OIL SEEP IN UPPER JURASSIC STRATA OF THE NAKNEK FORMATION NEAR BARABARA CREEK ON THE UGASHIK CREEK ANTICLINE, UGASHIK C-1 QUADRANGLE MAP, NORTHERN ALASKA PENINSULA

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The presence of significant surficial oil and gas seeps were the first primary tools used by petroleum explorationists in the search of new prospects in earliest times in the Industry, i.e. Azerbaijan in the former Soviet Union, Indonesia, Africa, Venezuela, Trinidad, California and the area around Titusville, Pennsylvania, site of first commercial oil well in North America drilled by Col. Edwin L. Drake in 1859 (Figure 1).

Seeps were also used as initial target area in Alaska dating back to the beginning of the first decade of the 20th Century in southern Alaska in the area of Katalla, Gulf of Alaska (Blodgett, 2018), the Puale Bay area in northeastern part of the Alaska Peninsula (Blodgett, 2017, Blasko 1976), and the Iniskin Peninsula on west side of Cook Inlet (Blodgett, 2018). An excellent summary of this early exploration activity in southern Alaska was provided by Roderick (1997). Additionally, oil seeps are well known from the North Slope.

Our emphasis here is to present more data on the largest oil seep, the Barabara Ceek seep, on the northeastern Alaska Peninsula, and delineate its stratigraphic setting better (see Figs. 12-13). The Alaska Peninsula and southern Cook Inlet region is under explored and has the potential source and reservoir strata, with working kitchen's strongly suggested by these documented oil seeps. The primary drilling done in the immediate region was completed with primitive cable tool equipment. We feel that reinvestigation and redrilling the immediate area could be highly successful.

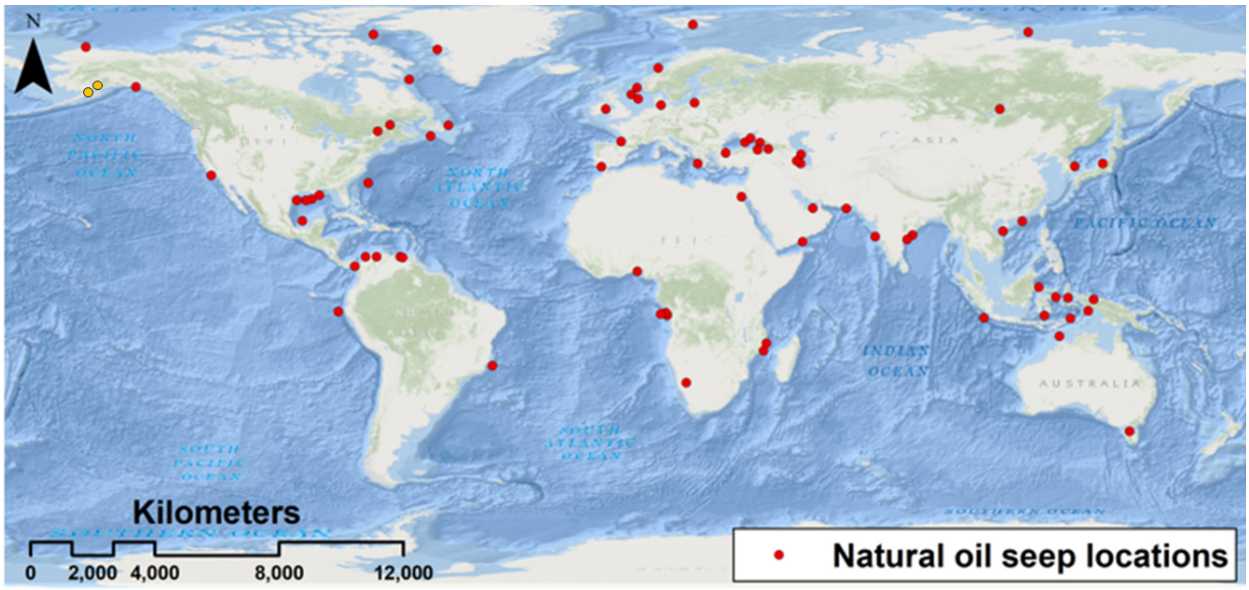

Figure 1. Generalized locations of well-documented natural oil seeps.

Figure 2. U.S. Geological Survey field party led by W.R. Smith cooking breakfast during summer of 1923 over natural gas seeps along the aptly named Gas Creek (NW of Becharof Lake near southern boundary of Katmai National Park). Gas appears to be emerging from stream gravels above Upper Jurassic Naknek Formation.

Ugashik Creek and Bear Creek anticlines

One of the primary seep concentrations on the Alaska Peninsula are situated near the crests of the NE-trending Ugashik Creek and Bear Creek anticlines. In the older archaic exploration language used in the regions these earlier known as the West Field and East Field. The East Field was the locus of drilling activity during the first decade of the 20th Century, and the West Field was subsequently drilled in the 1920's.

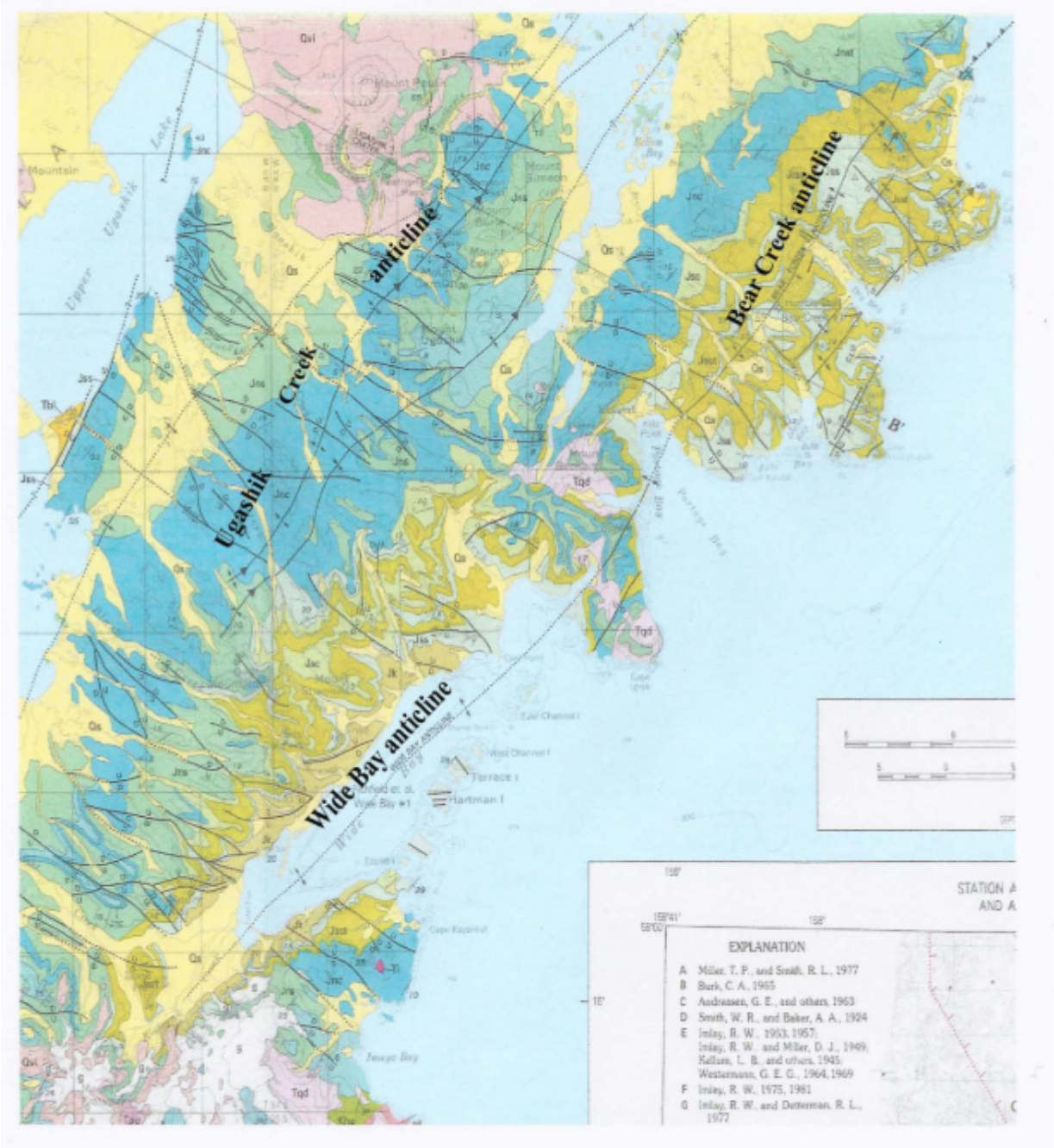

Figure 3. Map showing major anticlinal features in the northern portion of Koniag Inc. land holds on the Alaska Peninsula (base map modified from Detterman et al., 1987). The archiac oil field terms West Field and East Field correspond to the Ugashik Creek and Bear Creek

anticlines, respectively. The Wide Bay anticline represents a southerly extension of the Bear Creek anticline.

Figure 4. Reported oil seeps along the Ugashik Creek anticline (localities 11-13). Most of these are on or adjacent to current land holding of the Koniag Corporation. Locality 11, the Barabara Creek seep is the largest seep in the entire Puale Bay - Lake Becharof region and is located on the north side of Barabara Creek (mislabeled Little Ugashik Creek on current USGS Ugashik C-1 quadrangle topographic sheet). It is located near the base of a west-trending ridge descending from Mount Lee. Several well drills drilled in the 1920's (notably Lee #1 wel1) are located immediately to the south on the westerly flanks of Mount Demian. Test results from Weatherford Laboratories indicated the oil from the Barabara Creek seep to have an API Gravity @ 60° value of 16.0. All of these seeps are associated with nearby outcroppings of strata belonging to the lowermost part of the Upper Jurassic Naknek Formation (figure from Blodgett and Clautice, 2005).

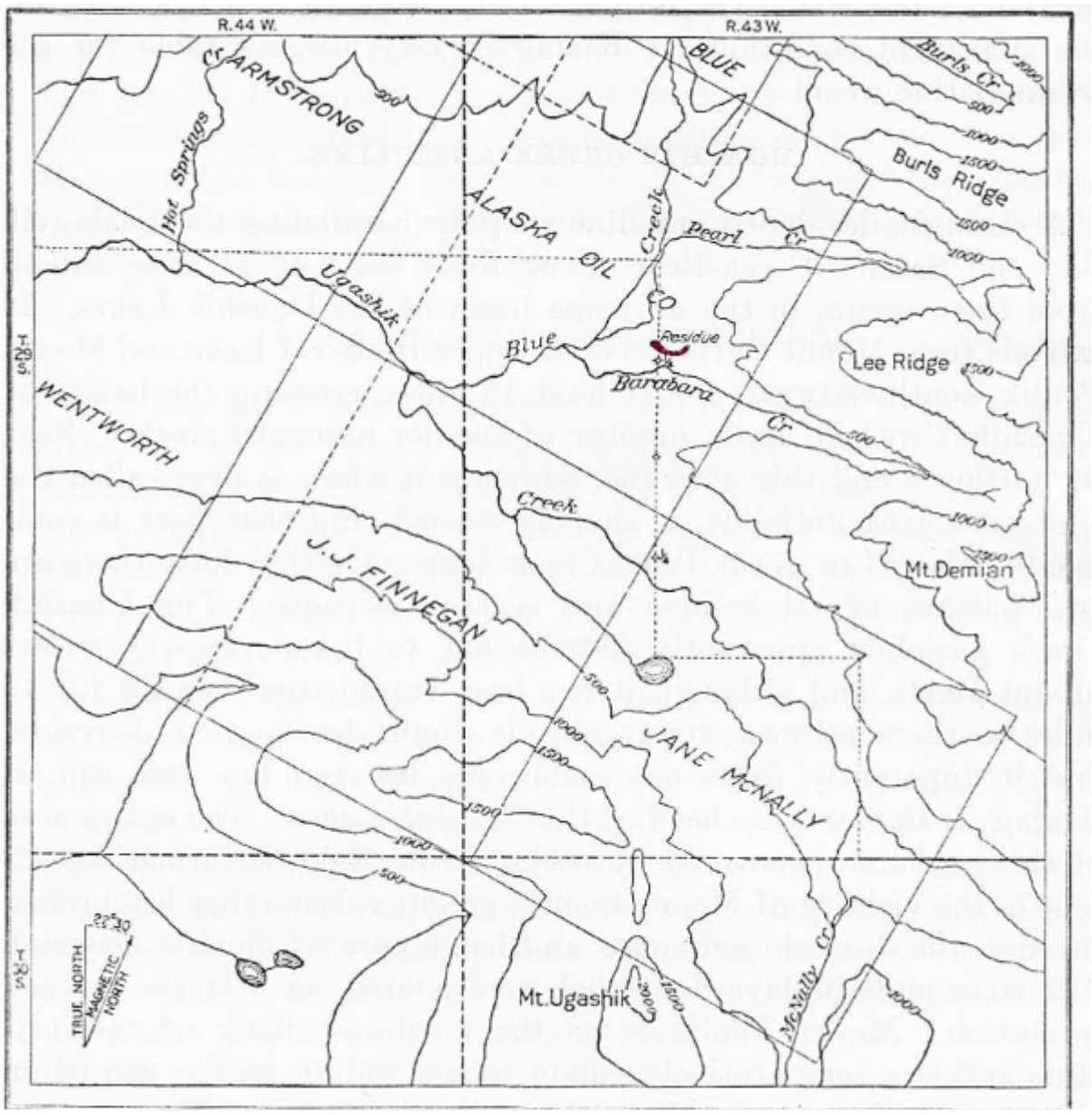

Figure 5. Map from Capps (1923, Fig. 6) showing Barabara Creek oil seep (colored red) and correct original locations of Barabara Creek and Pearl Creek (note the current USGS topographic map of the Ugashik C-1 quadrangle incorrectly labels them as Little Ugashik and Barbara creeks, respectively).

Figure 6. Barabara Creek oil seep. Pearl Creek Dome visible in the upper right corner.

Figure 7. Oil seepage along lower course of large oil seep on north side of Barabara Creek (mislabeled Little Ugashik Creek on current USGS Ugashik C-1 quadrangle topographic sheet). Seepage north of the "West Field" (Pearl Creek Dome) oil camp. Seepage referred to in Capps (1923), Smith and Baker (1924), and Smith (1926).

Figure 8. Oil seepage in middle of large oil seep on north side of Barabara Creek (mislabeled Little Ugashik Creek on current USGS Ugashik C-1 quadrangle map).

Figure 9. Oil seepage from upper end of large oil seep on north side of Barabara Creek (mislabeled Little Ugashik Creek on current USGS Ugashik C-1 quadrangle map). This is one of the largest and most oil-rich patches at this seep.

Figure 10. Another view of the oil seepage shown above from upper end of large oil seep on north side of Barabara Creek (mislabeled Little Ugashik Creek on current USGS Ugashik C-1 quadrangle map). This is one of the largest and most oil-rich patches at this seep.

Figure 11. Another view of the same oil seepage shown in Figures 6-10.

BARABARA CREEK OIL SEEP

The so-called "West Field" which was the locus of oil drilling on the Alaska Peninsula in the early 1920's was obviously selected due to the presence of two major oil seeps (localities 11-12 of Blodgett and Clautice, 2005) along Barabara and Pearl Creek of original usage (respectively now shown as Little Ugashik and Barbara Creeks on the current USGS Ugashik C-1 quadrangle topographic sheet). All of these seeps are situated just west of the axis of the Ugashik Creek anticline and are emerging from near outcrops of the basal part of the Upper Jurassic Naknek Formation [Jnc unit (or conglomerate member) of Detterman et al., 1987). We have visited the classic Barabara Creek seep (locality 11 of Blodgett and Clautice, 2005) and was impressed by the size and quality of oil issuing from this seep. It is by far the largest known seep in the upper Alaska Peninsula and the purity of oil in the upper reaches of the seep area exceeds that of all other known seeps that we are familiar with in southern Alaska.

Downslope from the seep is a residue patch which was mined during the 1920's to provide fuel for the drilling operations. This seep is documented photographically in Figs. 6-11. This seep was not reported upon in the definitive regional seep survey of Blasko (1976), presumably he and his colleagues were unable to locate this during aerial reconnaissance. A sample of oil was collected during the summer of 2012 and a geochemical analysis was done by Weatherford Laboratories (Shenandoah, Texas), the results. The Barabara Creek seep is closely associated with a major fault that trends down the creek (Smith, 1926), and seems most likely that this seep and its associated residue patch are directly linked to fractures along the fault trace.

SUMMARY

Cook Inlet and the Alaska Peninsula are a Fore Arc Basin dating from the Mesozoic to Present times and a major Oil and Gas producing Basin (USGS suggests there is ~650 million barrels of Oil, Condensates, NGLs, and 19 TCF of Gas Yet-To-Find in just North Cook Inlet). North Cook Inlet has been the focus of production since 1958 and has produced 1.2 Billion bbls and ~ 8 TCF of Gas from this area. The Alaska Peninsula and southern Cook Inlet region is under explored and has the potential source and reservoir strata, with working kitchen's strongly suggested by these documented oil seeps. Source rocks in this Southern Cook Inlet and Alaska Peninsula area, to date are seen in the Triassic and Jurassic marine strata (see Figs. 12-13).

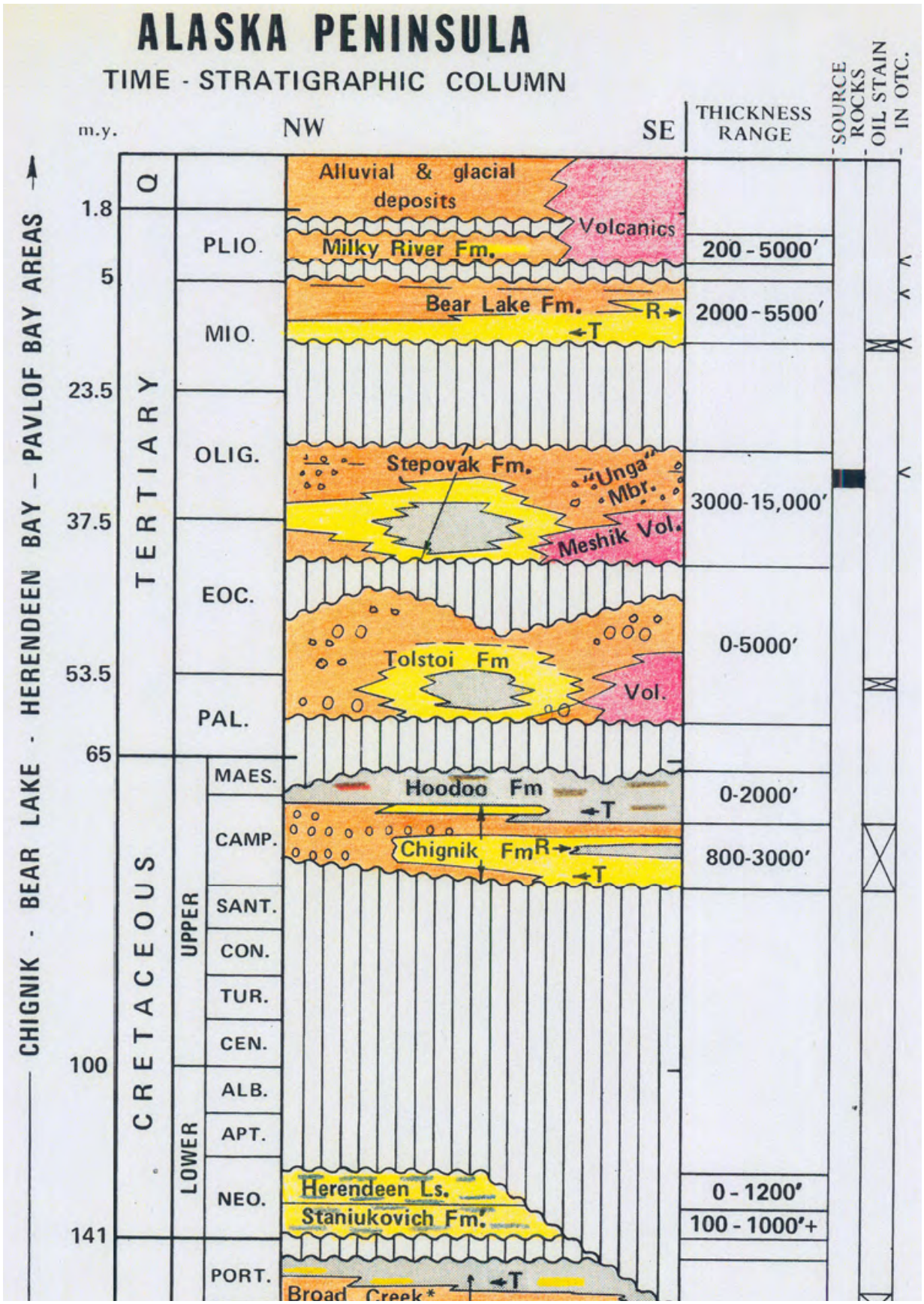
ALASKA PENINSULA
TIME - STRATIGRAPHIC COLUMN
CHIGNIK - BEAR LAKE - HERENDEEN BAY – PAVLOF BAY AREAS
m.y.
NW
SE
THICKNESS RANGE
SOURCE ROCKS
OIL STAIN IN OTC.
1.8
5
23.5
37.5
53.5
65
100
141
Q
TERTIARY
CRETACEOUS
PLIO.
MIO.
OLIG.
EOC.
PAL.
UPPER
LOWER
MAES.
CAMP.
SANT.
CON.
TUR.
CEN.
ALB.
APT.
NEO.
PORT.
Alluvial & glacial deposits
Volcanics
Milky River Fm.
200 - 5000'
Bear Lake Fm.
R
T
2000 - 5500'
Stepovak Fm.
Unga Mbr.
Meshik Vol.
3000-15,000'
Tolstoi Fm
Vol.
0-5000'
Hoodoo Fm
T
0-2000'
Chignik Fm
R
T
800-3000'
Herendeen Ls.
0 - 1200'
Staniukovich Fm.
100 - 1000'+
T
Broad Creek*

Figure 12. A stratigraphic column for the Mesozoic and Tertiary age rocks of the northern Alaska Peninsula (from Molenaar, 1977, fig. 2). Note three source horizons for petroleum indicated: the Upper Triassic Kamishak Formation (=his Kekurnoi Fm.), the Middle Jurassic Kialagvik Fm. (equivalent to the Tuxedni Group in Cook Inlet) and the Upper Jurassic Naknek Fm.

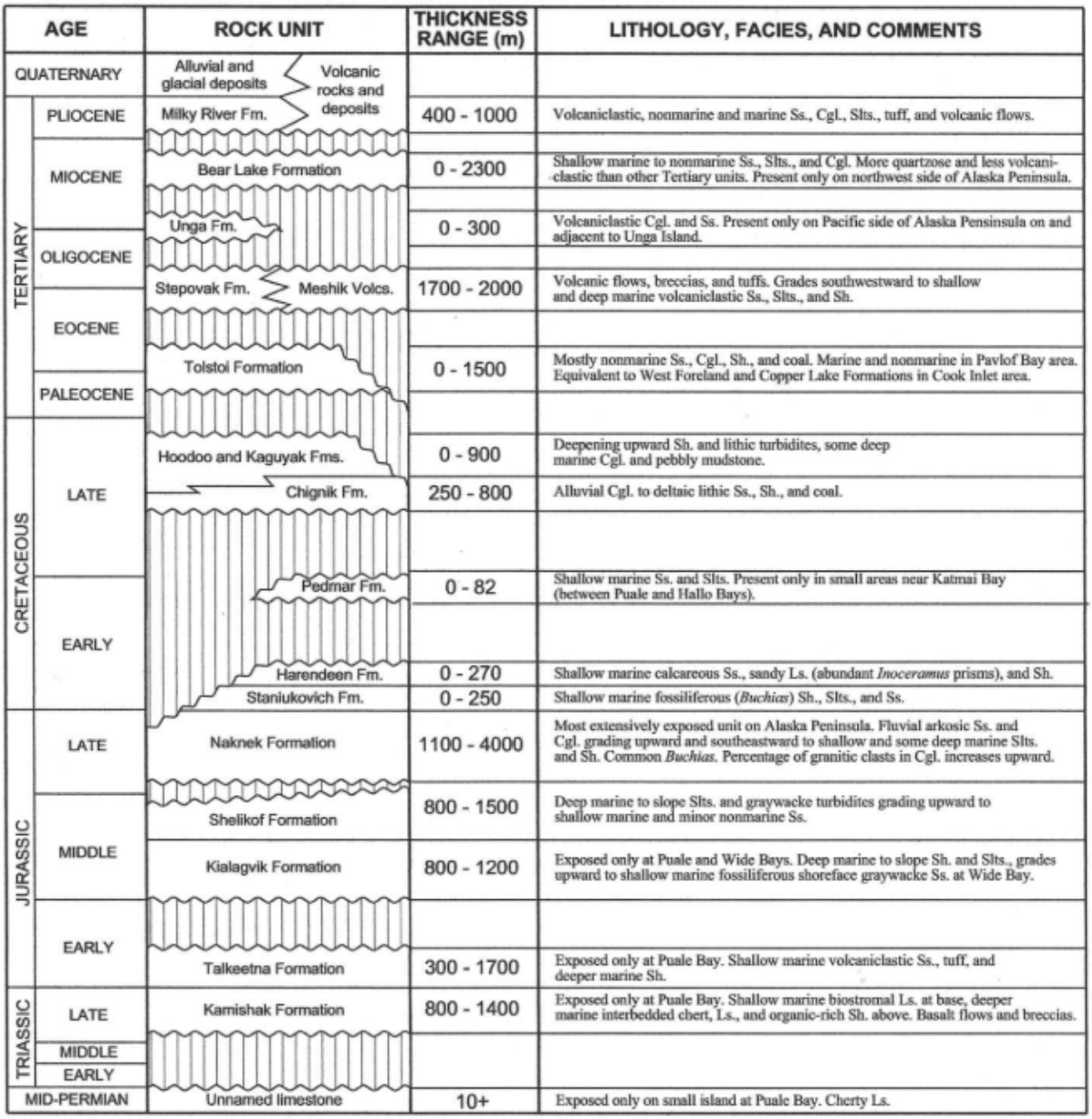

Figure 13. A later updated Stratigraphic column of the Alaska Peninsula (from Molenaar, 1996, fig. 2). Ss., sandstone; Cgl., conglomerate; Slts., siltstone; Sh., shale; Ls., limestone.

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