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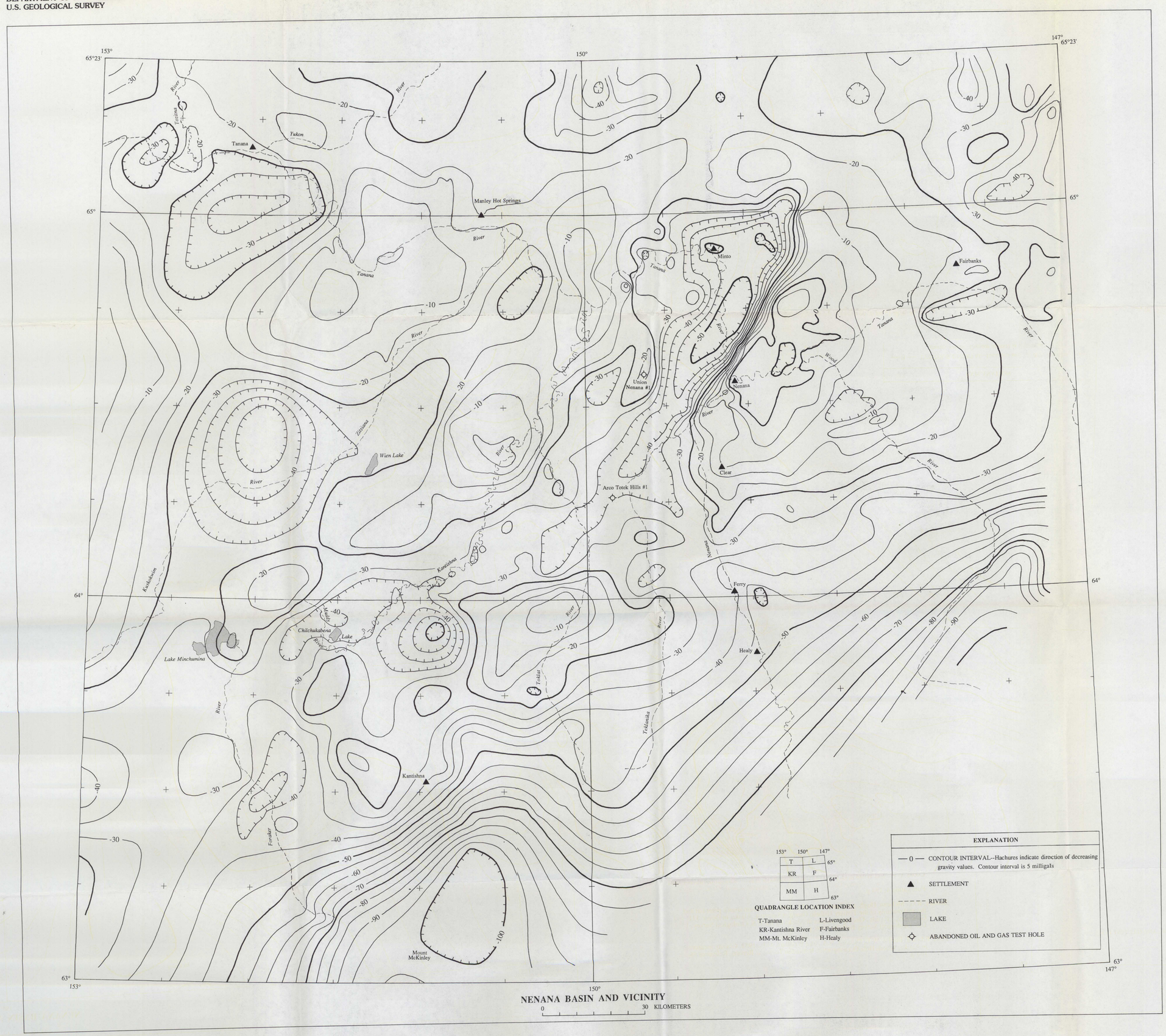
SHEET 1 OF 5



NENANA BASIN AND VICINITY

0 30 KILOMETERS

153° 150° 147°

T	L	65°
KR	F	64°
MM	H	63°

QUADRANGLE LOCATION INDEX

T-Tanana	L-Livengood
KR-Kantishna River	F-Fairbanks
MM-Mt. McKinley	H-Healy

EXPLANATION

- —0— CONTOUR INTERVAL--Hachures indicate direction of decreasing gravity values. Contour interval is 5 milligals
- ▲ SETTLEMENT
- ----- RIVER
- LAKE
- ABANDONED OIL AND GAS TEST HOLE

SIMPLE BOUGUER GRAVITY ANOMALY MAPS OF THE NENANA BASIN AREA, ALASKA

By

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DISCUSSION

These maps show most of the gravity measurements now available to the public from the Nenana basin area, central Alaska. The initial data showing a small sedimentary basin beneath the Minto Flats were published by Barnes (1961) and were later extended for preparation of the gravity map of Alaska (Barnes, 1977a, b). These data were then augmented by M.A. Fisher, J. Blank, T.R. Bruns, and P.V. Woodward during 1983, 1984, and 1985.

The early data were gathered largely along river and road traverses supplemented by a few landings of float- and ski-equipped airplanes. Temperature-compensated World Wide gravimeter WW11 was used to acquire the early data along the Alaska Railroad and around the Minto Flats. Thermostatically controlled LaCoste and Romberg gravimeters G17 and G426 were used for the more recent data collection. Gravity datum for the initial survey was obtained from stations established by Thiel and others (1958), but this datum was later modified by Barnes (1968). For these maps the data have all been modified to agree approximately with IGSN-71 (Morelli and others, 1974) and the absolute measurement at Fairbanks by Hammond and Faller (1971). A central base which can be used for future data collection is station "B-W4" at Nenana on the ground adjacent to USG&GS W4 at the northwest corner of the present railroad museum (former railroad station), and now obscured by a flower bed, where the gravity is 982,235.95 mGal on the IGSN-71 datum.

Elevation control was obtained from railroad surveys on the Alaska Railroad, from highway surveys on the principal highways, and from river gradients along the rivers. A few additional measurements were made at vertical angle benchmarks, and altimetry was used for the remaining measurements. Fisher, Blank, Bruns, and Woodward averaged the readings of three altimeters and used a recording base altimeter. The accuracy of the elevation control thus ranges from ± 0.2 m along the railroad to an estimated ± 10 m for the older altimetry data. The Bouguer anomalies were calculated with a reduction density of 2.67 g/cm^3 and the 1967 Geodetic Reference System (International Association of Geodesy, 1971), and have not been corrected for the effects of local terrain. Such corrections are probably unimportant in the flats that cover much of the mapped area, but may be large (5 mGal or more) in the Alaska Range and other highland areas.

The reduced data were initially gridded and contoured using a computer program known as Interactive Surface Modeling (ISM, a trademark of Dynamic Graphics, Inc.). The computer-generated contours were later modified by hand drafting for better agreement with individual station values. A few measurements have been omitted because of possible errors indicated by significant variations from nearby stations.

The maps were prepared as part of a U.S. Geological Survey effort to evaluate the undiscovered petroleum resources of central Alaska. The most promising area for oil and gas exploration is an elongate, northeast-trending gravity low with a maximum value of about -55 mGal in the area north of Nenana. This gravity low, first described by Barnes (1961), is believed to represent the deepest part of a subsurface sedimentary basin variously named the "Nenana basin" (Kirschner, 1988) and the "Middle Tanana basin" (Miller and others, 1959; Ehm, 1983). Gravity modelling and borehole records from two nearby wells, the Union Nenana No. 1 and the ARCO Totek Hills No. 1, suggest that in the area of the gravity low the Nenana basin is fault-bounded on its eastern flank, and filled by up to 3,000 m of Cenozoic strata (Barnes, 1961; Kirschner and others, 1985; Kirschner, 1988), including nonmarine fluvial and lacustrine deposits of the Eocene to Miocene Usibelli Group (Stanley and others, 1990). Organic geochemical studies indicate that mudstones and coals in the Usibelli Group are potential sources of petroleum; calculations based on borehole temperatures from nearby wells suggest that, in the area of the Nenana gravity low, these rocks may have been buried deep enough to generate hydrocarbons (Stanley and others, 1990). Other gravity lows along trend to the southwest of Nenana may reflect additional Cenozoic sedimentary basins.

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