lower 8 ft.; upper 0.5 ft. medium-gray hackly-weathering siltstone with thin coal stringers at base-----	12.
Sandstone, medium-dark-gray, hackly-weathering, irregularly bedded to laminated, very fine to fine-grained, subangular, very clayey; includes abundant medium-dark-gray laminations of siltstone; concretionary limy bodies near middle; lower contact sharp-----	2.2
Sandstone, medium-gray, thin-slabby-weathering, obscurely thin-bedded, friable, fine-grained, subangular-----	3.

Siltstone, medium-gray, weakly iron-stained, hard, limy; ledge former; few small plant fragments-----	0.5
Siltstone, medium-dark-gray, finely sandy, clayey; lami- nated with fine-grained sandstone-----	0.5
Sandstone, medium-gray, thin-slabby-weathering, obscurely thin-bedded, friable, fine-grained, subangular; poorly exposed; lower contact sharp-----	2.3
Siltstone, medium-gray, clayey; worm burrows(?)-----	0.4
Siltstone, medium-gray, laminated to very thin bedded, hard, limy, clayey; ledge former; abundant fine carbonaceous plant material on bedding surfaces; lower contact fairly sharp-----	1.
Sandstone, medium-gray, very fine to fine-grained, sub- angular to subrounded, slightly clayey; includes a 0.3-ft. siltstone bed 0.9 ft. above base-----	2.4
Sandstone and interbedded siltstone; sandstone, medium- gray, very fine to fine-grained, subangular to sub- rounded, slightly clayey; siltstone becomes dominant toward top-----	13.6
Siltstone, medium-gray, iron-stained, laminated, hard, limy, clayey; ledge former; small carbonaceous plant fragments on bedding surfaces-----	0.6
Sandstone, medium-gray, slabby-weathering, friable, very fine grained, subangular, slightly clayey; includes a few laminations and thin beds of dark-gray carbo- naceous siltstone; lower contact sharp-----	6.
Siltstone, medium-gray, poor platy- to blocky-weathering, obscurely bedded, not limy, clayey; no plant frag- ments seen; includes thin interbeds and laminations of medium-gray shale-----	0.7
Siltstone, medium-gray, iron-stained, laminated, hard, limy, clayey; ledge former; abundant small carbo- naceous plant fragments on bedding surfaces; lower contact sharp-----	0.6
Sandstone, medium-gray to light-brown, laminated to thin- bedded, very fine grained, subangular, silty, clayey, micaceous; upper 1.4 ft. includes many laminations of siltstone and shale; lower contact sharp-----	2.4

Sandstone, medium-light-gray, platy-bedded, partly cross-bedded, very fine grained, subangular, silty, clayey; some carbonaceous plant fragments on bedding surfaces; interbedded with siltstone and shale; siltstone dominant in upper half-----	5.4
Siltstone, medium-gray, poor platy- to blocky-weathering, obscurely thin bedded, clayey; no plant fragments seen; includes thin interbeds and laminations of medium-gray shale; basal 0.4 ft. limy and forms a slight ledge; small worm burrows(?) in basal part-----	18.3
Siltstone, medium-light-gray, partly laminated to very thin bedded, cross-bedded, hard, slightly limy, clayey; includes in upper 1 ft. laminations and thin beds of medium-gray platy- to chunky-weathering shale; lower contact appears sharp-----	3.9
Shale, medium-gray, light-gray-weathering, iron-stained on joint and fractures, hard, silty; includes many siltstone laminations; similar to underlying shale; lower contact sharp-----	4.5
Siltstone, medium-light-gray, subconchoidal-weathering, clayey; one bed; fractures perpendicular to bedding; no carbonaceous plant fragments; forms lighter color band on hillside-----	0.5
Shale, medium-gray, iron-stained on joints, platy- to chunky-weathering, very thin bedded, hard, very silty; abundant carbonaceous plant fragments; similar to underlying shale-----	29.5
Shale (<u>1P-134</u> -- basal 1 ft.)*, medium-gray, abundant iron-staining on joints and fractures, light-gray-platy- to chunky-weathering, fissile to platy-bedded, conchoidal-fracturing, very silty; includes scattered "floating" fine to coarse sand grains and large granules; carbonaceous plant fragments abundant at base and scattered in rest of unit-----	23.5
Coal, blocky; includes bony coal and black carbonaceous shale at base and top-----	0.7

*Palynological sample

- Shale, medium-gray, hackly- to blocky- and subconchoidal-
weathering, slightly silty; carbonaceous plant frag-
ments; interbedded near middle with subequal amounts
of siltstone and medium-gray thin-bedded fine-grained
partly limy and concretionary sandstone with carbo-
naceous laminations; includes a 0.1-ft. bony coal bed
about 1 ft. above base----- 6.
- Siltstone, medium-gray, blocky- to hackly-weathering,
obscurely bedded, clayey; few carbonaceous plant frag-
ments; lower contact gradational----- 1.
- Sandstone, medium-gray, slabby-weathering, obscurely
bedded, friable, medium-grained in lower part grading
to very fine grained at top, subangular to angular,
slightly clayey; lower contact sharp----- 5.5
- Shale, medium-gray, slightly iron-stained, hackly-weathering,
obscurely bedded; no plant fragments seen----- 4.2
- Sandstone, medium-gray, thin-slabby-weathering, thin-bedded,
probably partly cross-bedded, friable, fine-grained,
subangular to subrounded, slightly clayey; some carbo-
naceous plant fragments; interbedded with siltstone in
upper 1 ft.; lower contact sharp----- 3.7
- Shale and interbedded siltstone; shale, medium-gray,
slabby- to uneven-weathering, obscurely bedded; few
carbonaceous plant fragments; siltstone, medium-gray,
clayey; includes a 0.1-ft. bed of fissile to platy-
bedded carbonaceous shale about 1.5 ft. above base----- 4.5
- Coal, blocky; includes a 0.1-ft. parting of medium-brown
shale at 0.2 ft. above base; a 0.3-ft. bed of black
carbonaceous shale at top; locally upper part of
unit includes limy siltstone(?) concretions
(inaccessible)----- 1.
- Siltstone, medium-gray, partly iron-stained, slabby-weather-
ing, thin-bedded, hard, slightly clayey; includes
local laminations of carbonaceous plant material----- 4.4

Coal, mostly blocky; includes at 0.4 ft. above base a 1.8-ft. parting (pinches out southeastward) of medium-brownish-gray shale with coal fragments and a 0.1-ft. coal stringer near middle; a 0.3-ft. bed of brownish-gray fissile carbonaceous shale with abundant plant fragments at top; laterally this unit becomes 1.8 ft. of coal with a 0.1-ft. parting of brown siltstone at 0.5 ft. above base-----	4.
Siltstone, medium-gray, slabby-weathering, thin-bedded, cross-bedded, hard, clayey, sandy near top; inter-laminated with carbonaceous material; includes at 1 ft. above base a 1.3-ft. bed of medium-gray slabby-weathering fine- to medium-grained subangular to angular limy sandstone with abundant plant fragments; thin shale beds in upper 1 ft. of unit; upper 1 ft. locally limy and concretionary with abundant plant fragments-----	8.
Shale, medium-brown, platy-bedded; few plant fragments-----	0.6
Coal, platy-----	0.6
Siltstone, medium-gray, slightly iron-stained, slabby- to uneven-weathering, obscurely bedded, clayey; no plant fragments seen; includes an 0.8-ft. sandstone bed about 3 ft. above base; lower contact gradational-----	7.
Sandstone, medium-gray, cross-bedded, fine- to medium-grained, subangular to angular, clayey; locally inter-laminated with carbonaceous plant material; lower contact sharp and even-----	1.2
Shale, medium-gray, subconchoidal-weathering, obscurely bedded, slightly silty; no plant fragments-----	0.3
Shale, medium-brownish-gray, fissile, carbonaceous; includes coaly stringers-----	0.6
Siltstone, medium-brown, hard, sandy, clayey, pyroclastic; carbonaceous plant fragments-----	0.2
Coal, bony-----	0.6
Sandstone, medium-gray, light-gray-slabby-weathering, thin-bedded, cross-bedded, fine- to very fine grained, subangular to angular, very silty, very clayey; few small carbonaceous plant fragments; includes interbeds of medium-gray clayey siltstone; few ironstone nodules at top-----	7.5

Coal, bony; includes black carbonaceous shale----- 0.1

Bottom of measured section at base of sea cliff at mouth
of Diamond Creek.

Measured section 2

Location: Creek-bed and hillside exposures on Bidarki Creek from near cen. NE 1/4 SE 1/4 sec. 13 to sea cliff at creek mouth in SW 1/4 SE 1/4 NW 1/4 sec. 24, T. 6 S., R. 14 W., Seldovia C-5 quadrangle. This location is approximately the same as locality 117 of Barnes and Cobb (1959, pls. 18, 19).

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Coal, impure, platy-weathering in upper half to blocky- weathering in lower half; top concealed-----	1.8
Covered interval-----	127.
Coal, mostly platy-weathering and bony; poorly exposed; 1 ft. of blocky ledge-forming coal at 0.3 ft. above base; includes two 0.5-ft. beds, at 1.3 ft. above base and 2 ft. below top, of medium-gray fissile shale (2P-37)* with abundant carbonaceous plant fragments; lower contact sharp-----	6.3
Siltstone, medium-gray, hackly-weathering, obscurely bedded; common carbonaceous plant fragments; includes in upper 1 ft. some poorly exposed beds of medium-gray very fine grained very silty sandstone with abundant fine white plagioclase(?) crystals-----	5.
Covered interval-----	24.
Siltstone, medium-gray, thin-bedded(?), sandy, clayey; abundant plant fragments-----	1.5
Covered interval-----	6.5
Siltstone, medium-gray, partly iron-stained, hackly-weather- ing, obscurely bedded, clayey; few carbonaceous plant fragments-----	4.
Covered interval-----	44.
Siltstone, medium-gray, mostly iron-stained, hackly-weather- ing, obscurely thin-bedded, partly sandy, clayey; in- cludes 0.3-ft. ironstone nodules 2.5 ft. above base-----	7.
Covered interval-----	10.

*Palynological sample

Coal, weathered, blocky in lower half, platy and bony in upper half; lower contact sharp-----	2.
Siltstone, medium-gray, hackly-weathering, obscurely thin-bedded, clayey, sandy; few carbonaceous plant fragments; includes at base 0.5-ft. bed of medium-gray very fine grained sandstone-----	3.
Covered interval-----	80.
Sandstone, medium-gray, very thin bedded, cross-bedded, friable, medium-grained, silty; includes in middle 0.2-ft. bed of medium-gray indurated sandy siltstone-----	3.
Covered interval; probably includes 0.5-ft. coal bed in lower 2-3 ft.-----	18.
Shale, medium-gray, hackly-weathering, obscurely bedded, partly very silty; some carbonaceous plant fragments; includes at base 0.4-ft. bed of dark-brownish-gray probably platy-bedded shale with bony coal stringers and abundant carbonaceous material-----	3.2
Coal, bony-----	0.6
Covered interval-----	6.5
Coal, mostly blocky; appears bony in top 0.5 ft. and basal 0.5 ft.-----	3.5
Shale, deeply weathered; includes 0.5-ft. nodular iron-stone bed-----	1.
Siltstone, medium-gray, much iron-stained, very thin bedded, partly very finely sandy-----	5.
Covered interval-----	13.
Coal, blocky; includes at base and top 0.2-ft. beds of medium- to medium-dark-gray partly iron-stained fissile to platy-bedded carbonaceous shale with abundant plant fragments; lower contact sharp-----	1.2
Sandstone, medium-gray, hackly-weathering, very fine grained, very silty, clayey-----	2.
Covered interval-----	16.

Shale, medium-gray, very thin bedded to fissile; abundant carbonaceous plant fragments; abundant large plant fragments in lower 0.3 ft.; includes 0.2-ft. blocky coal bed 0.4 ft. below top-----	0.9
Covered interval-----	2.7
Coal, weathered, bony in lower half, blocky in upper half; abundant woody fragments in lower half-----	1.
Shale, medium-gray, hackly-weathering, very silty; common carbonaceous plant fragments; includes ironstone nodules up to 0.5 ft. thick with abundant plant fragments-----	1.
Siltstone and interbedded sandstone; siltstone, medium-gray, partly iron-stained, hackly-weathering, obscurely very thin bedded, partly very finely sandy; few carbonaceous plant fragments; sandstone, medium-gray, partly iron-stained, friable, very fine grained-----	2.
Covered interval-----	16.
Coal, blocky; top very slumpy-----	1.
Shale (2P-25)*, medium- to medium-dark-gray, partly fissile, clayey, partly very carbonaceous; abundant carbonaceous plant fragments; includes coal stringers-----	0.3
Covered interval-----	36.
Coal, blocky-----	0.5
Shale, medium-gray, very finely sandy, silty; abundant carbonaceous plant fragments-----	0.8
Covered interval-----	1.1
Shale and interbedded coal; shale, medium- to medium-dark-gray, fissile; abundant carbonaceous plant fragments; forms beds up to 0.5 ft. thick; coal, blocky- to platy-weathering, bony; forms beds up to 0.5 ft. thick-----	1.6
Shale (2P-23)*, medium-gray, blocky-weathering; plastic when wet; abundant carbonaceous plant fragments-----	0.7
Covered interval-----	4.8
Coal, blocky-----estimated-	0.5-1.

*Palynological sample

Covered interval-----	2.5
Coal, blocky-----estimated-	2.
Covered interval; includes slumped coal bed, thickness unknown, about 11.5 ft. above base-----	81.5
Sandstone, medium-gray, deeply weathered, very fine grained, very silty-----	2.5
Coal, blocky-----	0.65
Siltstone, medium-gray, iron-stained, deeply weathered, hackly-weathering, friable; includes at base 0.3-ft. lense of medium-gray hard iron-rich(?) siltstone with abundant plant fragments; carbonaceous in upper 0.2 ft.---	3.3
Coal and interbedded dark-gray carbonaceous shale, weathered---	0.3
Siltstone, medium-gray, iron-stained, hackly-weathering, obscurely thin-bedded, locally hard and concretionary in upper 1 ft.; few plant fragments; includes ironstone nodules up to 0.3 ft. thick 1.5 ft. below top-----	7.
Covered interval-----	21.
Sandstone, medium-gray, very thin to thin-bedded, friable, very fine to fine-grained, silty-----	2.
Coal, blocky; includes 2 partings of weathered shale, each about 0.05 ft. thick, near middle and in lower half; forms small waterfall at top of sea cliff-----	1.6
Siltstone and interbedded sandstone; siltstone, medium-gray, laminated to very thin bedded, sandy; few small carbo- naceous plant fragments; forms beds 0.5 ft.-0.8 ft. thick; sandstone, medium-gray, friable, very fine grained, silty; few carbonaceous plant fragments; lower contact sharp-----	4.8
Shale, dark-gray to black, fissile, carbonaceous; common carbonaceous plant fragments; includes bony coal stringers up to 0.1 ft. thick-----	0.5
Siltstone, medium-gray, iron-stained, hackly-weathering, obscurely bedded, clayey; few plant fragments-----	2.4

- Sandstone, medium-gray, partly iron-stained, obscurely thin-bedded, friable, very fine to fine-grained, silty; includes finely interbedded medium-gray siltstone; lower contact sharp----- 3.6
- Siltstone, medium-gray, iron-stained, hackly-weathering, poor very thin to thin-bedded; few small plant fragments; large bony coalified tree remains at base----- 2.2
- Shale and interbedded coal; shale, medium-gray, obscurely bedded, partly silty, clayey; common carbonaceous plant fragments; coal, very bony; includes black carbonaceous shale laminations in part; unit includes at base 0.2-ft. bed of dark-gray carbonaceous shale----- 3.3
- Coal, blocky; includes at 1.1 ft. above base 0.3-ft. bed of deeply weathered medium-gray iron-stained probably fissile shale with abundant coal stringers and carbonaceous plant fragments; few very thin beds or partings of bony coal in lower block; lower contact sharp----- 4.1
- Siltstone, medium-gray, hackly-weathering, obscurely bedded, probably very thin bedded; few carbonaceous plant fragments; scattered medium-gray clayey ironstone nodules up to 0.5 ft. thick in lower 5.5 ft.; includes at 1 ft. below top 0.5-ft. bed of medium-gray friable very fine grained sandstone; at top 0.5-ft. bed of medium-dark-gray siltstone with abundant plant fragments; lower contact fairly sharp----- 10.5
- Sandstone, medium-gray, slabby-weathering, obscurely thin bedded, friable, very fine grained, silty; includes medium-gray siltstone beds up to 0.2 ft. thick near middle and in upper one-third of unit; lower contact sharp----- 2.6
- Siltstone, medium-light-gray, lenticular, partly platy-bedded, limy; few carbonaceous plant fragments; lower contact sharp----- 1.
- Siltstone, medium-gray, hackly- to shard-like-weathering in upper part, very thin to thin-bedded, very sandy in upper part, clayey; few carbonaceous plant fragments; includes two 0.5-ft. beds of medium-light-gray very fine grained locally limy sandstone about 1.5 and 5 ft. above base; 0.05-ft. bony coal bed 2.5 ft. below top; upper 3 ft. dominantly medium-gray silty shale; lower contact fairly sharp----- 10.

Shale, dark-gray, fissile to platy-bedded, fairly hard, tough, silty, carbonaceous; includes some very thin coal stringers; medium-gray hard limy siltstone concretions with many leaf impressions-----	0.9
Shale, medium-dark-gray, probably platy-weathering, fissile to platy-bedded; many carbonaceous plant fragments on bedding-----	0.6
Coal, partly bony; includes near middle 0.05-ft. parting of dark-gray shale-----	1.1
Shale, dark-gray, fissile-weathering, carbonaceous-----	1.5
Coal, mostly bony-----	1.1
Shale (2P-11)*, medium-gray, obscurely bedded, clayey; many carbonaceous plant fragments; includes 0.05-ft. bony coal stringer near top-----	0.7
Shale, dark-gray to black, platy-bedded, very carbonaceous; includes thin bony coal stringers; lower contact gradational-----	0.5
Siltstone, medium-gray, platy- to hackly-weathering, very thin bedded, clayey, finely sandy; lower contact probably gradational-----	1.6
Sandstone, medium-gray, slabby-weathering, obscurely very thin bedded, friable, very fine grained, silty; few thin pieces of coal; lower contact sharp-----	1.4
Siltstone and interbedded shale; medium- to medium-dark-gray, hackly-weathering in lower half, hackly- to platy-weathering in upper half, laminated to thin-bedded, clayey; some small carbonaceous plant fragments; lower contact sharp-----	4.5
Sandstone, medium-gray, thin-bedded to laminated, cross-bedded, friable, very fine grained, silty; large iron-replaced coalified wood fragments; laminations of carbonaceous material; lower contact sharp-----	2.
Siltstone, medium-dark-gray, platy-bedded, very clayey; abundant carbonaceous plant fragments; includes coal stringers-----	0.5
Coal, platy-weathering-----	0.3

*Palynological sample

- Sandstone, medium-gray, thin-bedded, indurated, very fine grained, clayey, very silty; abundant plant fragments; includes beds, up to 0.2 ft. thick, of medium-gray siltstone with abundant leaf impressions in part; unit becomes principally sandy siltstone in upper half; lower contact sharp----- 2.
- Sandstone, medium-gray, iron-stained, slabby-weathering, cliff-forming, thin-bedded and cross-bedded in upper part, mostly very friable, fine-grained to very fine grained in upper part, locally limy and concretionary, silty; scattered carbonaceous wood fragments; lower two-thirds includes limy concretions up to 2 ft. thick----- 18.
- Coal, blocky; includes at base 0.2-ft. bed of dark-gray to dark-brownish-gray carbonaceous shale with very thin coal stringers; lower contact sharp----- 1.8
- Siltstone, medium-gray, obscurely bedded, clayey; includes at 3.3 ft. below top 0.8-ft. bed of medium-gray slabby-weathering laminated very fine grained silty sandstone; at 1.5 ft. below top 0.5-ft. bed of medium-gray silty shale with plant fragments; lower contact gradational----- 6.
- Sandstone, medium-gray, slabby-weathering, friable, very fine grained, very silty; lower contact gradational----- 0.5
- Siltstone, medium- to medium-dark-gray, hackly-weathering, laminated, very finely sandy, clayey; lower contact gradational----- 0.5
- Shale, medium-gray, hackly-weathering, obscurely bedded, probably thin-bedded, clayey, very silty; few carbonaceous plant fragments; includes at base 0.2-ft. bed of dark-gray carbonaceous shale----- 1.5
- Coal, blocky; bony in upper 0.1 ft.; includes at 0.1 ft. below top 0.2-ft. bed of black fissile carbonaceous shale with abundant plant fragments----- 1.
- Shale, black to medium-dark-gray, fissile, carbonaceous, silty; abundant carbonaceous plant fragments; lower contact gradational----- 0.5

Sandstone, medium-gray, slabby-weathering, laminated to very thin bedded, friable, very fine grained, very silty and clayey; lower half includes beds and lenses, up to 0.1 ft. thick, of medium- to coarse-grained sandstone and 0.05-ft. beds of sandstone with abundant coal stringers; lower contact gradational----- 3.5

Shale, medium- to medium-dark-gray, hackly-weathering, obscurely thin-bedded, mostly silty, clayey; at about 3 ft. below top includes medium-gray limy siltstone concretions, about 1 ft. thick, with common plant fragments----- 16.

Coal, bony; lower contact fairly sharp----- 0.05-0.1

Sandstone, medium-gray, poor slabby-weathering, laminated to thin-bedded, very friable, very fine grained, silty; includes laminations of carbonaceous material; 0.5-ft. bed of medium- to medium-dark-gray shale at 1.4 ft. above base; lower contact sharp----- 3.2

Siltstone, medium-gray, hackly-weathering, obscurely thin-bedded; scattered carbonaceous plant fragments; lower contact gradational----- 0.5

Siltstone, medium-gray to brownish-gray, platy-weathering, ledge-forming, hard, limy; abundant leaf impressions----- 1.

Siltstone, medium-gray, hackly-weathering, obscurely thin-bedded; scattered carbonaceous plant fragments; includes few 0.1-ft. ironstone nodules near middle; lower contact fairly sharp----- 7.3

Sandstone, medium-gray, very thin bedded to laminated, very fine grained, very silty and clayey; upper half includes interbeds of medium-gray laminated very finely sandy siltstone----- 3.

Siltstone, medium-gray, ledge-forming, hard, nodular, limy; abundant plant fragments----- 0.6

Siltstone, medium-gray, partly iron-stained, hackly-weathering, obscurely bedded in lower part, mostly very thin bedded, finely sandy----- 10.7

Coal, Cooper bed, blocky, platy-weathering in upper 1-2 ft.----- 5.4

Lower part of exposed rocks not measured

Measured section 3

Location: Creek-bed and hillside exposures in Bear Canyon along upper part of Palmer Creek from SE 1/4 sec. 3 southward to center sec. 10, T. 6 S., R. 13 W., Seldovia C-4 quadrangle. This location is approximately the same as locality 126 of Barnes and Cobb (1959, pls. 18, 19).

	Feet
Tertiary rocks - Kenai Group, Beluga Formation (upper part)	
Upper part of exposed rocks not measured	
Coal, (upper coal at locality 126 of Barnes and Cobb, 1959), platy-weathering; includes at 0.4 ft. above base a parting as much as 0.3 ft. thick of light-brownish-gray partly iron-stained hard clayey siltstone that weathers light-gray and contains pyroclastic(?) grains; lower contact sharp-----	2.
Sandstone, medium-gray, poor platy-weathering, obscurely very thin bedded, friable, very fine grained, sub-angular to subrounded, partly silty, slightly clayey; becomes medium-light-gray clayey siltstone in upper half; includes large randomly oriented coaly wood fragments in upper 0.5 ft.; lower contact sharp-----	2.
Siltstone (<u>3P-72</u>)*, medium-gray, partly iron-stained, hackly-weathering, obscurely very thin bedded, hard, clayey; locally abundant carbonaceous plant fragments; few leaf impressions near top; includes 0.3-ft. bed of medium-dark-gray fissile carbonaceous shale about 1 ft. above base-----	4.
Coal, bony; lower contact sharp-----	0.5
Siltstone, medium-gray, partly iron-stained, very thin bedded, hard, very sandy, clayey; locally abundant carbonaceous plant fragments; few very thin coal stringers; lower contact gradational-----	2.
Sandstone, medium-gray, mostly iron-stained, poor slabby-weathering, obscurely bedded, friable, fine- to medium-grained in lower 2 ft., very fine grained in upper 1.5 ft., subangular to subrounded, slightly silty; scattered carbonaceous plant fragments; lower contact sharp-----	3.5.

Shale, black, partly iron-stained, fissile to platy-bedded, carbonaceous; coalified wood fragments; lower contact gradational-----	0.3
Siltstone, medium-gray, partly iron-stained, hackly-weathering, obscurely very thin bedded, clayey, partly micaceous, partly sandy; few carbonaceous plant fragments-----	5.
Coal, bony; lower contact sharp-----	0.2
Sandstone and interbedded siltstone; sandstone, medium-gray, partly iron-stained, poor slabby-weathering, very thin bedded, friable, very fine to fine-grained, subangular to subrounded, silty, partly clayey; forms beds to 2 ft. thick; siltstone, medium-gray, hackly-weathering, obscurely bedded, clayey; locally includes leaf impressions and carbonaceous plant fragments; lower contact sharp-----	6.6
Sandstone, medium-gray, partly iron-stained, poor slabby-weathering, very thin bedded, friable, very fine to fine-grained, subangular to subrounded, silty, slightly clayey-----	1.
Siltstone and interbedded sandstone; siltstone, medium-gray, blocky-weathering, obscurely bedded, clayey; sandstone, medium-gray, partly iron-stained, very fine grained, subangular to subrounded, clayey; abundant carbonaceous plant fragments; lower contact probably sharp-----	10.
Sandstone, medium-gray, poor slabby-weathering, obscurely bedded, friable, very fine to fine-grained, subangular to subrounded; lower contact poorly observed-----	3.
Siltstone and interbedded sandstone; siltstone, medium-gray, blocky-weathering, obscurely bedded, hard, clayey, partly sandy; few carbonaceous plant fragments; sandstone, medium-gray, thin-bedded, very fine grained, subangular, silty, clayey; restricted to lower half of unit; lower contact gradational-----	6.

- Sandstone, medium-gray, partly iron-stained, poor slabby-weathering, very thin bedded, cross-bedded in part, friable, very fine to fine-grained, subangular to subrounded; includes a 2-ft. interval of interbedded very fine grained clayey sandstone and soft clayey siltstone with ironstone nodules about 1.5 ft. above base; a 0.5-ft. bed of medium-gray poorly friable very fine grained sandstone about 6 ft. above base; thin platy sandstone lenses in upper half; numerous micaceous very carbonaceous sandstone stringers less than 0.1 ft. thick in upper 2 ft.; lower contact sharp and possibly disconformable----- 19.5
- Siltstone and interbedded sandstone; siltstone, medium-gray, platy-weathering, very thin bedded to partly laminated, clayey; few carbonaceous plant fragments; sandstone, medium-gray, partly iron-stained, very thin bedded, friable, very fine to fine-grained, subangular, silty; becomes laminated to very thin bedded very fine grained sandstone with some carbonaceous wood material (possible roots in growth position?) in upper 1.5 ft.; lower contact sharp----- 7.5
- Siltstone, medium-gray, partly iron-stained, platy-weathering, very thin bedded to partly laminated, clayey, partly micaceous; few carbonaceous plant fragments; includes a 0.05-ft. medium-dark-gray fissile carbonaceous shale about 4 ft. above base, a 0.5-ft. dark-gray to black carbonaceous shale about 6 ft. above base; few small ironstones less than 0.1 ft. thick in courses scattered throughout; leaf impressions in upper 2 ft.; lower contact gradational----- 18.5
- Sandstone and interbedded siltstone; sandstone, medium-gray, partly iron-stained, platy-weathering, very thin bedded to laminated, very fine grained, subangular to subrounded, clayey, silty; locally abundant carbonaceous plant fragments (few in growth position?); siltstone, similar to sandstone; upper 1 ft. friable very fine grained subangular to subrounded sandstone; lower contact gradational----- 4.6
- Sandstone, medium-gray, partly iron-stained, slabby- to platy-weathering, very thin bedded, cross-bedded, mostly friable, very fine to fine-grained, subangular to subrounded; includes many thin beds of partly laminated non-friable very clayey silty sandstone; lower contact sharp----- 5.2

- Siltstone, medium-light-gray, flaggy- to platy-weathering, laminated to very thin bedded, sandy, clayey, slightly limy; common carbonaceous plant fragments; lower contact fairly sharp----- 2.
- Sandstone, medium-gray, partly iron-stained, slabby-weathering, very thin bedded, cross-bedded, friable, very fine to fine-grained, subangular; lower contact sharp----- 2.3
- Sandstone, medium-gray, partly iron-stained in lower 1 ft., prominent platy-weathering, laminated to platy-bedded, hard, very fine grained, subangular to subrounded, very silty in lower 1 ft., slightly limy; abundant carbonaceous plant fragments locally on bedding surfaces; lower contact sharp----- 3.6
- Sandstone, medium-gray, mostly iron-stained, poor slabby-weathering, very thin bedded, cross-bedded (small-scale), friable, very fine to fine-grained, subangular to subrounded; few coalified wood fragments in lower 1 ft.; includes few fragments of carbonaceous shale near base; a 0.5-ft. bed of medium-light-gray thinly interbedded limy very fine grained sandstone and clayey siltstone in lower 1 ft.; 4 laminated very fine grained clayey sandstone beds up to 0.2-ft. thick in lower 6 ft., few scattered iron-stained clayey lenses of sandstone up to 0.1 ft. thick; lower contact sharp and probably disconformable----- 17.
- Siltstone, medium-gray, partly iron-stained, hackly- to platy-weathering, very thin bedded to partly laminated, hard, clayey, sandy; abundant plant fragments and coalified iron-replaced plant fragments (partly in growth position?) mostly along bedding surfaces; includes at 3.5 ft. above base a 1-ft. bed of medium- to medium-dark-gray platy-bedded silty carbonaceous shale, with plant fragments, that grades to underlying and overlying siltstone; at top a 0.5-ft. bed of carbonaceous shale, similar to below, that contains locally abundant leaf impressions; lower contact gradational----- 8.2
- Sandstone, medium-gray, partly iron-stained, poor slabby-weathering, obscurely bedded, friable, very fine grained, subangular to subrounded, silty; lower contact fairly sharp----- 2.8

Siltstone, medium-gray, iron-stained in lower part, obscurely very thin bedded, soft, clayey, partly sandy; abundant carbonaceous plant fragments on bedding surfaces; lower contact fairly sharp-----	1.3
Shale, medium- to medium-dark-gray, platy-weathering, fissile to platy-bedded, partly carbonaceous; abundant plant fragments in upper 0.3 ft.; includes bony coal stringers and woody fragments; lower contact fairly sharp-----	1.2
Siltstone, medium-gray, partly iron-stained in lower 1 ft., platy- to blocky-weathering, very thin bedded to laminated, sandy, clayey, very clayey in upper 1 ft.; some small carbonaceous plant fragments-----	4.5
Shale, medium-gray, hackly-weathering, obscurely bedded, silty; some carbonaceous plant fragments; lower contact gradational-----	4.1
Siltstone, medium-gray, partly iron-stained, poor platy- to chunky-weathering, poorly very thin bedded to partly laminated, clayey, partly sandy; common carbonaceous plant fragments; lower contact sharp-----	4.4
Shale, dark-gray to black, platy-bedded, carbonaceous; includes bony coal stringers; ironstone nodules to 0.5 ft. thick in lower part-----	0.7
Shale, medium-gray, obscurely bedded, hard; many carbonaceous plant fragments; lower contact gradational-----	0.5
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey, sandy in basal part; many carbonaceous plant fragments; lower contact gradational-----	1.
Sandstone, medium-gray, partly iron-stained, slabby-weathering, obscurely very thin bedded, cross-bedded, mostly friable, very fine grained, subangular, silty, clayey, very clayey in top 0.2 ft.; some carbonaceous plant fragments; lower contact sharp-----	1.3
Shale, medium-gray, obscurely bedded, hard, silty; many carbonaceous plant fragments; includes ironstone nodules 0.3-ft. thick at 1.3 ft. above base; lower contact sharp-----	2.6

- Sandstone, medium-dark-gray, partly iron-stained, poor platy- to very thin bedded, very fine grained, subangular to subrounded, very clayey; many carbonaceous plant fragments; includes several thin very carbonaceous siltstone beds; a 0.2-ft. bony coal at top; lower contact sharp----- 1.2
- Sandstone and interbedded siltstone; sandstone, medium-gray, chunky-weathering, obscurely bedded, partly friable (0.5-ft. bed 0.7 ft. below top), very fine grained, subangular, mostly very clayey; some carbonaceous plant fragments; siltstone, medium-gray, obscurely bedded, clayey, mostly sandy; some carbonaceous plant fragments----- 4.6
- Sandstone, medium-gray, partly iron-stained, obscurely bedded, mostly friable, very fine grained, subangular, slightly silty, clayey; includes few thin clayey siltstone beds in basal part----- 1.4
- Siltstone, medium-gray, partly lightly iron-stained, hackly-weathering, laminated to poor platy-bedded, clayey, partly sandy; many carbonaceous plant fragments on bedding and some normal to bedding; includes few thin interbeds of very fine grained sandstone in lower and upper parts----- 4.
- Sandstone, medium-gray, partly iron-stained, chunky-weathering and hard in upper half, obscurely bedded, friable in lower half, fine-grained in lower part becoming very fine grained and very silty in upper part, subangular, clayey; few carbonaceous plant fragments; lower contact gradational----- 3.5
- Siltstone, medium-gray, partly iron-stained, poor platy- to very thin bedded, clayey, sandy in upper 0.3 ft.; some small carbonaceous plant fragments; includes 4 courses of ironstone nodules up to 0.2 ft. thick in lower 3.4 ft.----- 8.6
- Coal, bony; lower contact sharp----- 0.3
- Siltstone, medium-gray, partly iron-stained, poor platy-weathering in part, platy- to very thin bedded, hard, clayey; abundant carbonaceous plant fragments; upper 0.1 ft. becomes dark-gray and carbonaceous; lower contact sharp----- 2.5

Shale, dark-gray to black, poorly fissile to platy-bedded, carbonaceous; includes bony coal stringers in upper half; lower contact sharp-----	0.5
Shale, medium-gray, hackly-weathering, poorly very thin bedded, slightly silty; many small carbonaceous plant fragments-----	1.9
Coal, blocky; includes a 0.2-ft. parting of dark-gray to black iron-stained fissile to poor platy-bedded carbonaceous shale at 1.3 ft. above base; lower contact sharp-----	4.
Siltstone, medium-gray, partly iron-stained, platy-weathering, laminated to very thin bedded, clayey, partly finely sandy; many small and some large coaly plant fragments and iron-replaced wood fragments (some in growth position?); one coaly stump(?) extending upward from underlying shale; includes 2 intervals, 0.5-ft. thick, of thinly interbedded siltstone and very fine grained subangular silty sandstone at 4 and 6 ft. above base; abundant small randomly oriented plant remains in upper 0.2 ft.-----	9.
Shale, medium- to dark-gray, fissile, carbonaceous in part; abundant plant remains; includes bony coal lenses up to 0.05 ft. thick; lower contact sharp-----	0.1-0.3
Siltstone, medium-gray, blocky- to poor platy-weathering, obscurely bedded, slightly clayey; abundant plant remains; lower contact gradational-----	1.8
Sandstone, medium-gray, partly iron-stained, slabby-weathering in lower part, blocky- and platy-weathering in upper part, very thin bedded and cross-bedded in lower 2.3 ft., laminated in upper 1.3 ft., very fine grained, subangular, silty; scattered carbonaceous and iron-replaced plant remains (some in growth position?); includes a few thin beds of iron-stained fine- to medium-grained subangular to subrounded sandstone about 2.3 ft. above base; lower contact fairly sharp-----	3.6

<p>Sandstone, medium-gray, very iron-stained in lower 4 ft., very thin to thin-bedded in lower 3 ft., cross-bedded, friable, fine- to medium-grained becoming dominantly fine-grained in upper third, subangular to subrounded; many dark rock fragments; includes scattered iron-rich stringers up to 0.1 ft. thick; 4 beds up to 0.3 ft. thick, of medium-gray laminated to platy-bedded clayey siltstone at 30 to 34 ft. above base-----</p>	37.
<p>Siltstone and interbedded sandstone; siltstone, medium-gray, partly iron-stained, poor platy-bedded, clayey; plant fragments, leaf impressions; sandstone, medium-gray, partly iron-stained, poor platy-weathering, friable in part, very fine grained, subangular silty, clayey; few carbonaceous plant fragments; forms beds to 0.3 ft. thick; 0.1-ft. bed of black fissile very carbonaceous shale at top-----</p>	4.8
<p>Coal, bony-----</p>	0.1
<p>Shale, medium-gray, hackly-weathering, obscurely bedded, silty; many carbonaceous plant fragments; many leaf impressions in upper part; becomes dark-gray to black and very carbonaceous in middle-----</p>	1.7
<p>Coal, weathered, blocky; includes a 0.5-ft. medium- to dark-gray shale parting 0.5 ft. below top-----</p>	3.1
<p>Shale (3P-44)*, medium-gray, dark-gray in upper 0.2 ft., poor platy- to hackly-weathering, obscurely bedded, silty; abundant plant fragments; lower contact gradational-----</p>	1.8
<p>Siltstone, medium-gray, partly lightly iron-stained, poor platy-weathering, obscurely bedded, clayey, sandy in lower half; abundant plant fragments; lower contact sharp-----</p>	4.8
<p>Sandstone, medium-gray, laminated in part, more friable than underlying sandstone, very fine grained, subangular to subrounded; includes carbonaceous laminations-----</p>	1.4
<p>Sandstone, medium-gray, platy- to hackly-weathering, obscurely bedded, very fine grained, subangular to subrounded, very clayey; includes several medium-gray clayey siltstone interbeds-----</p>	1.6

*Palynological sample

Siltstone, medium-light-gray, partly iron-stained, platy- to very thin bedded, clayey, sandy; common plant fragments randomly oriented in part; abundant leaf impressions in upper 0.1 ft.; lower contact gradational-----	3.2
Sandstone, medium-gray, partly iron-stained, platy- to hackly- weathering, poor platy- to very thin bedded, hard, very fine grained, subangular, very clayey, silty; upper half becomes sandy siltstone; plant fragments in upper part; lower contact fairly sharp-----	1.9
Sandstone, medium-gray, partly iron-stained, partly platy- weathering, very thin to thin-bedded, cross-bedded, very fine grained, subangular, silty, slightly clayey-----	1.4
Sandstone, medium-gray in upper half, mostly iron-stained in lower half, poor slabby-weathering, probably thin-bedded and cross-bedded, friable, medium- to coarse-grained, subrounded to subangular, slightly silty; locally includes at base granules, pebbles, and cobbles of crystalline rock up to 0.5 by 0.2 ft.; few lenses, less than 0.1 ft. thick, of light-gray sandy pyroclastic(?) siltstone and very carbonaceous sandstone; upper 1 ft. includes several coaly lenses and coal fragments-----	18.4
Coal, blocky-----	0.7
Shale, medium-gray, platy-bedded; includes many coal stringers and carbonaceous plant fragments-----	0.6
Coal, blocky-----	0.2
Siltstone, medium-gray, partly iron-stained, obscurely bedded, hard, clayey; many carbonaceous plant fragments randomly oriented; lower contact sharp-----	0.2
Sandstone, medium-gray, partly iron-stained, obscurely very thin bedded, very fine grained, subangular to subrounded, silty, clayey; includes coal fragments in lower part; lower contact sharp-----	9.
Siltstone, medium-gray, obscurely bedded, very clayey; scattered to abundant plant fragments; some leaf impressions about 3 ft. above base; includes few iron-stone nodules at 4 ft. above base; few iron-stained very fine grained sandstone beds in upper 2 ft.; lower contact sharp-----	12.4

Sandstone, medium-gray, very iron-stained, obscurely thin-bedded to laminated, partly friable, very fine to fine-grained, subangular to subrounded, silty; carbonaceous plant material in lower and middle parts; includes at base a 0.3-ft. bed of medium-gray iron-stained sandy siltstone-----	2.6
Coal, bony; coaly wood fragments in basal part; lower contact sharp-----	0.3
Siltstone, medium-gray, partly iron-stained, platy- to hackly-weathering, laminated to very thin bedded in lower half, obscurely bedded in upper half; few small carbonaceous plant fragments; includes few thin interbeds of very fine grained subangular silty sandstone; few medium-gray shale interbeds in upper half-----	3.
Shale, dark-gray, carbonaceous; includes bony coal (large flattened coalified logs)-----	0.5
Siltstone, medium-gray, slightly iron-stained, hackly-weathering, obscurely very thin bedded, clayey, finely sandy; few plant fragments; lower contact sharp and uneven-----	6.6
Coal, weathered, mostly bony; includes flattened logs in basal part; a 0.4-ft. bed of black carbonaceous shale 0.8 ft. above base; lower contact sharp and wavy-----	3.2
Siltstone, medium- to medium-light-gray, iron-stained, platy- to uneven-weathering, laminated in upper part, hard, clayey; locally common plant fragments; leaf impressions in basal 1 ft.; includes very fine grained subangular silty clayey sandstone interbeds in upper 5.2 ft.; upper 1 ft. includes randomly oriented large irregular coal stringers and fragments; lower contact gradational-----	6.2
Siltstone, medium- to dark-gray, platy-bedded, carbonaceous in lower half; abundant plant fragments and coal stringers in upper half; lower contact sharp-----	0.5
Sandstone, medium-gray, iron-stained, platy- to uneven-weathering, very thin bedded, hard, very fine grained, subangular, silty, clayey; locally abundant plant fragments-----	3.5

Siltstone, medium-gray, partly iron-stained, platy-bedded, clayey, partly sandy; locally abundant plant fragments and leaf impressions; lower contact gradational-----	1.1
Siltstone, dark-gray, platy-bedded, clayey, carbonaceous; abundant plant fragments; scattered coaly stringers; lower contact fairly sharp-----	0.6
Sandstone, medium-gray, very iron-stained, platy- to very thin bedded, very fine grained, subangular to sub-rounded, silty, very clayey; locally abundant carbonaceous plant fragments; 0.5-ft. bed of hard iron-cemented(?) clayey siltstone at base; includes siltstone chips locally; upper half includes interbeds of friable sandstone and hard clayey sandstone; lower contact sharp-----	6.2
Siltstone, medium- to dark-gray, partly iron-stained, platy-bedded in part, hard, clayey, carbonaceous in part; abundant carbonaceous plant fragments (mostly leaves); includes bony coal stringers at base; lower contact sharp-----	0.8
Sandstone, medium-gray, partly iron-stained, platy-weathering, laminated, hard, very fine grained, subangular to subrounded, very silty, clayey; locally abundant carbonaceous laminations interbedded with medium-gray slabby-weathering obscurely bedded friable very fine grained subrounded sandstone; about equal amounts of both sandstone types in lower half forming beds 1-1.5 foot thick; laminated sandstone becomes dominant in upper half-----	14.
Sandstone, medium-gray, iron-stained, obscurely bedded, friable, very fine to fine-grained, subangular to subrounded; lower contact sharp-----	0.5

Siltstone, medium-gray, blocky-weathering in lower half, platy-weathering in upper half, partly obscurely bedded, laminated in upper half, clayey, sandy in upper half; leaf impressions and randomly oriented coaly fragments (twigs) in upper half; includes 0.1-ft. ironstone nodules about 1.5 ft. above base-----	3.6
Shale, medium-dark-gray to black, fissile, hard; abundant carbonaceous plant fragments-----	1.
Coal, platy-weathering; some fusain(?) films-----	1.5
Coal, bony; interbedded with medium-dark-gray carbonaceous shale; lower contact sharp-----	0.1
Sandstone, medium-gray, slabby-weathering, obscurely laminated to very thin bedded, cross-bedded, friable, hard in part, very fine grained, sub-angular to subrounded, silty, partly clayey, micaceous in upper 0.9 ft.; abundant plant fragments in upper 0.9 ft.; includes medium-gray clayey siltstone interbeds up to 0.2 ft. thick; lower contact fairly sharp-----	6.4
Siltstone, medium-gray, partly iron-stained, hackly-weathering, obscurely bedded, probably very thin bedded, hard, clayey; few plant fragments; includes medium-gray hard shale interbeds with abundant plant fragments in lower 2 ft.; slightly limy ironstone nodules 0.2 ft. thick at 1 ft. below top; lower contact gradational-----	5.6

Sandstone, medium-gray, slightly bluish when wet, slabby-weathering, obscurely thin-bedded, partly laminated about 6 ft. above base, very fine to fine-grained, subangular to subrounded, silty, clayey; no carbonaceous plant fragments seen; includes interbeds, up to 0.3 ft. thick, of medium-gray sandy clayey siltstone with scattered carbonaceous plant fragments in lower 2 ft. and upper 6 ft.-----	16.
Siltstone and interbedded sandstone; siltstone, medium-gray, partly iron-stained, obscurely bedded, hard, clayey; few carbonaceous plant fragments; sandstone, medium-gray, partly iron-stained, friable, very fine to fine-grained, subangular to subrounded, silty, clayey; beds 0.2-0.5 ft. thick-----	2.4
Covered interval-----	26.3
Sandstone, medium-gray, partly iron-stained in upper half, slabby-weathering, friable, fine-grained, some medium grains in lower part, subrounded to subangular; abundant dark rock fragments; upper 7 ft. includes interbeds, up to 1 ft. thick, of sandy clayey siltstone with scattered carbonaceous plant fragments; lower contact sharp-----	17.7
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey, partly sandy in upper 3 ft.; many small plant fragments; includes at top ironstone nodules, up to 0.35 ft. thick, containing abundant randomly oriented plant fragments; lower contact gradational-----	4.5
Shale, medium-gray, partly iron-stained, obscurely bedded, silty; abundant randomly oriented plant fragments; includes near middle ironstone nodules, up to 0.2 ft. thick, with abundant plant fragments roughly parallel to bedding-----	2.
Shale, dark-gray to black; abundant carbonaceous plant material on bedding surfaces; upper half very impure bony coal----	0.8
Shale (3P-25)*, medium-gray, weathered, obscurely bedded; many carbonaceous plant fragments-----	0.6
Coal, weathered, blocky-----	1.7

*Palynological sample

Siltstone, medium-gray, partly iron-stained, hackly-weathering, obscurely very thin bedded, clayey; some carbonaceous plant fragments; includes some sandstone interbeds similar to underlying unit; at top a 0.3-ft. bed of medium-dark-gray silty shale with abundant carbonaceous plant fragments; lower contact probably gradational-----	5.4
Sandstone, medium-gray, partly iron-stained, platy- to thin-bedded, hard, very fine grained, subangular to subrounded, silty, clayey; some carbonaceous plant fragments; includes siltstone interbeds in upper 1 ft.-----	3.4
Shale, black, fissile to platy-bedded, carbonaceous; abundant carbonaceous plant material; lower contact sharp-----	0.1
Shale, medium-gray, obscurely bedded, hard, silty; some carbonaceous plant fragments; 0.5-ft. bed of siltstone at base; lower contact gradational-----	3.
Sandstone, medium-gray, partly iron-stained, very thin bedded to partly laminated, cross-bedded, very fine to fine-grained, subangular to subrounded, silty, clayey; some carbonaceous laminations; lower contact sharp-----	2.5
Shale, medium-dark-gray, fissile to platy-bedded, hard, silty; abundant plant fragments on bedding surfaces; includes a 0.2-ft. bone coal near middle; large coalified logs in upper part; lower contact sharp-----	9.
Sandstone, medium-gray, chunky- to hackly-weathering, partly laminated, mostly obscurely very thin to thin-bedded, partly friable, very fine grained, subangular to subrounded, silty, clayey; upper half becomes mostly sandy siltstone with some carbonaceous plant fragments; lower contact gradational-----	5.1
Siltstone, medium-gray, locally iron-stained, obscurely bedded, clayey; some carbonaceous plant fragments locally; includes ironstone nodules, up to 0.5 ft. thick, near middle and at top; few interbeds of medium-gray shale and very fine grained sandstone-----	17.
Covered interval-----	6.2

Siltstone, medium-gray, obscurely thin-bedded, clayey, partly sandy in upper half; locally abundant carbonaceous plant fragments; includes a 0.7-ft. bed of medium-light-gray friable very fine grained subangular silty sandstone at 1.5 ft. above base; scattered ironstone nodules, up to 0.2 ft. thick, in upper half; lower contact gradational-----	8.5
Siltstone, medium-gray to brownish-gray, partly iron-stained, blocky-weathering, laminated to very thin bedded, clayey, partly finely sandy; few carbonaceous plant fragments; includes hard limy concretions in upper 0.5 ft.; lower contact sharp-----	1.5
Sandstone, medium-gray, partly iron-stained, obscurely very thin to thin-bedded, friable, very fine to fine-grained, subrounded to subangular; includes shale lenses up to 0.05 by 0.3 ft. in lower 1 ft.; lower contact sharp-----	4.5
Shale, medium-gray, obscurely very thin bedded; locally abundant plant fragments; includes ironstone nodules, 0.1 ft. thick, at 3 ft. above base; interbeds of friable very fine grained subangular sandstone in upper 0.5 ft.; lower contact fairly sharp-----	4.6
Siltstone, medium-gray to brownish-gray, locally strongly iron-stained, platy- to uneven-weathering, very thin bedded, clayey; lower contact fairly sharp-----	2.5
Sandstone, medium-gray to brownish-gray, slightly iron-stained in upper 0.5 ft., very thin bedded, very fine grained, subangular, very silty, very clayey; abundant carbonaceous plant fragments; includes 2 thin beds of friable sandstone in upper 1 ft.; lower contact fairly sharp-----	2.5
Sandstone, medium-gray, mildly iron-stained at top, obscurely bedded, friable, very fine to fine-grained, subangular to subrounded, silty; no plant fragments seen; lower contact fairly sharp-----	2.3
Shale, medium-gray, slightly iron-stained, small-chunky-weathering, obscurely very thin bedded, silty; few carbonaceous plant fragments; includes interbeds of medium-gray siltstone in upper half-----	5.1
Covered interval-----	6.9

Shale, gray, deeply weathered, silty, sandy-----	1.
Coal-----	0.5
Shale (3P-15)*, medium-gray, hackly-weathering, platy- to thin-bedded, slightly silty; abundant plant fragments----	3.3
Coal, blocky; includes a 0.3-ft. gray shale parting at 2.2 ft. below top and a 0.1-ft. gray shale parting 1.1 ft. below top; lower contact sharp and gently rolling-----	5.6
Siltstone, medium-gray, partly iron-stained, hackly-weathering, clayey, finely sandy; common plant fragments; includes at base about 1-ft. bed of medium-dark-gray very thin to platy-bedded sandy carbonaceous siltstone; 1-ft. bed of medium-light-gray friable very fine grained subangular to subrounded silty sandstone at 2.5 ft. above base; lower contact gradational-----	6.5
Sandstone, medium-gray, partly iron-stained, slabby- to hackly-weathering, very thin to platy-bedded, partly friable, very fine grained, subangular, silty; becomes more silty and clayey upward; includes friable zones up to 1 ft. thick in middle; lower contact gradational---	5.
Shale, medium-gray, partly iron-stained, fissile to platy-bedded in lower half, silty; abundant carbonaceous plant fragments in lower half becoming less common in upper half; includes at top 0.6-ft. hard limy siltstone concretion with few carbonaceous plant fragments-----	2.5
Siltstone, medium-gray, hackly- to poor-platy-weathering, thin- to platy-bedded, very clayey; common plant fragments; includes laminations and very thin beds of medium-gray very fine grained sandstone; lower contact gradational-----	3.5
Sandstone, medium-gray, partly iron-stained, probably hackly-weathering, obscurely bedded to partly laminated, very fine grained, subangular, silty, clayey; few carbonaceous plant fragments-----	2.
Covered interval; probably sandstone-----	2.
Shale, dark-gray, poor platy-weathering, fissile to platy-bedded, carbonaceous; abundant carbonaceous plant fragments-----	0.7

*Palynological sample

Coal, blocky-----	0.6
Sandstone, medium-gray, partly iron-stained, poor platy- weathering, very thin bedded to laminated, cross- bedded, hard, very fine grained, subangular to sub- rounded, silty, very clayey; common small carbonaceous plant fragments and few randomly oriented large coal fragments; includes few ironstone nodules in upper 1 ft.-----	3.5
Covered interval-----	5.
Coal, platy-weathering in lower part-----	1.5
Siltstone, medium-gray, hackly-weathering, obscurely bedded, hard, clayey, partly sandy; common carbonaceous plant fragments-----	0.5
Covered interval-----	11.7
Siltstone, medium-gray, partly iron-stained, hackly-weather- ing, obscurely very thin to thin-bedded, clayey, sandy and micaceous in upper half; locally abundant carbo- naceous plant fragments; includes at base a 0.4-ft. bed of dark-gray carbonaceous shale and a similar 0.6- ft. bed 2.2 ft. above base (contacts of carbonaceous shale beds are gradational); a 0.2-ft. ironstone at top--	5.
Coal, bony; includes black carbonaceous shale-----	0.3
Shale, medium-gray, partly iron-stained, obscurely bedded, hard; abundant carbonaceous plant fragments-----	0.4
Shale, dark-gray, very carbonaceous; abundant plant frag- ments; includes abundant interbedded bone coal; lower contact sharp-----	0.6
Siltstone, medium-gray, strongly iron-stained in places, hackly-weathering, obscurely very thin bedded, partly finely sandy, clayey, more shaly and hackly-weathering in upper 1 ft.; few large flattened coaly wood frag- ments in upper 1 ft.; includes ironstone nodules, up to 0.3 ft. thick, about 1.5 ft. above base; 0.3-ft. bony coal at 1 ft. below top-----	3.3
Shale, medium-gray, uneven-weathering, obscurely platy-bedded, slightly silty; abundant carbonaceous plant fragments; includes a 0.2-ft. bed of dark-gray carbonaceous shale about 2 ft. above base; lower contact gradational-----	3.3

Siltstone, medium-gray, slightly iron-stained, hackly- weathering, obscurely very thin bedded to partly lami- nated, clayey; common carbonaceous plant fragments; includes a 2-ft. bed of medium-gray laminated hard very fine grained subangular clayey sandstone about 1.5 ft. below top; probably contains ironstone nodules (none seen)-----	9.7
Coal, blocky, weathered-----	0.8
Shale (<u>3P-3</u>)*, medium-gray, obscurely bedded; some carbo- naceous plant fragments; upper 0.2 ft. becomes dark- gray fissile very carbonaceous shale-----	0.6
Shale, black, fissile-weathering, very carbonaceous-----	0.2
Coal, Cabin bed, bony, platy-weathering, mostly blocky; scattered amber grains; includes a 0.4-ft. bed of medium-dark-gray to black silty carbonaceous shale with many coal stringers at 0.35 ft. above base-----	1.85
Siltstone, medium-gray, partly iron-stained, hackly-weather- ing, poor platy- to very thin bedded, clayey; few small plant fragments; lower contact sharp-----	7.4
Shale, dark-gray to black, fissile- to platy-weathering, platy-bedded, very carbonaceous; abundant plant frag- ments; includes about 0.1-ft. bed of bony coal near middle; lower contact fairly sharp-----	0.7
Siltstone, medium-gray, hackly-weathering, poor platy- to thin-bedded, clayey; many carbonaceous plant fragments in upper two thirds; lower contact con- cealed in Palmer Creek-----	3.4

*Palynological sample

Measured section 4

Location: Hillside and creek-bed exposures in large unnamed canyon about 1 mile northeast of Bear Canyon near center of sec. 2, T. 6 S., R. 13 W., Seldovia C-4 quadrangle. This location is approximately the same as locality 127 of Barnes and Cobb (1959, pls. 18, 19). The youngest beds are exposed at the head of the canyon.

	Feet
Tertiary rocks-Kenai Group, Sterling Formation	
Upper part of exposed rocks not measured	
Shale (4P-30)*, medium-gray, partly iron-stained, platy- to hackly-weathering, obscurely bedded, clayey; abundant carbonaceous plant fragments-----	3.+
Coal, Fletcher bed, platy-weathering, impure, mostly flattened coalified logs and large wood remains; lower contact fairly sharp-----	2.9
Sandstone, medium-gray, partly iron-stained, platy-weathering, platy-bedded to partly laminated, partly friable, very fine grained, subangular, mostly clayey, very silty; locally common carbonaceous plant fragments, some plant fragments oriented perpendicular to bedding; includes four interbeds up to 1.5 ft. thick of medium-gray partly platy-bedded friable very fine grained sandstone; four interbeds less than 1 ft. thick of medium-gray partly iron-rich shale (4P-29)* with abundant plant fragments and locally abundant leaf impressions (three beds in upper half, one in lower half); lower contact fairly sharp-----	20.
Sandstone, medium-gray, medium-light-gray-weathering, uniformly light-brown iron-stained, weathering to rounded slabby steep knobby slopes, poor cliff-forming, very thin to thin-bedded, cross-bedded, friable, fine- to medium-grained, subangular to subrounded, silty; includes few shale flakes at base; few interbeds of medium-gray poor fissile- to platy-weathering platy-bedded to laminated very fine grained clayey sandstone with common carbonaceous laminations; lower contact fairly sharp-----	17.

*Palynological sample

- Sandstone, medium-gray, partly iron-stained, poor fissile-
to platy-weathering, platy-bedded, locally laminated,
very fine grained, subangular, clayey, very silty;
locally abundant carbonaceous plant fragments; in-
cludes common carbonaceous laminations; lower contact
fairly sharp----- 4.5
- Sandstone, medium gray, iron stained, medium-light-gray-
weathering, steep rounded slabby knobby slope-forming,
poor cliff-forming, very thin to thin-bedded, cross-
bedded, friable, fine- to coarse-grained in basal part
becoming mostly fine- to medium grained above 10 ft.
above base, subangular to subrounded, silty; scattered
large coalified wood fragments in lower 5 ft.; includes
medium-gray siltstone clasts in lower 3 ft.; interbeds
up to 2 ft. thick between 5.5 and 10 ft. above base of
platy to laminated very fine grained sandstone; banded
iron-stain pattern suggestive of soft-sediment flowage
or possible ground-water action; lower contact fairly
sharp and even----- 47.
- Sandstone, medium-gray, medium-light-gray-weathering, locally
iron-stained, partly friable, very fine to fine-grained,
subangular to subrounded, silty; scattered pebbles of
hard rock; includes at top 0.5-ft. bed of conglomerate
composed of granules and pebbles of hard rock and
pebbles and cobbles of medium-gray silty sandstone
and carbonaceous shale; includes medium-grained sand-
stone bed of carbonaceous wood fragments; lower con-
tact sharp, probably disconformity----- 1.5
- Beluga Formation (upper part)
- Siltstone, medium-gray, small chunky-weathering, obscurely
bedded, clayey, sandy in lower part; some carbonaceous
plant fragments partly oriented perpendicular to bedding;
lower contact gradational----- 0.8
- Sandstone, medium-gray, poor platy-weathering in upper two-
thirds, obscurely very thin bedded, friable in lower
part, fine-grained in lower part becoming very fine
grained in upper part, subangular, silty; common
carbonaceous plant fragments oriented perpendicular to
bedding in upper two-thirds; lower contact sharp----- 1.6
- Siltstone, medium-gray, poor platy-weathering, poor very
thin bedded, clayey, sandy at base; locally abundant
carbonaceous plant fragments----- 3.8

Sandstone, medium-gray, partly iron-stained, slabby-weathering, obscurely bedded, friable, fine-grained, subangular, silty; lower contact sharp-----	5.3
Shale, medium-gray, obscurely bedded, subconchoidally fracturing, clayey; some small carbonaceous plant fragments-----	0.2
Shale, dark-gray to black, silty, carbonaceous; coalified wood fragments-----	0.2
Coal, fairly blocky-----	1.3
Siltstone, medium-gray, obscurely bedded; many randomly oriented carbonaceous plant fragments-----	0.9
Shale, dark-gray to black, platy-weathering, fissile to platy-bedded, silty, carbonaceous; abundant small and fairly large carbonaceous plant fragments, some large coalified wood fragments-----	0.6
Siltstone, medium-gray, obscurely bedded; common carbonaceous plant fragments; lower contact gradational-----	0.4
Sandstone, medium-gray, slabby-weathering, obscurely bedded, mostly friable, very fine to fine-grained, subangular, very silty-----	2.4
Siltstone, medium-gray, obscurely bedded; some carbonaceous plant fragments, few leaf impressions; becomes very fine grained very clayey sandstone in upper 0.3 ft.; lower contact fairly sharp-----	1.3
Sandstone, medium-gray, partly iron-stained, poor platy-weathering, poor platy- to very thin bedded, very fine grained, subangular, very silty; some carbonaceous plant fragments, leaf impressions in part-----	2.
Siltstone and interbedded sandstone; siltstone, medium-gray, poor platy-weathering, obscurely bedded, clayey; many carbonaceous plant fragments; sandstone, medium-gray, poor platy-weathering, obscurely bedded, very fine grained, subangular, silty, very clayey; some carbonaceous plant fragments-----	8.
Shale, dark-gray to black, poor platy-bedded, silty, carbonaceous; abundant small and few large carbonaceous plant fragments; lower contact gradational-----	0.7

Siltstone, medium-gray, poor platy-weathering, obscurely bedded, clayey; many small carbonaceous plant fragments; lower contact gradational-----	0.4
Sandstone, medium-gray, slabby-weathering, obscurely bedded, partly friable, very fine grained, subangular, very silty; carbonaceous plant fragments in upper part; lower contact gradational-----	1.8
Siltstone and interbedded sandstone; siltstone, medium-gray, poor platy-weathering, obscurely bedded, clayey; many plant fragments; sandstone, medium-gray, very fine grained, subangular, silty, clayey; forms beds up to 0.6 ft. thick; unit includes at base 0.1-ft. bed of dark-gray to black fissile carbonaceous shale; lower contact gradational-----	4.8
Sandstone, medium-gray, obscurely bedded, friable in lower part, very fine grained, subangular, silty; many plant fragments in upper part; lower contact sharp-----	1.5
Siltstone, medium-gray, poor platy-weathering, obscurely bedded, clayey, sandy in upper part; many plant fragments; lower contact sharp-----	1.9
Shale, dark-gray to black, some brownish-gray, mostly platy-bedded, silty; abundant carbonaceous material; includes bony coal stringers; lower contact sharp-----	0.2
Siltstone, medium-gray, partly iron-stained, poor platy-weathering, platy- to poor very thin bedded, sandy, clayey; abundant leaf impressions 6.5 to 8.5 ft. above base; includes 2-ft. bed of medium-gray very fine grained sandstone at 0.8 ft. below top-----	11.6
Shale, dark-gray to black, fissile- to platy-weathering, platy-bedded, silty, carbonaceous; abundant plant fragments-----	0.3
Siltstone, medium-gray, poor platy-weathering, platy- to poor very thin bedded, some lamination in lower part. clayey; abundant carbonaceous plant fragments; includes few thin beds of very fine grained sandstone in basal 1 ft.-----	8.4

Shale, medium-gray, poor platy-bedded, very silty; abundant plant fragments, few large coalified wood fragments near base; includes few calcareous ironstone nodules up to 0.2 ft. thick about 2.4 ft. above base-----	3.
Coal and interbedded shale; coal, bone; shale, dark-gray to black, carbonaceous; includes many coal stringers-----	0.2
Shale (4P-16)*, medium-gray, iron-stained, obscurely bedded, subconchoidally fracturing, clayey; many carbonaceous plant fragments-----	0.8
Coal, platy-weathering-----	1.
Shale, dark-gray to black, fissile- to platy-bedded, carbonaceous; includes many coal stringers; lower contact sharp-----	0.2
Siltstone, medium-gray, partly iron-stained, platy-weathering, obscurely bedded, clayey; many randomly oriented fine plant imprints; lower contact sharp-----	2.
Shale, dark-gray to black, fissile- to platy-bedded, carbonaceous; abundant carbonaceous plant fragments; includes many small coal stringers; lower contact sharp----	0.8
Siltstone, medium-gray, poor platy-weathering, poor platy- to very thin bedded, partly sandy; abundant plant imprints in basal part and scattered above; includes thin interbeds of very fine grained subangular clayey sandstone; interval of very fine grained sandstone between 20 and 26 ft. above base; lower contact probably gradational-----	36.8
Siltstone, medium- to medium-dark-gray, poor platy-bedded, clayey; abundant plant imprints on bedding-----	0.6
Coal, blocky; includes interbeds of dark-gray carbonaceous shale and bony coal in upper 0.4 ft.-----	3.3
Sandstone and interbedded siltstone; sandstone, medium-gray, platy-weathering, very thin bedded, very fine grained, subangular, silty; siltstone, medium-gray, platy-weathering, very thin bedded, partly sandy; locally common plant fragments-----	13.
Coal, bone-----	0.2

*Palynological sample

- Siltstone and interbedded sandstone; siltstone, medium-gray, platy-weathering, very thin bedded to partly laminated in upper half, sandy in lower 5 ft.; locally common plant fragments, large coalified wood fragments in lower 2 ft.; sandstone, medium-gray, platy-weathering, very thin bedded to partly laminated, very fine grained, subangular, silty; unit includes 0.05-ft. beds about 15 ft. above base of dark-gray carbonaceous shale with bony coal stringers; lower contact fairly sharp----- 28.
- Sandstone, medium-gray, slabby-weathering, friable, fine- to medium-grained, scattered coarse grains in basal part becoming fine-grained above 5 ft. above base, subangular to subrounded; includes large carbonaceous wood remains; iron-cemented carbonaceous stringers; lower contact sharp and possibly disconformable----- 13.5
- Shale, brownish-gray, poor fissile to platy-bedded, partly carbonaceous; abundant small carbonaceous plat fragments; includes many bony coal stringers; lower contact sharp----- 1.5
- Siltstone, medium-gray, partly iron-stained, platy- to poor flaggy-weathering, very thin bedded, poorly fissile and shaly in lower 1 ft.; abundant carbonaceous plant fragments in lower 1 ft. and upper 4 ft.; includes near top some beds of brownish-gray siltstone with abundant carbonaceous plant fragments----- 16.5
- Coal, blocky-----about 2.5
- Siltstone, medium-gray, partly iron-stained, platy-weathering, laminated to very thin bedded, very clayey in upper 0.5 ft.; locally abundant small plant fragments, abundant small carbonaceous plant fragments in upper 0.5 ft.; includes few carbonaceous films and stringers; lower contact sharp----- 4.
- Coal, platy-weathering, impure----- 1.
- Sandstone, medium-gray, slabby-weathering, locally cliff-forming, very thin to thin-bedded, cross-bedded with sets up to 3 ft. thick, mostly friable, fine- to medium-grained with scattered coarse grains in lower part becoming mostly fine-grained in upper 10 ft., subangular to subrounded, silty; few large coalified wood fragments in lower 5 ft., at 14 ft. above base, and at about 20 ft. above base; includes 0.2-ft. lenses of very thin bedded to laminated siltstone between 3 and 10 ft. below top; 3-ft. bed at top of medium-light-gray hackly-weathering sandy siltstone with common plant fragments; lower contact sharp and possibly disconformable----- 32.

Sandstone, medium-gray, uneven-weathering, partly laminated, very fine grained, subangular, very silty; abundant plant remains; lower contact sharp-----	0.5
Interbedded shale and coal; shale, dark-gray, fissile, carbonaceous; abundant small plant fragments; shale (4P-6)*, medium-gray, obscurely bedded; abundant small plant remains; coal, bony; lower contact fairly sharp-----	1.1
Sandstone, medium-gray, slabby-weathering, obscurely bedded, very fine grained, subangular, very silty; locally abundant small carbonaceous plant fragments, few large coalified wood fragments near top; includes at top 0.3-ft. bed of siltstone with abundant plant remains; lower contact gradational-----	1.9
Siltstone, medium-gray, partly iron-stained, poor platy- to hackly-weathering, obscurely thin-bedded, clayey; common small carbonaceous plant fragments; lower contact gradational-----	1.8
Coal, weathered, bony; includes interbeds of dark-gray carbonaceous shale and bony coal in upper 0.1 ft.; lower contact sharp-----	0.5
Siltstone, medium-gray, iron-stained (mostly in lower half), poor platy- to hackly-weathering, obscurely very thin bedded, clayey (upper half); common small carbonaceous plant fragments in upper half, large coalified wood remains in 0.2-ft. interval in middle; includes few thin shale interbeds in upper half; lower contact gradational-----	3.
Sandstone, medium-gray, mostly platy-bedded, friable in middle part, very fine grained, subangular, very clayey in upper 0.5 ft., very silty; abundant carbonaceous plant fragments in upper 0.5 ft.; lower contact sharp-----	1.1
Shale, medium-gray, mostly iron-stained, shard-like-weathering, obscurely bedded, very silty; some carbonaceous plant fragments; includes at top 0.5-ft. bed of siltstone with gradational lower contact-----	1.6
Coal, weathered, fairly blocky for most part; lower contact sharp-----	1.5

*Palynological sample

- Siltstone, medium-gray, poor platy- to obscurely bedded, very sandy in lower part, partly clayey; scattered carbonaceous plant fragments in lower part, abundant randomly oriented carbonaceous plant fragments in upper part; large coalified wood fragments oriented at high angle to bedding at base; lower contact gradational----- 2.
- Sandstone, medium-gray, obscurely bedded, platy- to very thin bedded in upper 1 ft., friable, very fine to fine-grained, some medium grains in lower part, sub-angular, very silty----- 2.8
- Coal, weathered, probably bony in middle part; includes at 0.1 ft. below top a 0.4-ft. bed of medium-gray poorly bedded siltstone with brownish tint and many carbonaceous plant fragments----- 2.8
- Siltstone, medium-gray, dark-gray in upper 0.1 ft., obscurely bedded, mostly clayey, partly sandy; many randomly oriented carbonaceous plant fragments; lower contact gradational----- 1.
- Sandstone, medium-gray, obscurely bedded, mostly friable, very fine grained, subangular, silty; lower contact sharp----- 1.1
- Shale, medium-gray, obscurely bedded, sandy, clayey----- 0.8
- Coal, fairly blocky; includes at 0.8 ft. above base a 0.3-ft. parting of brownish-gray siltstone with carbonaceous plant fragments----- 2.8

Note: A fairly high waterfall is supported by the lower three coal beds and interbedded rocks described above.

Lower part of exposed rocks not measured

Measured section 5

Location: Gully exposure in head of unnamed canyon in NE 1/4 NE 1/4 sec. 2, T. 6 S., R. 13 W., Seldovia C-4 quadrangle. Top of section is about 14 feet below canyon rim adjacent to Skyline Drive. This location is the same as locality 128 of Barnes and Cobb (1959, pls. 18, 19).

Feet

Tertiary rocks --Kenai Group, Sterling Formation

Shale, burned red to orange, slumpy-----estimated- 8.

Coal, coal ash, carbonaceous shale, bone coal, and yellow to brownish-orange burned shale; slumpy; probably represents a 3-5-ft. coal bed with several partings
-----about- 3.

Shale, dark-gray, poor fissile to platy-bedded, carbonaceous; abundant coal films; upper half grades to very bony coal; lower contact gradational----- 0.5

Shale (5P-29)*, medium-gray, local ledge-forming, poor fissile to poor platy-bedded, clayey; abundant small carbonaceous plant fragments----- 1.

Coal and interbedded carbonaceous siltstone; lower contact sharp----- 0.2

Siltstone, medium-gray, obscurely bedded; common carbonaceous plant fragments, mostly randomly oriented; lower contact fairly sharp----- 1.4

Sandstone, medium-gray, platy-weathering, laminated to very thin bedded, friable to very friable, very fine grained subangular, very silty; locally common carbonaceous plant fragments, some randomly oriented; lower contact gradational----- 2.6

Siltstone, medium-gray, chunky- to poor platy-weathering, very thin to thin-bedded, sandy in upper part; some carbonaceous plant fragments----- 1.9

Shale, medium-dark- to dark-gray, carbonaceous; common carbonaceous plant fragments; includes abundant bony coal stringers in upper 0.1 ft.----- 0.45

*Palynological sample

Coal, dull, blocky; lower contact sharp-----	0.2
Siltstone, medium-gray, slabby-weathering, clayey in lower part becoming sandy in upper part; common carbonaceous plant fragments, mostly randomly oriented; includes 0.3-ft. bed of medium-gray fairly friable very fine grained silty sandstone at top-----	5.5
Coal, bony-----	0.2
Sandstone and interbedded siltstone; sandstone, medium-gray, platy-weathering, very thin bedded, partly laminated, friable, very fine grained, subangular, very silty; siltstone, medium-gray, obscurely thin-bedded, clayey; abundant carbonaceous plant fragments; upper 1 ft. of unit is chiefly siltstone; unit includes two 0.1-ft. beds of dark-gray very carbonaceous siltstone near middle and near base; lower contact sharp-----	2.2
Shale, medium-gray, obscurely bedded, probably platy-bedded, clayey; common carbonaceous plant fragments; includes few thin siltstone beds; lower contact gradational-----	2.1
Sandstone, medium-gray, slabby-weathering, platy- to very thin bedded, partly laminated, fairly friable, very fine grained, subangular, silty, clayey in upper 0.5 ft.; lower contact sharp-----	4.3
Siltstone, medium-gray, obscurely bedded, slightly friable; locally abundant small carbonaceous plant fragments; lower contact sharp-----	1.7
Sandstone, medium-gray, platy- to very thin bedded, partly laminated, fairly friable, very fine grained, subangular, silty; includes abundant micaceous carbonaceous laminations in 0.3-ft. zone 0.3 ft. below top; lower contact sharp-----	2.8
Siltstone, medium-gray, chunky-weathering(?), obscurely bedded, clayey; locally abundant carbonaceous plant fragments; lower contact fairly sharp-----	2.3
Sandstone, medium-gray, platy-weathering, laminated to very thin bedded, friable in few thin beds in upper half, very fine grained, subangular, mostly clayey, very silty; includes some interbeds of medium-gray siltstone -- principally in lower 1 ft.; lower contact gradational-----	3.8

- Siltstone, medium-gray, poor platy-bedded; abundant small carbonaceous plant fragments; some large thin carbonaceous plant fragments; few coal films; several thin interbeds of medium-gray conchoidally fracturing clayey shale with many carbonaceous plant fragments; lower contact gradational----- 1.6
- Shale, medium-gray, poor platy-bedded; abundant small carbonaceous plant fragments----- 0.5
- Coal, blocky; includes 0.15-ft. bed 0.1 ft. below top of medium-dark-gray to brownish-gray shale with many carbonaceous plant fragments----- 0.5
- Siltstone, medium-gray to brownish-gray, obscurely bedded; many small carbonaceous plant fragments; lower contact sharp----- 0.25
- Sandstone and interbedded siltstone; sandstone, medium-gray, poor platy-weathering, very thin to thin-bedded, friable in bottom 1 ft., very fine to fine-grained in basal 1 ft. becoming very fine grained above, subangular, very silty, clayey above basal 1 ft.; some carbonaceous plant fragments -- mostly in beds 0.5 ft. to 1 ft. thick; siltstone, medium-gray, obscurely very thin to thin-bedded, clayey; includes few small leaf impressions in upper part; lower contact sharp----- 13.3
- Siltstone, medium-gray, hackly- to poor platy-weathering, obscurely very thin to thin-bedded, sandy; locally abundant carbonaceous plant fragments; many large poorly oriented coalified wood fragments 2.5-3.5 ft. above base; includes many beds up to 1 ft. thick of medium-gray very thin bedded very fine grained sandstone; lower contact gradational----- 10.
- Shale, medium-gray to medium-dark-gray, poor fissile to platy-bedded, silty, clayey; abundant carbonaceous plant fragments on bedding----- 0.4
- Coal (5P-20 -- 2 shale partings)*, platy- to blocky-weathering; many large coalified wood fragments; includes 0.6-ft. parting 0.4 ft. below top of medium-gray very silty shale with abundant plant fragments; 0.5-ft. parting 2.3 ft. below top of medium-dark-gray very silty shale with abundant plant fragments----- 5.

*Palynological sample

- Siltstone, medium-gray, partly iron-stained, hackly- to platy-
weathering, very thin to obscurely bedded, clayey to very
clayey; locally abundant plant fragments; includes 2-ft.
bed 5 ft. below top of medium-gray platy-weathering very
thin bedded to laminated silty sandstone with few leaf
impressions; lower contact sharp----- 18.
- Sandstone, medium-gray, platy-weathering, very thin bedded,
partly friable, very fine grained, subangular to sub-
rounded, silty; includes 0.1-ft. siltstone bed 0.2 ft.
below top; lower contact gradational----- 1.2
- Siltstone, medium-gray, hackly-weathering, obscurely bedded;
includes 1-ft. bed at base of medium-gray platy-weather-
ing very thin bedded clayey to very clayey shale with
abundant carbonaceous plant fragments----- 4.2
- Coal, platy-weathering, deeply weathered, bony; includes
many very thin siltstone partings 0.2-0.5 ft. below
top; 0.2-ft. bed 0.5 ft. below top of brownish-gray
deeply weathered poor platy-bedded to fissile shale----- 0.9
- Siltstone, medium-dark-gray, clayey; abundant plant frag-
ments and finely disseminated carbonaceous material; in-
cludes carbonaceous lenses; lower contact gradational----- 0.4
- Siltstone, medium-gray, iron-stained in upper half, hackly-
weathering, obscurely bedded, clayey, sandy in upper 2
ft; abundant plant remains; lower contact gradational----- 4.3
- Shale, medium-gray, platy-weathering, obscurely fissile,
silty, very clayey; abundant small plant fragments;
some large coalified wood fragments in upper part;
lower contact gradational----- 2.5
- Shale, dark-gray, fissile- to platy-weathering, clayey,
carbonaceous; abundant plant fragments----- 0.3
- Siltstone, medium-gray, locally hard and calcareous
cemented, very clayey; abundant plant fragments----- 0.7
- Shale, dark-gray, platy-weathering, clayey, carbonaceous;
abundant plant fragments----- 0.1
- Coal, deeply weathered, fissile-weathering in lower 0.6 ft.;
mostly coalified wood remains; bony in upper 0.4 ft.;
includes many thin interbeds of dark-gray carbonaceous
shale----- 1.

- Siltstone and interbedded sandstone; siltstone, medium-gray, platy-weathering, very thin bedded, clayey, sandy; sandstone, medium-gray, platy-weathering, very thin bedded, mostly friable, very fine grained, sub-rounded to subangular, very silty; basal 1.5 ft. of unit is medium-grained subrounded to subangular sandstone with large coalified wood fragments; siltstone dominates in lower half of unit and sandstone dominates in upper half of unit; unit includes 1-ft. bed at top of medium-gray shale (5P-14)* with common plant fragments; lower contact fairly sharp----- 20.
- Sandstone and interbedded siltstone; sandstone, medium-gray, platy-weathering, very thin bedded to laminated, very fine grained, subangular, very silty; forms beds mostly 0.5 ft. thick; includes carbonaceous laminations; siltstone, medium-gray, partly iron-stained very thin bedded to laminated, partly sandy; forms beds mostly 0.5 ft. thick; unit includes 1.5-ft. siltstone bed at base; 1.2-ft. bed at top of medium-gray very thin bedded to laminated siltstone with abundant carbonaceous plant fragments; brownish tint in lower 0.2 ft.; lower contact sharp----- 8.7
- Shale, dark-gray to black, platy-weathering, carbonaceous; abundant plant fragments, coal films, and partings----- 0.2
- Coal, platy-weathering----- 1.
- Siltstone, medium-gray, partly iron-stained, probably very thin bedded, clayey; abundant carbonaceous plant fragments; includes at base abundant large coalified wood fragments in 0.4-ft. bed of dark-gray to black carbonaceous siltstone with many coal films and partings----- 1.3
- Coal, bony; includes very thin partings of medium-dark-gray carbonaceous siltstone----- 0.4
- Siltstone, medium-gray, hackly-weathering, obscurely bedded, probably thin-bedded, partly sandy; common small plant fragments; includes 4-ft. bed 2 ft. above base of platy-weathering very thin bedded cross-bedded subangular very fine grained very silty sandstone that becomes slabby-weathering and friable in lower 1 ft.; lower contact fairly sharp----- 11.1

*Palynological sample

Sandstone, medium-gray, locally iron-stained, slabby-weathering, friable, fine- to medium-grained, fine-grained in upper 1 ft, subrounded to subangular; lower contact sharp and possible disconformity-----	6.6
Coal, blocky; lower contact sharp-----	0.4
Siltstone, medium-gray, hackly-weathering, obscurely bedded, probably thin-bedded, partly very sandy, clayey; includes at base 0.5-ft. bed of medium-gray shale (5P-9)*, with abundant plant fragments that grade into overlying siltstone; 2.8-ft. bed 0.2 ft. below top of medium-gray slabby-weathering very thin bedded partly friable very fine grained sandstone; 0.2-ft. bed at top of medium-dark-gray carbonaceous siltstone with many plant fragments; lower contact sharp-----	11.8
Shale, dark-gray to black, platy-weathering, carbonaceous; white scattered very fine crystals; abundant carbonaceous plant fragments-----	0.4
Coal, platy-weathering, bony; includes interbedded dark-gray to black carbonaceous shale; lower contact sharp-----	0.4
Siltstone, medium-gray, hackly-weathering(?), obscurely bedded, probably thin-bedded, clayey, partly sandy; locally abundant carbonaceous plant fragments; large coalified wood fragments oriented perpendicular to bedding near top of unit; includes interbeds up to 0.5 ft. thick of medium-gray platy-weathering very thin bedded to laminated very fine grained sandstone in upper 3 ft.-----	12.2
Coal and interbedded shale; coal, bony; large coalified wood remains; shale, dark-gray to black, carbonaceous-----	0.4
Sandstone, medium-gray, slabby-weathering, obscurely bedded, fairly friable, very fine grained, subrounded to subangular, very silty and clayey in upper 1.5 ft.; some carbonaceous plant fragments; large coalified wood remains about 1.3 ft. below top-----	4.8
Siltstone and interbedded sandstone; siltstone, medium-gray, poor platy- to thin-bedded, sandy; many carbonaceous plant fragments; sandstone, medium-gray, obscurely bedded, very fine grained, subrounded to subangular; lower contact gradational-----	15.8

*Palynological sample

Sandstone, medium-gray, partly iron-stained, obscurely bedded, mostly friable, becoming less friable toward top, very fine grained, subrounded, very clayey in upper half and grades to sandy siltstone in part-----	10.3
Siltstone, medium-gray, poor platy- to thin-bedded, clayey; many carbonaceous plant fragments; includes numerous thin beds of very fine grained sandstone; lower contact gradational-----	11.5
Sandstone, medium-gray, slightly iron-stained, slabby-weathering, very thin bedded, partly laminated, very fine grained, subangular, very silty; lower contact fairly sharp-----	2.
Shale, medium- to medium-dark-gray, partly iron-stained, obscurely bedded, silty; many small carbonaceous plant fragments; few large carbonaceous plant fragments in upper 1 ft.; few large coalified wood fragments at 0.3-0.5 ft. above base; lower contact sharp-----	5.
Coal, Fletcher bed, partly platy-weathering, blocky; lower contact sharp-----	2.7
Sandstone, medium-gray, slabby-weathering, obscurely bedded, friable in small part, very fine grained, subangular, silty; scattered carbonaceous plant fragments; includes 2-ft. bed 1 ft. below top of medium-gray obscurely bedded sandy very clayey siltstone with many carbonaceous plant fragments-----	6.7
Siltstone, medium-gray, locally ledge-forming, obscurely bedded, hard, limy, sandy; abundant small carbonaceous plant fragments-----	0.8
Siltstone, medium-gray, poor very thin bedded, clayey to very sandy; common carbonaceous plant fragments; includes few thin interbeds of medium-gray very fine grained subangular very silty sandstone in upper 4 ft.; lower contact sharp-----	10.7
Shale, dark-gray to black, platy-bedded, silty, carbonaceous; includes bony coal stringers-----	0.2
Sandstone, medium-gray, partly iron-stained, slabby-weathering, very thin to thin-bedded, platy- to thin-bedded in upper 5 ft., cross-bedded, mostly friable, very fine to fine-grained, subangular, silty to very silty, very clayey in upper 5 ft.; includes several thin interbeds of sandy siltstone; lower contact sharp-----	30.

- Shale, medium- to medium-dark-gray, platy-weathering, platy-bedded, silty, carbonaceous; many carbonaceous plant fragments on bedding----- 1.5
- Coal, platy-weathering; mostly large coalified wood remains; includes 0.1-ft. parting 0.4 ft. above base of medium-gray shale with many carbonaceous plant fragments; lower contact sharp and rolling----- 3.7
- Siltstone, medium-gray, slabby-weathering, obscurely thin-bedded, clayey; many small carbonaceous plant fragments; some large plant remains oriented perpendicular to bedding at top; includes medium-gray hard dense limy siltstone concretions up to 0.9 ft. x 6 ft. at top; lower contact not examined----- 2.+

Measured section 6

Location: Gully and hillside exposures at forks of Swift Creek in NW 1/4 SW 1/4 NE 1/4 sec. 23, T. 4 S., R., 11 W., Seldovia D-3 quadrangle. This location is approximately the same as locality 168 of Barnes and Cobb (1959, pl. 18).

	Feet
Pleistocene deposits, slumpy-----	about 95.
Unconformity; covered by slope wash	
Tertiary rocks-Kenai Group, Sterling Formation	
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; few carbonaceous plant fragments; upper 4 ft. somewhat plastic when wet-----	10.
Sandstone, medium-gray, obscurely bedded, friable, very fine to fine-grained, subangular, silty, clayey; scattered coaly wood fragments; includes very thin beds of medium-gray obscurely bedded clayey siltstone in upper 0.4 ft.-----	1.2
Siltstone, medium-gray, partly lightly iron-stained, obscurely bedded, clayey, shaly in upper 5 ft.; few carbonaceous plant fragments; includes 0.3-ft. bed of brownish-gray carbonaceous siltstone at 4 ft. above base; lower contact sharp-----	9.3
Siltstone and coal; siltstone, brownish-gray, poor platy-bedded, clayey, carbonaceous; forms lower two-thirds of unit; coal, impure(?); lower contact sharp-----	0.15
Siltstone and interbedded sandstone; siltstone, medium-gray, partly iron-stained, chunky- to poor platy-weathering, obscurely platy- to very thin bedded, clayey; few carbonaceous plant fragments; sandstone, medium-gray, partly iron-stained, obscurely very thin bedded, partly friable, very fine grained, subangular to subrounded; occurs in middle and lower part of unit in beds up to 0.5 ft. thick; unit includes some thin beds of medium-gray shale with common plant fragments in upper 1.5 ft.; clayey ironstone nodules 0.1-0.2 ft. thick about 3 ft. below top; lower contact fairly sharp-----	8.6

Sandstone, medium-dark-bluish-gray, partly iron-stained, slabby-weathering, mostly friable, fine- to medium-grained, scattered coarse grains in basal 0.7 ft. becoming dominately fine-grained above, subangular to subrounded; numerous rounded shale flakes; lower contact sharp and possibly disconformable-----	3.3
Shale (6P-73)*, medium-gray, obscurely bedded; many carbonaceous plant fragments; lower contact sharp-----	0.2
Shale, brownish-gray to dark-gray, platy-bedded, hard, tough, carbonaceous; lower contact sharp-----	0.2
Siltstone, medium-gray, poor platy-weathering, obscurely platy- to very thin bedded, shaly in lower part, clayey, partly finely sandy; few small carbonaceous plant fragments and large coalified wood fragments near base; includes some interbedded very fine grained sandstone about 5-6 ft. above base; bed less than 0.1 ft. thick of medium-dark-gray poorly bedded shale with abundant plant fragments at top-----	8.6
Coal, weathered, largely impure(?)-----	1.7
Sandstone, medium-gray, partly iron-stained, slabby-weathering, poor platy-bedded in upper half, very friable in lower half, fine-grained in lower half becoming very fine grained to fine-grained and clayey in upper half, subangular to subrounded; lower contact sharp-----	2.3
Siltstone, medium-gray, poor platy- to chunky-weathering, obscurely bedded, clayey, shaly in basal 0.5 ft. and upper 0.3 ft., sandy in middle part; common plant fragments in part; lower contact sharp-----	4.1
Shale, medium- to medium-dark-gray, obscurely bedded; abundant carbonaceous plant fragments; includes few very thin beds of dark-gray to black impure coal or carbonaceous shale in lower half; at top 0.25-ft. bed of brownish-gray to dark-gray platy-bedded carbonaceous shale with abundant plant fragments on bedding-----	1.8
Coal, blocky; includes medium-brown friable sandy siltstone parting 0.1 ft. thick at 0.1 ft. below top; much woody material in upper 0.1 ft.; irregular short stumps locally at top; lower contact sharp-----	2.1

*Palynological sample

- Shale (6P-69)*, medium-gray, medium-light-gray-weathering, obscurely bedded, poor platy-bedded in upper 0.5 ft., hard; abundant plant fragments; abundant slickensides about 0.5 ft. below top; lower contact gradational----- 1.8
- Siltstone, medium-gray, medium-dark-gray in lower 1 ft., poor platy-weathering(?), poor platy-bedded, clayey; abundant plant fragments in lower 1 ft.; few large coalified wood remains and locally abundant carbonaceous root remains in upper 2 ft.; lower contact sharp----- 3.
- Sandstone, medium-gray, partly iron-stained, slabby-weathering, mostly obscurely bedded, partly platy-bedded, friable, very fine grained, subangular; includes 1-ft. bed of medium-gray laminated partly friable siltstone at base; 1-ft. bed, 8 ft. above base, of medium-gray obscurely bedded clayey siltstone with common plant fragments; 1-ft. bed of medium-gray chunky- to poor platy-weathering clayey siltstone at 18 ft. above base; 1.5-ft. bed of similar siltstone at 27 ft. above base; lower contact gradational----- 29.5
- Siltstone, medium-gray, partly iron-stained, chunky- to poor platy-weathering, obscurely bedded, clayey; scattered carbonaceous plant fragments; lower contact gradational----- 3.3
- Sandstone and interlaminated siltstone; sandstone, medium-gray, platy-weathering, uniformly laminated, very fine grained, subangular, very silty, clayey; siltstone, medium-gray, platy-weathering, clayey----- 4.
- Siltstone, medium-gray, partly iron-stained, chunky-weathering, obscurely bedded, clayey; scattered plant fragments; includes 1-ft. bed, 0.5 ft. above base, of friable very fine grained sandstone; 0.5-ft. bed in middle of medium-gray obscurely bedded shale; lower contact fairly sharp----- 6.5
- Sandstone, medium-gray, partly iron-stained, slabby-weathering, obscurely to partly platy-bedded, friable, very fine grained, subangular, silty; includes interbeds of medium-gray partly friable clayey siltstone; lower contact fairly sharp----- 3.
- Siltstone, medium-gray, chunky-weathering, obscurely bedded, partly poor platy-bedded, clayey; common plant fragments; lower contact gradational----- 3.8

*Palynological sample

- Sandstone, medium-gray, partly iron-stained, slabby-weathering, mostly obscurely bedded, some platy- to very thin bedded, friable, very fine to fine-grained, subangular; becomes very fine grained, clayey, and less friable in upper 3 ft.; lower contact gradational----- 8.1
- Siltstone, medium-gray, partly iron-stained, platy-weathering, laminated, finely sandy, clayey; may include ironstone nodules near top; lower contact gradational----- 2.
- Shale, medium- to medium-dark-gray, poor platy-weathering in upper 0.5 ft., obscurely bedded, locally fissile, poor platy-bedded in upper 0.5 ft., very silty in upper 0.5 ft.; abundant carbonaceous plant fragments; includes 0.2-ft. bed, 2.5 ft. above base, of shale with scattered to abundant white medium-sand-size pyroclastic grains----- 5.3
- Coal, upper 0.5 ft. deeply weathered bone coal; includes 0.5-ft. parting, 0.5 ft. above base, of medium-gray hard shale with abundant plant fragments; 0.8-ft. parting, 1.9 ft. above base, of medium-gray clayey siltstone with abundant large coalified wood remains----- 3.2
- Siltstone, medium-gray, partly iron-stained, slabby-weathering, obscurely platy-bedded, clayey; few carbonaceous plant fragments; includes at top 2-ft. bed of medium-gray slabby- to platy-weathering platy-bedded very fine grained subangular sandstone; lower contact gradational----- 8.
- Sandstone, medium-gray, partly iron-stained, platy-weathering, platy- to very thin bedded, partly friable, very fine grained, subrounded, silty, very clayey in part; includes 1-ft. bed, about 0.3 ft above base, of fine-grained friable sandstone with few large coalified wood fragments and few lenses and thin beds of inter-laminated carbonaceous material and sandstone; 1-ft. bed, 6 ft. above base, of medium-gray platy-weathering platy-bedded siltstone; 5-ft. bed, 7 ft. above base, of fine-grained friable sandstone; lower contact gradational----- 16.
- Siltstone, medium-gray, partly lightly iron-stained, platy-weathering in upper half and chunky-weathering in lower half, platy- to very thin bedded, clayey; scattered carbonaceous plant fragments; lower contact gradational-- 3.4

Shale, medium-gray, obscurely bedded, silty; abundant carbonaceous plant fragments-----	0.2
Coal, bone-----	0.2
Siltstone, brownish-gray to medium-gray, poor fissile to platy-bedded, clayey; abundant carbonaceous wood fragments; some large coalified wood remains oriented parallel to bedding-----	0.4
Shale (6P-57)*, medium-gray, obscurely bedded; many carbonaceous plant fragments-----	0.1-0.3
Coal, lower 1.2 ft. poor blocky; upper 0.3 ft. probably very impure; lower contact sharp-----	1.5
Siltstone, medium-gray, poor platy-weathering, partly poor platy- to very thin bedded, clayey, micaceous; locally common carbonaceous plant fragments; upper half includes few beds, 0.5 ft. thick, of medium-gray shale with many carbonaceous plant fragments; large slickensides about 1 ft. above base; lower contact gradational-----	9.7
Sandstone and interbedded siltstone; sandstone, medium-gray, obscurely bedded, very fine grained, subangular, very clayey; some carbonaceous plant fragments; siltstone, medium-gray, obscurely bedded, clayey; common carbonaceous plant fragments; unit weathers slabby to poor platy; lower contact fairly sharp-----	4.5
Sandstone, medium-gray, mostly iron-stained, partly laminated to platy-bedded, partly friable, very fine grained, subangular, micaceous, mostly clayey; some carbonaceous plant fragments-----	1.
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; many carbonaceous plant fragments-----	0.9
Coal-----	0.7
Siltstone, brownish-gray to dark-gray, platy-bedded, clayey, carbonaceous; lower contact sharp-----	0.15

*Palynological sample

<p>Sandstone and interbedded siltstone; sandstone, medium-gray, partly iron-stained, obscurely very thin bedded, partly friable, very fine grained, subangular, silty, very clayey; local carbonaceous plant fragments randomly oriented in part; includes 1.4-ft. bed of friable sandstone at 1 ft. below top; siltstone, medium-gray, obscurely bedded, largely sandy, clayey; some carbonaceous plant fragments randomly oriented in part; unit includes at top few ironstone nodules, 0.25 ft. thick, with abundant small carbonaceous plant fragments; unit weathers slabby; lower contact sharp-----</p>	20.
<p>Siltstone, brownish-gray to dark-gray, poor fissile to platy-bedded, clayey, carbonaceous; abundant carbonaceous plant fragments on bedding; lower contact fairly sharp---</p>	0.5
<p>Siltstone, medium-gray, obscurely bedded, clayey; some carbonaceous plant fragments; includes interbeds of very fine grained very clayey sandstone in upper half; lower contact gradational-----</p>	6.3
<p>Sandstone, medium-gray, slabby-weathering, obscurely bedded, very fine grained, subangular to subrounded, very clayey; few carbonaceous plant fragments; lower contact sharp----</p>	6.3
<p>Sandstone, medium-gray, slabby-weathering, obscurely bedded, friable, medium- to coarse-grained in basal part becoming fine-grained in upper part, subrounded, clayey, micaceous in lower part; basal part includes few small medium-gray shale flakes up to 0.05 ft. thick-----</p>	3.1
<p>Coal-----</p>	0.6
<p>Siltstone, medium-gray, poor slabby-weathering, obscurely bedded, clayey; common carbonaceous plant fragments; few large randomly oriented coalified wood fragments in upper 1 ft.; few coal stringers; includes at top 0.6-ft. bed of brownish-gray poorly bedded carbonaceous siltstone; lower contact fairly sharp-----</p>	4.3
<p>Sandstone, medium-gray, partly iron-stained, obscurely bedded in lower part becoming very thin bedded and cross-bedded in upper 3 ft., friable to poorly friable in upper half, very fine to fine-grained, subangular; very clayey in upper 3 ft.; common randomly oriented plant fragments in upper 3 ft.; few large coalified wood remains normal to bedding in upper 1 ft.; includes few thin beds of medium-gray obscurely bedded very clayey siltstone in upper 3 ft.; lower contact sharp-----</p>	7.3

Siltstone, medium-gray, partly iron-stained, poor slabby-weathering, obscurely bedded, clayey; abundant randomly oriented carbonaceous plant fragments in part; includes few thin beds of medium-gray very fine grained sandstone in upper 1.4 ft.; lower contact sharp and somewhat uneven-----	8.7
Sandstone, medium-gray, mostly iron-stained, slabby-weathering, obscurely bedded, friable, very fine to fine-grained, subangular to subrounded; lower contact fairly sharp-----	3.7
Siltstone, medium-gray, chunky-weathering, obscurely bedded, soft; abundant carbonaceous plant fragments in basal part and scattered in upper part; lower contact sharp----	0.4
Siltstone, brownish-gray, fissile, carbonaceous; lower contact fairly sharp-----	0.2
Sandstone, medium-gray, strongly iron-stained in lower part, slabby-weathering, obscurely bedded in lower part, platy- to very thin bedded in upper half, friable, fine- to medium-grained in lower part becoming very fine grained in upper half, subangular to subrounded, slightly silty; scattered large coalified wood remains; lower contact sharp-----	10.
Sandstone and interbedded siltstone; sandstone, medium-gray, partly iron-stained, platy- to very thin bedded, partly friable, very fine grained, subangular, silty; common carbonaceous laminations; siltstone, medium-gray, partly lightly iron-stained, poor platy- weathering, platy- to very thin bedded, sandy; locally abundant carbonaceous plant fragments; lower contact fairly sharp-----	36.
Shale, medium-dark-gray, fissile to platy-bedded, carbonaceous; abundant carbonaceous plant fragments-----	0.6
Siltstone and interbedded coal; siltstone, brownish-gray, fissile to platy-bedded, clayey; abundant plant remains; forms beds up to 0.3 ft. thick; coal, mostly coalified wood remains; forms 6 beds up to 0.4 ft. thick-----	3.6
Coal, abundant coalified wood remains; weathered-----	1.

- Sandstone, medium-gray, light-gray-weathering, iron-stained, poor platy-weathering, platy(?) bedded, partly friable, very fine to fine-grained, subangular to subrounded; few large coalified plant remains mostly oriented parallel to bedding; includes few coal lenses and stringers in upper 0.3 ft; lower contact gradational----- 1.5
- Siltstone, medium-gray, slabby- to chunky-weathering, obscurely bedded, clayey; lower contact gradational----- 1.
- Shale (6P-46)*, medium-gray, obscurely bedded; common to locally abundant plant fragments; numerous large coalified wood remains oriented mostly parallel to bedding; includes irregular ironstone nodules up to 0.2 ft. thick at 0.3 ft. above base; common slickensides----- 2.
- Coal, dull, platy-weathering; lower contact sharp----- 0.5
- Sandstone, medium-gray, iron-stained in lower part, obscurely bedded, friable, very fine to fine-grained becoming very fine grained in upper 0.5 ft., subangular; clayey in upper 0.5 ft.; includes common randomly oriented plant fragments in upper 0.5 ft.----- 3.5
- Siltstone, medium-gray, partly iron-stained, poor platy- to chunky-weathering, partly platy-bedded, partly clayey; locally abundant small carbonaceous plant fragments; includes beds, up to 1.5 ft. thick, of medium-gray platy-bedded partly friable very fine to fine-grained sandstone; 0.3-ft. bed of medium-dark-gray carbonaceous siltstone overlain by 0.2-ft. bed of bone coal at top; lower contact gradational----- 15.7
- Sandstone, medium-gray, partly iron-stained, platy-weathering, laminated to very thin bedded, partly friable, very fine to fine-grained, subangular, partly silty, partly clayey----- 5.9
- Shale, brownish-gray, poor fissile to platy-bedded, carbonaceous; abundant plant fragments----- 0.3
- Coal, Bed T(?), platy-weathering; includes 3 brownish-gray platy-bedded to fissile carbonaceous shale partings (0.2 ft. thick 0.4 ft. below top, 0.1 ft. thick 0.8 ft. below top, 0.3 ft. thick 1.2 ft. below top); much wood remains; lower contact sharp----- 3.2

*Palynological sample

- Siltstone, medium-gray, chunky-weathering, obscurely bedded, partly very thin bedded, hard, very clayey; locally abundant carbonaceous plant fragments; few randomly oriented large coalified wood fragments about 2 ft. below top; includes at top 0.5-ft. bed of medium-brownish-gray very thin bedded clayey siltstone with abundant carbonaceous plant fragments; lower contact gradational----- 6.2
- Sandstone, medium-gray, platy-weathering, laminated to platy-bedded, partly friable, very fine grained, subangular, partly very clayey; lower contact sharp----- 3.5
- Siltstone and shale; siltstone, brownish-gray to medium-gray, chunky- to poor platy-weathering, platy-bedded to fissile; locally abundant carbonaceous plant fragments; forms upper half of unit; shale (6P-41)*, medium-gray, obscurely bedded; common plant fragments; includes 0.02-ft. black carbonaceous shale bed at base; lower contact sharp----- 1.2
- Sandstone and interbedded siltstone; sandstone, medium-gray, platy-weathering, platy-bedded to laminated, very fine grained, subangular; includes few very thin beds of friable very fine grained sandstone; siltstone, medium-gray, obscurely bedded, clayey; common carbonaceous plant fragments; occurs in 2 beds (0.5-ft. bed in middle of unit and 1-ft. bed near top); lower contact gradational----- 6.5
- Sandstone, medium-light-gray, slabby-weathering, poor cliff-forming, platy- to very thin bedded, cross-bedded (sets about 1.5 ft. thick), friable, less friable in upper 2 ft., fine-grained becoming very fine grained in upper 2 ft., subangular to subrounded; includes few thin iron-cemented carbonaceous beds and lenses up to 0.1 ft. thick; lower contact sharp----- 10.8
- Sandstone, medium-gray, mostly iron-stained, platy-weathering, evenly platy-bedded; abundant carbonaceous laminae----- 1.

*Palynological sample

<p>Sandstone, medium-light-gray, partly iron-stained, slabby-weathering, smooth steep slope-forming, platy- to very thin bedded, even and platy-bedded in upper 2 ft., cross-bedded, friable, fine- to medium-grained in basal part becoming dominately fine-grained 5 ft. above base, very fine to fine-grained in upper 2 ft., subangular to subrounded, silty; contorted bedding between 4 and 10 ft. below top; long narrow coalified plant fragments in basal 0.2 ft.; includes scattered ironstones; some very thin iron-cemented carbonaceous beds; abundant ironstones up to 0.2 ft. thick at base; lower contact sharp-----</p>	31.2
<p>Siltstone, medium-gray, slabby- to poor platy-weathering, poor platy- to very thin bedded, clayey; carbonaceous plant fragments locally abundant; grades to mostly medium-gray laminated very fine grained clayey sandstone in upper 1 ft.; lower contact sharp-----</p>	4.
<p>Sandstone, medium-gray, iron-stained, slabby-weathering, obscurely bedded, friable, very fine grained, subangular; lower contact fairly sharp-----</p>	4.4
<p>Siltstone and interbedded sandstone; siltstone, medium-gray, platy- to very thin bedded, clayey, partly sandy; common carbonaceous plant fragments; sandstone, medium-gray, slabby-weathering, obscurely very thin bedded, partly friable, very fine grained, subangular, very clayey; includes ironstone nodules up to 0.2 ft. thick at about 1 and 2.5 ft. above base; 0.3-ft. bed of medium-gray friable very fine grained sandstone near middle; lower contact gradational-----</p>	6.3
<p>Sandstone, medium-gray, partly iron-stained, slabby-weathering, obscurely very thin bedded, friable, very fine grained, subangular, very clayey; lower contact gradational-----</p>	7.6
<p>Siltstone, medium-gray, obscurely bedded, clayey, partly sandy; few carbonaceous plant fragments; includes at base 0.3-ft. bed of medium-gray platy- to very thin bedded shale with abundant small carbonaceous plant fragments-----</p>	1.3
<p>Coal, dark-brownish-gray to black, platy-weathering; abundant large coalified wood fragments; lower contact sharp-----</p>	0.5

Siltstone, medium-gray, poor platy(?) weathering, obscurely bedded, clayey; abundant partly randomly oriented carbonaceous plant fragments-----	2.3
Coal, very impure, bony-----	0.3
Shale, medium-gray, poor platy-bedded; abundant carbonaceous plant fragments-----	0.3
Coal, very impure, bony-----	0.3
Shale, medium-gray, poor platy-bedded; abundant carbonaceous plant fragments-----	0-0.4
Coal, very impure, bony-----	1.2
Shale (6P-32)*, medium-gray, partly brown-tinted, poor platy-bedded; abundant partly randomly oriented carbonaceous plant fragments; some large randomly oriented wood fragments-----	0.7
Coal, very impure, bony-----	0.1
Sandstone, medium-gray to brownish-gray, friable, very fine to fine-grained; many carbonaceous films-----	0.2
Coal, Bed S, platy weathering; mostly large flattened coalified wood remains-----	5.
Sandstone, medium-light-gray, steep fairly smooth slope-forming, locally cliff-forming, platy- to thin-bedded, cross bedded (sets less than 2 ft. thick), mostly friable, locally strongly iron-cemented in thin beds and lenses up to 0.5 ft. thick, medium- to coarse-grained in basal 1 ft., mostly fine-grained, very fine grained in upper 6 ft., subangular to subrounded, very clayey in upper 2 ft.; abundant small carbonaceous plant fragments randomly oriented in upper 2 ft.; scattered very carbonaceous laminae; lower contact sharp-----	41.
Coal, blocky to platy; upper 0.3 ft. impure; many large coalified wood fragments; 0.35-ft. lenticular parting 1.2 ft. above base of brownish-gray sandy clayey pyroclastic(?) siltstone; 0.1-ft. parting of dark-brownish-gray to dark-gray carbonaceous shale at 0.3 ft. below top; lower contact sharp-----	2.6

*Palynological sample

- Siltstone, medium-gray, chunky-weathering, obscurely bedded, hard, clayey, mostly sandy; abundant randomly oriented carbonaceous plant fragments; few large randomly oriented plant remains; lower contact gradational----- 2.9
- Sandstone, medium-gray, slabby-weathering, obscurely thin-bedded, very fine grained, very clayey; some carbonaceous plant fragments; few long plant remains extend into this unit from underlying siltstone; lower contact gradational----- 2.7
- Siltstone, medium-gray, chunky- to hackly-weathering, obscurely bedded, clayey; common randomly oriented carbonaceous plant fragments; one long plant fragment about 0.05 ft. in diameter extends upward into the overlying unit; lower contact sharp----- 0.7
- Siltstone, brownish-gray, platy-weathering, locally ledge-forming, fissile to platy-bedded, clayey; abundant plant fragments on bedding; lower contact fairly sharp----- 0.6
- Siltstone, medium-gray to partly brownish-gray in upper 0.3 ft., chunky-weathering, obscurely bedded, clayey; many randomly oriented carbonaceous plant fragments; lower contact fairly sharp----- 2.5
- Sandstone, medium-gray, partly iron-stained, slabby-weathering, very thin bedded, fairly friable, very fine grained, subangular to subrounded; many carbonaceous laminae; lower contact sharp----- 2.6
- Siltstone, medium-gray, chunky- to poor slabby-weathering, obscurely bedded, very clayey, sandy in lower 3 ft.; common randomly oriented carbonaceous plant fragments; includes few ironstone nodules up to 0.3 ft. thick at 0.2 ft. above base; lower contact sharp----- 5.3
- Sandstone, medium-gray, poor slabby-weathering, obscurely platy-bedded, friable, very fine grained, subangular to subrounded; lower contact sharp----- 1.5
- Siltstone, medium-gray, poor platy- to slabby-weathering, obscurely thin-bedded, clayey, sandy in upper 0.5 ft.; carbonaceous plant fragments locally common; includes ironstone nodules up to 0.2 ft. thick near middle; lower contact gradational----- 2.7
- Sandstone, medium-gray, obscurely bedded, very fine grained, very clayey; poorly exposed; lower contact gradational--- 4.6

Siltstone, medium-gray, probably chunky-weathering, obscurely bedded, clayey; few carbonaceous plant fragments; poorly exposed; lower contact gradational-----	1.8
Sandstone, medium-gray, very thin bedded, slightly friable in part, very fine grained, subangular to subrounded, clayey-----	2.5
Siltstone, medium-gray, thin-bedded(?), sandy; locally abundant carbonaceous plant fragments; includes few very fine grained sandstone laminae; lower contact gradational-----	2.5
Sandstone, medium-gray, slabby-weathering(?), friable, very fine to fine-grained, subangular to subrounded; poorly observed; lower contact fairly sharp-----	3.2
Sandstone, medium-gray, platy-weathering, laminated, very fine grained; lower contact fairly sharp-----	1.6
Siltstone, medium-gray, partly iron-stained, very thin bedded(?), clayey; few small carbonaceous plant fragments; includes ironstone nodules up to 0.2 ft. thick about 0.5 ft. below top; lower contact gradational-----	4.
Shale (<u>6P-22</u>)*, medium-gray, poor platy-weathering(?), poor platy-bedded to fissile; abundant plant fragments-----	1.
Coal, platy, bony; abundant large coalified wood fragments; includes 0.2-ft. lense of medium-brown clayey siltstone at 0.5 ft. below top; 0.1-ft. lenticular parting of light-gray claystone at 0.1 ft. below top-----	2.
Sandstone and interbedded siltstone; sandstone, medium-gray, slabby-weathering, very thin bedded, partly friable, very fine to fine-grained, subangular to subrounded; siltstone, medium-gray to brownish-gray, poor platy- to slabby-weathering, obscurely bedded, clayey, sandy; locally abundant carbonaceous material and plant fragments; unit includes many large randomly oriented coalified wood fragments in upper 1.5 ft.-----	4.
Siltstone, brownish-gray, clayey; abundant plant remains-----	0.2
Shale, dark-gray to black, fissile, carbonaceous; lower contact sharp-----	0.1

*Palynological sample

<p>Sandstone, medium-gray, poor platy- to slabby-weathering, very thin bedded, cross-bedded, friable in middle part, very fine grained to partly fine-grained, very silty in upper part; few large carbonaceous wood fragments in upper part; lower contact covered-----</p>	3.6
<p>Covered interval-----</p>	4.4
<p>Sandstone and interbedded siltstone; sandstone, medium-gray, platy-weathering, platy- to very thin bedded, very fine grained; siltstone, medium-gray to brownish-gray, poor platy-weathering, very thin bedded, partly sandy, clayey; locally abundant carbonaceous plant fragments; forms beds about 0.5 ft. thick and makes up about 20 percent of unit; unit includes at top a brownish-gray siltstone bed with abundant carbonaceous plant fragments; lower contact sharp-----</p>	10.
<p>Siltstone, medium-light-gray, slightly brownish-tinted, even-textured, platy- to shard-like-weathering, very thin to platy-bedded, friable, pyroclastic; lower contact sharp-----</p>	1.5
<p>Shale, medium-gray, obscurely bedded; few plant fragments; grades to medium-gray clayey siltstone in upper 0.5 ft.; includes at 0.5 ft. below top 0.1-ft. bed of brownish-gray platy-bedded clayey carbonaceous siltstone with abundant plant fragments; lower contact gradational-----</p>	2.2
<p>Siltstone and interbedded sandstone; siltstone, medium-gray, very thin bedded, clayey, sandy; locally common plant fragments; sandstone, medium-gray to brownish-gray, slabby- to poor platy-weathering, very thin bedded, very fine grained; occurs in beds up to 0.5 ft. thick in basal 2 ft.; upper part of unit weathers poor platy to chunky; lower contact gradational-----</p>	8.6
<p>Sandstone and interbedded siltstone; sandstone, medium-gray, poor slabby-weathering, obscurely bedded, probably very thin bedded, very fine grained, very silty; siltstone, brownish-gray, poor platy-weathering, very thin bedded, clayey; common plant fragments; includes at 4 ft. above base 1-ft. bed of medium-gray obscurely bedded shale with few randomly oriented carbonaceous plant fragments; at 5 ft. above base 0.2-0.3 ft.-bed of brownish gray obscurely bedded shale with common plant fragments; lower contact gradational-----</p>	8.2

Siltstone, medium-gray, slabby-weathering, poor platy- to very thin bedded, clayey; some carbonaceous plant fragments-----	7.3
Sandstone and interbedded siltstone; sandstone, medium-gray, laminated to very thin bedded, very fine to fine-grained, silty, clayey; abundant carbonaceous material on bedding in basal 0.4 ft.; siltstone, medium-gray, probably laminated to platy-bedded, clayey; carbonaceous plant fragments; unit weathers slabby; lower contact sharp-----	6.3
Sandstone, medium-gray, slabby-weathering, obscurely bedded, probably cross-bedded, friable, fine- to very coarse grained with many granules in lower part becoming fine- to medium-grained in upper part, slightly clayey; includes in lower half many lenses and clasts up to 0.3 ft. thick of brownish-gray clayey siltstone with some carbonaceous plant fragments; unit wedges out in about 10 ft.; lower contact sharp, irregular, and probably disconformable-----	3.3
Sandstone, medium-gray, light-brown iron-stained, obscurely bedded, friable, fine-grained; few fairly large carbonaceous plant fragments near base; includes at top 0.1-ft. bed of medium-dark-gray fine- to coarse-grained sandstone; few siltstone lenses in lower 0.5 ft.; thickness of unit increases to 3 ft. in a distance of about 6 ft. laterally; lower contact sharp-----	1.7
Siltstone, medium-gray, iron-stained in 0.1-ft. interval about 0.1 ft. below top, chunky-weathering, obscurely bedded; some carbonaceous plant fragments; includes few thin beds of very fine grained clayey sandstone in lower 0.5 ft.-----	3.9
Shale, medium-gray, obscurely bedded; many carbonaceous plant fragments; some slickensides in lower half; lower contact sharp-----	1.3
Siltstone, brownish-gray, partly iron-stained, clayey; many small carbonaceous plant fragments; lower contact gradational-----	0.2
Sandstone, medium-gray, obscurely bedded, very fine grained, subangular to subrounded, silty, clayey; few carbonaceous plant fragments; becomes siltstone in upper 0.2 ft.; lower contact covered-----	3.6

Covered interval; laterally consists of sandstone and siltstone-----	15.5
Sandstone, medium-gray, slabby-weathering, obscurely bedded, friable, very fine grained, angular to subangular; lower contact fairly sharp-----	1.
Siltstone, medium-gray, chunky-weathering, obscurely bedded, clayey; scattered sand grains; some carbonaceous plant fragments; lower contact covered-----	1.8
Covered interval; laterally consists of sandstone and siltstone-----	9.
Siltstone, medium-gray, poor platy-weathering, laminated to poor platy-bedded, clayey; many carbonaceous plant fragments in a few thin beds; upper 1 ft. grades to laminated very fine grained silty sandstone with many carbonaceous plant fragments-----	5.
Coal and interbedded lenticular shale; coal, platy-weathering; abundant large coalified wood remains; forms 5 beds up to 0.9 ft. thick; shale (6P-7 -- from highest shale in unit)*, medium-light-gray, light-gray-weathering, mostly poorly bedded to nonbedded; abundant carbonaceous plant fragments; scattered to common large coalified wood fragments; locally few leaf impressions; forms beds up to 1.3 ft. thick; unit includes brownish-gray platy-bedded shale with many carbonaceous plant fragments at 0.1-0.5 ft. above base; lower contact sharp; unit equivalent to uppermost coal and shale unit in measured section 11-----	6.
Siltstone, medium-light- to medium-gray, partly brownish-gray in upper part, chunky- to poor platy-weathering, laminated to very thin bedded, poorly bedded in upper 0.7 ft., clayey; many carbonaceous plant fragments; some large randomly oriented coaly plant fragments in upper 1.3 ft.; few leaf impressions in lower half; includes at base 0.3-ft. bed of medium-gray laminated very fine grained very clayey sandstone; lower contact sharp-----	6.4
Shale, medium- to medium-dark-gray and brownish-gray, chunky-weathering, poor platy-bedded; abundant carbonaceous plant fragments; includes at base 0.4-ft. bed of medium-gray poorly bedded shale; lenses of medium-light-gray and medium-brownish-gray shale about 0.5 ft. above base; lower contact gradational-----	2.1

*Palynological sample

<p>Sandstone and interbedded siltstone; sandstone, medium-gray, laminated to very thin bedded, very fine grained, subangular to subrounded; locally abundant carbonaceous plant fragments on bedding; siltstone, medium-gray, chunky- to poor platy-weathering, obscurely bedded, clayey; few carbonaceous plant fragments; unit includes friable very fine grained sandstone beds up to 0.2 ft. thick in upper 4.5 ft.; lower contact fairly sharp-----</p>	14.6
<p>Sandstone and interlaminated bone coal; sandstone, medium-gray, fissile to platy-weathering, very fine grained, subangular to subrounded; lower contact sharp-----</p>	1.
<p>Siltstone, medium-gray, chunky- to poor platy-weathering, obscurely bedded, probably very thin bedded, clayey, very sandy at base; few carbonaceous plant fragments; lower contact gradational-----</p>	3.6
<p>Sandstone, medium-gray, obscurely very thin bedded, friable in lower part becoming less friable upward, very fine to fine-grained, angular to subangular, micaceous; lower contact sharp-----</p>	5.8
<p>Sandstone, medium-gray, platy-weathering, laminated to very thin bedded, poorly friable, very fine grained, subangular to subrounded; large coalified wood fragments (possibly roots in growth position); some large coaly fragments extend into underlying siltstone; lower contact fairly sharp-----</p>	1.2
<p>Siltstone, medium-gray, mostly platy-weathering, some fissile-weathering, fissile to platy-bedded, clayey; abundant carbonaceous plant fragments; includes carbonaceous beds and lenses up to 0.1 ft. thick; few very thin beds or lenses of bone coal; lower contact sharp-----</p>	3.
<p>Sandstone, medium-gray, slabby-weathering, very thin bedded, friable, very fine grained, subangular to subrounded, silty; includes bone coal stringers at base; lower contact gradational-----</p>	2.
<p>Siltstone, medium-gray, poor platy-weathering, obscurely poor platy- to very thin bedded, clayey; abundant carbonaceous plant fragments on bedding; lenses of carbonaceous siltstone, up to 0.1 ft. thick, interbedded with bone coal about 0.2 ft. below top; lower contact covered at forks of Swift Creek-----</p>	1.+

Measured section 7

Location: Hillside exposure on northwest side of Fox Creek about 50-200 yd. upstream from mouth of southeast flowing tributary (locally known as Danny Creek) in E 1/2 SW 1/4 NW 1/4 sec. 33, T. 3 S., R. 10 W., Seldovia D-3 quadrangle.

	Feet
Pleistocene gravel-----	about 10.
Unconformity	
Tertiary rocks -- Kenai Group, Sterling Formation	
Shale and interbedded siltstone; shale, medium-gray to light-olive-gray, partly iron-stained, deeply-weathered, clayey, silty; siltstone, medium-gray to light-olive-gray, partly iron-stained, deeply weathered, clayey-----	4.
Sandstone, medium-gray, largely iron-stained, obscurely bedded, soft, friable, very fine grained, subrounded, well sorted; includes 1.5-ft. bed of medium-gray siltstone near middle; ironstone nodules less than 0.1 ft. thick in middle-----	7.2
Siltstone, medium-gray, partly iron-stained, deeply iron-stained in upper 0.1 ft., partly olive-gray-weathering, mostly obscurely bedded, partly laminated to very thin bedded in middle, largely very clayey; small carbonaceous plant fragments in part-----	12.5
Sandstone, medium-gray, slabby-weathering, obscurely bedded, laminated in part, soft, mostly friable, very fine grained, subangular, very silty; becomes siltstone in upper 1 ft.; includes few very thin lenses and beds of medium-gray shale in lower 1.5 ft.; lower contact sharp-----	4.4
Shale, medium-gray, poor platy- to hackly-weathering, obscurely bedded, clayey; small plant fragments common in upper part; includes few very thin to thin interbeds of medium-gray partly iron-stained siltstone; lower contact gradational-----	4.4

- Sandstone, medium-gray, largely iron-stained, slabby-weathering, obscurely very thin bedded, mostly friable, very fine to fine-grained, subangular, very silty, clayey; includes few beds of medium-gray siltstone and sandy shale up to 0.5 ft. thick in lower 3 ft.; few ironstone nodules less than 0.1 ft. thick in siltstone bed 1.5 ft. above base; lower contact gradational----- 8.5
- Shale, medium-dark-bluish-gray, some light-gray laminations near middle, mostly obscurely bedded with some platy bedding near middle, silty; grades to siltstone in upper 0.2 ft.; common small plant fragments; includes 1.5-ft. bed of medium-dark-bluish-gray very fine grained very silty sandstone at base; 0.4-ft. bed of medium-gray friable very fine grained sandstone 0.8 ft. below top; lower contact sharp----- 6.
- Siltstone and interbedded sandstone; siltstone, medium-gray, slabby-weathering, obscurely bedded, clayey, abundant small carbonaceous plant fragments; sandstone, medium-gray, slabby-weathering, obscurely bedded, very fine to medium-grained, poorly sorted, very clayey; lower contact gradational----- 3.3
- Shale and interbedded siltstone; shale (7P-55)*, medium-gray, obscurely bedded, clayey, silty; many small plant fragments; siltstone, medium-gray, hackly-weathering, obscurely bedded, clayey, sandy in lower part; includes few very thin beds of medium-gray very clayey fine- to medium-grained sandstone; lower contact sharp----- 3.
- Sandstone, medium-dark-bluish-gray, partly iron-stained, slabby-weathering, obscurely bedded, friable, fine- to coarse-grained in lower part becoming fine- to medium-grained with scattered coarse grains in upper part, poorly sorted, very silty, very clayey; includes abundant dark-gray fine- to coarse-grained shale flakes; very thin lenses of medium-dark-gray shale about 1 ft. above base; lower contact sharp----- 11.9
- Shale, dark-gray, platy-weathering, poor blocky-weathering in lower 0.3 ft., poor fissile to platy-bedded, carbonaceous; upper half becomes less carbonaceous and includes many fine-grained particles of light-brownish-gray volcanic ash and pumice(?); lower contact sharp---- 0.9

*Palynological sample

Siltstone, medium-dark-bluish-gray, hackly-weathering, obscurely bedded, very clayey especially in upper part; plant fragments common in part; lower contact sharp-----	3.4
Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, fairly friable, very fine to fine-grained, subangular to subrounded, very silty, very clayey; includes few large weathered biotite flakes and abundant dark-gray phyllitic shale flakes; 0.1-ft. siltstone bed in middle; poorly observed; lower contact sharp-----	2.2
Siltstone, medium-dark-bluish-gray, hackly-weathering, obscurely bedded, clayey to very clayey in upper part; few plant fragments at base-----	6.3
Sandstone, medium-dark-bluish-gray, partly iron-stained, slabby-weathering, partly obscurely very thin bedded and cross-bedded, friable, very fine grained, subangular, clayey, very silty; includes very thin siltstone interbeds or lenses; lower contact gradational-----	8.3
Siltstone, medium-gray, partly iron-stained, mostly obscurely bedded but partly laminated, sandy to very sandy in upper part-----	1.5
Coal, platy-weathering, bony; includes light-gray medium-grained pyroclastic(?) grains; probably tuff or devitrified pumice-----	0.2
Sandstone, medium-dark-bluish-gray, slabby- to partly poor platy-weathering, obscurely very thin bedded, soft, very fine grained, subangular, very silty; includes 3 beds of medium-gray sandy siltstone (0.5-ft. bed near middle, 0.2-ft. bed 0.5 ft. below top, and 0.3-ft. bed about 1.5 ft. above base)-----	8.5
Shale and interbedded siltstone; shale, medium-dark-bluish-gray, obscurely bedded, silty; few plant fragments and large coalified wood remains; siltstone, medium-gray, hackly-weathering, obscurely bedded, sandy; includes few very thin beds of medium-gray friable very fine grained very silty sandstone in lower 1.5 ft.-----	3.3
Shale, medium-dark-bluish-gray, obscurely bedded, silty; few plant fragments and large coaly wood remains at top-----	2.3

Coal, very impure; includes some large woody remains; includes several lenses up to 0.1 ft. thick of light-brown to light-brownish-gray siltstone with abundant light-gray grains of tuff or devitrified pumice; lower contact sharp-----	0.8
Shale, medium-gray, hackly-weathering, obscurely bedded, silty, partly sandy in lower half; carbonaceous plant fragments common in part; lower contact fairly sharp-----	3.6
Sandstone, medium-gray, obscurely bedded, mostly friable, very fine grained, very silty, shaly in basal part; lower contact gradational-----	1.2
Shale, medium- to medium-light-gray, hackly-weathering, obscurely bedded, silty; carbonaceous plant fragments abundant in basal 0.3 ft. and scattered elsewhere in unit; lower contact sharp-----	4.2
Siltstone, medium-brown to brownish-gray, platy-weathering, poor platy-bedded; many carbonaceous plant fragments on bedding; includes light-gray grains of tuff or devitrified pumice-----	0.7
Coal, dull, impure; upper two-thirds of unit grades laterally into medium-brown sandy siltstone with abundant light-gray grains of tuff or devitrified pumice; lower contact sharp-----	0.4
Shale, medium-gray to medium-dark-bluish-gray, hackly-weathering, obscurely bedded, silty; scattered plant fragments randomly oriented; includes very thin interbeds of medium-gray siltstone in lower 1 ft.; lense up to 0.15 ft. thick of brownish-gray coaly shale near top; lower contact gradational-----	5.7
Sandstone, medium-dark-bluish-gray, fine- to medium-grained in lower 1 ft. becoming fine-grained in middle and very fine grained in upper part, subangular, clayey, very silty; includes abundant dark-gray shale flakes; few very thin beds of medium-gray siltstone-----	5.5
Siltstone and shale; siltstone, medium-gray to medium-dark-bluish-gray, obscurely bedded, very sandy; shale, medium-gray, obscurely bedded, very silty; some carbonaceous plant fragments-----	0.7

Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, friable, very fine to fine-grained with scattered medium grains near middle, subangular, clayey, very silty; abundant dark-gray shale flakes; plant remains near middle; includes 0.2-ft. medium-gray siltstone bed 0.5 ft. below top; several very thin beds or lenses of siltstone-----	4.
Shale, medium-gray, obscurely bedded; abundant small plant fragments; scattered large wood fragments; lower contact sharp-----	1.5
Sandstone, medium-gray, obscurely bedded, friable, very fine to fine-grained, subangular, clayey, very silty; many small dark-gray shale flakes; abundant plant fragments in top 0.2 ft.; includes few very thin beds or lenses of medium-gray siltstone; lower contact sharp-----	4.
Shale, medium-gray; abundant large coalified tree remains; includes few very thin lenses of medium-gray to medium-dark-bluish-gray friable very fine to fine-grained sandstone-----	0.3
Sandstone, medium-dark-bluish-gray, partly iron-stained, slabby-weathering, obscurely bedded, soft, friable, very fine grained with the upper 1 ft. becoming mainly siltstone, subangular, clayey, very silty; many small dark-gray shale flakes; few large plant fragments; includes some very thin interbeds of medium-gray siltstone; lower contact gradational-----	7.4
Sandstone and interbedded siltstone; sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, very fine grained, subangular, clayey, very silty; siltstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, clayey; some large coaly wood fragments near middle; lower contact gradational-----	2.2
Shale, medium-gray to medium-dark-bluish-gray, obscurely bedded, very silty; some carbonaceous plant fragments; few large plant fragments near top; lower contact gradational-----	1.
Shale, medium-gray to medium-dark-bluish-gray, chunky- to poor platy-weathering, obscurely bedded, very silty; scattered to abundant very fine grained white to clear feldspar crystals and pumice(?) fragments in lower two-thirds of unit-----	2.9

Shale, medium-gray, hackly-weathering, obscurely bedded, silty; common carbonaceous plant fragments; lower contact sharp-----	3.4
Siltstone, brownish-gray, poor platy-weathering, poor platy- to very thin bedded, very sandy, microbreccia; includes abundant olive-gray and dark-gray medium-grained shale flakes and light-gray pumice(?) fragments; lower contact gradational-----	1.2
Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, friable, fine- to medium-grained, subangular, very clayey in upper 0.3 ft., very silty; abundant dark-gray medium- to fine-grained shale flakes; lower contact fairly sharp-----	2.5
Sandstone, medium-dark-bluish-gray, partly platy- to very thin bedded, partly cross-bedded, fairly friable, fine- to medium-grained, scattered coarse grains in lower 4.5 ft., subrounded to subangular, clayey, very silty; subequal quantities of monomineralic grains and dark-gray shale flakes; scattered coalified wood remains in lower part; includes many lenses up to 2 ft. thick of medium- to very coarse grained sandstone with scattered to abundant granules between 4.5 ft. and 21 ft. above base; abundant medium-gray shale flakes up to 0.03 ft. thick in 0.3-ft. bed 0.5 ft. above base; unit locally forms steep bare rounded slopes; lower contact sharp-----	22.5
Shale and interbedded sandstone; shale, medium-gray, hackly-weathering, obscurely bedded, silty; includes some brownish-gray poor platy-bedded clayey shale with abundant plant fragments; sandstone, medium-gray, partly iron-stained, fine- to medium-grained; includes shale flakes and shale lenses less than 0.1 ft. thick; unit includes large carbonaceous wood remains; lower contact sharp-----	0.6
Shale, medium-gray to medium-dark-bluish-gray, hackly-weathering, obscurely bedded, silty; some small plant fragments; lower contact sharp-----	6.4
Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, friable, very fine to fine-grained, subangular, clayey, very silty; abundant small dark-gray shale flakes; lower contact gradational-----	3.6

Siltstone and interbedded sandstone; siltstone, medium-gray, very thin bedded, partly platy-bedded, very clayey; sandstone, medium-gray, slabby- to poor platy-weathering, very thin bedded, friable, very fine grained, sub-angular, clayey, very silty; few small dark-gray shale flakes-----	4.8
Shale, medium-gray, hackly- to conchoidal-weathering, obscurely bedded, tough, compact, silty; few carbonaceous plant fragments; many large coalified tree remains at base and top; lower contact fairly sharp-----	1.5
Siltstone, medium-gray, slabby-weathering, obscurely bedded, sandy to very sandy in upper half; includes few thin beds of medium-gray friable very fine grained clayey very silty sandstone; lower contact gradational-----	9.6
Siltstone, medium-gray, slabby-weathering, obscurely bedded, partly sandy, clayey at base; abundant carbonaceous plant fragments in part-----	6.6
Shale, medium- to medium-dark-gray, poor fissile to platy-bedded, carbonaceous; abundant plant fragments; includes fissile bone coal stringers; 0.02-ft. lense near middle of light-gray fine- to medium-grained sandstone with clear feldspar crystal fragments and grains of light-gray devitrified pumice(?) and/or tuff; lower contact gradational-----	0.6
Shale, medium-gray, poor platy-bedded to fissile in part, silty; abundant small carbonaceous fragments; lower contact fairly sharp-----	3.4
Shale and interbedded carbonaceous shale, medium- to dark-gray, deeply weathered, fissile; abundant plant fragments and large carbonaceous wood remains; poorly developed vertical cleat and the appearance of coal; lower contact sharp-----	1.5

- Siltstone, medium-gray, partly brownish-gray, poor platy-weathering in lower part and slabby- to hackly-weathering in upper part, platy-bedded in lower part to obscurely bedded in upper part, very clayey in upper 0.5 ft.; some leaf impressions in part; large carbonaceous wood remains locally abundant in 0.2-ft. interval 0.5 ft. below top; includes brownish-gray beds with abundant fine grains of light-gray devitrified pumice(?) and clear feldspar and glass(?) in a 1-ft. interval 1.5 ft. above base; some slickensides in lower part; few dark-gray to black carbonaceous shale beds less than 0.1 ft. thick in lower part; lower contact gradational----- 7.8
- Shale (7P-28)*, medium-gray, hackly-weathering, obscurely bedded, silty; common carbonaceous plant fragments; lower contact gradational----- 5.
- Siltstone, medium-gray, slabby- to poor platy-weathering, platy-bedded, soft, clayey; few carbonaceous plant fragments; includes several beds up to 0.5 ft. thick, of medium-gray friable very fine grained subangular sandstone; unit poorly exposed; lower contact sharp----- 12.
- Sandstone, medium-gray, very thin bedded, cross-bedded, friable, fine- to medium-grained in lower 2 ft. becoming fine-grained above, subangular, silty; few leaf impressions 6 ft. above base; includes abundant black rock fragments; few thin beds and lenses of platy-weathering iron-rich sandstone; thin beds of medium-gray laminated siltstone in upper 2.5 ft.; unit locally a poor cliff former; lower contact fairly sharp----- 11.2
- Sandstone, medium-gray, poor platy- to slabby-weathering, platy- to very thin bedded, partly friable, very fine grained, subangular, very silty; includes a few very thin interbeds of medium-gray sandy siltstone; lower contact sharp----- 6.
- Siltstone and interbedded sandstone; siltstone, medium-gray, platy-bedded, clayey, partly calcareous; sandstone, medium-gray, partly iron-stained, platy- to very thin bedded, friable, very fine grained, subangular; includes few thin beds of medium-gray shale; lower contact sharp----- 1.7

*Palynological sample

- Sandstone, medium-gray, iron-stained, slabby-weathering, obscurely bedded, friable, very fine grained, sub-angular, very silty; common small dark-gray shale flakes; lower contact sharp----- 2.7
- Siltstone, medium-dark-bluish-gray, slabby- to poor platy-weathering in upper 1.5 ft., obscurely bedded, clayey in upper 1.5 ft.; few plant fragments in lower half; includes very thin beds of friable very fine grained sandstone in 1-ft. interval near middle; 0.1-ft. bed of light-brownish-gray claystone about 3 ft. below top; lower contact gradational----- 9.7
- Sandstone, medium-gray to medium-dark-bluish-gray, partly iron-stained, slabby-weathering, obscurely bedded, partly platy- to very thin bedded, partly cross-bedded, mostly friable, very fine grained, subangular; very clayey, very silty; includes few fine- to medium-grained sandstone interbeds up to 1 ft. thick; 0.5-ft. bed of medium-gray sandy siltstone about 3 ft. above base; lower contact sharp----- 11.5
- Siltstone, medium-gray, partly iron-stained, slabby- to poor platy-weathering, partly platy- to thin-bedded, somewhat uneven-bedded, partly sandy; locally common plant fragments; coalified tree remains in 0.5-ft. interval near middle; includes few thin beds of medium-gray friable very fine grained sandstone; becomes very shaly in upper 2 ft.; lower contact gradational----- 12.
- Siltstone, medium-gray, slabby-weathering, obscurely bedded, even-textured, soft, sandy; lower contact fairly sharp--- 1.5
- Shale (7P-21)*, medium-gray, obscurely bedded, very silty; abundant carbonaceous plant fragments in lower part; includes 0.6-ft. interval of brownish-gray shale in middle; bone-coal lenses up to 0.4 ft. thick and large carbonaceous wood remains; lower contact gradational----- 3.1
- Siltstone and interbedded sandstone; siltstone, medium-gray to medium-dark-bluish-gray, slabby-weathering, obscurely bedded, partly sandy; sandstone, medium-gray to medium-dark-bluish-gray, slabby weathering, obscurely bedded, friable, very fine grained; subangular, very silty, very clayey; forms beds up to 1 ft. thick in upper two-thirds of unit; lower contact sharp----- 14.7

*Palynological sample

<p>Sandstone, medium-gray, slabby-weathering, poor platy-bedded, very fine grained, subangular, clayey, very silty; includes in lower part interbedded siltstone and shale with many plant fragments; 0.1-ft. lense 0.5 ft. above base of dark-brownish-gray to dark-gray shale with very thin lenses of yellowish-brown very fine grained particles of tuff or devitrified glass(?); lower contact gradational-----</p>	3.8
<p>Siltstone, medium-gray to medium-dark-bluish-gray, hackly- to poor slabby-weathering, obscurely bedded, sandy; some large wood remains; lower contact gradational-----</p>	1.6
<p>Sandstone, medium-gray to medium-dark-bluish-gray, slabby- weathering, obscurely bedded, probably platy- to very thin bedded, very fine grained, subangular, very silty, very clayey; lower contact gradational-----</p>	1.8
<p>Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded to very thin bedded, cross-bedded, friable, mostly medium- to coarse-grained, some very coarse grains and granules in lower 3 ft., fine-grained in upper 1 ft., predominately composed of dark-gray shale flakes with scattered large shale flakes and several courses of large shale flakes in lower 3 ft.; lower contact sharp-----</p>	12.1
<p>Shale, medium-gray, hackly- to poor slabby-weathering, ob- scurely bedded, clayey to very silty; plant fragments common in upper half and scattered in lower half-----</p>	3.5
<p>Sandstone, medium-dark-bluish-gray, partly iron-stained, slabby-weathering, obscurely bedded, friable, medium- to coarse-grained at base becoming very fine to fine- grained at top, subangular, very silty, very clayey; abundant dark-gray shale flakes; lower contact sharp-----</p>	7.6
<p>Shale and interbedded siltstone; shale, medium-dark-bluish- gray, obscurely bedded, silty; some plant fragments; siltstone, medium-dark-bluish-gray, obscurely bedded, clayey, sandy; some plant fragments; unit weathers hackly to chunky-----</p>	4.2
<p>Siltstone, brownish-gray to medium-gray, poor platy-bedded, carbonaceous; many plant fragments; probably pinches out in short lateral distance-----</p>	0.2

- Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, mostly friable, medium- to coarse-grained in basal 1 ft. becoming fine- to medium-grained about 3.5 ft. above base, subangular, very silty, very clayey; composed mostly of dark-gray shale flakes; lower contact sharp and undulating----- 7.6
- Shale, medium- to dark-gray, poor fissile to platy-bedded, very silty; many plant fragments on bedding surfaces; lower contact fairly sharp----- 0.3-0.7
- Sandstone, medium-dark-bluish-gray, obscurely bedded, very fine grained, subangular, silty, very clayey; abundant dark-gray shale flakes; upper 0.5 ft. dominately siltstone; includes at 0.5 ft. below top lense less than 0.1 ft. thick of yellowish-brown very fine grained very silty sandstone; lower contact fairly sharp----- 2.4
- Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, friable, very fine to fine-grained, subangular, very silty; abundant dark-gray shale flakes; lower contact sharp----- 3.3
- Shale (7P-13)*, medium-gray, obscurely bedded, silty; some small plant fragments and large coalified wood remains; slickensided in part; lower contact sharp----- 1.1
- Sandstone, medium-dark-bluish-gray, partly iron-stained (particularly in upper 1 ft.), mostly slabby-weathering, friable in lower 3 ft., very fine to fine-grained, clayey in upper 1 ft.; abundant dark-gray shale flakes; some large coaly wood fragments; lower contact sharp----- 4.
- Siltstone, mottled medium-gray and brownish-gray in lower part to mostly dark-brownish-gray in upper part, fissile- to chunky-weathering, obscurely to poor platy-bedded in upper part, carbonaceous in part; fine grains of tuff, clear feldspar and devitrified glass(?); many carbonaceous plant fragments; includes lenses up to 0.3 ft. thick of medium-gray friable fine-grained very silty sandstone in upper 1 ft.; lower contact gradational----- 1.9
- Siltstone, medium-gray, obscurely bedded, soft, sandy in upper 1 ft., clayey; some carbonaceous plant fragments and few large coalified wood remains in lower part; lower contact sharp----- 3.4

*Palynological sample

- Sandstone, medium-gray to medium-dark-bluish-gray, slabby-weathering, obscurely bedded, friable, very fine to medium-grained, upper 0.8 ft. mostly very fine grained, subangular, clayey, very silty, poorly sorted; abundant dark-gray shale flakes; lower contact gradational----- 4.1
- Siltstone and interbedded shale; siltstone, medium-gray, obscurely bedded, silty, sandy; common randomly oriented plant fragments; shale, medium-gray, obscurely bedded, very silty; common randomly oriented plant fragments; unit weathers slabby and includes very thin beds and lenses of medium-gray very fine to medium-grained sandstone----- 2.
- Siltstone and bone coal; siltstone, brownish-gray to medium-gray, poor fissile to platy-bedded, clayey, carbonaceous in part; many plant fragments; coal, impure, weathered, lenticular; large coalified wood remains; lower contact gradational; unit probably equivalent to uppermost coal described in measured section 10----- 1.1
- Siltstone, medium-gray, slabby- to hackly-weathering, obscurely bedded, clayey; few small plant fragments; few large coaly wood fragments about 1 ft. above base and in upper 0.5 ft.; includes some interbedded shale in lower half; lower contact sharp----- 9.7
- Siltstone, medium-gray becoming brownish-gray in upper part, platy-bedded and hard in upper half, mostly clayey, sandy in upper part; coalified wood fragments at top; lower contact gradational----- 3.
- Sandstone, medium-dark-bluish-gray, slabby-weathering, obscurely bedded, friable, medium- to coarse-grained in lower 3 ft. becoming mostly medium-grained in middle part and very fine grained in upper 3 ft., subangular, clayey, very silty; abundant dark-gray shale flakes; lower part mostly covered -- poorly exposed by trenching; lower contact sharp and probably disconformable----- 32.

Note: The rocks described below are exposed in a steep hillside about 100 yd. southwest of the 32-ft. sandstone described above. The sandstone is mostly covered across this distance, and correlation is based on the medium to coarse grain size and position on the hillside.

- Siltstone, medium-gray, obscurely bedded, sandy in lower part, very clayey, slickensided; plant remains common; abundant light-gray grains and granules of tuff and devitrified pumice; common clear feldspar grains; solution cavities(?) in 1.5-ft. interval 1 ft. above base; 0.1-ft. bed of brownish-gray carbonaceous siltstone at top; lower contact gradational; this unit apparently cut out to the northeast by the overlying sandstone----- 3.7
- Sandstone, medium-gray, mostly iron-stained, slabby-weathering, partly very thin bedded, partly laminated, soft, friable, very fine grained, subangular, very silty in upper part; includes a 2.5-ft. bed of medium-gray obscurely bedded siltstone near middle; poorly developed ironstone nodules at top; lower contact fairly sharp; upper part of this unit probably cut out to the northeast by overlying sandstone----- 14.
- Siltstone, medium-gray, iron-stained, hackly-weathering, obscurely bedded, partly sandy; includes very thin interbeds of medium-gray platy-bedded friable very fine to medium-grained very silty sandstone; scattered yellowish-brown soft poorly defined concretions up to 0.1 ft. thick; lower contact gradational----- 7.
- Sandstone, medium-gray, slabby-weathering, platy- to very thin bedded, platy-bedded in upper 1 ft., friable, very fine grained, subangular, clayey, very silty; common dark-gray rock fragments; lower contact fairly sharp----- 4.2
- Siltstone and interbedded sandstone; siltstone, medium-gray to medium-dark-bluish-gray, platy- to very thin bedded, soft, sandy; sandstone, medium-gray, platy- to very thin bedded, soft, very fine grained; unit weathers hackly; includes 0.1-ft. bed of medium-gray friable fine-grained sandstone 0.2 ft. below top; lower contact fairly sharp----- 3.4
- Siltstone, medium-gray to medium-dark-bluish-gray, hackly-weathering, obscurely bedded in lower half, platy-bedded to laminated in upper half, clayey; includes 0.1-ft. irregular bed of mottled yellowish-brown siltstone 0.2 ft. below top; lower contact gradational----- 1.9

Sandstone, medium-gray to medium-dark-bluish-gray, slabby-weathering, mostly obscurely bedded, partly very thin bedded, mostly soft, partly friable, medium-grained in basal 1 ft. becoming very fine grained above, sub-angular, clayey, very silty; lower contact sharp----- 6.5

Siltstone (7P-1 -- 3 ft. above base)*, medium-gray to medium-dark-bluish-gray, hackly-weathering in upper 4 ft., poor platy-weathering in upper 0.5 ft., poor conchoidally fracturing, mostly obscurely bedded, platy-bedded in upper 4 ft., partly laminated in upper 0.5 ft., soft, sandy, clayey; few plant fragments; common yellowish-gray partly limy clayey shale flakes in a thin bed about 3 ft. above base; includes interbeds up to 1 ft. thick of medium-gray soft very fine grained sandstone; 0.2-ft. bed of medium-dark-gray platy-bedded to poorly fissile carbonaceous siltstone 5 ft. above base; lower contact concealed in Fox Creek----- 13.2

*Palynological sample

Measured section 8

Location: Hillside exposure in large unnamed west tributary of Fox Creek from SE corner SW 1/4 SE 1/4 sec. 7 southward to SW 1/4 NE 1/4 NE 1/4 sec. 18, T. 4 S., R. 10 W., Seldovia D-3 quadrangle. This location is approximately the same as locality 172 of Barnes and Cobb (1959, pls. 18, 19). Section starts about 15 ft. below canyon rim.

	Feet
Tertiary rocks-Kenai Group, Sterling Formation	
Siltstone (8P-96 -- middle part)*, medium-gray, mostly light-olive-gray-weathering, partly iron-stained, chunky-weathering, obscurely bedded, clayey, sandy in basal 1 ft.; abundant carbonaceous plant fragments; clayey ironstone nodules 0.1 ft. thick about 3.5 ft. above base; overlain by deeply weathered siltstone and soil; lower contact gradational-----	8.+
Sandstone, medium-light-gray, partly iron-stained, slabby-weathering, laminated to platy-bedded, soft, friable, very fine grained, subangular to subrounded; lower contact gradational-----	5.5
Sandstone, medium-gray, partly iron-stained, mostly obscurely bedded but laminated to platy-bedded in upper 1.5 ft., friable, fine- to medium-grained (lower 1 ft.) grading upward to very fine grained (upper 1.5 ft.), subangular to subrounded; lower 3 ft. includes scattered rounded shale pebbles (less than 0.1 ft. long) with carbonaceous plant fragments; lower contact sharp-----	11.4
Siltstone, medium-light-gray, partly iron-stained, mostly platy-bedded, hard, tough, clayey; some carbonaceous plant fragments; several very thin iron-rich beds-----	0.5
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey, mostly sandy; many carbonaceous plant fragments; includes at 0.1 ft. below top a 0.2-ft. lense of sandstone similar to below; lower contact sharp and irregular-----	1.1
Sandstone, medium-light-gray, mostly iron-stained, obscurely bedded, friable, very fine to fine-grained, subangular to subrounded; lower contact sharp-----	1.8

*Palynological sample

Siltstone, medium-gray, deeply iron-stained and hard in upper 0.2 ft., obscurely bedded, clayey; many carbonaceous plant fragments; lower contact sharp-----	1.2
Sandstone, medium-gray, mostly iron-stained, mostly obscurely bedded, friable, very fine grained, subangular to subrounded; lower contact sharp-----	4.
Sandstone, medium-gray, partly iron-stained, mostly laminated to platy-bedded, partly friable, very fine grained, subangular to subrounded, silty, very clayey in upper 1 ft.; upper half includes numerous irregular thin (about 0.1 ft.) beds of medium-gray clayey siltstone; ironstone nodules 0.2 ft. thick at 1.2 ft. below top; lower contact sharp-----	6.9
Siltstone, medium-gray, partly iron-stained, slabby-weathering, partly laminated to platy-bedded, obscurely bedded (middle), clayey; some carbonaceous plant fragments, large coalified plant fragments near base; includes at 1.5 ft. above base a 1.3-ft. bed of medium-gray partly iron-stained friable very fine grained subangular to subrounded sandstone and a similar bed of partly laminated sandstone 0.6 ft. thick at 0.9 ft. below top; upper 3 ft. includes about 4 ironstone-nodule zones (each mostly less than 0.1 ft. thick)-----	8.3
Coal; includes at 0.7 ft. above base a 0.5-ft. bed of brownish-gray weathered clayey siltstone; lower contact fairly sharp-----	2.8
Siltstone, medium-gray, chunky-weathering, obscurely bedded, clayey; many randomly oriented carbonaceous plant fragments; upper 0.1 ft. becomes medium-dark-gray laminated to platy-bedded carbonaceous siltstone-----	1.
Sandstone, medium-gray, platy- to slabby-weathering, laminated to platy-bedded (lower half), very fine to fine-grained, subangular to subrounded, silty, clayey; abundant carbonaceous material near base, numerous large coalified wood fragments at high angle to bedding; lower contact gradational-----	1.2
Siltstone, medium-gray, medium-dark-gray (middle), platy-weathering, obscurely bedded, sandy in upper 0.2 ft., very clayey in lower 0.5 ft.; many carbonaceous plant fragments-----	2.4

Coal, poor blocky- to platy-weathering; many flattened coalified logs; includes at 0.8 ft. above base a lenticular bed (0-0.2 ft.) of brownish-gray fissile- to platy-weathering clayey siltstone with many carbonaceous plant fragments; at 0.3 ft. below top lenses (less than 0.1 ft. thick) of medium-brown-weathering siltstone-----	2.1
Siltstone, medium-gray, light-gray-weathering, obscure platy- to very thin bedded, very clayey; many small and large carbonaceous wood fragments mostly parallel to bedding-----	0.3-0.8
Coal, platy-weathering, very impure-----	0.2-0.4
Siltstone, medium-dark-gray, partly iron-stained, laminated to platy-bedded, clayey, very sandy; abundant carbonaceous plant fragments on bedding; lower contact sharp-----	0.4
Sandstone, medium-gray, mostly iron-stained, obscurely bedded, friable, fine-grained, subangular to subrounded, slightly silty; some randomly oriented carbonaceous plant fragments; includes in upper 1 ft. very thin irregular beds and lenses of medium-gray to iron-stained siltstone; lower contact sharp-----	3.3
Siltstone and interbedded sandstone; siltstone, medium-gray, chunky-weathering, obscurely bedded, clayey; many carbonaceous plant fragments; sandstone (lower half of unit), medium-gray, obscurely bedded, friable, fine- to medium-grained at base becoming very fine grained at top, subangular to subrounded, silty; abundant carbonaceous laminations and very thin coal stringers in 0.3-ft. sandstone bed about 3 ft. below top of unit; upper 0.5 ft. of unit grades to medium-gray partly laminated silty shale; lower contact sharp-----	5.8
Siltstone, medium-gray, partly iron-stained, mostly obscurely bedded, some laminated to platy-bedded, clayey; includes 2 carbonaceous clayey siltstone beds (each about 0.1 ft. thick) at 0.2 ft. and about 8 ft. above base; few beds as much as 1 ft. thick of medium-gray friable laminated very fine grained silty sandstone; lower contact sharp-----	9.2

Coal and interbedded siltstone and carbonaceous shale; coal, mostly platy, one 0.3-ft. bed at top, very impure; siltstone, medium-gray, poor fissile- to platy-weathering, clayey; abundant carbonaceous plant fragments; lower contact fairly sharp-----	0.8
Sandstone, medium-gray, obscurely bedded, friable, fine-grained becoming partly very fine grained in upper part, subangular to subrounded, silty; lower contact sharp-----	2.4
Siltstone, medium-gray, partly iron-stained, mostly obscurely bedded, partly laminated to platy-bedded, clayey; few carbonaceous plant fragments; includes laminae and beds (as much as 0.05 ft. thick) of very fine grained sandstone in lower part-----	4.2
Coal, very impure; lower contact sharp-----	0.7
Sandstone, medium-gray, laminated, soft, very fine grained, subangular to subrounded, silty; grades into siltstone in upper half; very clayey in upper 1 ft. (8P-83)*; few carbonaceous plant fragments; lower contact gradational-----	5.
Siltstone, medium-gray, obscurely bedded, clayey; abundant carbonaceous plant fragments; upper half interlaminated with very fine grained silty sandstone; includes 0.1-ft. bed of friable fine-grained sandstone near middle; 0.1-ft. bed of dark-gray coaly shale in upper-middle part; lower contact gradational-----	2.
Sandstone, medium-gray, obscurely bedded, friable, fine- to medium-grained (lower 1 ft.) grading upward to very fine grained (upper 5.5 ft.), subangular to subrounded; upper part appears more quartzose than lower part; lower contact sharp and probably disconformable-----	8.5
Siltstone, medium-gray, slabby-weathering, obscurely bedded, clayey in upper 0.5 ft.; some carbonaceous plant fragments-----	4.9
Coal, impure; flattened coalified logs-----	0.2
Siltstone, medium-gray, poor laminated to platy-bedded, clayey; many carbonaceous plant fragments parallel to bedding-----	0.5
Coal, very impure-----	0.4

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Siltstone, light-brown, light-gray-weathering, irregular obscurely laminated, clayey, sandy; many carbonaceous plant fragments; probably of pyroclastic origin-----	0.1-0.5
Coal, blocky; many flattened coalified logs; lower contact fairly sharp-----	0.7
Siltstone, medium-gray, obscurely bedded, clayey; some carbonaceous plant fragments; upper part becomes carbonaceous siltstone; lower contact sharp-----	1.-1.6
Sandstone, medium-gray, iron-stained, cross-bedded, friable, fine-grained, partly very fine grained (upper part), subangular to subrounded; lower contact sharp and probably disconformable-----	9.
Siltstone, medium-gray, chunky-weathering, obscurely bedded, very clayey; lower contact fairly sharp-----	3.2
Siltstone, brown, dark-gray platy-weathering, obscurely bedded, very clayey; few carbonaceous plant fragments; upper 0.1 ft. includes flat siltstone clasts; lower contact fairly sharp-----	2.
Siltstone, medium-gray, slabby- to chunky-weathering (poorly observed), obscurely bedded, clayey; some small carbonaceous plant fragments, many large carbonaceous plant fragments normal to bedding; includes in middle a 1.5-ft. bed of laminated to platy-bedded very fine grained subangular to subrounded silty sandstone; grades into shale in upper 1 ft. (8P-76)*; lower contact sharp-----	8.8
Sandstone, medium-gray, iron-stained, laminated to platy-bedded, friable, very fine grained, subangular to subrounded, silty; lower contact sharp-----	3.5
Siltstone, medium-gray, obscurely bedded, clayey, shaly (upper 1 ft.), friable (lower 0.5 ft.); few carbonaceous plant fragments; lower contact gradational-----	3.9
Sandstone, medium-gray, iron-stained, obscurely bedded, probably cross-bedded, fine-grained, very fine grained (upper 1 ft.), very silty (upper 0.5 ft.); includes few platy beds of iron-rich clayey sandstone; lower contact sharp-----	6.
Siltstone, medium-gray, obscurely bedded, friable, soft; few carbonaceous plant fragments-----	1.6

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- Ironstone, reddish-brown, clayey; lower contact sharp----- 0.1
- Siltstone, medium-gray, obscurely bedded, clayey; few carbonaceous plant fragments; lower contact gradational----- 2.6
- Sandstone, medium-gray, partly iron-stained, mostly laminated to platy-bedded; partly obscurely bedded, very fine grained, subangular to subrounded; includes at 7.5 ft. above base a 1.5-ft. bed of medium-gray iron-stained friable fine-grained clayey sandstone (contacts sharp at base and gradational at top); at 12 ft. above base a 2.5-ft. bed of medium-gray obscurely bedded clayey siltstone with carbonaceous plant fragments; lower contact sharp----- 18.
- Sandstone and interbedded siltstone; sandstone, medium-gray, partly iron-stained, laminated to platy-bedded (partly obscure), partly friable, very fine grained, subangular to subrounded; forms beds mostly 2-4 ft. thick; includes 3 friable fine-grained sandstone beds, each about 0.5 ft. thick; siltstone, medium-gray, obscurely bedded, clayey; some carbonaceous plant fragments; forms beds about 0.5 ft. thick except for 1.5-ft. bed at base and a 3-ft. bed about 12 ft. above base; siltstone in upper 5 ft. includes clayey ironstone nodules as much as 0.2 ft. thick; lower contact sharp----- 17.2
- Sandstone, medium-gray, iron-stained, mostly laminated to platy-bedded, fine-grained (basal 1 ft.) to very fine grained, subangular to subrounded, very silty (upper 2 ft.); some laminae of very fine carbonaceous material; some iron-rich beds as much as 0.05 ft. thick mostly in upper half; lower contact sharp----- 7.1
- Sandstone, medium-gray, partly laminated to platy-bedded, friable, very fine grained, subangular to subrounded, very silty; includes at 1 ft. above base a 0.5-ft. bed of friable fine-grained sandstone; upper half becomes partly iron-stained clayey siltstone; few large coalified wood fragments; lower contact fairly sharp----- 4.8
- Shale (8P-68)*, medium-gray, obscurely bedded; includes medium size sand grains (probably of volcanic origin); few small carbonaceous plant fragments----- 2.3

*Palynological sample

Coal and interbedded siltstone and carbonaceous shale (lenticular beds as much as 0.5 ft. thick); coal, platy-weathering; flattened coalified logs; siltstone, medium-gray to brownish-gray, obscurely bedded, clayey; some carbonaceous plant fragments and large coalified wood fragments; abundant white angular grains (volcanic origin?) in the siltstone and coal-----	2.7
Siltstone, medium- to medium-dark-gray, obscurely bedded, clayey; very carbonaceous in basal 0.5 ft.; many carbonaceous plant fragments; many large plant fragments in upper 1 ft.; lower contact gradational-----	4.4
Sandstone, medium-gray, mostly obscurely bedded, laminated to platy-bedded (at 9.5-12 ft. above base), mostly friable, fine- to medium-grained (basal 1.5 ft.) grading upward to very fine grained and very silty (upper 4 ft.), subangular to angular; fine carbonaceous material and much iron stain at 9.5-12 ft. above base-----	16.
Coal-----	0.6
Siltstone, medium-gray, clayey; carbonaceous plant fragments-----	0.3
Coal; includes 0.1-ft. bed of dark-gray carbonaceous shale 0.2 ft. below top-----	1.3
Siltstone, medium-brown, clayey-----	0.5
Coal; much medium- to dark-gray carbonaceous shale in basal 0.3 ft.; includes 0.1-ft. lenticular bed of medium-brown siltstone 0.5 ft. below top-----	1.1
Siltstone, medium-gray, obscurely bedded, clayey; many carbonaceous plant fragments-----	0.5
Coal; includes 0.2-ft. bed of dark-gray very carbonaceous shale in middle-----	0.8
Sandstone, medium-gray, partly iron-stained, obscurely bedded, probably partly cross-bedded, friable, fine- to medium-grained (basal part) grading upward to very fine grained and very silty (uppermost part), subangular to subrounded; lower contact sharp-----	11.3

Siltstone, medium- to medium-dark-gray, mostly obscure platy-bedded, clayey, sandy in basal part; many carbonaceous plant fragments in part; lower contact gradational-----	2.7
Sandstone, medium-gray, partly iron-stained, slabby-weathering, partly laminated to platy-bedded, friable, fine-grained, fine- to medium-grained (basal 1 ft.); subangular to subrounded, upper 0.5 ft. grades to micaceous clayey siltstone; many randomly oriented carbonaceous plant fragments in upper 1.5 ft.; lower contact sharp-----	7.1
Sandstone, medium-gray, poor platy- to poor slabby-weathering, obscurely bedded, partly friable, very fine to fine-grained, medium- to coarse-grained (basal 1.5 ft.); subangular to subrounded, silty; includes few medium-gray sandy clayey siltstone beds about 0.5 ft. thick in middle and upper parts-----	5.
Coal and carbonaceous shale (subequal amounts); coal, impure; mostly in lower half of unit; poorly exposed-----	1.4
Siltstone, medium-gray, light-brown tinted, obscurely bedded, clayey; white angular grains (volcanic origin?); some carbonaceous fragments-----	0.8
Coal; includes irregular partings of medium-gray siltstone in lower half and brown siltstone (pyroclastic?) less than 0.1 ft. thick about 0.2 ft. below top-----	0.7
Siltstone, medium-gray, partly brown tinted, obscurely bedded, clayey; abundant carbonaceous plant fragments, some large flattened coalified logs; includes very irregular coal lenses as much as 0.5 ft. thick near middle; lower contact "wavy" and irregular-----	2.2
Coal, platy- to blocky-weathering; includes a 0.2-ft. bed of brownish-gray carbonaceous shale at base and lenticular bed of medium-brown siltstone about 0.1-0.2 ft. thick at 0.2 ft. below top-----	1.3
Siltstone, medium-gray, obscurely bedded, very clayey; many randomly oriented carbonaceous plant fragments; includes at top 0.5-ft. bed of medium-gray non-bedded claystone (8P-59)* (underclay?) with abundant plant fragments and many slickensides-----	3.

*Palynological sample

Sandstone, medium-gray, partly iron-stained, obscurely bedded, friable, fine-grained to very fine grained at top, subangular to subrounded; lower contact fairly sharp-----	2.5
Siltstone, medium-gray, partly iron-stained, chunky- to poor slabby-weathering, obscurely bedded, hard, very clayey; some carbonaceous plant fragments; lower contact gradational-----	4.6
Shale (8P-53)*, dark-gray (base) to medium-gray (top), obscurely bedded; abundant carbonaceous plant fragments; lower contact gradational-----	0.7
Coal, very impure; lower contact sharp-----	0.3
Sandstone, medium-gray, mostly iron-stained, partly irregular laminated to platy-bedded, mostly friable, very fine grained, subangular to subrounded, silty, clayey; few ironstone nodules less than 0.1 ft. thick about 3 ft. above base; some carbonaceous plant fragments in upper-middle part; includes medium-gray obscurely bedded clayey siltstone in basal part (1.5 ft.) and in beds about 1 ft. thick in upper 4 ft.; lower contact sharp-----	11.
Sandstone and interbedded siltstone (subequal amounts); sandstone, medium-gray, mostly laminated to platy-bedded, partly friable, very fine grained, subangular to subrounded; abundant fine carbonaceous material on many bedding planes; forms beds about 1-2 ft. thick; siltstone, medium-gray, obscure to poor platy-bedded, very clayey; many carbonaceous plant fragments; unit includes few beds about 0.5 ft. thick of medium-gray silty shale with plant fragments; 0.3-ft. bed of dark-gray carbonaceous siltstone at top; lower contact sharp-----	22.1
Sandstone, medium-gray, partly reddish-brown stained (caused by burning of underlying coal?), obscurely bedded, very fine grained, subangular to subrounded, very silty, clayey-----	7.
Coal bloom, Bed U (?), deeply weathered, clayey; includes at top yellowish-brown and reddish-brown coal ash 0.1 ft. thick-----	1.

*Palynological sample

- Siltstone, medium-gray, upper part stained reddish-brown (result of burning of overlying coal?), obscurely bedded, clayey in basal 0.2 ft.; lower half includes numerous thin beds of laminated to platy-bedded very fine grained subangular to subrounded sandstone; lower contact fairly sharp----- 6.
- Sandstone, medium-gray, partly iron-stained, poor platy-weathering, laminated to platy-bedded, partly friable, very fine grained, subangular to subrounded, mostly silty; includes at base a 0.5-ft. bed of friable fine-grained sandstone and a similar bed about 5 ft. above base; latter bed overlain in upward order by hard micaceous very sandy siltstone about 2 ft. thick and very clayey siltstone about 0.5 ft. thick; lower contact sharp----- 13.
- Siltstone, medium-gray, slabby-weathering, obscure platy-bedded, clayey, very sandy; few carbonaceous plant fragments; includes at base a bed of platy-weathering medium-dark-gray clayey siltstone about 2.5 ft. thick; near middle a few beds of medium-gray very fine grained very silty clayey sandstone with average thickness of about 1 ft----- 20.
- Coal, Bed T (?), platy- to blocky-weathering, impure; many flattened coalified logs in upper half; includes near middle a 0.1-ft. lenticular bed of medium-gray clayey siltstone; lower contact fairly sharp----- 1.5
- Shale (8P-51)*, medium-dark-gray, poor fissile-bedded, silty; abundant carbonaceous plant fragments mostly on bedding; locally includes 0.2-ft. coal at base; lower contact fairly sharp----- 1.6
- Siltstone, medium-gray, partly iron-stained, locally slabby-weathering, obscurely bedded, hard in basal 1 ft., very clayey; scattered randomly oriented carbonaceous plant fragments; ironstone nodules in basal 1 ft., near middle, and in upper 0.2 ft.; lower contact fairly sharp----- 9.7
- Sandstone, medium-gray, iron-stained, laminated to platy-bedded, friable, very fine grained, subangular to subrounded, clayey, very silty in upper 2 ft.; lower contact gradational----- 8.6
- Sandstone, medium-gray, obscurely bedded, friable, fine-grained, subangular to subrounded; lower contact gradational----- 2.8

<p>Sandstone, medium-gray, iron-stained, poor platy-weathering, laminated to platy-bedded, friable, very fine grained, subangular to subrounded, silty, clayey; hard iron-rich bed 0.1 ft. thick 0.3 ft. above base; lower contact fairly sharp-----</p>	1.5
<p>Sandstone, medium-gray, mostly iron-stained, massive-weathering, poor cliff-forming, laminated to platy-bedded, cross-bedded (cross-bed sets about 1.5 ft. thick), partly friable, fine-grained, subangular to subrounded; few iron-rich lenses as much as 0.5 ft. thick about 8-12 ft. above base; few ironstone nodules at 15 ft. above base and probably at other places; lower contact sharp and probably disconformable-----</p>	45.
<p>Shale, medium-gray, obscurely bedded; many carbonaceous plant fragments; abundant coalified wood fragments in 0.1-ft. zone 0.5 ft. above base; lower contact sharp-----</p>	3.4
<p>Coal, platy-weathering, very impure; lower contact fairly sharp-----</p>	0.3
<p>Siltstone, medium-gray, obscurely bedded, clayey; abundant randomly oriented carbonaceous plant fragments; lower contact fairly sharp-----</p>	1.8
<p>Coal, platy-weathering, very impure; lower contact gradational-----</p>	0.7
<p>Siltstone, medium- to medium-dark-gray, partly iron-stained, poor platy- to chunky-weathering, partly laminated, partly carbonaceous, clayey; abundant carbonaceous plant and wood fragments; lower contact sharp-----</p>	2.9
<p>Siltstone, medium-gray, slabby-weathering, probably laminated to platy-bedded (obscure), clayey; abundant carbonaceous plant fragments (roots?) in part, some leaf impressions; grades into medium-gray obscurely bedded friable very fine grained subangular to subrounded silty sandstone in upper half-----</p>	2.
<p>Coal, Bed S (?), platy- to massive-weathering, partly very impure; many flattened coalified logs; includes 0.1-ft. lenticular bed of brownish-gray sandy carbonaceous siltstone 0.1 ft. below top; lower contact sharp-----</p>	3.6

Sandstone and interbedded siltstone, mostly similar to below; many carbonaceous plant fragments and large randomly oriented coalified wood fragments; includes at base bed of medium-gray friable fine- to medium-grained subangular to subrounded silty sandstone about 1.5 ft. thick and at top bed of very fine grained sandstone about 2 ft. thick; lower contact sharp-----	8.5
Sandstone and interbedded siltstone; sandstone, medium-gray, much iron-stained, partly laminated, mostly friable, very fine grained, subangular to subrounded; includes at 8.8 ft. above base a 0.3-ft. bed of medium-gray iron-stained hard sandy clayey siltstone overlain by 1.3-ft. bed of brownish-gray siltstone; 0.5-ft. bed of medium-gray silty shale at top; some carbonaceous plant fragments in siltstone and shale; beds in unit commonly 1-2 ft. thick; lower contact sharp-----	15.4
Siltstone, medium-gray, obscurely bedded, clayey, partly sandy; some carbonaceous plant fragments randomly oriented in part-----	3.
Coal; locally sharp variation in thickness; lower contact sharp-----	1.2-1.9
Siltstone and interbedded sandstone, slabby- to chunky-weathering; siltstone, medium-gray, obscurely bedded, clayey; abundant carbonaceous plant fragments in part; sandstone, medium-gray, partly laminated, friable, very fine grained, subangular to subrounded; 1.5-ft. sandstone bed at top includes large randomly oriented carbonaceous plant fragments-----	8.
Siltstone, light-gray to yellowish-gray, sandy; may be a very fine grained tuff or volcanic ash-----	0.15
Siltstone, dark-gray, carbonaceous, clayey-----	0.3
Coal, impure-----	0.4
Shale (8P-39)*, medium-dark-gray, poor platy-bedded; abundant carbonaceous plant fragments and coal stringers mostly parallel to bedding; lower contact gradational-----	1.6
Siltstone, yellowish-gray, partly laminated, clayey; few carbonaceous plant fragments; may be a very fine grained tuff or volcanic ash-----	4.6

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- Siltstone, medium-gray, partly iron-stained, obscure platy-bedded, clayey; many carbonaceous plant fragments in part; includes few beds as much as 1 ft. thick of medium-gray partly laminated to platy-bedded very fine grained sandstone; lower contact fairly sharp----- 13.
- Sandstone, medium-gray, partly iron-stained; partly faint platy-bedded, friable, fine-grained, subangular to subrounded; very fine grained and partly laminated in upper 3 ft.; abundant carbonaceous plant fragments in 0.1-ft. zone 4.3 ft. above base; lower contact sharp----- 10.
- Siltstone, similar to below, partly mottled; includes light-gray deeply weathered irregular coarse clayey grains (volcanic origin?) in 0.1-0.2-ft. beds about 5 ft. above base and in upper part; few interbeds of sandstone similar to below----- 13.
- Siltstone, medium-gray, slabby- to poor platy-weathering, partly laminated to obscure platy-bedded, clayey; carbonaceous plant fragments scattered to abundant; includes several beds, about 1 ft. thick, of medium-gray very fine grained sandstone; lower contact sharp; unit poorly exposed in gully bottom----- 30.
- Siltstone (volcanic ash?), medium-light-gray, obscurely bedded, soft, clayey----- 0.1
- Siltstone, mostly medium-light-gray, brownish-gray (upper 1.5 ft.), partly slabby- to poor platy-weathering, obscure platy-bedded, clayey; many carbonaceous fragments in part (some randomly oriented); includes near middle a bed, about 2 ft. thick, of medium-gray partly iron-stained laminated very fine grained sandstone; lower contact gradational; unit mostly covered----- 9.
- Siltstone, medium- to dark-gray, obscurely bedded, clayey; some carbonaceous plant fragments; includes in middle a bed, about 0.5 ft. thick, of medium-gray very fine grained sandstone; lower contact sharp----- 1.5
- Shale, dark-gray, poor fissile to platy-bedded, carbonaceous; abundant plant fragments----- 0.2
- Coal, mostly platy- to partly blocky-weathering; lower contact sharp----- 1.9

Siltstone (<u>8P-32</u>)*, medium-dark-gray, partly brown tinted, poorly fissile to platy-bedded, hard, clayey; abundant carbonaceous plant fragments; lower contact sharp-----	0.9
Siltstone and interbedded sandstone; siltstone, medium-gray, poor platy-weathering, clayey; abundant carbonaceous plant fragments in 0.2-ft. zone 2 ft. below top; sandstone, generally similar to below; beds as much as 2 ft. thick; includes a 0.1-ft. coal bed at 20 ft. above base; unit mostly covered except in gully bottom-----	28.
Sandstone, medium-gray, partly iron-stained, poor platy-weathering, laminated to platy-bedded, partly cross-bedded, very fine grained, partly very silty, clayey; many carbonaceous laminations in part; includes a few siltstone beds similar to above and as much as 1 ft. thick; medium-dark-gray carbonaceous siltstone beds (0.1-0.2 ft. thick) at about 5, 10, and 12 ft. above base; siltstone bed at 5 ft. above base includes 0.05-ft. bed of light-gray ash in middle; few ironstone nodules at 17 ft. above base; unit mostly covered except in gully bottom-----	20.
Coal (locally burned), platy- to blocky-weathering, impure in upper 0.7 ft.; many flattened coalified logs-----	2.1
Siltstone, medium-gray, poor platy-bedded, clayey, finely sandy; many carbonaceous plant fragments in some beds (locally oxidized to reddish-brown color near top of unit); includes near base 2 beds of carbonaceous shale (baked red locally) about 0.1 ft. thick; 2 beds of medium-gray friable very fine grained subangular to subrounded sandstone each about 0.5 ft. thick near middle-----	15.2
Shale, dark-gray, fissile, carbonaceous-----	0.5
Coal, platy- to partly blocky-weathering-----	1.5
Claystone (<u>8P-28</u>)*, medium-gray, obscurely bedded; slickensides; abundant carbonaceous plant fragments-----	0.2-0.5
Shale, dark-gray, fissile to platy-bedded, carbonaceous; may pinch out locally-----	0.3

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<p>Sandstone and interbedded siltstone; sandstone, medium-gray, locally iron-stained, probably platy-bedded (obscure), friable, very fine to fine-grained, subangular to subrounded; average bed thickness about 3 ft.; beds become finer grained upward and grade into siltstone; siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey, finely sandy; beds about 1 ft. thick and poor ledge formers locally; few carbonaceous plant fragments; few large coalified logs in upper part of unit; lower contact sharp-----</p>	14.4
<p>Sandstone and interbedded siltstone; sandstone, medium-gray, laminated, partly friable, very fine grained, subangular to subrounded, silty; average bed thickness about 2.5 ft.; siltstone, medium-gray, obscurely bedded, hard, clayey; abundant carbonaceous plant fragments in part; lower contact sharp-----</p>	10.4
<p>Sandstone and interbedded siltstone; sandstone, medium-gray, locally iron-stained, probably platy-bedded (obscure), friable, very fine to fine-grained, subangular to subrounded; average bed thickness about 3 ft.; beds become finer grained upward and grade into siltstone; siltstone, medium-gray, obscurely bedded, clayey; beds about 1 ft. thick and poor ledge formers locally; few carbonaceous plant fragments; lower contact gradational; apparently grades into massive sandstone on east side of gully-----</p>	20.7
<p>Siltstone and interbedded sandstone; siltstone, medium-gray, mostly poor platy- and some hackly-weathering, obscure platy-bedded, clayey; abundant carbonaceous plant fragments in part; sandstone, medium-gray, partly laminated, very fine grained, subangular to subrounded; beds about 1 ft. thick; 1 bed about 0.5 ft. thick of friable sandstone near middle-----</p>	9.6
<p>Coal, platy-weathering, very impure; includes in middle a 0.2-ft. lenticular bed of medium-light-gray hackly-weathering obscurely bedded clayey siltstone with many carbonaceous plant fragments-----</p>	1.
<p>Siltstone (<u>8P-23</u>)*, as above-----</p>	0.3
<p>Coal, platy-weathering; lower 0.3 ft. grades into carbonaceous shale; lower contact sharp-----</p>	0.8

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- Siltstone, medium-light-gray, chunky-weathering, obscurely bedded, hard, clayey, micaceous; abundant carbonaceous plant fragments (roots?); upper 0.4 ft. becomes light-brownish-gray and poor platy bedded----- 4.
- Siltstone, medium-gray, obscurely bedded (lower 5.5 ft.) and laminated to platy-bedded (upper 6.3 ft.), clayey; some randomly oriented carbonaceous plant fragments; includes several sandstone beds as much as 0.5 ft. thick in upper 6.3 ft. and at top a bed of very fine grained sandstone about 2 ft. thick; white stringer composed of plagioclase and quartz grains at about 1.5 ft. below top; lower contact sharp----- 11.8
- Siltstone, medium-gray, poor platy-weathering, laminated to platy-bedded, clayey; some carbonaceous plant fragments; includes several beds, about 0.5 ft. thick, of friable very fine to fine-grained subangular to subrounded sandstone; 1.8-ft. bed of sandstone at top----- 13.3
- Coal; Bed R (?), includes 0.1-ft. bed of hard brownish-gray shale 1 ft. below top; lower contact sharp----- 2.
- Siltstone, medium-gray, partly iron-stained, hackly-weathering, obscurely bedded, clayey; many randomly oriented small and large carbonaceous plant fragments; includes a 0.5-ft. bed of very fine grained friable subangular to subrounded sandstone about 1.5 ft. below top; lower contact gradational----- 4.4
- Sandstone, medium-gray, mostly iron-stained, slabby-weathering, obscure platy-bedded, cross-bedded, friable, fine- to medium-grained (lower part) grading upward to very fine grained (upper third), subangular to subrounded; basal 1 ft. includes irregular lenses of medium- to coarse-grained sandstone, clasts of ironstone and dark-gray hard shale, and local iron-rich lenses; scattered large coalified wood fragments; lower contact sharp, disconformable, and locally channeled into underlying rocks as much as 3 ft.;----- 15.
- Sandstone and interbedded siltstone; sandstone, medium-gray, partly iron-stained, obscure platy-bedded, friable, very fine to fine-grained, subangular to subrounded; siltstone, medium-gray, partly iron-stained, platy-bedded, clayey; some carbonaceous plant fragments in both rock types; upper 11.7 ft. of unit probably more than half siltstone; includes at 11.3 ft. above base a 1.3-ft. bed of medium-gray silty shale (8P-16)* with many randomly oriented plant fragments----- 24.3

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Siltstone, medium-gray, partly iron-stained, poor platy-weathering, laminated to platy-bedded, clayey; some carbonaceous plant fragments; lower contact gradational-----	3.1.
Siltstone, medium-dark-gray to brownish-gray, platy-bedded, clayey; abundant carbonaceous plant fragments; includes at base a 0.5-ft. bed of medium-gray silty shale with many plant fragments; very thin coal stringers about 0.5 ft. below top; lower contact sharp-----	1.7
Sandstone, medium-gray, obscurely bedded, friable, fine-grained, subangular to subrounded; locally includes 0.2-ft. carbonaceous zone about 2 ft. below top; lower contact sharp-----	6.2
Siltstone, medium-gray, brownish-gray (middle), chunky-to hackly-weathering, obscure very thin to thin-bedded, clayey; many randomly oriented carbonaceous plant fragments-----	2.8
Sandstone, medium-gray, probably poor platy-weathering, laminated to platy-bedded, very fine grained, subangular to subrounded; scattered carbonaceous plant fragments; lower half includes few beds, about 0.5 ft. thick, of fine-grained sandstone-----	17.8
Covered interval; probably silty shale in lower half-----	6.7
Coal(?), deeply weathered-----	0.1
Shale, light- to medium-brown, deeply weathered; appears bentonitic-----	0.2
Shale, dark-gray, poor platy-bedded; abundant large carbonaceous plant fragments in lower part; some coal stringers in upper part; includes 0.5-ft. platy-weathering coal bed in middle-----	2.1
Coal, platy-weathering; upper 0.3 ft. probably very impure with many flattened coalified logs; includes at 2.3 ft. above base a 0.1-ft. somewhat lenticular bed of light-brown clayey siltstone (fine-grained tuff?) with abundant carbonaceous plant fragments; lower contact sharp-----	2.7

Siltstone, medium-gray, obscure platy-bedded, clayey; few carbonaceous plant fragments; includes 1-ft. bed of medium-gray laminated very fine grained sandstone 0.5 ft. below top-----	5.5
Sandstone, medium-gray, obscure laminated to platy-bedded, friable, very fine grained, subangular to subrounded, silty; includes siltstone interbeds and becomes mostly siltstone in upper half; lower contact sharp-----	5.
Sandstone, medium-light-gray, partly iron-stained, massive-weathering, platy-bedded, much cross-bedded (cross-bed sets about 1 ft. thick), friable, fine- to medium-grained (lower 6 ft.) becoming fine-grained upward, subangular to subrounded; some very carbonaceous laminations; includes near base coarsely sandy clayey lenses as much as 0.2 ft. thick; near middle a very iron-rich zone about 2 ft. thick with resistant ledges as much as 0.3 ft. thick-----	31.7
Coal, Bed Q (?), platy-weathering in basal 0.2 ft. and upper 0.5 ft.-----	3.-3.5
Sandstone, medium-gray, slabby-weathering, platy-bedded, partly laminated, cross-bedded, friable, fine-grained, subangular to subrounded, slightly silty; some very fine grained carbonaceous laminae; some ironstone clasts as much as 0.15 ft. thick; few large coalified wood fragments in lower part; includes several sandy clayey siltstone beds as much as 3 ft. thick; upper 4 ft. becomes siltstone (8P-9 -- about 3 ft. below top)* with abundant randomly oriented carbonaceous plant fragments and some roots(?) that extend downward about 1 ft. from the overlying coal; lower contact sharp; mostly not well observed because of very steep hillside-----	48.
Siltstone and interbedded shale, medium-gray, hackly- to poor platy-weathering, laminated to platy-bedded; abundant carbonaceous plant fragments in shale; some coalified wood near base-----	5.6
Coal, Bed P (?), fairly platy-weathering-----	1.5
Shale, dark-gray, carbonaceous; lower contact sharp-----	0.5
Shale, medium-gray, silty; many carbonaceous plant fragments-----	0.3

*Palynological sample

Sandstone, medium-gray, poor platy-weathering, laminated (lower 1 ft.), very fine grained, subangular to sub-rounded, slightly clayey; lower contact sharp-----	1.9
Sandstone, medium-gray, partly iron-stained, partly slabby-weathering, obscurely bedded, friable, very fine to fine-grained, subangular to subrounded; lower contact sharp-----	4.2
Siltstone, medium-gray, platy-weathering, poor platy-bedded, clayey; scattered ironstone nodules as much as 0.2 ft. thick; some interlamination of sandy siltstone and carbonaceous plant material; includes near middle a 0.5-ft. bed of black fissile carbonaceous shale; lower contact sharp-----	7.8
Sandstone, medium-gray, locally slightly iron-stained, partly slabby-weathering, obscurely bedded, very friable, very fine to fine-grained, angular to subangular; lower contact sharp-----	5.4
Siltstone, medium-gray, hackly-weathering, obscurely bedded, very clayey; abundant carbonaceous plant fragments, few large coalified logs; upper 0.2 ft. becomes platy weathering and carbonaceous; lower contact sharp-----	2.5
Coal, lower 3.8 ft. hard; large coalified tree stumps locally; upper 1.5 ft. platy weathering with many flattened coalified logs; includes at 0.4 ft. below top a 0.3-0.7-ft. bed of medium-gray claystone (8P-4)* with abundant carbonaceous plant fragments; lower contact sharp; forms about 10-ft. waterfall-----	5.3
Siltstone (8P-3)*, medium-gray, non-bedded, very clayey; abundant carbonaceous plant fragments-----	0.4
Sandstone, medium-gray, partly iron-stained, poor slabby-weathering, laminated, very fine to fine-grained, silty, clayey; some small and large carbonaceous plant fragments; lower contact sharp-----	2.4
Siltstone, medium-gray, chunky-weathering, partly poor platy-bedded, fairly hard, clayey; ironstone nodules as much as 0.3 ft. thick about 2.5 ft. above base; abundant carbonaceous plant fragments on bedding and randomly oriented; includes very fine grained sandstone laminae and, at 3.3 ft. above base, a bed 0.8 ft. thick of medium-gray friable very fine grained sandstone; lower contact sharp-----	7.8

*Palynological sample

Sandstone, medium-gray, mostly iron-stained, mostly obscurely bedded, some platy-bedded (upper 1 ft.), probably cross-bedded, friable, fine- to medium-grained becoming mostly fine-grained in upper 5 ft., subangular to subrounded; few coalified plant fragments-----	27.
Covered interval-----	6.
Coal, Bed 0(?), exposed in creek bed about 30 yd. downstream from sandstone described above; base concealed----	1.8+

Measured section 9

Location: Hillside exposure in small open canyon on west side of Fox Creek in SE 1/4 NE 1/4 sec. 5, T. 4 S., R. 10 W., Seldovia D-3 quadrangle. Measured section is about 300 ft. above Fox Creek.

	Feet
Tertiary rocks -- Kenai Group, Sterling Formation	
Upper part of exposed rocks not measured	
Sandstone, medium-gray, partly iron-stained, locally cliff-forming, laminated to platy-bedded, cross-bedded, fine- to medium-grained, becomes fine-grained upward; few coarse grains in basal 1 ft.; lower half sampled and remainder estimated; lower contact sharp and probably disconformable-----estimated-	30.
Siltstone, medium-gray, hackly-weathering, obscurely bedded, very clayey; some carbonaceous plant fragments-----	1.
Coal, impure; includes a 0.1-ft. lenticular bed of fine-grained tuff-----	0.4
Siltstone (9P-13)*, medium-gray, hackly-weathering, obscurely bedded, clayey; some large coalified wood fragments-----	1.6
Coal-----	0.5
Tuff, light-yellowish-brown, white-weathering, coarse-grained; few carbonaceous plant fragments-----	0.7
Coal and interbedded siltstone; coal beds average about 0.3 ft. thick; siltstone, medium-gray, obscurely bedded, clayey; abundant carbonaceous plant fragments; beds average about 0.2 ft. thick; lower contact sharp-----	2.3
Sandstone, medium-gray, probably laminated to platy-bedded and cross-bedded (obscure), fine-grained, subangular, slightly clayey; includes 0.2-ft. beds of medium-gray siltstone at base and about 3.5 ft. below top; upper 1 ft. becomes siltstone; very carbonaceous in upper 0.1 ft.; lower contact sharp-----	7.7
Siltstone, medium-dark-gray, poor platy-bedded, clayey; abundant carbonaceous plant fragments and large flattened coalified logs-----	0.8

*Palynological sample

Coal, impure; lower contact sharp-----	1.3
Siltstone, medium-gray, obscurely bedded, clayey; few carbonaceous plant fragments; includes at 0.2 ft. above base a 1.5-ft. bed of obscurely bedded friable very fine to fine-grained sandstone that becomes finer upward-----	5.2
Coal, very impure; lower contact sharp-----	0.2
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; few carbonaceous plant fragments-----	5.
Sandstone, medium-gray, friable, very fine to medium-grained, subangular; becomes finer grained upward; lower contact sharp-----	2.5
Siltstone, medium-gray, obscurely bedded, partly sandy, clayey; some carbonaceous plant fragments; includes at 1.5 ft. above base a 1-ft. bed of medium-gray friable medium-grained sandstone overlain by a 1-ft. bed of very fine grained sandstone-----	6.9
Shale, medium-dark-gray, carbonaceous-----	0.1
Coal, impure; lower contact sharp-----	0.3
Siltstone and sandstone; siltstone, medium-gray, obscurely bedded, clayey; few carbonaceous plant fragments (randomly oriented at top); includes at 0.3 and about 4 ft. above base thin (less than 0.1 ft. thick) coaly zones mostly composed of flattened coalified logs; sandstone (3 ft. thick and 4 ft. above base of unit), medium-gray, obscurely bedded, medium-grained, subangular; overlain gradationally by platy-bedded(?) friable very fine grained sandstone 3 ft. thick-----	11.6
Coal and interbedded siltstone and shale; coal, impure in upper half, forms beds 0.2-0.5 ft. thick; siltstone, medium-gray and medium-brown, obscurely bedded, clayey; many carbonaceous plant fragments; forms 2 beds 0.1-0.2 ft. thick in lower 1 ft.; shale, medium- to dark-gray, probably fissile (obscure), mostly carbonaceous; slickensides in lower bed; forms 2 beds 0.1 ft. thick at 0.2 ft. and 0.8 ft. below top-----	2.2
Siltstone, light-gray-hackly-weathering, obscurely bedded, slightly clayey; abundant carbonaceous plant fragments-----	0.4

Coal and interbedded siltstone and shale; generally similar
to above; lower contact sharp----- 0.9

Siltstone, brownish-gray, obscure platy-bedded, sandy, clayey,
carbonaceous; abundant large coalified wood fragments
randomly oriented in part; lower contact sharp----- 1.1

Sandstone, medium-gray, slabby-weathering, obscurely bedded,
medium-grained, subangular, silty; numerous small carbo-
naceous plant fragments; probably pinches out laterally;
lower contact sharp and uneven----- 2.

Siltstone, medium-gray, slabby-weathering, obscurely bedded,
clayey; small and large carbonaceous plant fragments
randomly oriented; lower contact fairly sharp----- 2.3

Siltstone, dark-gray, finely sandy, clayey, carbonaceous;
abundant carbonaceous plant fragments on bedding;
lower contact gradational----- 0.5

Sandstone, medium-gray, obscurely bedded, very fine grained,
subangular, very silty, clayey; base concealed----- 2.+

Lower part of exposed rocks not measured

Measured section 10

Location: Gully exposure on west side of Fox Creek at center of north line NW 1/4 SW 1/4 sec. 33, T. 3 S., R. 10 W., Seidovia D-3 quadrangle. The base of this section is about 25 ft. above Fox Creek. The rocks were wet and poorly exposed, and most of the section was dug out.

	Feet
Tertiary rocks -- Kenai Group, Sterling Formation	
Upper part of exposed rocks not measured	
Coal, very impure; includes many very thin beds of siltstone---	1.
Unexamined interval, mostly siltstone and sandstone; includes 0.3-ft. bed of carbonaceous shale 23 ft. below top-----	60.
Sandstone, not examined or sampled; lower contact sharp-----	10.
Siltstone, medium-gray, obscurely bedded, very clayey; carbonaceous plant fragments; scattered ironstone nodules near middle; upper half includes beds of very fine grained sandstone as much as 1.2 ft. thick-----	13.
Covered interval-----	6.5
Sandstone, medium-gray, obscurely bedded, soft, friable, very fine to medium-grained, subangular, silty-----	4.4
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; scattered carbonaceous plant fragments; upper half includes 2 beds, each about 0.2 ft. thick, of very fine grained clayey sandstone; at 0.2 ft. below top a thin bed (less than 0.2 ft. thick) of dark-gray carbonaceous shale and brownish-gray siltstone; lower contact sharp-----	3.4
Sandstone, medium-gray, probably partly laminated to platy-bedded, very fine grained, subangular, silty, clayey; poorly observed-----	3.
Covered interval-----	2.

Sandstone, medium-gray, obscurely bedded, friable, fine-grained, subangular, silty, clayey-----	2.7
Siltstone, medium-gray, obscurely bedded, very clayey; some carbonaceous plant fragments; includes 0.2-ft. bed of carbonaceous siltstone about 1.5 ft. below top-----	4.8
Sandstone, medium-gray, very fine grained, clayey-----	2.
Covered interval-----	6.
Sandstone, medium-gray, probably laminated to platy-bedded, very fine grained, subangular, silty, clayey; lower contact sharp; poorly observed-----	3.5
Siltstone, medium-gray, obscurely bedded, clayey; some carbonaceous plant fragments; lower contact probably gradational-----	3.5
Sandstone, medium-gray, laminated to platy-bedded (mostly upper half), very fine grained, subangular, slightly silty; some carbonaceous plant fragments; few very thin beds of medium-grained sandstone in upper-middle part; includes many beds, 0.1-0.5 ft. thick, of medium-gray siltstone-----	14.5
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; carbonaceous plant fragments mostly scattered but abundant in upper 0.5 ft.; includes near middle a bed of medium-gray very fine grained sandstone about 0.5 ft. thick; few very thin beds of brownish-gray carbonaceous siltstone in upper 0.3 ft.; lower contact sharp-----	3.9
Sandstone, medium-gray, partly laminated to platy-bedded, mostly very fine grained, upper half partly fine-grained, angular to subangular; few carbonaceous plant fragments; includes several medium-gray siltstone beds about 0.5-1 ft. thick; lower contact gradational-----	14.
Siltstone, medium-gray, partly laminated to platy-bedded, clayey; scattered carbonaceous plant fragments; includes numerous beds, about 0.1-0.2 ft. thick, of medium-gray very fine grained sandstone-----	3.2
Coal; lower contact sharp-----	0.1

- Shale (10P-4)*, medium-gray, laminated to platy-bedded;
 some carbonaceous plant fragments; lower contact
 sharp----- 0.8
- Sandstone, medium-gray, obscurely bedded, friable, fine- to
 medium-grained becoming very fine grained near top,
 subangular, clayey; carbonaceous plant fragments in
 upper part; includes at top a 0.1-ft. bed of dark-
 gray to brownish-gray laminated to platy-bedded carbo-
 naceous siltstone with abundant plant fragments; lower
 contact sharp----- 3.4
- Shale, medium-gray, locally iron-stained, obscurely bedded;
 becomes siltstone in upper half; some carbonaceous
 plant fragments; lower contact gradational----- 1.
- Shale, dark-gray, fissile to platy-bedded, carbonaceous;
 abundant carbonaceous plant fragments; many impure
 coal stringers; lower contact gradational----- 0.6
- Tuff, yellowish-gray to yellowish-brown, thin-slabby-
 weathering, medium-grained; includes, mostly in lower
 half, laminae and very thin beds of friable medium-
 grained sandstone showing wavy bedding and "micro-
 faulting"; interfingers with underlying unit----- 5.5
- Siltstone, medium-gray, obscurely bedded, clayey; carbo-
 naceous plant fragments generally scattered but
 abundant in several beds about 0.5 ft. thick in upper
 3 ft.; includes at top a 0.2-ft. bed of medium-gray
 friable medium-grained sandstone; base concealed----- 8.+

*Palynological sample

Measured section 11

Location: Creek-bed and hillside exposures on Swift Creek from SE 1/4 SW 1/4 NE 1/4 downstream to NW 1/4 NE 1/4 SE 1/4 sec. 23, T. 4 S., R. 11 W., Seldovia D-3 quadrangle. This location lies between localities 168 and 169 of Barnes and Cobb (1959, pls. 18, 19).

Feet

Tertiary rocks -- Kenai Group, Sterling Formation

Upper part of exposed rocks not measured

Coal and interbedded shale, poorly observed; forms prominent overhanging ledge on steep hillside-----approx.- 6.

Sandstone, medium-gray, partly iron-stained, obscure laminated to platy-bedded, cross-bedded, friable, very fine to fine-grained, subrounded, slightly clayey; becomes finer grained upward and upper half grades into medium-gray obscurely bedded siltstone with many large carbonaceous wood fragments at high angle to bedding; lower contact sharp----- 4.

Sandstone, similar to above but very fine grained; upper half becomes siltstone as above; lower contact sharp----- 5.6

Sandstone, medium-gray, partly iron-stained, obscure laminated to platy-bedded, cross-bedded, friable, very fine to fine-grained, subangular, clayey; becomes finer grained upward and upper one-fourth grades into medium-gray obscurely bedded siltstone with abundant carbonaceous plant fragments and some large roots(?); very carbonaceous in upper 0.1 ft.; lower contact sharp----- 6.6

Siltstone, medium-dark-gray, obscurely-bedded, partly platy-bedded, clayey; includes at 2 ft. above base a zone about 4 ft. thick of medium-dark-gray platy-weathering obscurely bedded fine- to medium-grained sandstone with a few interbeds of siltstone; lower contact of 4-ft. zone sharp and upper contact gradational; lower contact of unit gradational----- 14.6

Sandstone, medium-gray, obscurely-bedded, friable, very fine to fine-grained, subangular; few coarse grains at base; becomes finer grained upward, micaceous and very silty in uppermost part; lower contact sharp----- 6.

- Siltstone, medium-gray, obscurely bedded, clayey; some carbonaceous plant fragments; includes at base 0.8-ft. bed of very fine grained sandstone----- 4.5
- Shale (11P-28)*, medium-gray; abundant carbonaceous plant fragments----- 0.2
- Sandstone, medium-gray, obscurely laminated, friable, very fine grained, subangular, clayey; includes at top 0.1-ft. bed of dark-gray carbonaceous siltstone----- 1.3
- Siltstone, medium-gray, obscurely bedded; slickensides in upper 0.5 ft.; carbonaceous laminations in part; carbonaceous plant fragments abundant in part; lower contact sharp----- 5.5
- Sandstone, medium-gray, partly iron-stained, obscure laminated to platy-bedded, cross-bedded, friable, very fine to fine-grained, subangular; includes at about 3 ft. above base a 1-ft. bed of medium-gray siltstone that includes some ironstone nodules about 0.2 ft. thick; lower contact of siltstone gradational and upper contact sharp; lower contact of unit sharp----- 9.5
- Sandstone, medium-gray to pale-brown, partly iron-stained, partly platy-weathering (upper one-third), laminated to platy-bedded, cross-bedded, friable, very fine grained, angular to subangular, very silty in upper one-third; few iron-rich beds less than 0.2 ft. thick; includes beds of medium-gray siltstone about 1 ft. thick at 4.5, 7, 11, 13, and 17 ft. above base; ironstone nodules as much as 0.2 ft. thick in lower siltstone and at 13 ft. above base; sandstone beds commonly include some fine grains at base and grade upward into siltstone; uppermost siltstone includes 0.2-ft. ironstone ledge and 0.05-ft. bone coal near top; lower contact sharp----- 18.1
- Siltstone, medium-gray, obscurely bedded, sandy at base, clayey; abundant carbonaceous plant fragments; includes at 3 ft. above base a 3-ft. zone of platy-weathering siltstone interlaminated with very fine grained sandstone; 0.1-ft. bed of medium-dark-gray carbonaceous siltstone at top; lower contact gradational----- 8.1

*Palynological sample

Sandstone, medium-gray, partly iron-stained, obscure laminated to platy-bedded, cross-bedded, friable, very fine grained, subangular, very silty in upper 0.5 ft.; small carbonaceous plant fragments; includes 0.3-ft. iron-rich bed about 3 ft. above base-----	8.5
Siltstone, medium-gray, obscurely bedded, clayey; abundant small carbonaceous wood fragments; large coalified wood fragments about 1 ft. above base; includes 1-ft. bed of medium-gray friable very fine grained sandstone at 2.5 ft. above base and similar bed 0.3 ft. thick at 0.4 ft. below top; 0.5-ft. bed of carbonaceous siltstone about 4.5 ft. above base; 0.1-ft. medium-dark-gray platy-weathering carbonaceous shale at top-----	7.2
Coal, platy-weathering-----	0.15
Shale, medium-gray, obscurely bedded; many carbonaceous plant fragments-----	1.2
Coal, Bed R, platy-weathering; lower 2 ft. includes 4 partings, 0.05-0.1 ft. thick, of brownish-gray siltstone; lower contact sharp-----	3.5
Siltstone, medium-gray, slabby-weathering, obscure platy-bedded; non-bedded(?) in upper 1 ft. (11P-21)*; partly sandy, clayey; upper two-thirds of unit includes some large carbonaceous wood fragments mostly at high angle to bedding; lower contact sharp-----	14.7
Sandstone and interbedded siltstone; sandstone, medium-gray, partly laminated to platy-bedded, mostly friable, very fine to fine-grained, subangular, clayey; forms beds generally 1-3 ft. thick; siltstone, medium-gray, obscurely bedded, finely sandy, clayey; some carbonaceous plant fragments; forms beds about 1 ft. thick except for a 3-ft. bed about 3 ft. above base-----	13.5
Siltstone, medium-gray, platy- to poor conchoidal-weathering, mostly platy-bedded, clayey; scattered small carbonaceous plant fragments; lower contact gradational---	4.
Shale, brownish-black to black, platy-weathering, laminated to platy-bedded, hard, silty-----	1.2

*Palynological sample

- Coal, impure; lower contact sharp----- 0.7
- Sandstone, medium-gray, partly iron-stained, laminated to platy-bedded, very fine to fine-grained becoming very fine grained in upper part, subangular; many carbonaceous plant fragments and some large coalified wood fragments in upper 1 ft.; upper half includes medium-gray siltstone in beds about 0.1 ft. thick; 0.2-ft. bed of non-bedded siltstone at top; lower contact sharp----- 5.2
- Siltstone, medium-gray, laminated to platy-bedded, clayey; some carbonaceous plant fragments randomly oriented in part; includes near middle laminae and very thin beds of very fine grained sandstone; lower contact gradational----- 1.6
- Siltstone, medium-dark-gray, obscurely bedded, clayey; abundant carbonaceous plant fragments; includes at 0.2 ft. above base very thin irregular lenses of light-brown friable well sorted siltstone; lower contact sharp----- 0.8
- Sandstone, medium-gray, partly iron-stained, locally cliff-forming, mostly platy-bedded, cross-bedded, medium-grained at base grading upward to fine-grained about 4 ft. above base and very fine grained about 14 ft. above base, subangular to subrounded; many iron-rich lenses about 1 ft. thick in middle part; few beds of medium-gray siltstone as much as 1 ft. thick in upper 6 ft.; lower contact sharp----- 20.
- Siltstone, medium- to dark-gray, obscurely bedded, upper 1 ft. mostly sandy, clayey; carbonaceous plant fragments abundant in part, especially near top; includes about 1-ft. bed of very fine grained sandstone about 1 ft. below top; uppermost 0.2 ft. iron-rich and hard; lower contact sharp----- 9.5
- Sandstone, medium-gray, obscurely bedded (lower 2.3 ft.) and laminated to platy-bedded, cross-bedded, friable, very fine grained, subangular, silty, clayey; some small carbonaceous fragments; lower 2.3 ft. partly fine-grained, local iron-rich zone 0.1 ft. thick about 4.5 ft. above base; includes in upper 5 ft. several beds of medium-gray siltstone mostly less than 0.5 ft. thick; lower contact sharp----- 11.

- Siltstone, medium-gray, hackly- to chunky-weathering, mostly platy-bedded, partly laminated (lower 1 ft.); clayey, carbonaceous plant fragments abundant in lower 1 ft. and about 9 ft. above base; several courses of scattered ironstones as much as 0.2 ft. thick; includes few beds of very fine grained clayey sandstone, less than 1 ft. thick, about 8-10 ft. above base----- 18.
- Shale (11P-13)*, medium- to medium-dark-gray, conchoidal-weathering (upper half), poor fissile to platy-bedded; few ironstone nodules about 0.3 ft. thick in upper half; abundant carbonaceous plant fragments; abundant large coalified plant fragments in middle and at top----- 2.
- Coal, Bed Q, fairly blocky- to partly platy-weathering; forms high waterfall; lower contact sharp----- 5.5
- Siltstone, medium-light- to medium-gray, partly iron-stained, blocky- to poor conchoidal-weathering, laminated to platy-bedded, regularly bedded, hard, clayey; carbonaceous plant fragments in upper part; includes lenticular coal beds as much as 0.3 ft. thick in upper 1 ft.----- 8.
- Coal, Bed Q (lower bench), blocky-weathering; includes at 0.5 ft. above base a 0.1-ft. bed of medium-brown-weathering carbonaceous shale with fine-grained spherules of bog iron(?); at 2 ft. above base a 0.2 ft. lenticular bed of light-gray-weathering light-brown siltstone containing pyroclastic grains; at 0.2 ft. below top a lenticular bed of light-gray fine-grained tuff as much as 0.3 ft. thick; lower contact sharp----- 2.8
- Siltstone, medium-gray, partly laminated, mostly obscurely bedded, finely sandy in part, clayey; carbonaceous plant fragments abundant in part; ironstone nodules 0.2 ft. thick about 5 and 10 ft. above base; 3-ft. bed of friable very fine to fine-grained sandstone about 6 ft. above base; very thin beds of laminated very fine grained sandstone in 1-ft. zone about 15 ft. above base; 0.2-ft. bed of carbonaceous siltstone about 17 ft. above base; 3-ft. bed of laminated to obscurely bedded partly friable very fine grained sandstone about 20 ft. above base; lower contact fairly sharp----- 25.6

*Palynological sample

- Sandstone, medium-gray, partly iron-stained, partly laminated, friable, fine-grained at base becoming very fine grained upward, subangular; some clayey sandstone in upper part; includes 1-ft. siltstone bed about 1.5 ft. below top; lower contact sharp and probably disconformable----- 11.2
- Coal, Bed P, lower contact sharp----- 3.1
- Siltstone, medium-gray, partly iron-stained, mostly obscurely bedded, partly laminated, clayey; abundant carbonaceous plant fragments in part; few root(?) fragments in upper 0.5 ft.; includes few beds, less than 1 ft. thick, of friable very fine to fine-grained sandstone; 3 beds of carbonaceous shale, less than 0.3 ft. thick, about 5 ft. above base, near middle, and near top----- 16.8
- Sandstone, medium-gray, friable, very fine to fine-grained, subangular, silty; some small carbonaceous plant fragments; lower contact fairly sharp----- 3.
- Siltstone, medium-gray, mostly obscurely bedded, some laminated to platy-bedded, clayey; abundant carbonaceous plant fragments in part; few coalified wood fragments randomly oriented in part; upper part includes few beds, less than 1 ft. thick, of laminated very fine grained sandstone; lower contact gradational----- 12.6
- Sandstone, medium-gray to grayish-brown, partly iron-stained, laminated to platy-bedded (upper half), friable (lower half), very fine grained, subangular, silty, clayey; includes interbedded medium-gray siltstone in upper 2 ft.; lower contact sharp----- 7.1
- Siltstone, medium-gray, obscurely bedded, partly very finely sandy, clayey in upper 0.5 ft.; carbonaceous plant fragments in part; lower contact sharp----- 6.
- Sandstone, medium-gray, lightly iron-stained in part, probably laminated to platy-bedded (obscure), cross-bedded, friable, fine-grained, partly very fine grained in upper 5 ft., subangular; lenses of iron-cemented sandstone less than 0.5 ft. thick; lower contact sharp----- 25.
- Coal, Bed O (upper bench)----- 1.3

Shale, medium- to dark-gray, fissile to poor platy-bedded,
 very carbonaceous in part; abundant carbonaceous
 plant fragments; includes 0.1-ft. coal bed in
 middle----- 0.8

Coal, platy-weathering----- 1.

Shale (11P-2)*, medium-gray, poor platy-weathering, ob-
 scurely bedded; abundant small carbonaceous plant
 fragments and numerous large coalified wood frag-
 ments----- 0.9

Coal, Bed 0, fairly blocky-weathering; forms waterfall about
 5-8 ft. high in creek; lower contact sharp----- 5.2

Sandstone, medium-gray, slabby-weathering, partly laminated,
 cross-bedded, mostly friable, very fine to fine-
 grained, subangular, slightly clayey; upper 1.5 ft.
 becomes very fine grained and very silty; upper half
 includes carbonaceous laminae and large coalified wood
 fragments along bedding and also randomly oriented;
 lower contact concealed----- 9.+

*Palynological sample

Measured section 12

Location: Hillside and creek-bed exposures in large unnamed canyon on northeast side of Swift Creek in N 1/2 SE 1/4 SW 1/4 sec. 24, T. 4 S., R. 11 W., Seldovia D-3 quadrangle. This location is approximately the same as locality 170 of Barnes and Cobb (1959, pls. 18, 19).

Feet

Tertiary rocks -- Kenai Group, Sterling Formation

Upper part of exposed rocks not measured

Coal, Bed P-----not measured

Interval, not studied or sampled; mostly siltstone; includes sandstone bed about 15 ft. thick about 4 ft. below top---- 72.

Clinker, moderate-brown to reddish-brown----- 2.

Coal ash, Bed O, reddish-brown to yellowish-brown; includes 0.3-ft. bed of weathered powdered coal at base----- 0.8

Siltstone, burned, brown, carbonaceous----- 0.8

Siltstone and interbedded sandstone; siltstone, medium-gray, partly iron-stained, poor slabby-weathering, obscurely bedded, clayey; some carbonaceous plant fragments; ironstone nodules as much as 0.2 ft. thick in basal 1 ft.; includes 0.2-ft. coal bed about 0.5 ft. above base of unit (12P-33 -- siltstone below coal)*; sandstone, medium-gray, partly iron-stained, slabby-weathering, laminated to platy-bedded, cross-bedded, soft, friable, very fine to fine-grained, subangular, slightly silty; includes carbonaceous laminae about 2.5 ft. above base of unit; forms beds as much as 3 ft. thick; lower contact fairly sharp----- 11.8

Sandstone, medium-gray, iron-stained, laminated to platy-bedded, cross-bedded, soft, friable, fine-grained (lower 3 ft.) becoming very fine to fine-grained in remainder, subangular; lower contact sharp and probably disconformable----- 16.3

*Palynological sample

- Siltstone and interbedded sandstone; similar to interbedded unit below; siltstone beds commonly 2-3 ft. thick and sandstone beds about 1-2 ft. thick; abundant coal films; includes ironstone nodules about 0.2 ft. thick near base of unit and about 3.5-5 ft. below top----- 20.5
- Siltstone and interbedded sandstone; similar to interbedded unit below; siltstone beds about 4-5 ft. thick and sandstone beds about 1-3 ft. thick----- 26.5
- Siltstone and interbedded sandstone (subequal amounts in beds commonly about 3 ft. thick); siltstone, medium-gray, poor slabby-weathering, obscurely bedded, clayey; some carbonaceous plant fragments; sandstone, medium-gray, partly iron-stained, slabby-weathering, laminated to platy-bedded, cross-bedded, soft, friable, very fine to fine-grained, subangular, clayey; some sandstone beds become finer grained upward; contacts between siltstone and sandstone mostly gradational to fairly sharp; unit includes a bed of medium-dark-gray carbonaceous siltstone about 0.5 ft. thick at about 4 ft. above base; lower contact sharp----- 27.5
- Sandstone, medium-gray, iron-stained, locally poor cliff-forming, obscurely bedded, soft, friable, very fine to fine-grained, subangular, clayey; becomes finer grained upward and grades into siltstone at 12. ft. above base; includes 0.5-ft. bed of medium-dark-gray carbonaceous siltstone about 1.5 ft. below top; lower contact sharp and possibly disconformable----- 15.
- Siltstone, medium-light-gray, chunky-weathering, mostly obscurely bedded, partly irregularly laminated, clayey; some carbonaceous plant fragments; basal 1 ft. includes lenses of bone coal as much as 0.1 ft. thick; ironstone nodules 0.2 ft. thick at 0.2 ft. below top; lower contact sharp----- 2.7
- Siltstone, dark-gray to brownish-gray, partly iron-stained, poor fissile to platy-bedded, finely sandy, clayey, very carbonaceous; abundant carbonaceous plant and wood fragments; few bone-coal stringers 0.05 ft. thick; 0.2-ft. impure coal at top; lower contact sharp----- 1.
- Siltstone, medium-gray, obscurely bedded, sandy; some carbonaceous plant fragments; lower contact fairly sharp----- 0.6

- Sandstone, medium-gray, laminated to platy-bedded, cross-bedded, friable, very fine grained, subangular, silty at base, clayey; finely carbonaceous laminae; lower contact gradational----- 2.1
- Siltstone, medium-gray, slightly iron-stained, hackly-weathering, obscurely bedded, clayey; few carbonaceous plant fragments; includes 0.5-ft. bed of very fine grained sandstone in middle; lower contact sharp----- 4.
- Siltstone, dark-gray, poor fissile to platy-bedded, hard, finely sandy, clayey, very carbonaceous; lower contact sharp----- 0.5
- Siltstone, medium-gray, slabby- to hackly-weathering, obscurely bedded, partly laminated, sandy in lower 3 ft. and upper 5 ft., clayey; abundant carbonaceous plant fragments in part; lower contact sharp----- 14.
- Siltstone, dark-gray, laminated to platy-bedded, clayey, carbonaceous; many bone-coal laminae and stringers; lower contact sharp----- 1.1
- Sandstone, medium-gray, mostly obscurely bedded, partly laminated to platy-bedded, slightly limy, very fine grained, subangular, partly silty; carbonaceous laminae in part; few beds of medium-gray siltstone as much as 1.5 ft. thick; lower contact sharp----- 18.6
- Coal, Bed N, blocky-weathering; probably very impure in upper 0.3 ft.; includes at 2.1 ft. below top a 0.2-ft. bed of weathered carbonaceous shale and siltstone; at 1.5 ft. below top a 0.15-ft. bed of weathered dark-gray to black carbonaceous shale and brown siltstone; lower contact sharp----- 3.7
- Siltstone, medium-gray, obscurely bedded, clayey, sandy in upper 0.3 ft.; many carbonaceous plant fragments; lower contact sharp----- 1.1
- Sandstone, medium-gray, laminated to platy-bedded (lower 1.5 ft.) and obscurely bedded (upper 0.6 ft.), partly cross-bedded (probably laminar type), very fine to fine-grained becoming fine-grained in upper 0.6 ft., subangular; abundant carbonaceous laminae in lower part; lower contact sharp----- 2.1

- Siltstone and interbedded sandstone (alternating beds commonly 1-2 ft. thick), slabby-weathering; siltstone, medium-gray, mostly obscurely bedded, clayey; sandstone, medium-gray, very fine grained, subangular, silty, clayey; many carbonaceous laminae and plant fragments in upper 3 ft.----- 16.
- Siltstone, medium- to medium-dark-gray, slabby-weathering, mostly obscurely bedded, partly laminated to platy-bedded, partly sandy, clayey; includes at 2 ft. above base a 1.5-ft. bed of medium-gray obscurely bedded friable fine- to medium-grained sandstone; at about 12 ft. above base a 2.2-ft. bed of medium-dark-gray laminated to platy-bedded cross-bedded friable very fine to fine-grained sandstone; lower contact sharp----- 15.
- Siltstone, medium-dark-gray, poor platy-bedded, clayey, carbonaceous; includes 0.1-ft. bed of bone coal at top; lower contact fairly sharp----- 1.1
- Siltstone, medium-gray, obscurely bedded, slightly clayey, very sandy in lower part; many carbonaceous plant fragments, few large randomly oriented carbonaceous wood fragments; lower contact fairly sharp;----- 2.2
- Siltstone, medium-dark-gray, poor platy-bedded, clayey; abundant carbonaceous plant fragments; lower contact sharp----- 0.5
- Sandstone, medium-gray, mostly obscurely bedded, partly laminated to platy-bedded, very fine to fine-grained, subangular; abundant carbonaceous laminae in part; unit largely consists of alternating beds, about 1 ft. thick, of laminated to platy-bedded very fine grained sandstone and obscurely bedded fine-grained sandstone; includes 2 beds, each about 1 ft. thick, of medium-gray obscurely laminated clayey siltstone at about 6.5 and 8 ft. above base; upper 2 ft. becomes very silty and grades into siltstone with abundant carbonaceous plant fragments; lower contact gradational----- 12.3
- Siltstone, brownish-gray to medium-gray (top), obscurely bedded, probably partly laminated, clayey; some carbonaceous plant fragments----- 1.1
- Coal, platy-weathering; includes at 0.1 ft. below top a 0.1-ft. parting of brownish-gray weathered shale with abundant carbonaceous plant fragments; lower contact sharp----- 1.3

Sandstone, medium-gray, laminated to platy-bedded, partly obscurely bedded, partly friable (2-ft. zone 3 ft. above base and upper 2 ft.), very fine grained (fine-grained in lower friable zone), subangular to sub-rounded; carbonaceous laminae in part; includes few beds, commonly about 1 ft. thick, of medium-gray obscurely bedded siltstone; lower contact fairly sharp-----	14.7
Sandstone, medium-gray, mostly obscurely bedded, laminated to platy-bedded in middle, partly friable, mostly fine-grained, subangular; very fine grained, very silty and clayey in middle part; lower contact fairly sharp-----	5.7
Siltstone, medium-gray, partly iron-stained, obscurely bedded, clayey; some carbonaceous plant fragments; brownish-gray and very carbonaceous in basal 0.2 ft.; includes 1.5-ft. bed of medium-gray very fine grained sandstone about 1 ft. above base-----	7.1
Coal-----	0.6
Siltstone, brownish-gray to black, laminated to platy-bedded, clayey, carbonaceous-----	0-0.5
Siltstone, medium-gray, obscurely bedded, clayey; abundant carbonaceous plant fragments-----	0.5
Coal-----	0.3-0.5
Siltstone, medium-gray (lower 0.5 ft.) and brownish-gray to dark-gray, mostly poor platy-bedded, finely sandy; abundant carbonaceous plant fragments-----	1.7
Shale, brownish-gray to black, laminated to platy-bedded, very carbonaceous; abundant plant fragments-----	0.4
Claystone (volcanic ash?), light- to very light gray, faintly laminated; abundant carbonaceous plant fragments; lenticular-----	0-0.2
Siltstone, medium-gray, obscurely bedded, clayey; abundant carbonaceous plant fragments; coal stringer as much as 0.15 ft. thick near base-----	1.6
Coal-----	1.5

- Siltstone, medium-gray, poor slabby-weathering, obscurely bedded, partly clayey, partly finely sandy; many carbonaceous plant fragments; brownish-gray and very carbonaceous in upper 0.2 ft.; lower contact gradational----- 5.9
- Sandstone, medium-gray, poor slabby-weathering (upper part), mostly laminated to platy-bedded, cross-bedded, fine-grained (lower 16 ft.) to very fine grained and very silty in upper part, angular to subangular; includes clasts about 0.5 ft. long of hard very fine grained sandstone at 4-5 ft. above base; numerous large irregular carbonaceous plant fragments in upper 10 ft.----- 26.7
- Coal, very impure in upper part; at 0.4 ft. above base includes 0.5-ft. bed of medium-gray obscurely bedded conchoidally fracturing shale (12P-8)* with slickensides and abundant carbonaceous plant fragments; lower contact sharp----- 1.2
- Siltstone, medium-gray, partly iron-stained, chunky-weathering, platy- to very thin bedded (lower half), sandy (upper half), clayey; abundant carbonaceous plant fragments mostly randomly oriented----- 4.8
- Coal; lower contact sharp----- 0.8
- Sandstone, medium-gray, partly iron-stained, mostly cross-bedded, obscurely bedded in lower 3-4 ft., mostly friable, medium-grained (lower 8 ft.) grading upward to very fine grained and mostly very silty (upper 10 ft.), subangular; lower 3 ft. includes scattered rounded pebbles commonly less than 0.05 ft. in diameter; few large coalified wood fragments 3-5 ft. above base; 0.5-ft. iron-rich zone at base of scour about 7 ft. above base; locally abundant carbonaceous laminae and stringers about 8 ft. above base; upper 10 ft. includes several beds, commonly 0.5-1 ft. thick, of medium-gray sandy siltstone; 0.5-ft. siltstone bed at top contains abundant randomly oriented carbonaceous plant fragments; unit weathers to steep rounded gully sides (probably poor cliff-former locally); lower contact sharp----- 27.8

*Palynological sample

Siltstone and interbedded sandstone; siltstone, medium-gray, large chunky-weathering, obscurely bedded, clayey; abundant carbonaceous plant fragments in part (especially near base and in upper half); forms beds commonly 3-5 ft. thick in lower half and 1-3 ft. thick in upper half; sandstone, medium-gray, partly laminated to platy-bedded, partly cross-bedded, mostly very fine grained, some fine-grained in lower half, subangular; forms beds commonly 0.3-1.5 ft. thick in lower half and 1-2 ft. thick in upper half; sandstone makes up about one-third of lower half and two-thirds of upper half-----	35.
Coal; locally includes flattened conical-shaped tree-root(?) masses at top; lower contact sharp-----	0.9
Siltstone, medium- to medium-dark-gray, brown tint in basal 0.2 and upper 0.2 ft., chunky-weathering, obscurely bedded, clayey; abundant carbonaceous plant fragments; few large coalified wood fragments oriented at high angle to bedding; lower contact sharp-----	2.4
Coal, platy-weathering; lower contact sharp-----	0.8
Siltstone, medium-gray, obscurely bedded, clayey, mostly sandy in upper part; abundant carbonaceous plant fragments; includes in middle about 0.2-ft. bed of medium-gray platy-bedded very fine grained sandstone; lower contact gradational-----	2.3
Sandstone, medium-gray, partly iron-stained, obscure platy-bedded, cross-bedded, fine-grained, subangular; some medium grains in lower half; very silty in upper 0.5 ft.; lower contact sharp-----	12.1
Coal; basal 0.1 ft. includes abundant pyroclastic(?) grains-----	1.
Sandstone, medium-gray, obscurely bedded, very fine grained, subangular, very silty, clayey; abundant randomly oriented carbonaceous plant fragments; few large coalified wood fragments at high angle to bedding-----	2.
Covered interval-----	3.5
Coal; lower contact sharp-----	1.3

Siltstone (12P-1 -- upper 0.5 ft.)*, medium-gray, chunky-
weathering, obscurely bedded, clayey; many carbonaceous
plant fragments; includes near middle 0.5-ft. bed of
medium-gray friable very fine to fine-grained sand-
stone overlain by 0.8-ft. bed of brownish-gray very
fine grained carbonaceous sandstone and siltstone;
lower contact concealed in creek----- 4.+

*Palynological sample

Measured section L1

Location: Sea-cliff exposures about 1 mile southwest of McNeil Canyon in the NW 1/4 SE 1/4 sec. 26, T. 5 S., R. 12 W., Seldovia C-4 quadrangle. This is near locality 142 of Barnes and Cobb (1959, pl. 18).

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Claystone, medium-gray-----	1.+
Coal, shaly; uppermost part of Bed B-----	0.4
Coal-----	2.9
Shale, coaly-----	0.1
Coal-----	1.6
Shale, coaly-----	0.5
Coal, lowest part of Bed B-----	0.4
Claystone (L1P-28 -- from upper 0.5 ft. of unit)*, medium-gray, light-gray-weathering, silty; slightly carbonaceous and coaly about 1.5 ft. below top-----	9.5
Siltstone, calcareous, concretionary-----	0.5
Siltstone, medium-dark-gray, iron-stained, medium-gray-weathering, angular-fracturing, soft, very clayey-----	9.5
Sandstone, light-gray-weathering, iron-stained, massive, soft, very fine to fine-grained; scattered calcareous concretions-----	6.
Covered-----	6.
Siltstone, iron-stained, lenticular, calcareous, concretionary-----	0.4
Partly covered; mostly dark-gray soft silty claystone-----	17.5
Siltstone (L1-27)**, medium-light-gray, platy-bedded, clayey, partly finely sandy, calcareous; includes few laminae of very fine grained silty sandstone-----	0.3

*Palynological sample

**Lithological sample

Partly covered; mostly medium-dark-gray soft clayey siltstone in lower part; harder silty claystone and claystone and claystone in upper part-----	23.5
Sandstone (<u>L1-26</u>)**, medium-dark-gray, massive, soft, partly friable, very fine to fine-grained, sub-angular, very clayey; abundant dark rock fragments-----	3.5
Siltstone, medium-dark-gray, massive, soft, clayey, sandy; grades to overlying sandstone-----	5.
Shale, carbonaceous, coaly-----	0.3
Claystone, medium-gray-----	0.5
Coal-----	0.4
Claystone, medium-gray, silty-----	1.7
Shale (<u>L1P-25</u>)*, carbonaceous-----	0.3
Coal-----	0.9
Coal and interbedded claystone (<u>L1P-24</u> -- from claystone)*----	0.5
Coal-----	0.2
Claystone, medium-gray, soft, silty-----	3.5
Siltstone, medium-gray, iron-stained, angular-fracturing, very clayey; becomes medium-dark-gray massive soft sandy siltstone-----	6.4
Siltstone, calcareous, concretionary-----	1.4
Siltstone (<u>L1P-23</u>)*, dark-gray, thick-bedded, soft-----	1.5
Siltstone, dark-gray, massive, soft, clayey; interbedded with dark-gray silty claystone-----	8.8
Siltstone (<u>L1-22</u>)**, medium-gray, partly iron-stained, very angular-weathering, hackly-fracturing, hard, very clayey-----	5.8
Siltstone (<u>L1-21</u>)**, medium-dark-gray, iron-stained, grayish-orange-weathering, clayey, calcareous, concretionary; few small carbonaceous plant fragments-----	0.9

*Palynological sample

**Lithological sample

Siltstone, medium-dark-gray, iron-stained, very clayey; includes scattered rounded calcareous concretionary parts in lower part of unit-----	5.5
Claystone (L1-20)**, medium-gray, iron-stained, poor platy- bedded, dominant-angular-fracturing, silty; few carbo- naceous plant fragments-----	3.3
Siltstone, dark-gray, massive, soft, clayey-----	6.
Claystone (L1-19)**, medium-light-gray, compact, very silty; abundant carbonaceous plant fragments-----	1.4
Covered-----	6.
Coal-----	1.
Shale (L1P-18)*, carbonaceous-----	0.2
Siltstone, medium-dark-gray, clayey; upper part medium- gray silty claystone-----	12.5
Sandstone (L1-17)**, dark-gray, massive, soft, friable, fine- to medium-grained, subrounded to subangular, silty, slightly clayey; abundant dark rock frag- ments-----	9.4
Siltstone (L1-16)**, medium-dark-gray, partly iron-stained, calcareous, concretionary; abundant carbonaceous plant fragments-----	1.9
Coal-----	0.6
Siltstone (L1P-15)*, carbonaceous-----	0.3
Claystone (L1-14)**, medium-gray, partly iron-stained, slightly silty; plastic when wet-----	0.5
Covered-----	16.6
Siltstone (L1-13)** and (L1P-13)*, dark-gray, clayey, finely sandy, carbonaceous-----	1.5
Coal-----	0.2
Partly covered; mostly medium-light-gray massive clayey siltstone-----	19.
Covered-----	14.6

*Palynological sample

**Lithological sample

Claystone, dark-gray, light-gray-flaky-weathering, soft-----	1.4
Claystone (<u>L1-12</u>)**, medium-gray, iron-stained, calcareous, concretionary; abundant large carbonaceous plant frag- ments-----	0.5
Claystone, medium-gray, light-gray-weathering, compact, silty-----	0.4
Shale, carbonaceous-----	0.2
Shale, coaly; shaly coal-----	0.8
Coal, Bed A-----	2.8
Claystone (<u>L1-11</u> -- from middle of unit)** (<u>L1P-11</u> -- from upper 0.2 ft. of unit)*, dark-gray, partly iron-stained, soft, silty; few carbonaceous plant fragments-----	3.
Siltstone (<u>L1-10</u>)**, medium-gray, iron-stained, light-gray- weathering, lenticular, hard, clayey, calcareous, con- cretionary; scattered carbonaceous plant fragments-----	0.7
Siltstone (<u>L1-9</u>)**, medium-dark-gray, very sandy, clayey; grades to dark-gray subconchoidal-fracturing claystone in upper 2 ft.; few carbonaceous plant fragments-----	10.6
Coal; includes 50 percent interbedded shaly coal and coaly shale-----	0.6
Coal-----	0.2
Shale (<u>L1P-8</u>)*, carbonaceous, coaly-----	0.4
Claystone, medium-dark-gray, light-gray-weathering, angular- to subconchoidal-fracturing-----	4.
Siltstone (<u>L1-7</u>)**, medium- to medium-light-gray, angular- fracturing, partly sandy, very clayey to clayey; abun- dant carbonaceous plant fragments-----	9.
Claystone (<u>L1-6</u>)**, medium-light-gray, light-gray-weathering, angular to subconchoidal-fracturing, hard, silty; scattered carbonaceous plant fragments; interbedded with about 40 percent coal lenses as much as 0.3 ft. thick-----	2.6
Siltstone, medium-gray, sandy; grades upward to silty claystone at top-----	2.9

*Palynological sample

**Lithological sample

Coal, lenticular-----	0.2
Sandstone (L1-5)**, dark-gray, horizontally laminated with carbonaceous fragments; very fine to fine-grained, subangular to subrounded, silty, clayey in upper part----	3.8
Shale (L1-4)** and (L1P-4)*, medium-dark-gray, carbonaceous; abundant small carbonaceous plant fragments-----	0.5
Coal-----	0.6
Sandstone (L1-3)**, light-brown, speckled, yellowish-brown-weathering, soft, plastic, fine-grained, subangular, very clayey, volcanic(?)-----	0.2
Coal-----	2.2
Siltstone (L1-2)** and (L1P-2 -- from upper 0.2 ft. of unit)*, medium-gray, partly iron-stained, very light-gray-weathering, angular-fracturing, very clayey; scattered carbonaceous plant fragments-----	2.7
Sandstone (L1-1)**, medium-dark-gray, massive, soft, friable, fine- to medium-grained, silty, clayey; abundant dark rock fragments-----	3.3+

*Palynological sample

**Lithological sample

Measured section L2

Location: Sea-cliff exposures southwest of McNeil Canyon in the SE 1/4 NW 1/4 sec. 25, T. 5 S., R. 12 W., Seidovia C-4 quadrangle. This is near locality 143 of Barnes and Cobb (1959, pl. 18).

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Sandstone (L2-11)** (L2P-11 -- from near base of unit)*, medium-light-gray, partly iron-stained, yellowish-gray-weathering, massive, soft, friable, very fine to fine-grained, subangular to subrounded, clayey; scattered large coaly fragments-----	8.7
Coal-----	0.2
Siltstone, medium-gray, massive, soft, clayey in upper part-----	4.6
Coal-----	0.9
Shale, coaly; shaly coal-----	0.9
Claystone, carbonaceous-----	0.4
Shale, coaly-----	0.3
Siltstone (L2P-10 -- from upper part of unit)*, dark-gray, brownish-gray-weathering, angular-fracturing, sandy in lower part, clayey and carbonaceous in upper part-----	1.5
Coal, shaly-----	0.5
Siltstone, medium-gray, iron-stained, angular-fracturing, very clayey-----	7.
Coal-----	0.2
Claystone, carbonaceous-----	0.5
Sandstone (L2-9)**, medium-dark-gray, iron-stained, poorly laminated, angular-fracturing, very fine grained, subangular to subrounded, silty and clayey in upper part; scattered carbonaceous plant fragments-----	10.5
Concretion, iron-stained, calcareous-----	0.5

*Palynological sample

**Lithological sample

Claystone, medium-gray, angular-fracturing, slightly silty----	4.1
Sandstone (<u>L2-8</u>)**, medium-gray, yellowish-gray-weathering, thick-bedded, soft, friable, very fine to fine-grained, subangular, clayey; few carbonaceous plant fragments-----	1.4
Partly covered; mostly medium-gray platy-bedded very fine grained silty sandstone; includes few poorly developed calcareous concretionary parts-----	6.
Claystone, yellowish-brown-weathering, poor platy-bedded, slightly silty-----	7.
Covered-----	6.
Shale (<u>L2P-7</u>)*, carbonaceous, coaly; upper part of Bed D-----	0.5
Clay (<u>L2-6</u>)**, grayish-yellow, iron-stained, soft, bentonitic; few woody plant fragments-----	0.2
Coal, lowest part of Bed D-----	1.
Claystone (<u>L2P-5</u>)*, dark-gray-----	0.5
Sandstone (<u>L2-5</u>)**, dark-gray, massive-weathering, poorly cross-laminated at high angle, soft, friable, fine- to medium-grained, subrounded, clayey and very silty in upper part; abundant dark rock fragments-----	8.9
Claystone, dark-gray, silty; scattered calcareous con- cretions-----	13.
Sandstone, yellowish-gray-weathering, massive, soft, fine- grained-----	3.
Covered-----	19.
Claystone, medium-gray, silty-----	0.8
Shale, carbonaceous-----	0.1
Coal, Bed C; includes a lenticular 0.3-ft. silty sand- stone parting at 2.5 ft. above base-----	5.3
Siltstone (<u>L2P-4</u> -- from uppermost 0.3 ft. of unit)*, medium-gray, very clayey; grades to dark-gray silty claystone in upper 2 ft.-----	7.
Siltstone, clayey, coaly-----	0.3

*Palynological sample

**Lithological sample

Siltstone, medium-gray, massive, very clayey-----	5.
Siltstone, clayey, coaly-----	0.2
Siltstone, medium-gray, massive, clayey-----	4.6
Coal-----	0.5
Siltstone, medium-gray, massive, hard, very clayey-----	16.
Sandstone (L2-3)**, light-gray, massive, soft, friable, fine- to very fine grained, subrounded, slightly silty; abundant dark rock fragments; forms vertically fluted face-----	10.5
Coal-----	0.8
Inaccessible; mostly medium-light-gray silty claystone-----	22.
Siltstone (L2-2)**, medium-gray, partly iron-stained, light-gray-weathering, rough-angular to subconchoidal- fracturing, hard, sandy, clayey; scattered carbonaceous plant fragments-----	9.
Siltstone, medium-gray, soft, very clayey-----	1.
Siltstone, medium-gray, laminated with abundant carbo- naceous fragments, clayey-----	1.7
Sandstone (L2-1)**, medium-dark-gray, thick-bedded, soft, friable, very fine to fine-grained, subrounded to subangular, silty to very silty in upper part-----	1.5
Siltstone (L2-1)**, medium-light-gray, laminated to platy- bedded; very clayey; few carbonaceous plant fragments; scattered light-gray calcareous concretions in upper part-----	5.7
Covered-----	2.
Top of coal bed B	

**Lithological sample

Measured section L3

Location: Sea-cliff exposures northeast of McNeil Canyon in the SW 1/4 SE 1/4 sec. 24, T. 5 S., R. 12 W., Seldovia C-4 quadrangle. This locality is northeast of locality 146 of Barnes and Cobb (1959, pl. 18).

	Feet
Tertiary rocks -- kenai Group, Beluga Formation (upper part)	
Partly covered; mostly medium-gray silty claystone-----	5.+
Coal, upper part of Bed E; includes scattered iron-stained calcareous concretions as much as 2 ft. long in upper 0.6 ft.-----	2.2
Claystone (L3-19)**, medium-gray, light-gray-weathering, partly silty; abundant small carbonaceous plant fragments-----	1.2
Coal-----	1.3
Shale (L3P-18)*, carbonaceous-----	0.3
Coal, lower part of Bed E-----	0.5
Claystone (L3P-17)*, medium-gray, silty-----	0.3
Sandstone, medium-gray, thick-bedded, soft, fine- to very fine grained, silty-----	2.7
Mostly covered; lower part of unit mostly medium-gray clayey siltstone; upper part mostly medium-gray massive soft sandstone; few scattered iron-stained calcareous concretions in lower part-----	33.
Coal-----	0.8
Claystone, medium-gray, light-gray-weathering, angular-fracturing-----	4.7
Coal-----	0.4
Claystone, medium-gray, light-gray-weathering-----	1.4
Coal-----	1.

*Palynological sample

**Lithological sample

Partly covered; lower part mostly soft slightly carbonaceous claystone; upper part mostly clayey siltstone-----	13.8
Coal-----	0.7
Claystone (L3-16)**, medium-gray, light-gray-weathering, hard, silty, slightly carbonaceous; scattered carbonaceous plant fragments-----	0.9
Coal-----	3.6
Claystone (L3P-15)*, carbonaceous; includes few laminae of sandstone-----	0.2
Coal-----	0.2
Sandstone, medium-gray, angular-fracturing, very silty, clayey-----	4.5
Sandstone, medium-gray, iron-stained, yellowish-brown-weathering, massive, soft in lower part, silty, clayey; grades upward to harder less silty and clayey sandstone with large carbonaceous plant fragments-----	26.
Coal and carbonaceous shale (L3P-14)*-----	0.8
Claystone, medium-gray, slightly carbonaceous-----	0.3
Coal-----	1.2
Sandstone (L3-13 -- from lower part of unit)**, medium-light-gray, mostly massive but some laminae and cross-laminae shown by carbonaceous fragments, soft, friable, fine- to very fine grained, subangular, clayey; includes few interbeds of medium-gray clayey siltstone and carbonaceous parts 0.5-0.2 ft. thick; clayey in upper 5 ft.-----	20.1
Siltstone, medium-light-gray, angular-fracturing, sandy, clayey; poorly developed joint system at 30-60 degrees to horizontal-----	6.
Coal-----	0.9
Coal and shaly coal (L3P-12)*; some interbedded medium-gray claystone-----	0.3

*Palynological sample

**Lithological sample

Claystone (<u>L3-11</u>)**, light-brown, grayish-yellow-weathering, soft, plastic, bentonitic; abundant carbonaceous plant fragments-----	0.1
Claystone, medium-gray, slightly carbonaceous-----	0.1
Coal-----	0.6
Sandstone, medium-gray to medium-light-gray, clayey and silty in upper part-----	4.1
Siltstone, medium-gray, angular-fracturing, clayey-----	4.
Sandstone, medium-gray, massive, some lamination and cross-lamination shown by carbonaceous plant fragments, soft, silty; interbedded with about 20 percent slightly more resistant laminated clayey silty sandstone-----	5.
Sandstone (<u>L3-10</u>)**, medium-light-gray, partly iron-stained, laminated and cross-laminated at low angles shown by carbonaceous plant fragments, soft, very fine grained, subangular, silty, clayey-----	15.8
Claystone (<u>L3P-9</u>)*, medium-gray, carbonaceous-----	0.3
Sandstone (<u>L3-8</u>)**, medium-dark-gray, massive, soft, friable, mostly very fine grained, subangular to sub-rounded, clayey and silty in upper part; abundant dark rock fragments-----	6.
Siltstone, medium-gray, angular-fracturing, very clayey-----	6.9
Sandstone, medium-dark-gray, massive-weathering, laminated and cross-laminated with carbonaceous plant fragments, soft, very fine to fine-grained-----	3.6
Siltstone, medium-gray, angular-fracturing, very clayey-----	1.5
Coal, shaly-----	0.2
Siltstone, medium-gray, partly laminated and cross-laminated with carbonaceous plant fragments, angular-fracturing, very clayey-----	8.1
Clay (<u>L3P-7</u>)*, carbonaceous, coaly-----	0.1
Siltstone, dark-gray, laminated and cross-laminated with carbonaceous plant fragments, clayey-----	2.5

*Palynological sample

**Lithological sample

Sandstone (L3-6)**, medium-dark-gray, iron-stained, hard, very fine grained, subangular, carbonaceous, semi-concretionary, clayey, silty; scattered small carbonaceous plant fragments-----	0.3
Siltstone, dark-gray, massive-weathering, laminated and cross-laminated with carbonaceous plant fragments, very clayey-----	0.8
Covered-----	1.4
Partly covered; mostly medium-light-gray angular-fracturing very clayey siltstone-----	7.
Shale, coaly, carbonaceous-----	0.1
Siltstone (L3-5)**, medium-gray, angular-fracturing, hard, very clayey, partly sandy; scattered carbonaceous fragments-----	2.3
Sandstone (L3-4)**, medium-light-gray, yellowish-gray-weathering, thick-bedded, soft, friable, very fine to fine-grained, subangular, slightly clayey-----	2.4
Sandstone (L3-3)**, medium-light-gray, yellowish-brown-weathering, laminated and cross-laminated, very fine grained, subangular, clayey, silty, slightly calcareous; more resistant than overlying and underlying units-----	0.6
Sandstone, medium-light-gray, grayish-yellow-weathering, massive, soft, very fine grained-----	4.7
Sandstone (L3-2)**, medium-light-gray, partly iron-stained, yellowish-brown-weathering, laminated, very fine grained, subangular, silty, clayey; few carbonaceous plant fragments; more resistant than overlying and underlying units-----	0.4
Sandstone, medium-light-gray, grayish-yellow-weathering, massive, soft, very fine grained-----	6.
Concretion, iron-stained, calcareous-----	0.4
Claystone, medium-gray, poor platy-bedded, slightly carbonaceous-----	1.2
Coal, Bed D-----	3.

**Lithological sample

Siltstone (L3-1 and L3P-1 -- from upper 0.8 ft. of unit)** *
dark-gray, very clayey; scattered carbonaceous plant
fragments----- 3.+

*Palynological sample
**Lithological sample

Measured section L4

Location: Sea-cliff exposure west of Eastland Creek in the SW 1/4 SW 1/4 sec. 9 and SE 1/4 SE 1/4 sec. 8, T. 5 S., R. 11 W., Seldovia D-4 quadrangle. This is near locality 157 of Barnes and Cobb (1959, pls. 18, 19).

	Feet
Tertiary rocks -- Kenai Group, Sterling Formation	
Claystone, light-gray-weathering, rectangular-fracturing, silty-----	1.1
Coal, shaly; upper part of Bed G-----	0.4
Coal-----	2.2
Coal (<u>L4P-6</u>)*, shaly; lower part of Bed G-----	0.3
Claystone, medium-gray, angular-fracturing, silty in lower part, carbonaceous in upper part-----	2.2
Partly covered; mostly yellowish-gray-weathering clayey siltstone-----	4.5
Concretion, iron-stained, calcareous-----	0.7
Coal-----	0.3
Claystone (<u>L4-5</u> -- from upper part of unit)**, medium-gray, iron-stained, grayish-brown-weathering, sandy, silty; abundant carbonaceous fragments; includes coal lenses as much as 0.3 ft. thick; scattered iron-stained calcareous concretions-----	7.3
Sandstone, medium-gray, massive, soft, very fine to fine-grained, silty; interbedded with about 50 percent medium-gray siltstone-----	4.3
Siltstone, medium-gray, angular-fracturing, very clayey-----	4.5
Sandstone, medium-gray, massive, soft, very fine to fine-grained-----	3.4
Beluga Formation (upper part)	
Claystone, medium-dark-gray, iron-stained, mostly angular-fracturing, partly poorly laminated-----	3.6
Coal-----	2.5

*Palynological sample

**Lithological sample

Claystone, medium-gray, very light-gray-weathering-----	0.2
Coal-----	0.2
Partly covered; mostly silty claystone, especially in upper part-----	3.3
Claystone, very carbonaceous; less carbonaceous in upper part-----	0.7
Coal, upper part of Bed F-----	0.8
Claystone, medium-dark-gray, slightly carbonaceous-----	0.7
Coal, shaly-----	0.3
Shale (<u>L4P-3</u>)*, carbonaceous-----	0.5
Coal, lower part of Bed F-----	1.7
Siltstone (<u>L4-2</u> -- from upper 0.3 ft. of unit)**, medium- dark-gray, light-gray-weathering, massive, soft, very clayey; scattered carbonaceous plant fragments; in- cludes two coaly lenses, 0.2 ft. thick, at 5 ft. above base and 3 ft. below top-----	16.
Coal-----	0.5
Claystone, medium-gray, silty-----	0.7
Coal-----	0.4
Claystone, medium-gray, silty; includes a 0.4-ft. coal lense at 1.2 ft. below top-----	3.3
Concretion, iron-stained, calcareous-----	0.9
Claystone, medium-gray, angular-fracturing, silty-----	10.3
Shale, coaly; upper part of Bed E-----	0.2
Coal-----	1.9
Shale, carbonaceous-----	0.4
Coal-----	0.9
Claystone (<u>L4P-1</u>)*, carbonaceous-----	0.4

*Palynological sample

**Lithological sample

Coal, lower part of Bed E-----	0.2
Claystone, silty, carbonaceous-----	0.3
Claystone, yellowish-gray to yellowish-brown, iron- stained, angular-fracturing, silty, slightly carbonaceous-----	0.5+

Measured section L5

Location: Sea-cliff northeast of Falls Creek in the NE 1/4 SE 1/4 sec. 3, T. 5 S., R. 11 W., Seldovia D-3 quadrangle. This is locality 161 of Barnes and Cobb (1959, pls. 18, 19).

	Feet
Tertiary rocks -- Kenai Group, Sterling Formation	
Base of lowest bench of coal bed K	
Sandstone, medium-gray, light-gray-weathering, massive, soft, silty in upper part; abundant carbonaceous plant fragments in upper part-----	5.6
Coal-----	0.6
Claystone, light-gray-weathering, angular- to conchoidal-fracturing, slightly carbonaceous-----	0.4
Coal-----	0.3
Claystone (L5-23)**, medium-light-gray, partly iron-stained, light-gray-weathering, conchoidal-fracturing, hard; scattered carbonaceous plant fragments-----	1.2
Claystone, medium-gray; includes lenticular coal laminae-----	0.4
Coal-----	0.3
Siltstone, medium-gray, light-gray-weathering, angular-fracturing at high angles to top and bottom of unit, partly clayey-----	11.5
Coal-----	1.
Siltstone, medium-dark-gray, light-gray-weathering, angular-fracturing along vertical planes or along planes at 30 degrees to top and bottom of unit-----	12.7
Siltstone, carbonaceous-----	0.1
Siltstone, similar to 12.7-ft. unit above-----	0.6
Siltstone, carbonaceous-----	0.1
Siltstone, similar to 12.7-ft. unit above-----	11.3

**Lithological sample

Coal-----	0.3
Siltstone, medium-dark-gray, angular-fracturing, clayey; interbedded with about 20 percent silty claystone and lentils of very fine grained silty sandstone; scattered ironstone concretions about 0.5 ft. thick by 1 ft. long at 2 ft. below top-----	20.
Shale, carbonaceous-----	0.3
Coal-----	0.8
Sandstone, medium-dark-gray, massive, partly angular-fracturing, soft, very fine grained, silty; interbedded with medium-gray angular-fracturing clayey siltstone-----	6.6
Siltstone (L5-22)**, medium-gray, carbonaceous; interbedded with slightly carbonaceous silty micaceous claystone and silty very fine grained subangular sandstone-----	1.9
Partly covered; mostly medium-gray (light-gray-weathering) poor platy-bedded silty claystone; some ironstone concretions about 0.2 ft. thick and 0.5 ft. long at 2.5 ft. below top-----	11.5
Claystone, medium-gray, soft, very silty-----	0.5
Coal, shaly; uppermost part of Bed J; along strike unit becomes coaly shale with calcareous concretions in places-----	0.8
Coal-----	1.6
Shale, carbonaceous-----	0.7
Coal-----	0.5
Sandstone (L5-21 -- from upper part)**, medium-dark-gray, thick bedded, soft, friable, very fine to fine-grained, subangular to subrounded, silty, very carbonaceous in upper part; abundant carbonaceous plant fragments-----	1.6
Coal-----	0.2
Shale, carbonaceous-----	0.8
Coal, lowest part of Bed J-----	3.4

**Lithological sample

Siltstone (<u>L5P-20</u> -- from upper 0.6 ft. of unit)*, light-gray-platy-weathering, platy-bedded, sandy; abundant carbonaceous plant fragments; grades rapidly downward to silty sandstone in lower part-----	2.2
Partly covered; mostly clayey siltstone-----	6.
Sandstone, yellowish-brown-weathering, massive, soft, very fine grained; interbedded with about 50 percent silty claystone and clayey siltstone in beds 0.5-2 ft. thick-----	11.5
Claystone, medium-dark-gray, platy-bedded, silty-----	1.9
Note: The bedding in the claystone units is generally more obvious in this and lower parts of the stratigraphic sequence than in the parts stratigraphically higher.	
Sandstone, yellowish-brown-weathering, thin-bedded, soft, very fine grained-----	0.3
Claystone, medium-dark-gray, platy-bedded, very silty-----	2.
Coal, shaly-----	0.3
Shale, coaly, carbonaceous-----	0.3
Coal-----	0.2
Siltstone, medium-dark-gray, light-gray-weathering, angular-fracturing, very clayey; includes a poorly developed calcareous concretion (0.5 ft. by 3 ft.) about 4 ft. above base-----	7.5
Sandstone, yellowish-brown-weathering, thin-bedded, soft, very fine grained-----	0.3
Siltstone, medium-dark-gray, angular-fracturing, clayey-----	2.
Shale (<u>L5P-19</u>)*, carbonaceous-----	0.3
Coal-----	0.8
Shale, carbonaceous-----	0.5
Coal-----	0.1
Shale, coaly-----	0.2
*Palynological sample	

Coal-----	0.2
Sandstone, dark-gray, yellowish-brown-weathering, medium-bedded, soft, very fine to fine-grained-----	0.6
Siltstone, medium-gray, poor platy-bedded, sandy-----	1.5
Sandstone, yellowish-brown-weathering, thin-bedded, soft, very fine grained-----	0.4
Siltstone, medium-gray, soft, very clayey-----	1.
Shale, coaly-----	0.4
Coal-----	0.4
Shale, coaly; shaly coal-----	0.3
Coal-----	0.4
Claystone (L5-18)** (L5P-18 -- from upper 0.5 ft.)*, medium-gray, light-gray-weathering, angular-fracturing, very silty, carbonaceous in upper 0.5 ft.; scattered carbonaceous plant fragments-----	13.8
Sandstone, medium-gray, thin-bedded, soft, very fine to fine-grained, silty, clayey-----	0.3
Siltstone, medium-dark-gray, angular-fracturing, soft, clayey-----	9.
Claystone, medium-gray, angular-fracturing, soft, silty-----	3.
Siltstone (L5-17)**, medium-gray, poor platy-bedded, angular-fracturing, soft, very clayey, finely sandy; few scattered carbonaceous plant fragments-----	2.5
Coal (L5P-16 -- from upper 0.1 ft. of unit)*, shaly; upper part of Bed I-----	0.6
Coal, lower part of Bed I-----	1.6
Siltstone, medium-gray, angular-fracturing, soft, very clayey-----	1.6
Claystone (L5P-15)*, carbonaceous-----	0.6
Coal-----	0.1

*Palynological sample

**Lithological sample

Claystone, carbonaceous, coaly-----	0.5
Claystone, medium-light-gray, angular-fracturing, silty-----	0.4
Covered-----	30.
Claystone, medium-gray, angular-fracturing, very silty-----	7.
Coal, shaly-----	0.4
Coal-----	0.5
Shale, coaly-----	0.9
Shale, carbonaceous-----	0.2
Siltstone, medium-gray, angular-fracturing, very clayey-----	1.1
Claystone, medium-gray, light-gray-weathering, angular- fracturing, silty in upper part-----	9.4
Sandstone, medium-dark-gray, medium-bedded, soft, very fine to fine-grained-----	0.7
Shale, carbonaceous-----	0.3
Coal-----	0.2
Shale, coaly-----	0.5
Coal-----	0.6
Coal, shaly-----	0.4
Shale, coaly, carbonaceous-----	0.8
Shale, very coaly-----	1.3
Claystone (<u>L5-14</u> -- from lower part of unit)** (<u>L5P-14</u> -- from upper 0.4-ft. of unit)*, medium-gray, light- gray-weathering, angular-fracturing, silty, carbo- naceous in upper 0.4 ft.; few carbonaceous plant fragments-----	8.2
Covered-----	6.
Sandstone, medium-light-gray, thick-bedded, soft, very fine to fine-grained-----	2.

*Palynological sample

**Lithological sample

Claystone, medium-gray, light-gray-weathering, angular-fracturing, silty-----	2.5
Sandstone (L5-13)**, medium-light-gray, yellowish-brown-weathering, medium-bedded, soft, very fine to fine-grained, subangular, very clayey-----	0.7
Partly covered (L5-12)**; mostly medium-gray very clayey siltstone with scattered plant fragments-----	14.
Claystone, medium-dark-gray, light-gray-weathering, angular-fracturing-----	6.
Coal; includes a lenticular 0.1-ft. claystone parting 0.2 ft. above base-----	2.7
Claystone (L5-11 and L5P-11 -- from upper 1 ft. of unit)** *, medium-gray, iron-stained, yellowish-brown- to grayish-yellow-weathering, tough, compact, slightly silty; abundant carbonaceous plant fragments-----	5.1
Covered-----	2.
Partly covered (L5-10)**; lower part medium-gray partly iron-stained sandy clayey siltstone; upper part medium-gray massive soft friable very fine grained subangular silty sandstone-----	4.
Partly covered; mostly yellowish-brown- to grayish-yellow-weathering, massive, soft sandstone, upper part silty----	6.
Sandstone (L5-9)**, medium-gray, grayish-yellow- to yellowish-brown-weathering massive soft, friable, very fine to fine-grained, subangular to subrounded-----	13.
Coal (L5P-8)*, shaly-----	0.1
Coal-----	1.8
Claystone, medium-gray, angular-fracturing, silty-----	1.5
Covered-----	29.
Coal-----	0.1
Shale, carbonaceous-----	0.3
Coal, Bed G-----	1.3

*Palynological sample

**Lithological sample

Coal (<u>L5P-7</u>)*, shaly-----	0.5
Claystone (<u>L5-6</u>)**, medium-dark-gray, yellowish-brown- weathering, silty; few carbonaceous plant fragments; interbedded with medium-gray friable very fine grained subangular sandstone-----	15.
Coal, shaly-----	0.4
Siltstone, medium-gray, sandy, clayey; scattered coaly lenses less than 0.2 ft. thick; interbedded with a few beds, less than 1 ft. thick, of medium-gray soft sand- stone: lower contact gradational-----	13.
Sandstone (<u>L5-5</u>)**, medium-gray, yellowish-gray-weathering, massive, soft, friable, very fine to fine-grained, partly fine- to medium-grained with cross-bedded lentils of coarser material, rare pebbles, and some rounded clay masses, subrounded to subangular, silty; unit generally finer grained upward; bold cliff-former-----	30.
Beluga Formation (upper part)	
Coal, upper bench of Bed F-----	1.4
Siltstone, medium-gray, very light-gray-weathering, partly laminated with carbonaceous plant material, platy- fracturing at about 30 degrees to top and base of unit, sandy-----	1.3
Sandstone (<u>L5-4</u>)**, medium-dark-gray, thick-bedded, soft, friable, fine- to medium-grained, subrounded, partly clayey; abundant dark rock fragments-----	1.9
Siltstone (<u>L5P3</u>)*, medium-dark-gray, clayey near base, sandy near top-----	1.7
Shale, carbonaceous-----	0.3
Coal, middle bench of Bed F-----	0.9
Claystone (<u>L5-2</u>)**, medium-dark-gray, hard, compact, very silty in upper part-----	7.
Shale, carbonaceous-----	0.3
Coal, lower bench of Bed F-----	1.4
Claystone, medium-dark-gray, light-gray-weathering, angular-fracturing-----	2.

*Palynological sample

**Lithological sample

Coal----- 0.5
Claystone (L5-1)**, medium-dark-gray, light-gray-weather-
ing, angular-fracturing, hard; some subhorizontal
lamination shown by carbonaceous plant fragments----- 2.+

**Lithological sample

Measured section L5

Location: Stream-bed and canyon-wall exposures in unnamed canyon in the SE 1/4 NW 1/4 sec. 36, T. 4 S., R. 11 W., Seidovia D-3 quadrangle. This is locality 166 of Barnes and Cobb (1959, pls. 18, 19).

Feet

Tertiary rocks -- Kenai Group, Sterling Formation

Partly covered (<u>L6-15</u> and <u>L6P-15</u> -- from upper 5 ft. of unit)** *, mostly medium-gray partly iron-stained yellowish-brown-weathering sandy clayey siltstone that breaks to angular cobbles and pebbles; abundant carbonaceous plant fragments; interbedded with about 25 percent sandstone similar to underlying unit; includes a 0.1-ft. coal (<u>L6P-14</u>)* at 19 ft. above base-----	30.
Sandstone, yellowish-brown-weathering, poor platy-bedded, partly horizontally laminated with carbonaceous plant fragments, mostly very fine grained; breaks to rectangular cobbles and pebbles-----	6.
Covered-----	5.
Sandstone, yellowish-brown-weathering, platy-bedded, soft, very fine to fine-grained-----	0.3
Coal; burned in places-----	2.2
Sandstone, light-gray-weathering, partly iron-stained, laminated with carbonaceous plant fragments, very fine grained, silty in upper part-----	4.2
Claystone, slightly carbonaceous in lower part, silty and sandy in upper part-----	2.9
Coal-----	0.6
Shale, coaly-----	0.1
Coal and shaly coal-----	0.3
Claystone, carbonaceous-----	0.5
Coal-----	0.2

*Palynological sample

**Lithological sample

Siltstone, medium-dark-gray, poorly laminated to poor platy-bedded, very clayey; breaks to angular pebbles-----	7.2
Claystone (L6-13)**, medium-brown, brownish-gray-weathering, hard, clayey, partly carbonaceous; few carbonaceous plant fragments; scattered pyroclastic(?) grains-----	0.1
Shale, carbonaceous; interbedded with shaly coal and coal-----	0.8
Siltstone, medium-dark-gray, slightly carbonaceous-----	2.6
Coal and shaly coal-----	0.5
Claystone, medium-light-gray, light-gray-weathering, flaky, partly carbonaceous-----	0.9
Coal, shaly, and carbonaceous shale-----	0.8
Claystone, carbonaceous-----	0.2
Shale, coaly-----	0.4
Coal-----	0.4
Siltstone (L6-11)**, light-brown, brownish-gray-weathering, hard, clayey, partly carbonaceous; abundant carbonaceous plant fragments; scattered white pyroclastic(?) grains-----	0.1
Coal-----	0.8
Partly covered: about 50 percent yellowish-gray-weathering fine-grained sandstone; rest of unit light-gray-weathering siltstone; 1-ft. carbonaceous siltstone at top-----	6.5
Shale, carbonaceous, coaly-----	0.6
Coal-----	0.5
Claystone (L6-10)**, medium-light-gray, light-gray to yellowish-gray-weathering, hard, partly silty; weathers rounded in places but breaks to angular cobbles and pebbles in other places; abundant carbonaceous plant fragments-----	3.
Sandstone, grayish-yellow-weathering, partly iron-stained, medium-bedded, soft-----	0.6
**Lithological sample	

Siltstone (<u>L6-9</u>)**, medium-gray, light-gray-weathering, poor platy-bedded, soft, clayey, finely sandy; few carbonaceous plant fragments-----	5.9
Shale, carbonaceous, coaly-----	0.2
Coal-----	0.5
Claystone, medium-dark-gray, light-gray-weathering, poor platy-bedded, silty; abundant carbonaceous plant fragments-----	1.4
Coal-----	0.1
Siltstone, medium-dark-gray, light-gray-weathering, poor platy-bedded, clayey-----	1.4
Sandstone, medium-gray, grayish-yellow-weathering, thick-bedded, soft, fine-grained-----	2.4
Claystone, light-gray-weathering, poor platy-bedded, very silty; slightly carbonaceous in lower 1 ft.-----	5.
Sandstone, medium-gray, medium-bedded, soft, fine-grained-----	0.6
Claystone (<u>L6-8</u>)**, medium-gray, very light-gray-rounded-weathering, poor platy-bedded, hard, partly silty; few small carbonaceous plant fragments-----	3.5
Sandstone, medium-gray, iron-stained, yellowish-gray-weathering, poor platy-bedded, very fine grained, silty-----	10.
Sandstone, medium-gray, yellowish-gray-weathering, massive, soft, fine- to very fine grained-----	5.
Sandstone, medium-gray, very iron stained, laminated with abundant carbonaceous plant fragments, massive, soft, very fine to fine-grained-----	3.3
Sandstone (<u>L5-7</u>)**, medium-gray, iron-stained, yellowish-gray-weathering, massive, soft, friable, mostly fine-grained, subrounded to subangular, silty; some cross-laminations of carbonaceous fragments at angles of 10-25 degrees-----	17.5
Siltstone, medium-dark-gray, light-gray-weathering, platy-bedded-----	4.3

**Lithological sample

Sandstone, medium-gray, very iron-stained, yellowish-brown-weathering, thick-bedded, soft, mostly fine-grained-----	1.2
Siltstone, medium-dark-gray, light-gray-flaky- to platy-weathering, platy-bedded, very clayey-----	10.
Covered-----	12.6
Claystone, medium-dark-gray, carbonaceous-----	2.
Coal, Bed M-----	5.
Siltstone, light-gray-weathering to hard angular blocks and platy pieces, platy-bedded, very sandy in part-----	5.5
Coal and shaly coal-----	0.3
Siltstone, medium-gray, light-gray-weathering, breaks to hard rounded pieces; scattered carbonaceous fragments----	2.4
Sandstone, medium-gray, yellowish-gray-weathering, massive to poorly laminated in upper 2 ft., soft-----	9.3
Siltstone, medium-gray, light-gray-weathering, poor platy-bedded-----	6.8
Sandstone, medium-gray, yellowish-brown-weathering, laminated with carbonaceous plant fragments-----	2.9
Siltstone, medium-gray, light-gray-weathering, very clayey; interbedded with medium-dark-gray (light-gray-weathering) poorly laminated claystone-----	6.8
Coaly shale and shaly coal-----	1.5
Siltstone, medium-gray, light-gray-weathering-----	4.7
Sandstone, medium-gray, light-gray- to grayish-orange-weathering, massive, soft, very fine to fine-grained, silty in upper part-----	7.5
Claystone, medium-gray, light-gray-platy-weathering, poorly laminated to platy-bedded, silty-----	0.8
Coal, shaly-----	0.8
Shale (L6P-6)*, coaly-----	0.7

*Palynological sample

Claystone, dark-gray, light-gray-weathering, poor platy-bedded, silty; interbedded with about 50 percent yellowish-gray-weathering soft very fine to fine-grained sandstone in beds about 0.2 ft. thick-----	29.2
Coal-----	1.
Siltstone, medium-gray, light-gray- to brownish-gray-weathering, breaks to angular flakes and pebble-size chunks, poorly laminated, very clayey-----	13.
Siltstone, coaly, carbonaceous-----	0.2
Siltstone, medium-dark-gray, breaks to angular pebble-sized chunks, poorly laminated to poor platy-bedded, sandy in lower part, clayey in upper part-----	7.2
Partly covered; mostly yellowish-gray-weathering very fine grained sandstone and light-gray-weathering siltstone-----	5.8
Coal and shaly coal-----	0.6
Shale, carbonaceous, coaly-----	0.3
Coal-----	1.4
Siltstone, light-gray-weathering, angular-fracturing, clayey; scattered iron-stained calcareous concretions in upper part-----	5.5
Sandstone, medium-gray, thick-bedded, soft, fine-grained-----	1.4
Coal, shaly-----	0.3
Siltstone, medium-gray, clayey; includes coaly streak 0.4 ft. below top-----	3.1
Sandstone (L6-5)**, medium-gray, very iron stained, yellowish-brown-weathering, friable, fine- to very fine grained, subangular to subrounded, silty in upper part; laminated with carbonaceous plant fragments-----	4.7
Claystone, light-gray-weathering, poor platy-bedded, very silty-----	3.4
Coal and shaly coal-----	0.3

**Lithological sample

Siltstone, medium-dark-gray, light-gray-weathering, poor platy-bedded, very clayey-----	6.2
Coal-----	0.7
Shale, coaly-----	0.2
Sandstone, medium-gray, medium-bedded, soft, mostly fine- grained, silty-----	0.4
Covered-----	8.
Siltstone (<u>L6-4</u>)**, medium-gray, partly iron-stained, light-gray-weathering; breaks to angular flakes and pebble-sized pieces, very clayey; abundant carbo- naceous plant fragments-----	4.
Sandstone (<u>L6-3</u> -- from lower part of unit)**, medium-dark- gray, massive to obscurely bedded, soft, friable, fine- to very fine grained, subangular to subrounded, clayey, silty in upper part-----	5.
Coal, upper bench of Bed L-----	2.1
Shale, carbonaceous-----	0.4
Claystone (<u>L6-1</u>)**, medium-brown, yellow-weathering, silty; abundant carbonaceous plant fragments-----	0.1
Coal, lower bench of Bed L-----	1.8
Siltstone (<u>L6P-2</u>)*, yellowish-gray to light-gray-weather- ing, breaks to hard angular cobble- and pebble-sized pieces, clayey, carbonaceous in upper part; abundant plant stem imprints-----	1.1
Sandstone, medium-gray, angular-fracturing, silty-----	0.5
Covered-----	26.3
Coal, shaly-----	0.3
Claystone, medium-gray, angular-fracturing, silty, very silty in upper part; includes a 0.1-ft. coaly clay- stone bed 1.9 ft. above base-----	5.1
Coal, uppermost part of Bed K-----	0.4

*Palynological sample

**Lithological sample

Claystone, medium-gray, light-gray-weathering, angular- fracturing, partly carbonaceous-----	1.1
Coal-----	0.2
Claystone, medium-gray, light-gray-weathering, angular- fracturing, partly carbonaceous-----	1.1
Coal-----	1.6
Shale, carbonaceous-----	0.4
Coal; lowest part of Bed K-----	2.1
Sandstone, medium-gray, massive, soft, very silty-----	2.+

Measured section L7

Location: West side of canyon of Swift Creek, in the SW 1/4 NW 1/4 sec. 25, T. 4 S., R. 11 W., Seidovia D-3 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Sterling Formation	
Coal, Bed Q(?); top eroded-----	2.4+
Siltstone, medium-gray, iron-stained, light-gray-weathering, poor platy-bedded, sandy; interbedded with about 35-40 percent medium-gray iron-stained massive soft fine- to very fine grained sandstone in beds up to 3 ft. thick; includes a 0.3-ft. carbonaceous shale bed 24.7 ft. above base-----	36.3
Sandstone, medium-gray, iron-stained, yellowish-brown- to yellowish-orange-weathering, thick-bedded, soft, fine- to very fine grained-----	2.4
Siltstone, medium-gray, iron-stained, light-gray-weathering, poor platy-bedded; breaks to angular flakes, very clayey; siltstone in beds as much as 5 ft. thick; interbedded with about 25 percent sandstone similar to overlying unit in beds as much as 1.5 ft. thick-----	26.8
Shale, carbonaceous-----	0.8
Coal-----	0.7
Shale, carbonaceous-----	0.5
Partly covered; mostly light-gray-weathering poor platy-bedded sandy siltstone; lower 2 ft. of unit more sandy; includes 0.3-ft. carbonaceous shale bed 2 ft. below top-----	19.7
Clinker; mostly burned and baked siltstone-----	8.
Siltstone, medium-dark-gray, light-gray-weathering, angular-fracturing, clayey-----	1.
Sandstone, medium-light-gray, iron-stained, yellowish-brown- to yellowish-orange-weathering, thick-bedded, soft, fine- to very fine grained-----	1.4

Claystone, medium-light-gray, angular-fracturing, silty; abundant carbonaceous plant fragments-----	2.2
Sandstone, medium-light-gray, partly iron-stained, yellow- ish-gray-weathering, massive, soft, fine- to very fine grained; some 0.4-ft. beds of silty claystone in lower 3.5 ft.; lower contact gradational-----	5.6
Claystone, dark-gray, medium- to light-gray-weathering, poor platy-bedded, angular-fracturing, silty; includes a 0.1-ft. carbonaceous shale bed 9.3 ft. above base-----	16.2
Covered-----	11.
Siltstone, medium-light-gray, light-gray-weathering, poor platy-bedded, sandy in upper part-----	8.8
Sandstone, medium-gray, iron-stained, yellowish-brown- weathering, thick-bedded, soft, fine- to very fine grained-----	1.3
Claystone, medium-dark-gray, angular-fracturing, silty; abundant carbonaceous plant fragments; includes a 0.2-ft. coaly shale bed 0.5 ft. above base-----	9.7
Sandstone, medium-dark-gray, iron-stained, yellowish-brown- weathering, massive, soft, very fine to fine-grained; scattered carbonaceous plant fragments-----	7.4
Siltstone, light-gray-weathering, poor platy-bedded; scattered carbonaceous plant fragments-----	5.4
Sandstone, medium-gray, iron-stained, yellowish-brown- weathering, thick-bedded, soft, fine- to very fine grained; carbonaceous in interval 0.2 ft. thick 0.9 ft. above base-----	2.1
Claystone, medium-dark-gray, angular-fracturing, silty; abundant carbonaceous plant fragments-----	0.9
Sandstone, medium-gray, iron-stained, yellowish-brown- weathering, thick-bedded, soft, fine- to very fine grained-----	2.5
Siltstone, light-gray-weathering, platy-bedded, flaky-----	5.5
Shale, platy-bedded, carbonaceous; interbedded with about 50 percent yellowish-brown-weathering platy-bedded sandstone-----	9.2

Sandstone, carbonaceous-----	0.3
Sandstone, medium-gray, iron-stained, yellowish-brown- weathering, platy-bedded, soft, fine- to medium- grained-----	0.2
Shale, carbonaceous-----	0.3
Covered-----	5.
Partly covered; mostly iron-stained light-gray-weathering angular-fracturing silty claystone-----	26.4
Sandstone, medium-dark-gray, iron-stained, massive weather- ing, cross-laminated with carbonaceous material, medium- grained in lower part to fine-grained in upper part-----	14.
Coal and coaly shale-----	0.4
Claystone, medium-gray, very silty in upper part; interbedded with lenticular carbonaceous clay- stone-----	5.4
Coal and shaly coal-----	0.2
Shale, coaly-----	0.6
Claystone, carbonaceous-----	0.3
Shale, coaly-----	0.5
Claystone, carbonaceous-----	0.2
Coal-----	0.4
Claystone, light-gray-weathering, flaky, slightly carbo- naceous-----	1.
Coal-----	0.4
Siltstone, light-gray-weathering, angular-fracturing-----	2.+

Measured section L8

Location: Sea-cliff exposures in the SE 1/4 SW 1/4 sec. 26, T. 5 S., R. 12 W., Seidovia C-4 quadrangle. This is near locality 140 of Barnes and Cobb (1959, pl. 18).

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Coal-----	0.5
Sandstone (L8-2)**. dark-gray to medium-brown, soft, plastic, fine-grained, angular to subangular, very clayey, volcanic?; this is the same unit as sampled as L1-3 in measured section L1-----	0.3
Coal-----	2.
Siltstone, medium-gray, light-gray-weathering, sandy in lower part, clayey at top; lower contact gradational-----	21.5
Sandstone, medium-gray, light-gray-weathering, massive, very fine to fine-grained, silty, clayey; lower part with calcareous cement in places and rounded concretionary form; unit forms near-vertical cliff-----	54.5
Siltstone, medium-gray, light-gray-weathering, thick-bedded, angular-fracturing, soft; lower contact gradational-----	2.7
Claystone, carbonaceous in lower part, silty in upper part-----	2.
Coal-----	0.5
Coal (L8P-1)*, sandy-----	0.3
Siltstone, medium-gray, light-gray-weathering, obscurely bedded, few poorly developed cross-beds shown by laminae of clay, clayey-----	1.+

*Palynological sample

**Lithological sample

Measured section L9

Location: Sea-cliff exposure west of measured section L8 in the NE 1/4 NW 1/4 sec. 35, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of shaly coal unit sampled as (L8P-1)* in measured section L8.	
Partly covered; mostly medium-gray siltstone-----	5.5
Sandstone (L9-6)**, medium-dark-gray, massive, soft, friable, mostly fine- to medium-grained, subrounded, very silty and clayey-----	6.
Sandstone (L9-5)**, dark-gray, massive, soft, friable, fine- to medium-grained, subrounded, silty, clayey; abundant dark rock fragments; forms rounded smooth-surfaced cliff-----	11.
Partly covered; mostly medium-light-gray-weathering siltstone-----	5.5
Concretion (L9-4)**, medium-gray, iron-stained, yellowish-gray-rounded-weathering, hard, calcareous, clayey; includes in places a 0.1-ft. coal at base; lower contact wavy-----	2.4
Siltstone, medium-gray, light-gray-weathering, obscurely bedded and clayey in upper part-----	3.5
Sandstone (L9-3)**, medium-dark-gray, massive, soft, friable, fine- to medium-grained, subrounded to sub-angular, silty, clayey; abundant rock fragments-----	10.
Partly covered; mostly medium-gray soft claystone-----	6.
Claystone, medium-gray, soft-----	2.
Coal, shaly; coal-----	0.2
Siltstone, medium-gray, clayey-----	2.
Shale, coaly-----	0.1
Clay, carbonaceous-----	0.1
*Palynological sample	
**Lithological sample	

Coal-----	0.7
Sandstone (L9-2)**, medium-dark-gray, massive, soft, friable, fine- to very fine grained, subangular to subrounded, silty, very clayey in upper 0.5 ft.-----	3.2
Claystone, medium-gray, light-gray-weathering, soft, slightly carbonaceous in lower part, silty and sandy in upper part-----	1.
Coal-----	1.1
Siltstone (L9-1)**, medium-gray, light-gray-weathering, angular-fracturing, hard, very clayey, slightly carbonaceous; scattered carbonaceous plant frag- ments-----	2.
Coal-----	0.1
Claystone, light-brownish-gray-weathering, very silty, slightly carbonaceous-----	0.5+

**Lithological sample

Measured section L10

Location: Sea-cliff exposure west of measured section L9 in the NW 1/4
NW 1/4 sec. 35, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

Feet

Tertiary rocks -- Kenai Group, Beluga Formation (upper part)

Base of 0.1-ft. coal bed in lower part of measured section
L9.

Sandstone (<u>L10-3</u> -- from lower part of unit)**, medium- dark-gray, massive, smooth-faced cliff-forming, friable, very fine to fine-grained with some medium grains, subrounded to subangular, silty, clayey; abundant dark rock fragments; upper part of unit very silty, clayey and softer than rest of unit-----	58.
Siltstone, medium-gray, soft, very clayey, sandy in upper part-----	1.8
Coal and coaly shale-----	1.1
Claystone, medium-gray, soft-----	3.
Coal and coaly shale (<u>L10P-2</u>)*-----	0.2

*Palynological sample

**Lithological sample

Measured section L11

Location: Sea-cliff exposures west of measured section L10 in the NW
1/4 NW 1/4 sec. 35, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

Feet

Tertiary rocks -- Kenai Group, Beluga Formation (upper part)

Base of the 0.2-ft. coaly unit at base of measured section
L10.

Sandstone (L11-2)**, medium-gray, yellowish-gray-weathering,
steep-cliff-forming, massive, few cross-laminae shown
by carbonaceous plant fragments, friable, fine- to
medium-grained, subrounded, silty, clayey; abundant
dark rock fragments; some rounded calcareous con-
cretionary masses near middle and at top----- 18.8

Shale (L11P-1)*, carbonaceous, coaly in top part----- 0.6

Coal----- 1.

Siltstone, medium-gray, light-gray-weathering, soft,
very clayey----- 0.6

Coal----- 0.5

*Palynological sample

**Lithological sample

Measured section L12

Location: Sea-cliff exposures west of measured section L11 in the SW
1/4 NW 1/4 sec. 35, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

Feet

Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of 0.5-ft. coal at base of measured section L11.	
Sandstone (L12-2)**, medium-dark-gray, massive, soft, friable, very fine to fine-grained, subangular to subrounded, silty, clayey in upper part; abundant dark rock fragments-----	5.5
Partly covered; mostly medium-light-gray angular-fracturing soft claystone-----	9.5
Covered-----	17.5
Coal, shaly-----	0.3
Partly covered; mostly medium-gray soft slightly silty claystone-----	4.5
Coal, shaly-----	0.1
Claystone (L12P-1)*, carbonaceous-----	0.4
Coal-----	0.3
Claystone, silty in lower part, carbonaceous in upper part-----	0.4

*Palynological sample

**Lithological sample

Measured section L13

Location: Sea-cliff exposures west of measured section L12 in the SE 1/4 NE 1/4 sec. 34, T. 5 S., R. 12 W., Seidovia C-4 quadrangle.

Feet

Tertiary rocks -- Kenai Group, Beluga Formation (upper part)

Base of 0.4-ft. silty claystone at base of measured section L12.

Sandstone (L13-5)**, medium-dark-gray, light-gray-weathering, massive, hard, fine- to very fine grained, sub-angular, very silty, clayey; scattered carbonaceous plant fragments; forms small cliffs with rounded vertically faceted face-----	4.5
Covered-----	3.3
Shale, coaly-----	0.2
Partly covered; mostly medium-gray soft claystone-----	4.5
Shale, carbonaceous; coaly shale-----	0.5
Coal-----	0.1
Claystone, medium-gray, silty, sandy-----	1.3
Claystone, carbonaceous-----	0.5
Claystone, medium-gray, soft-----	1.
Sandstone, medium-dark-gray, massive, soft, very fine grained, silty-----	3.2
Partly covered; mostly medium-gray massive soft sandy siltstone-----	3.
Shale, coaly-----	0.5
Coal-----	0.2
Sandstone, medium-dark-gray, massive, soft, very fine grained, silty-----	3.2
Coal (L13P-5)*, shaly; coaly shale-----	0.3

*Palynological sample

**Lithological sample

Coal-----	0.1
Sandstone, medium-dark-gray, thick-bedded, soft, very fine to fine-grained, clayey, silty-----	1.1
Siltstone, medium-dark-gray, angular-fracturing-----	2.
Claystone, medium-light-gray, soft-----	0.8
Shale, coaly-----	0.4
Claystone, medium-light-gray, soft, silty-----	1.7
Shale, coaly-----	0.4
Claystone, medium-light-gray, soft, silty-----	4.5
Sandstone (<u>L13-4</u> -- from 2 ft. above base)**, medium- gray, massive, soft, friable, fine- to medium- grained, subrounded, clayey, silty in lower part; abundant dark rock fragments-----	9.
Claystone (<u>L13-3</u>)**, medium-dark-gray, soft, very silty and sandy in upper part; scattered carbonaceous plant fragments-----	6.
Coal, shaly-----	0.1
Claystone, medium-gray, soft-----	0.8
Coal and shaly coal-----	0.1
Claystone, medium-gray, soft, silty-----	2.2
Coal (<u>L13P-2</u>)*, shaly; interbedded with carbonaceous shale-----	0.2
Coal-----	0.4
Sandstone (<u>L13-1</u>)**, medium-dark-gray, massive, soft, very fine to fine-grained, subangular, very silty, very clayey in upper part-----	5.2
Partly covered; mostly medium-light- to medium-gray poor angular-fracturing soft claystone; includes 0.2-ft. coaly claystone bed about 6 ft. above base-----	17.5
Coal-----	0.3

*Palynological sample

**Lithological sample

Claystone, medium-light-gray, soft-----	0.6
Coal-----	0.2
Claystone, medium-light-gray, soft-----	0.5

Measured section L14

Location: Sea-cliff exposures west of measured section L13 in the SE 1/4 NE 1/4 sec. 34, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of lowest unit of measured section L13.	
Partly covered; mostly very silty sandstone, clayey toward top; scattered calcareous concretionary parts-----	4.8
Sandstone (L14-3)**, medium-gray, partly iron-stained, thick-bedded, partly angular-fracturing, soft, friable, very fine grained, subangular, very silty, clayey-----	2.
Partly covered; mostly medium-gray siltstone, clayey in lower part-----	4.
Shale, coaly; shaly coal-----	0.7
Siltstone, medium-gray, angular-fracturing, clayey-----	7.1
Partly covered (L14-2 -- from lower part of unit)**; mostly medium-gray angular-fracturing soft slightly silty claystone with scattered carbonaceous plant fragments-----	5.8
Claystone (L14P-1 -- from lower part of unit)*, carbonaceous; scattered laminae and lenses of coal-----	2.
Coal-----	0.6

*Palynological sample

**Lithological sample

Measured section L15

Location: Sea-cliff exposures west of measured section L14 in the SW
1/4 NE 1/4 sec. 34, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of lowest unit of measured section L14.	
Partly covered; mostly medium-gray soft very clayey siltstone-----	6.8
Coal, shaly; coal-----	0.4
Claystone (<u>L15-4</u>)**, medium-dark-gray, partly iron- stained, soft; scattered sand grains-----	5.
Sandstone (<u>L15-3</u> -- from lower 3 ft. of unit)**, medium- dark-gray, massive, some low-angle cross-bedding shown by carbonaceous plant material, soft, friable, fine- to very fine grained, subangular to subrounded, silty, clayey; abundant dark rock fragments-----	14.2
Partly covered (<u>L15-2</u> -- from lower part of unit)**; mostly medium-dark-gray soft very silty claystone with small scattered carbonaceous plant fragments-----	11.5
Sandstone (<u>L15-1A</u> -- from lower part of unit)** (<u>L15-1B</u> -- from upper part of unit)**, dark-gray, light-gray- weathering, massive, some low-angle cross-bedding shown by carbonaceous plant fragments, soft and friable in lower part, harder in upper part, medium- grained in lower part to fine-grained in upper part, subrounded, clayey in lower part, silty in upper part; large woody carbonaceous plant fragments in lower part; scattered rounded concretionary bodies as much as 4 ft. in diameter; forms bold cliff-----	24.

**Lithological sample

Measured section L16

Location: Sea-cliff exposures west of measured section L15 in the SW
1/4 NE 1/4 sec. 34, T. 5 S., R., 12 W., Seldovia C-4 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of lowest unit in measured section L15.	
Coal-----	0.2
Claystone, medium-gray, soft, silty-----	7.5
Sandstone (L16-3 -- from lower part)**, dark-gray, massive, soft, friable, medium- to fine-grained in lower part, very fine grained to silty in upper part, subrounded, clayey; abundant dark rock fragments; includes cal- careous concretionary parts as much as 6 ft. long in upper part-----	17.5
Coal-----	0.1
Partly covered; mostly medium-dark-gray silty claystone-----	8.4
Shale, carbonaceous; coaly shale-----	0.2
Partly covered; lower part of unit mostly medium-dark- gray angular-fracturing soft very clayey silty sandstone; upper part mostly medium-dark-gray soft silty claystone-----	9.7
Partly covered; mostly medium-gray soft clayey silt- stone-----	6.
Claystone (L16P-2)*, very carbonaceous-----	0.8
Coal and shaly coal-----	0.2
Siltstone, medium-dark-gray, soft, clayey to very clayey in upper part; includes a 0.05-ft. coal at 6.4 ft. above base-----	9.
Coal-----	0.2
Siltstone (L16P-1)*, medium-gray to brownish-gray, soft, very clayey, carbonaceous-----	0.5

*Palynological sample

**Lithological sample

Measured section L17

Location: Sea-cliff exposures west of measured section L16 in the NE
1/4 SW 1/4 sec. 34, T. 5 S., R. 12 W., Seldovia C-4 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of lowest unit of measured section L16.	
Claystone, medium-dark-gray, light-gray-angular-weathering, silty, slightly carbonaceous in upper part-----	3.
Siltstone, dark-gray, light-gray-weathering, thick-bedded, soft-----	1.9
Sandstone (L17-3)**, medium-light-gray, yellowish-gray-weathering, partly massive, some poorly defined planar cross-bedding, soft, friable, mostly medium-grained, subrounded, clayey, very silty, partly pebbly with few cobbles; includes laminae and lenses, 0.2-1. ft. thick, of fine- to very fine grained subangular sandstone; forms a fluted ledge-----	13.6
Claystone, medium-dark-gray, soft, silty, carbonaceous in lower part; includes 0.1 by 0.2-ft. iron-stained calcareous concretions in upper part-----	5.3
Coal-----	1.2
Claystone, medium-dark-gray, light-gray-weathering, angular-fracturing, soft, carbonaceous in upper 0.2 ft.-----	1.8
Coal-----	0.9
Shale (L17P-2)*, carbonaceous-----	0.2
Covered-----	5.5
Partly covered; mostly medium-dark-gray clayey siltstone; includes scattered calcareous concretionary parts 2 ft. thick by 6 ft. long about 6 ft. above base-----	13.5
Partly covered; mostly medium-dark-gray (light-gray-weathering) angular-fracturing silty claystone-----	4.
Coal and shaly coal-----	0.5
*Palynological sample	
**Lithological sample	

Partly covered; mostly medium-dark-gray (light-gray- weathering) angular-fracturing claystone, slightly carbonaceous in lower part and silty in upper part; includes a 0.1-ft. carbonaceous shale about 0.2 ft. above base-----	10.4
Coal-----	1.
Claystone (L17 ^P -1)*, dark-gray, carbonaceous, slightly silty-----	0.3
Coal-----	0.4
Coal, shaly-----	0.5
Claystone, dark-gray, carbonaceous, slightly silty-----	0.5

*Palynological sample

Measured section L18

Location: Sea-cliff exposures west of measured section L17 in the NE 1/4 SW 1/4 sec. 34, T. 5 S.; R. 12 W., Seldovia C-4 quadrangle.

	Feet
Tertiary rocks -- Kenai Group, Beluga Formation (upper part)	
Base of lowest unit of measured section L17.	
Partly covered; mostly soft very clayey siltstone-----	5.7
Sandstone, medium-gray, thick-bedded, soft, very fine grained-----	2.4
Coal and coaly shale-----	0.6
Sandstone, medium-dark-gray, massive, soft, fine- to very fine grained-----	10.5
Siltstone, medium-gray, soft; includes scattered coaly lenses as much as 0.1 ft. thick-----	6.
Coal and coaly shale-----	0.3
Siltstone, medium-gray, angular-fracturing, soft-----	2.6
Sandstone (L18-5)**, medium-gray, massive, soft, friable, very fine grained, subangular to subrounded, clayey, silty in upper part-----	4.5
Siltstone, medium-gray, soft, coaly at top-----	4.5
Coal and shaly coal-----	0.2
Sandstone, medium-gray, thick-bedded, soft, very fine grained, silty, clayey-----	1.5
Coal-----	0.2
Siltstone, medium-dark-gray, soft, very clayey-----	2.
Sandstone, medium-dark-gray, thick-bedded, soft, fine- grained-----	2.5
Claystone, medium-dark-gray, silty-----	2.8

**Lithological sample

Sandstone, medium-dark-gray, cross-bedded at angles of 45-50 degrees in planar(?) sets, fine- to very fine grained, silty, clayey; includes scattered coal lenses up to 0.01 ft. thick-----	7.2
Siltstone (L18-4)**, dark-gray, soft, very clayey; includes few medium-dark-gray calcareous concretionary parts up to 8 ft. long with few carbonaceous plant fragments-----	2.5
Claystone, medium-gray, soft-----	0.4
Coal-----	0.2
Claystone, dark-gray, slightly carbonaceous-----	0.2
Coal, shaly-----	0.2
Coal-----	0.3
Siltstone, medium-dark-gray, soft, very clayey-----	5.
Coal-----	0.2
Claystone (L18P-3)*, carbonaceous-----	0.1
Coal-----	0.2
Claystone (L18-2)**, medium-gray, partly iron-stained, soft, silty in part; abundant carbonaceous plant fragments-----	2.
Coal-----	0.7
Sandstone (L18-1)**, dark-gray, thick-bedded, soft, friable, fine- to very fine grained, subrounded to sub-angular, silty, clayey; abundant dark rock fragments-----	2.2
Siltstone, medium-gray, soft, very clayey-----	3.4
Shale, coaly-----	0.2
Siltstone, dark-gray, soft, very clayey-----	2.+

*Palynological sample
**Lithological sample