SUPPLEMENTAL INFORMATION

Flow-Model Design

The flow model consists of three active layers with head-dependent vertical leakage between layers. Lateral hydraulic conductivity and transmissivity were spatially distributed as previously indicated. Vertical leakance between active layers was calculated as the vertical hydraulic conductivity of shale (3.6×10^{-4} ft/d) divided by the thickness of the confining layers and was spatially distributed on the basis of shale thickness as previously defined.

Several types of boundary conditions were used in the model. Precipitation recharge was simulated at nodes at the outcrops of each aquifer as indicated in figures 51-53. The rate of recharge was calculated as the product of the potential recharge rate times the area of outcrop in each node. A constant-head boundary condition was simulated at each node representing the subcrop of the entire thickness of an aquifer under a perennial stream. Most constant-head nodes are located near the more steeply dipping formations at the margins of the aquifers (figs. 51-53). Constant-head altitudes were defined by the altitude of the stream at the subcrop. Head-dependent leakage into or out of a stream overlying an aquifer (but not in contact with the full thickness of the aquifer, as in the case of constant-head nodes) was simulated by river nodes. Spatially distributed conductance of the river confining layer was estimated on the basis of the shale thickness in the aquifer near the river and the vertical hydraulic conductivity of shale. Ground-water discharge by evapotranspiration and springs in areas where the overlying confining layer outcrops was simulated by head-dependent discharge ("L" in figs. 51 and 52). Spatially distributed conductance of the confining layer was defined by the shale thickness of the outcrop part of the unit and the vertical hydraulic conductivity of shale. No cross-boundary flow was simulated on the periphery of the aquifers because the aquifers outcrop or because model boundaries coincide with the potentiometric gradient.

Solute-Transport Model Design

The design of the solute-transport model is similar to that of the flow model except for those aspects that deal with vertical connection between layers. Both models use the same grid spacing and the same grid network (figs. 54 and 55), although two additional rows and columns of inactive nodes are required by the solute-transport model code. The models share common values and areal distributions of lateral hydraulic conductivity, precipitation recharge, constant-head nodes, rivers, and discharge to outcrops of the confining layers. In the flow model, vertical leakage between model layers is computed by the model as a function of head difference between model layers. The solute-transport model simulates only a single layer and vertical leakage is specified in the model as a constant rate of recharge or discharge. The rate and spatial distribution of vertical leakage used in the solute-transport model is defined by flow-model results. Because both models simulate steady-flow conditions, changes in vertical leakage with time are not considered. In figure 54, vertical leakage between the underlying Trout Creek aquifer ("U") is differentiated from the vertical leakage to the overlying Twentymile aquifer ("M"); however, leakage is used in the solute-transport model as a net value.

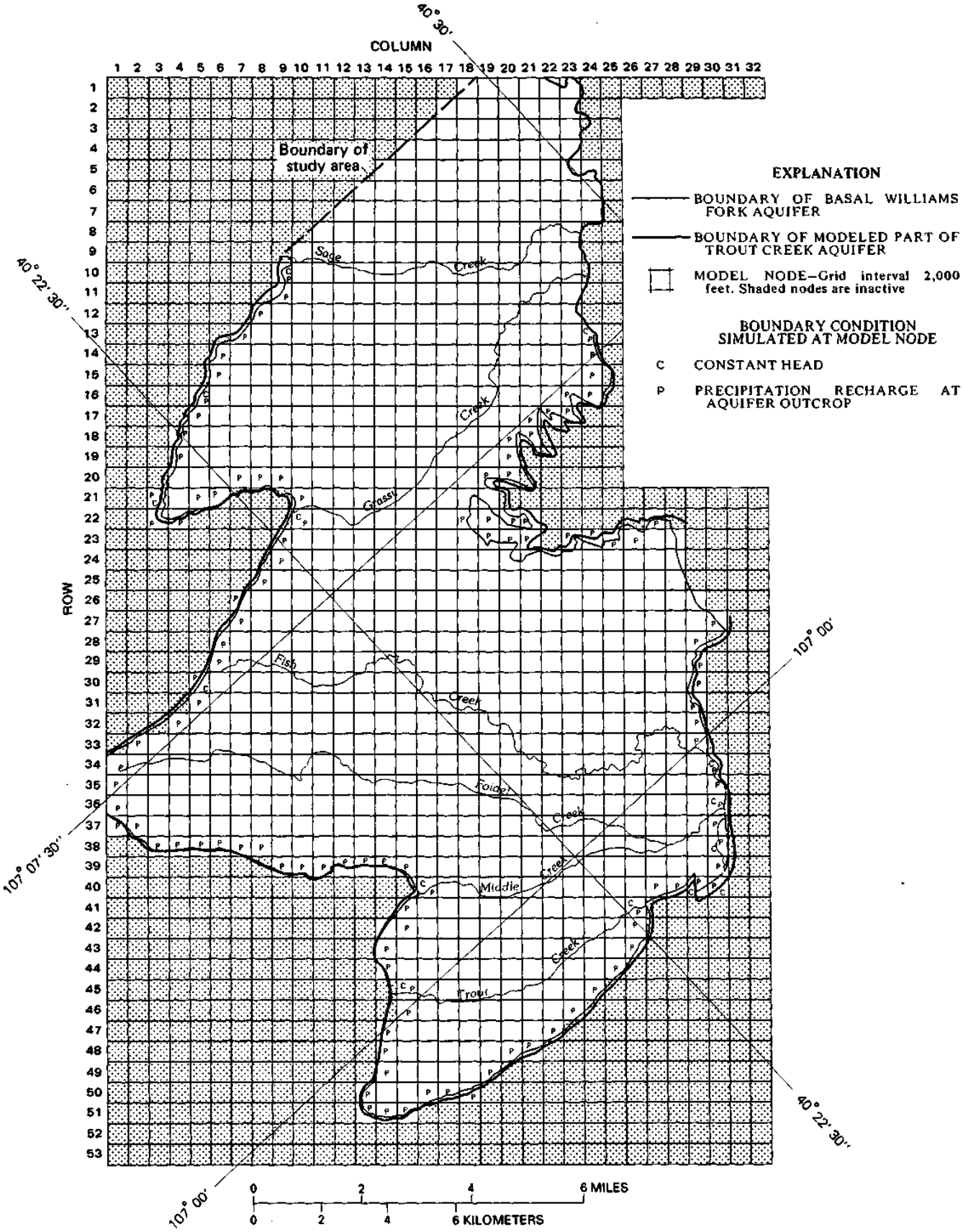

Figure 51.--Flow-model grid and nodal distribution of boundary conditions in the Trout Creek aquifer.

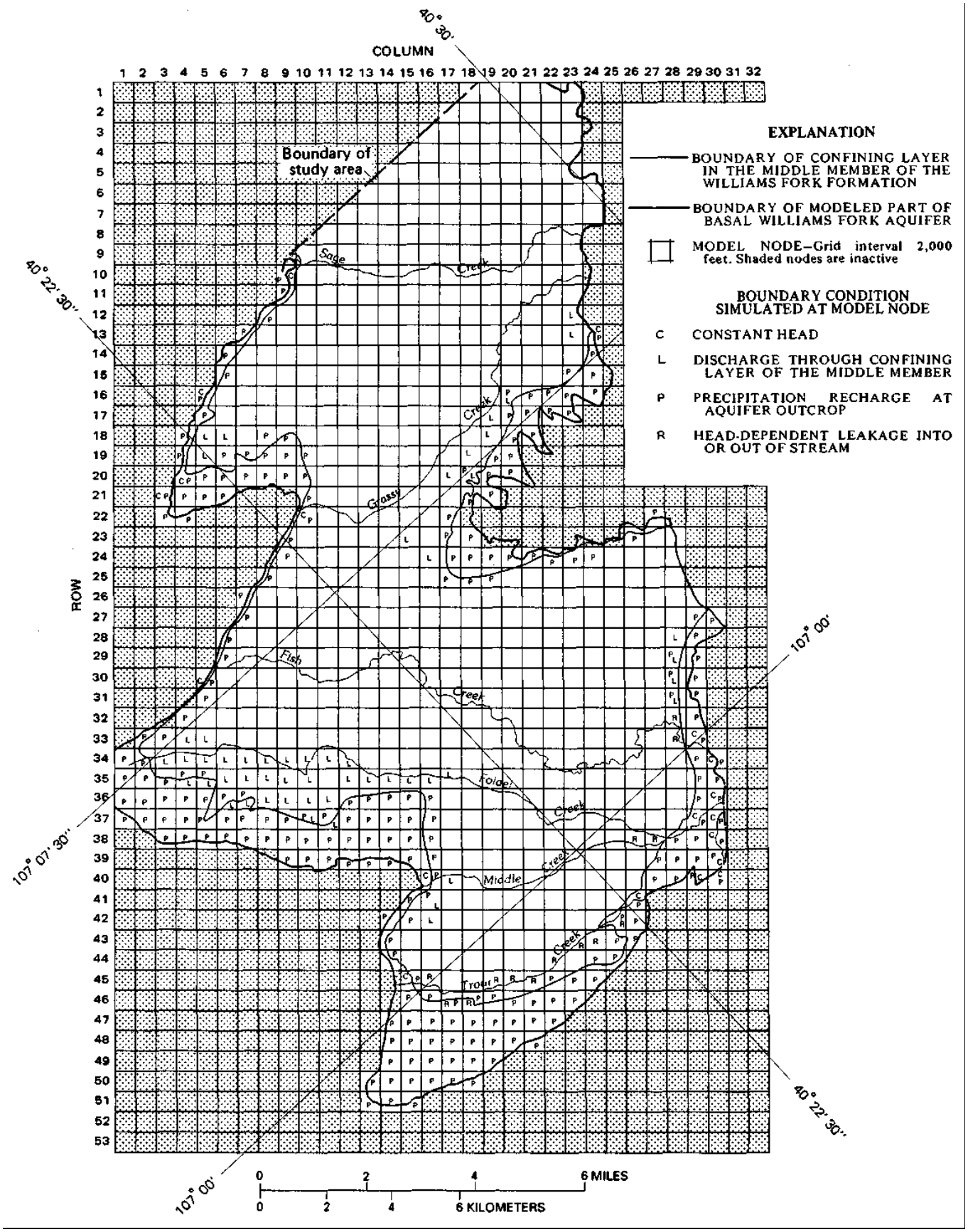

Figure 52.--Flow-model grid and nodal distribution of boundary conditions in the basal Williams Fork aquifer.

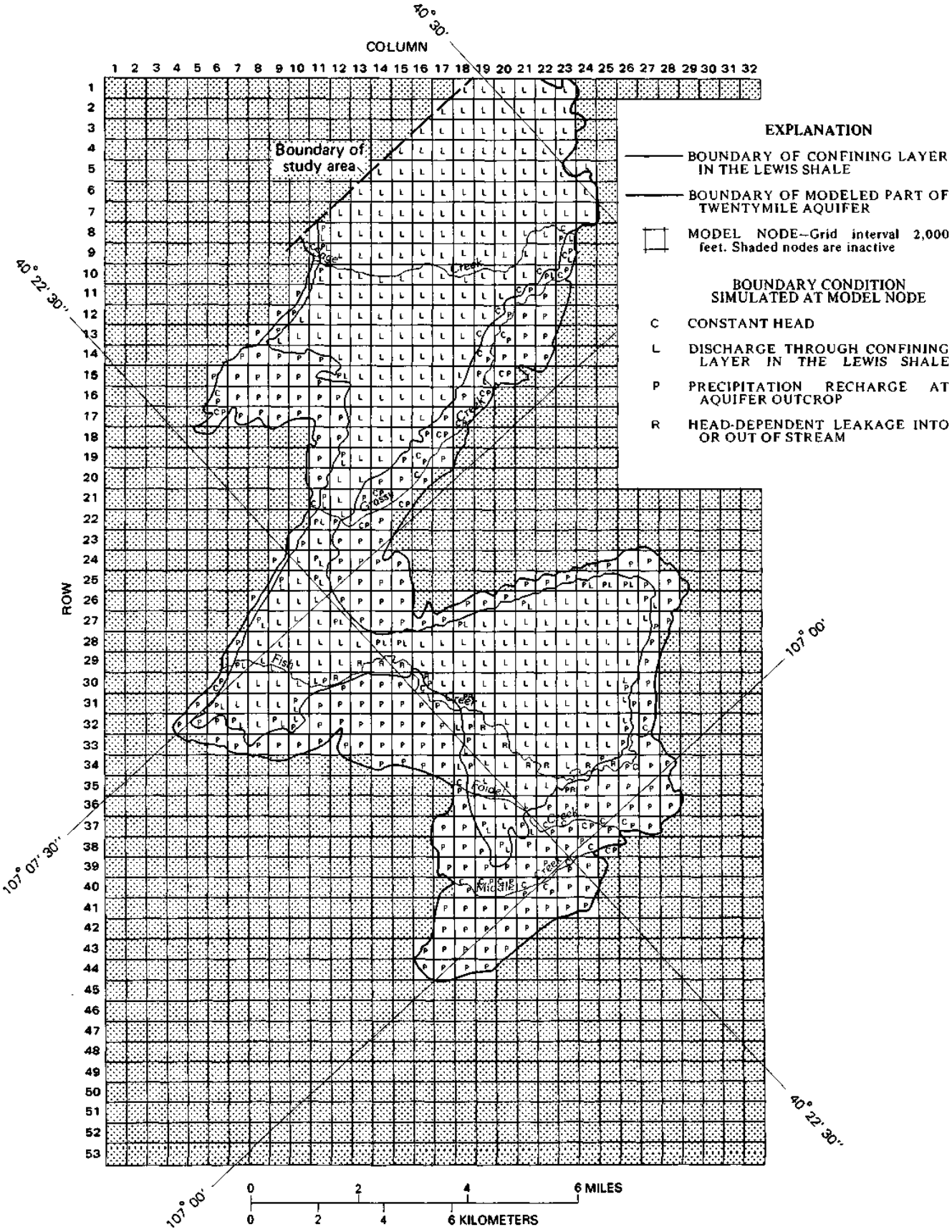

Figure 53.--Flow-model grid and nodal distribution of boundary conditions in the Twentymile aquifer.

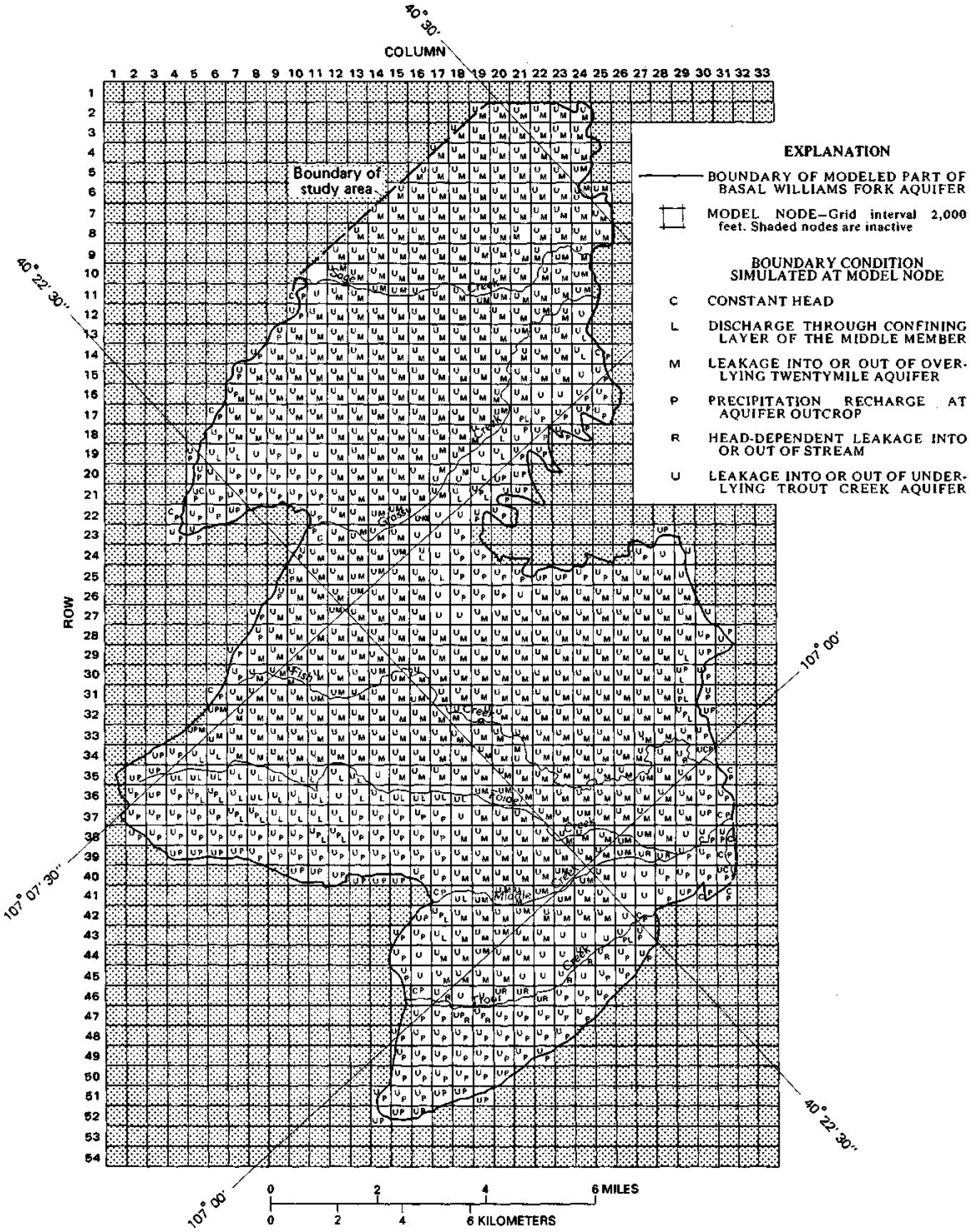

Figure 54.--Solute-transport model grid and nodal distribution of boundary conditions in the basal Williams Fork aquifer.

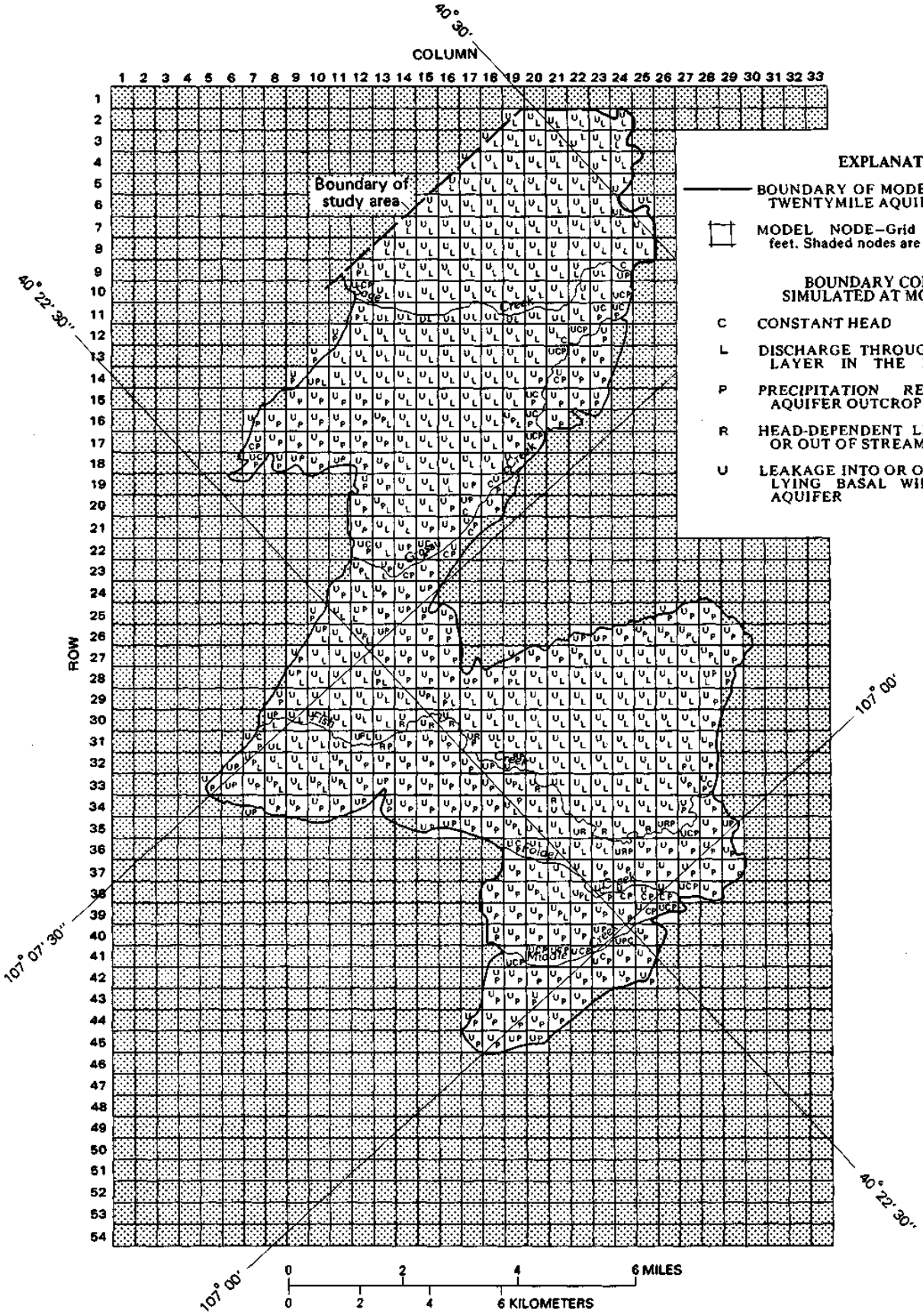

Figure 55.--Solute-transport model grid and nodal distribution of boundary conditions in the Twentymile aquifer.

☆US. GOVERNMENT PRINTING OFFICE: 1991 - 574-286