REPORT OF INVESTIGATIONS NO. 102

SURFACE GEOLOGY AND STRUCTURE OF THE PINEVIEW AREA

SUMMIT COUNTY, UTAH

Prepared at the request of the Division of Oil, Gas, and Mining,
Department of Natural Resources, State of Utah

by
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INTRODUCTION

This investigation of the geologic relationships in the Pineview area was carried out at the request of the State Division of Oil, Gas, and Mining. Their request is the result of an application by the American Quasar Petroleum Company to dispose of water produced with oil into sands of the middle part of the Kelvin Formation. The sands occur below 3700 feet in the No. 1 Newton Sheep Company well and below 3400 feet in the No. 3-1 Union Pacific Railroad Company well according to American Quasar's exhibits B and C, presented before the Board of Oil, Gas, and Mining on August 20, 1975. The major questions to be answered are whether the Kelvin Formation crops out in the vicinity of the proposed disposal well (NE 1/4 section 4, T. 2 N., R. 7 E., S. L. M.), and whether or not other geologic conditions may be significant to the proposed salt water disposal.

Field investigations were carried out on August 26, 1975 by H. R. Ritzma and J. A. Campbell, on August 28, 1975 by J. A. Campbell and R. S. Bacon, and on August 31 by J. A. Campbell.

There is considerable variation in stratigraphic nomenclature of the latest Cretaceous and early Tertiary strata used by various authors who have worked in the area. This report attempts to be consistent with that of Mullens (1971).

GEOLOGIC INVESTIGATION

Most of the Kelvin Formation (Lower Cretaceous) is exposed at the surface in the west part of section 2, T. 2 N., R. 7 E. and in sections adjoining to the north and south (fig. 1). These exposures are about 1 1/4 miles east of the proposed salt water disposal well. The Kelvin and Aspen Formations are exposed on a horst (or upthrown) block, apparently bounded by high-angle faults (fig. 2). Faults were originally mapped in the Pineview area by Eardley (1950-51), and the present investigation adds greater detail and precision to his work.

The presence of the upper part of the Kelvin Formation at the surface is certain where the distinctive lithology of the overlying Aspen Formation is also present. It is also reinforced by the presence of considerable sandstone (the Bear River Formation of some previous authors) in the uppermost part of the Kelvin Formation. However, the similarity of lithologies of much of the Kelvin Formation to parts of the overlying Evanston and Wasatch Formations render the Kelvin inseparable from them in areas of poor exposures and incomplete sections.

Field evidence indicates that the fault bounding the west side of the horst block is as illustrated on figures 1 and 2. However, it is possible that the fault actually occurs farther to the west. The exact position cannot be ascertained on the surface because the fault brings the similar lithologies of the Kelvin and Evanston/Wasatch Formations

into juxtaposition. Subsurface information (seismic profiles and lithologic logs) in the area may be of considerable help in resolving the question of the position of this fault.

Strata exposed in the south part of the Upton Quadrangle (essentially sections 14 through 23 of T. 2 N., R. 7 E. appear to be entirely of the Evanston and/or Wasatch Formations. Therefore it is evident that the subject fault dies out to the south, and that the Kelvin Formation is overlain by younger strata in this area. The relationship of the Kelvin to these truncating latest Cretaceous and early Tertiary strata is not precisely known, but has been discussed briefly by Randall (1952, p. 27-28).

CONCLUSIONS

The Kelvin Formation does not crop out in the Pineview area west of the fault which probably passes through the west part of section 2, T. 2 N., R. 7 E. It is evident from this study and from Randall (1952, p. 7) that most of the Kelvin Formation occurs in section 35, T. 3 N., R. 7 E., although most of the section is poorly exposed.

It is of interest that the sandstones of the same part of the Kelvin Formation that are proposed for salt water disposal at Pineview are used for Natural gas storage at Mountain Fuel Supply's Chalk Creek field, about eight miles west of the present study (see Hale, 1969).

There appears to be no danger to fresh water supplies inherent with the disposal of salt water into the Kelvin Formation in the Pineview area. However, higher formation pressure resulting from prolonged salt water disposal may eventually result in the migration of disposed fluids along faults into other formations.

The nature of the erosion surface which truncates the Kelvin Formation and other Mesozoic strata is not known in any detail, but it is likely to be complex and variable. Eardley (1950-51) illustrates up to 33 degrees of angular discordance at the base of Tertiary sediments. It is unlikely that brine disposal below 3000 feet would cause sufficient pressure increase to cause migration of disposed fluids into the truncating strata which may carry potable water. However, the shallower the strata used for disposal, the greater the probability that undesirable fluid migrations might occur. Therefore it is recommended that shallower stratanot be utilized for brine disposal without specific application to the Board of Oil, Gas, and Mining.

In view of the possible growth of this field to major size, it is also recommended that a comprehensive plan for salt water disposal be worked out for the future. This can only be done with structural and stratigraphic information based on seismic and well data that was not available for this brief study. It is recommended that the operators

of the field be requested to furnish this information to enable the UGMS to cooperate in accomplishing a satisfactory long-term solution to the disposal problem.

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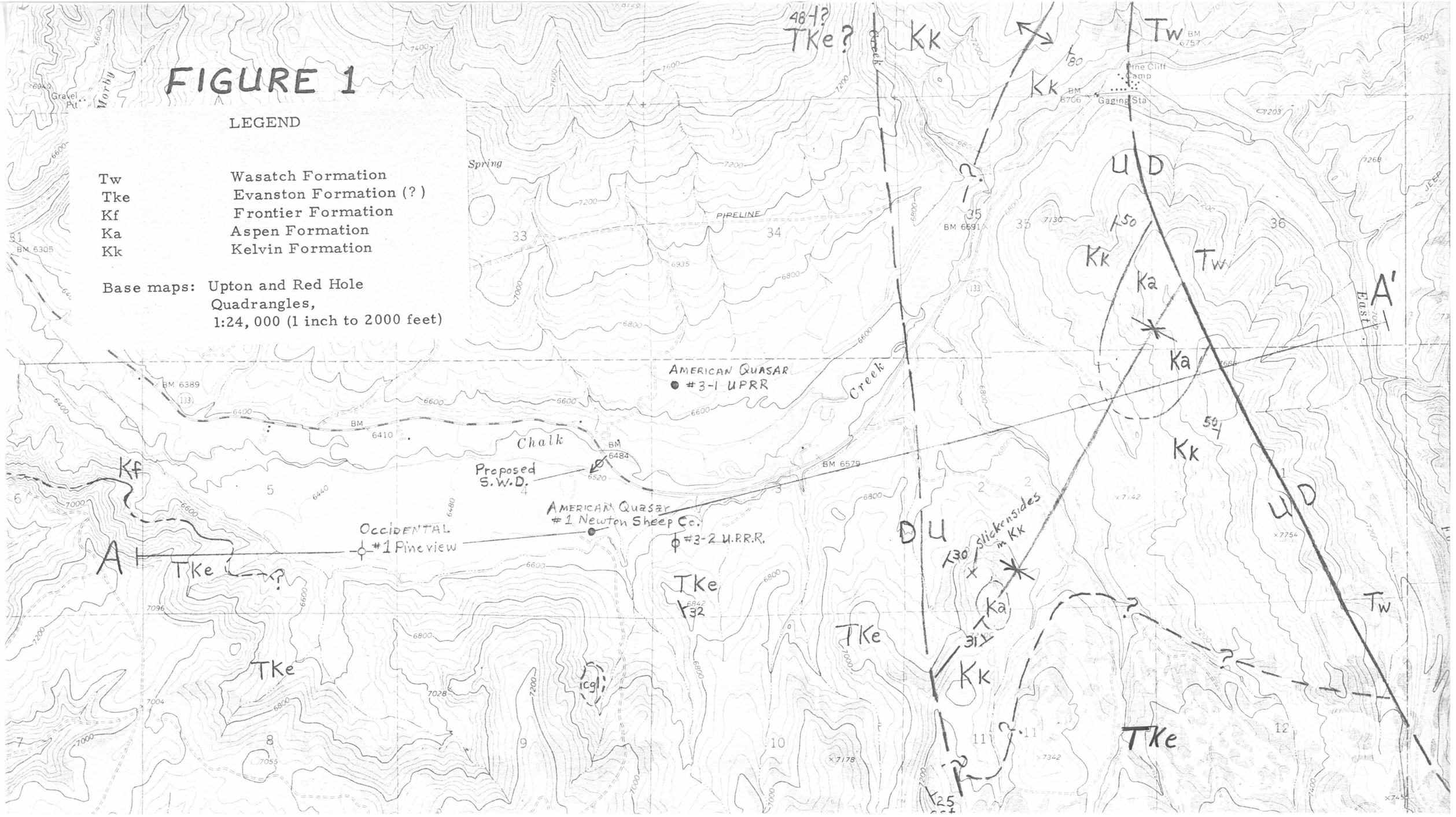
Eardley, Armand J., 1950-51, Geologic and structure-contour map of the Coalville-Chalk Creek area, Summit Co., Utah (unpublished).

Hale, Lyle A., 1969, Northern Utah in Utah Geological Society: Guidebook to the Uinta Mountains, sixteenth annual field conference, p. 101-108.

Mullens, Thomas E., 1971, Reconaissance study of the Wasatch, Evanston, and Echo Canyon Formations in part of northern Utah: U. S. Geol. Survey Bull. 1311-D, 31 p.

Randall, Arthur G., 1952, Areal geology of the Pinecliff area, Summit County, Utah: Univ. of Utah M. S. Thesis, unpublished, 43 p.

FIGURE 1


LEGEND
Tw Wasatch Formation
Tke Evanston Formation (?)
Kf Frontier Formation
Ka Aspen Formation
Kk Kelvin Formation
Base maps: Upton and Red Hole Quadrangles, 1:24, 000 (1 inch to 2000 feet)
Gravel Pit
Morby
Spring
PIPELINE
Pine Cliff Camp
Gaging Sta
BM 6305
BM 6389
BM 6410
BM 6484
BM 6579
BM 6691
BM 6757
Chalk
Creek
Proposed S.W.D.
AMERICAN QUASAR #3-1 UPRR
AMERICAN Quasar #1 Newton Sheep Co.
#3-2 U.P.R.R.
OCCIDENTAL #1 Pineview
Slickensides in Kk
A
A'
East
TKe?
TKe
Kk
Ka
Kf
Tw
U
D
cgl

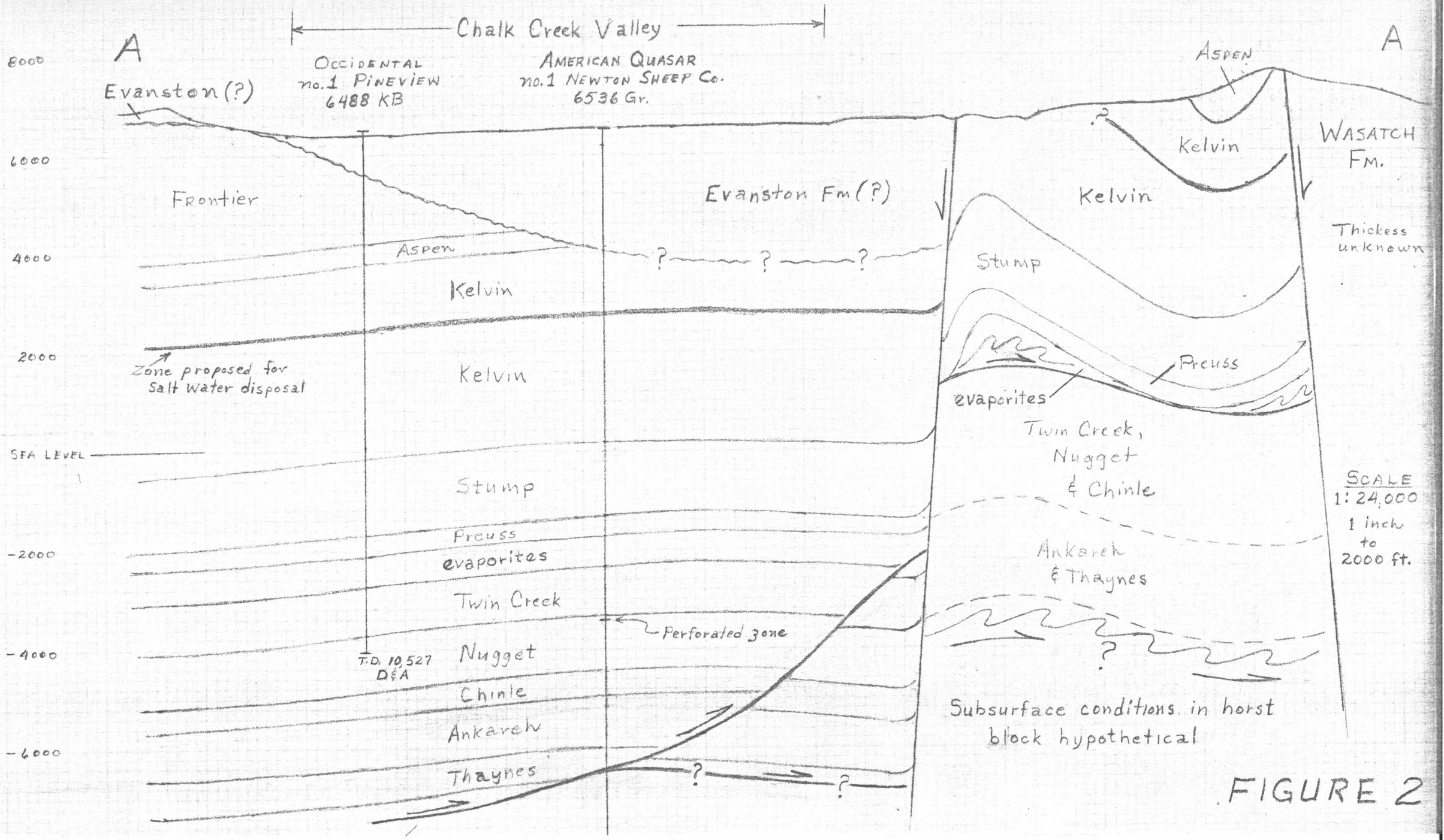

Chalk Creek Valley
A
A
8000
6000
4000
2000
SEA LEVEL
-2000
-4000
-6000
Evanston (?)
Occidental
no. 1 Pineview
6488 KB
American Quasar
no. 1 Newton Sheep Co.
6536 Gr.
Frontier
Aspen
Kelvin
Kelvin
Zone proposed for
Salt water disposal
Stump
Preuss
evaporites
Twin Creek
Nugget
Chinle
Ankareh
Thaynes
T.D. 10,527
D&A
Perforated zone
Evanston Fm (?)
?
?
?
?
?
Aspen
Kelvin
Stump
Preuss
evaporites
Twin Creek,
Nugget
& Chinle
Ankareh
& Thaynes
?
Wasatch
Fm.
Thickess
unknown
Subsurface conditions in horst
block hypothetical
Scale
1:24,000
1 inch
to
2000 ft.

FIGURE 2