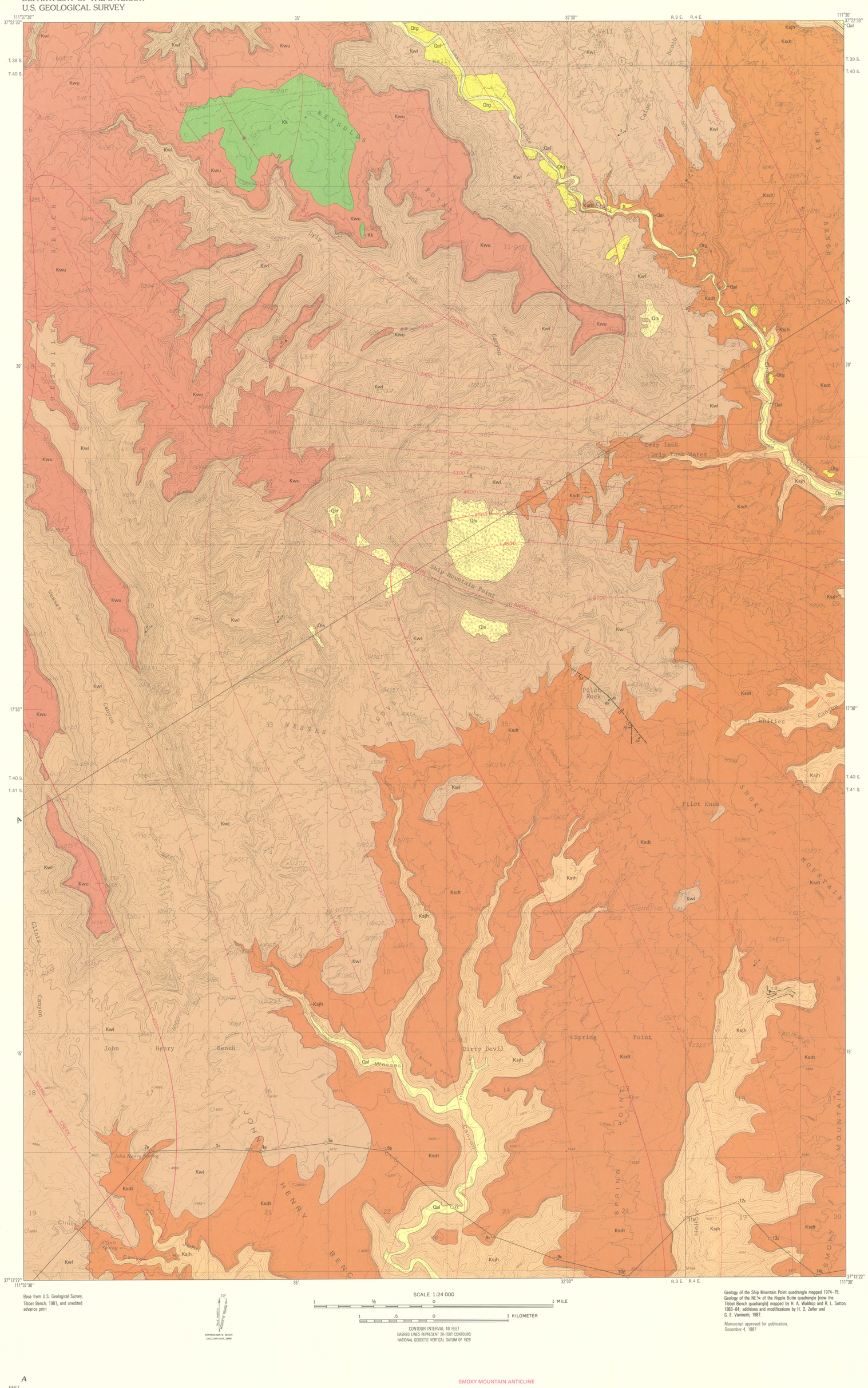

Base from U.S. Geological Survey, Tibbet Bench, 1981, and unedited advance print

APPROXIMATE MEAN DECLINATION, 1990

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DASHED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology of the Ship Mountain Point quadrangle mapped 1974–75.
Geology of the NE¼ of the Nipple Butte quadrangle (now the Tibbet Bench quadrangle) mapped by H. A. Waldrop and R. L. Sutton, 1963–64; additions and modifications by H. D. Zeller and G. E. Vaninetti, 1987.

Manuscript approved for publication, December 4, 1987

CORRELATION OF MAP UNITS

Unit	Epoch	Period
Qal, Qtg, Qls	Holocene and Pleistocene	QUATERNARY
Unconformity		
Kk, Kwu, Kwl, Ksdt, Ksjh	Upper Cretaceous	CRETACEOUS
Unconformity		
Ksst, Kt	Upper Cretaceous	CRETACEOUS

DESCRIPTION OF MAP UNITS

Qal — **Alluvium (Holocene and Pleistocene)**—Unconsolidated stratified deposits of silt, sand, and gravel along major drainages; includes coarse unsorted flood deposits in Last Chance Creek. Thickness 5–50 feet

Qtg — **Terrace deposits (Holocene and Pleistocene)**—Gravel, sand, and silt in stratified deposits generally 5–10 feet above present drainage. Thickness 5–20 feet

Qls — **Landslide deposits (Holocene and Pleistocene)**—Gravel, sand, and mud stratified deposits; includes large sandstone blocks of the Wahweap and Straight Cliffs Formations and rubble that has moved down steep slopes as landslide material and talus. Thickness 5–75 feet

Kk — **Kaiparowits Formation (Upper Cretaceous)**—Sandstone, greenish gray to brownish gray, very fine grained, friable, some thin mudstone. Only lower 100 feet exposed in quadrangle

Wahweap Formation (Upper Cretaceous)

Kwu — **Upper part**—Massive light-gray, cliff-forming sandstone, fine to coarse grained, crossbedded. Contains pebble conglomerate lenses; some gray mudstone interbeds in upper 100 feet, grades into Kaiparowits Formation (Kk). Thickness 200–300 feet. Fluvial probably alluvial plain deposits

Kwl — **Lower part**—Light brown, fine- to medium-grained sandstone and interbedded olive-gray mudstone; sandstone very lenticular and crossbedded. Thickness 1,000–1,300 feet. Fluvial; probably coastal plain and alluvial plain deposit

Straight Cliffs Formation (Upper Cretaceous)

Ksdt — **Drip Tank Member**—Grayish-orange to light-gray medium- to coarse-grained, crossbedded sandstone. Generally fluvial in origin. Thickness 100–200 feet. The type section of the Drip Tank Member (Peterson 1969) is in sec. 24, T. 40 S., R. 3 E. near Drip Tank on the north side of Drip Tank Canyon

Ksjh — **John Henry Member**—Pale-yellowish-orange, fine-grained, fluvial sandstone interbedded with gray mudstone, brownish-gray carbonaceous shale, and coal. Coal resources mainly in the Christensen coal zone; minor coal beds present in the Rees and Alvey coal zones. Thickness 600–700 feet

Ksst — **Smoky Hollow and Tibbet Canyon Members undivided**—Shown on cross section only. Smoky Hollow Member is mottled white to grayish-orange, coarse-grained to conglomeratic, massive sandstone; crossbedded at top (Calico bed). Lower part, interbedded gray mudstone, carbonaceous shale, and thin lenticular coal beds. Thickness 100–300 feet. Tibbet Canyon Member is grayish-yellow, fine-grained sandstone; marginal marine in origin, intertongues with Tropic Shale (Kt). Thickness 80–100 feet

Kt — **Tropic Shale (Upper Cretaceous)**—Shown on cross section only. Olive-gray marine shale; a few thin grayish-orange, fine-grained sandstone beds in upper part. Thickness 600–700 feet

Coal bed—Dashed where approximately located. Thickness of coal, in feet, measured at triangle

Contact—Approximately located

Structure contours—Drawn at unconformity at top of Smoky Hollow Member (Calico bed) from subsurface and projected surface control. Approximately located. Contour interval 100 feet

Anticline—Showing crestline and direction of plunge. Approximately located

Syncline—Showing troughline and direction of plunge. Approximately located

Fault—Dashed where approximately located. U, upthrown side; D, downthrown side. Showing adjoining dip symbol below line and throw in feet above line

Strike and dip of beds

Component of dip of beds—Dot marks point of observation

Drill hole—Circled number keyed to subsurface coal section

Drill holes located in map area shown in correlation diagram

ECONOMIC GEOLOGY

The Ship Mountain Point quadrangle and the north part of the Tibbet Bench quadrangle, Utah, were mapped as part of the U.S. Geological Survey program of classifying and evaluating mineral lands in the public domain. Coal is the main resource of economic interest. Approximately 75 percent of the map area is covered by Federal coal leases, 10 percent is covered by State of Utah coal leases, and the remaining 15 percent is not leased. The entire map area is in the Kaiparowits Plateau Known Recoverable Coal Resource Area (KRCRA). The area was mapped by Doelling and Graham (1972, p. 227–230) and their report contains pertinent geographic and stratigraphic descriptions. New coal and structural information that was not available to them has been incorporated in the present report.

The northern border of the map area is about 39 miles south of Escalante, Utah, and the southern border is 23 miles northeast of Glen Canyon City, Utah, on U.S. Highway 89. The map area can be reached by vehicle on the Alvey Wash-Big Sage road south of Escalante or the Kelly Grade-Smoky Mountain road northeast of Glen Canyon City. The map area has considerable relief ranging from 6,500 feet at Ship Mountain Point to below 4,400 feet in Wesses Canyon. Fourmile Bench and Reynolds Point are high mesa areas in the north and west cut by the deep Drip Tank Canyon and Wesses Canyon. Ship Mountain Point is an outlier near the center of the Ship Mountain Point quadrangle. Although the western part of the map area is a highly dissected, high relief area, the eastern part is fairly flat containing the low relief Caine Bench, Dry Bench, and Smoky Mountain. Last Chance Creek and Drip Tank Canyon drain the northern part of the map area and Clints Canyon, Wesses Canyon, Stony Point Canyon, and Smoky Hollow Canyon drain the southern part into Warm Creek and ultimately Lake Powell.

COAL

No significant coal crops out in the map area; data provided by El Paso Coal Company (drill hole no. 1) in the Ship Mountain Point quadrangle and by Resources Corporation in the north part of the Tibbet Bench quadrangle are the only coal measurements available for this study. These two companies have the coal leases throughout most of the map area. Most of the coal in the map area is in the Christensen coal zone with a few beds in the Rees coal zone and one bed in the Alvey coal zone (drill hole no. 1).

The east-west cross section of the Straight Cliffs Formation from Vaninetti (1978, fig. 11) is one he chose from 32 available primary north-south and east-west sections and many secondary diagonal cross sections and is representative of the area south of Ship Mountain Point. Most of the coal in the southern part of the map area occurs in the Christensen coal zone as seen in the correlation of coal seams 1 through 6 in the east-west cross section. Vaninetti (1978, p. 44–116) presents a detailed study of each of these seams and the methodology of their correlation.

No official information on coal quality is available from the map area, however, an analysis of coal from the Christensen coal zone about 24 miles to the north at the abandoned Don Shurtz mine produced the following results on an air-dried basis (Gregory and Moore, 1931, p. 153): 12.20 percent moisture, 39.35 percent volatile matter, 40.20 percent carbon, 4.25 percent ash, 0.82 percent sulfur, and produced a heating value of 11,108 Btu/lb.

Coal from the Alvey, Rees, and Christensen coal zones taken from a core hole drilled by the U.S. Geological Survey about 16 miles north of the map area on Mossy Dell Ridge had an average (as-received) analysis of 20 percent moisture, 34 percent volatile matter, 38 percent fixed carbon, 7 percent ash, 0.80 percent sulfur, and a heating value of 9,600 Btu/lb (Zeller, 1979). The average heating value for moist, mineral-matter-free Btu was calculated according to the American Society for Testing and Materials (Parr Formula), (Wood and others, 1983, p. 28) and is 10,400 Btu/lb. Although the general class of coal in the Kaiparowits Plateau is subbituminous A, it would be considered a better quality coal if the moisture content was lower. A grab sample from the stock pile of the experimental mine operated by the Freeman Coal Company (for Resources Company and others) in Smoky Hollow was sampled after it had been exposed to the sun for one year. The moisture content of the grab sample was only 3.3 percent, volatile matter 44.0 percent, fixed carbon 47.8 percent, ash 4.9 percent, sulfur 0.40 percent, and the coal produced 12,660 Btu/lb in contrast to the average moisture of coal sampled in a typical Kaiparowits Plateau mine which was 12–14 percent.

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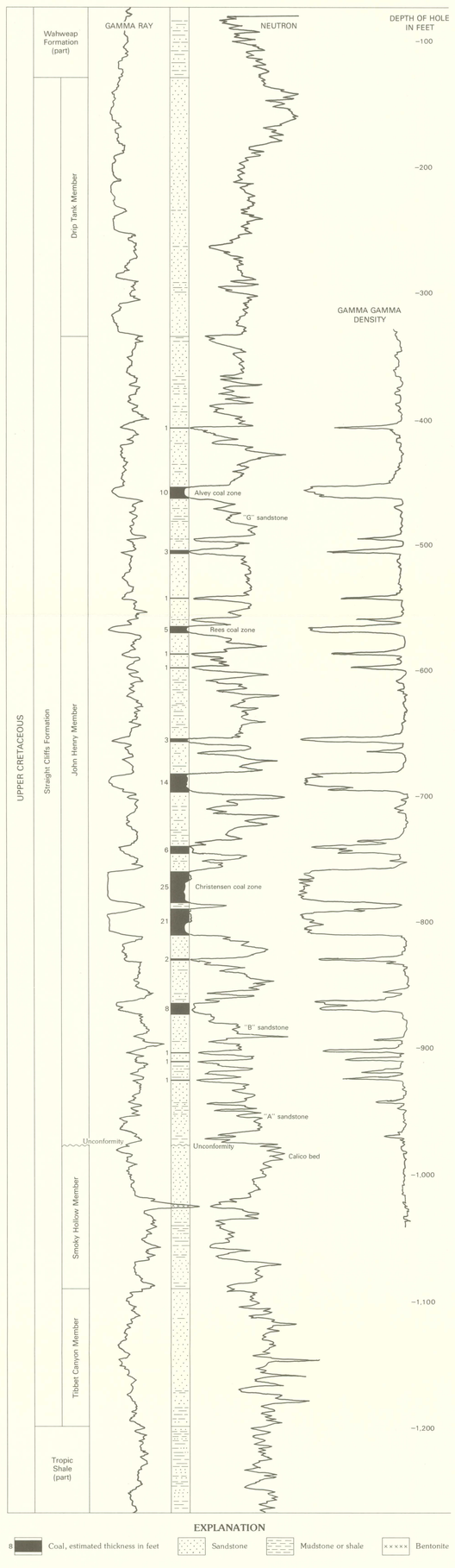
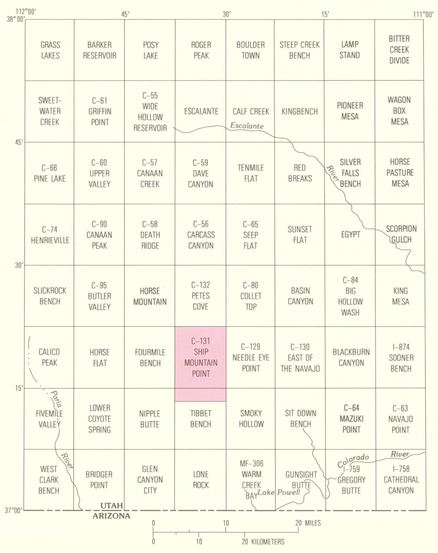
CONVERSION FACTORS FOR METRIC EQUIVALENTS

To convert ENGLISH UNIT	Multiply by	To obtain METRIC UNIT
Short ton	0.9072	Metric ton
Mile	1.609	Kilometer
Foot	.3048	Meter
Inch	2.54	Centimeter
Square Mile	2.59	Square kilometer
Acre	.4047	Hectare

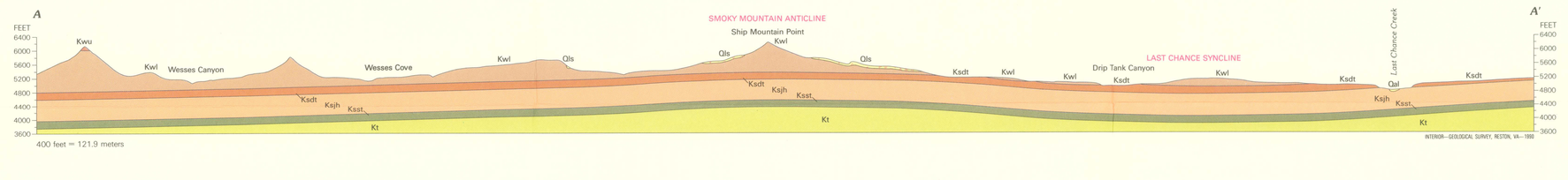
DRILL HOLE NO. 1

Sec. 36, T. 39 S., R. 3 E., Salt Lake Meridian
Used by permission of El Paso Coal Company
Ground level, 5,214 ft





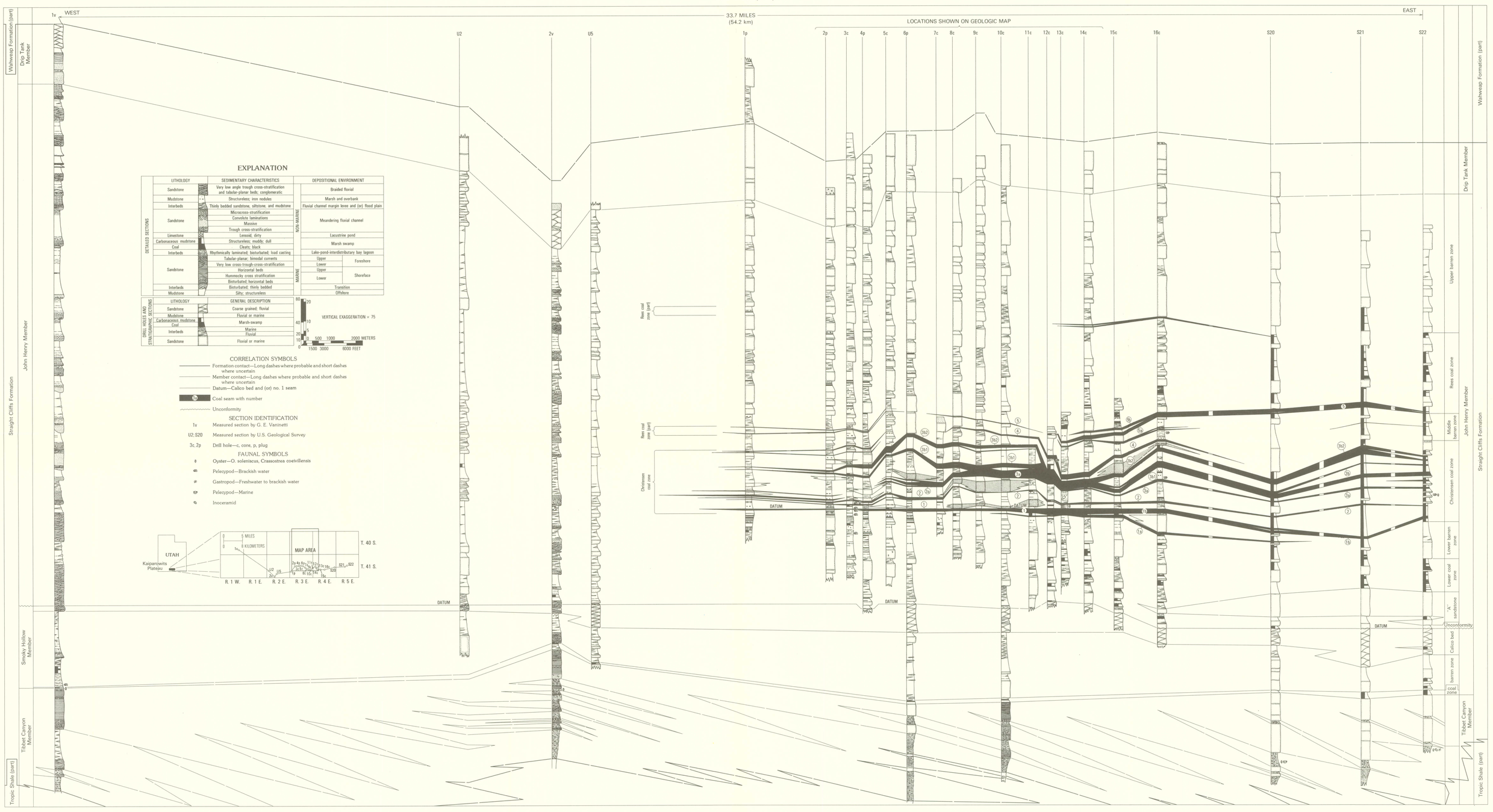
INDEX MAP OF SOUTH-CENTRAL UTAH—Showing Ship Mountain Point and Tibbet Bench quadrangles, quadrangle names, and numbers of recently published U.S. Geological Survey Coal Investigations (C), Miscellaneous Investigations Series (I), and Miscellaneous Field Studies (MF) maps.



INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1990

CORRELATION OF COLUMNAR SECTIONS OF THE STRAIGHT CLIFFS FORMATION

from Vaninetti (1978)



GEOLOGIC MAP AND COAL STRATIGRAPHY OF THE SHIP MOUNTAIN POINT QUADRANGLE AND THE NORTH PART OF THE TIBBET BENCH QUADRANGLE, KANE COUNTY, UTAH

By
H. D. Zeller and G. E. Vaninetti

1990

Any use of trade names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey

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