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WMHT: ~~3184~~ vol. 2

Dr. Raul Deju
Rockwell Hanford Operations
P. O. Box 800
Richland, WA 99352

Dear Dr. Deju:

As a follow-up of an April 16 telephone conversation between RHO's Arnett and LaRue and NRC's Prestholt, Quinn and Wright I enclose two copies of pages from an NRC draft document. Page 8 discusses perceived differences between RHO's conceptual and mathematical groundwater models. Pages to 43 discuss perceived differences between RHO and PNL groundwater models.

This material is in preliminary form and has not been completely reviewed or edited by the NRC. However, preliminary review suggests that the final version will not be substantially different from the enclosed draft.

Sincerely,

ORIGINAL SIGNED BY

Robert J. Wright
Senior Technical Advisor
High-Level Waste Technical
Development Branch
Division of Waste Management

Enclosure:
As stated

cc w/encl:
R. Stein, DOE, Washington
R. Goranson, DOE, Richland

OFFICE	WMHT	WMHT					
SURNAME	RJWright	HJMiller					
DATE	4/20/82	4/20/82					00170

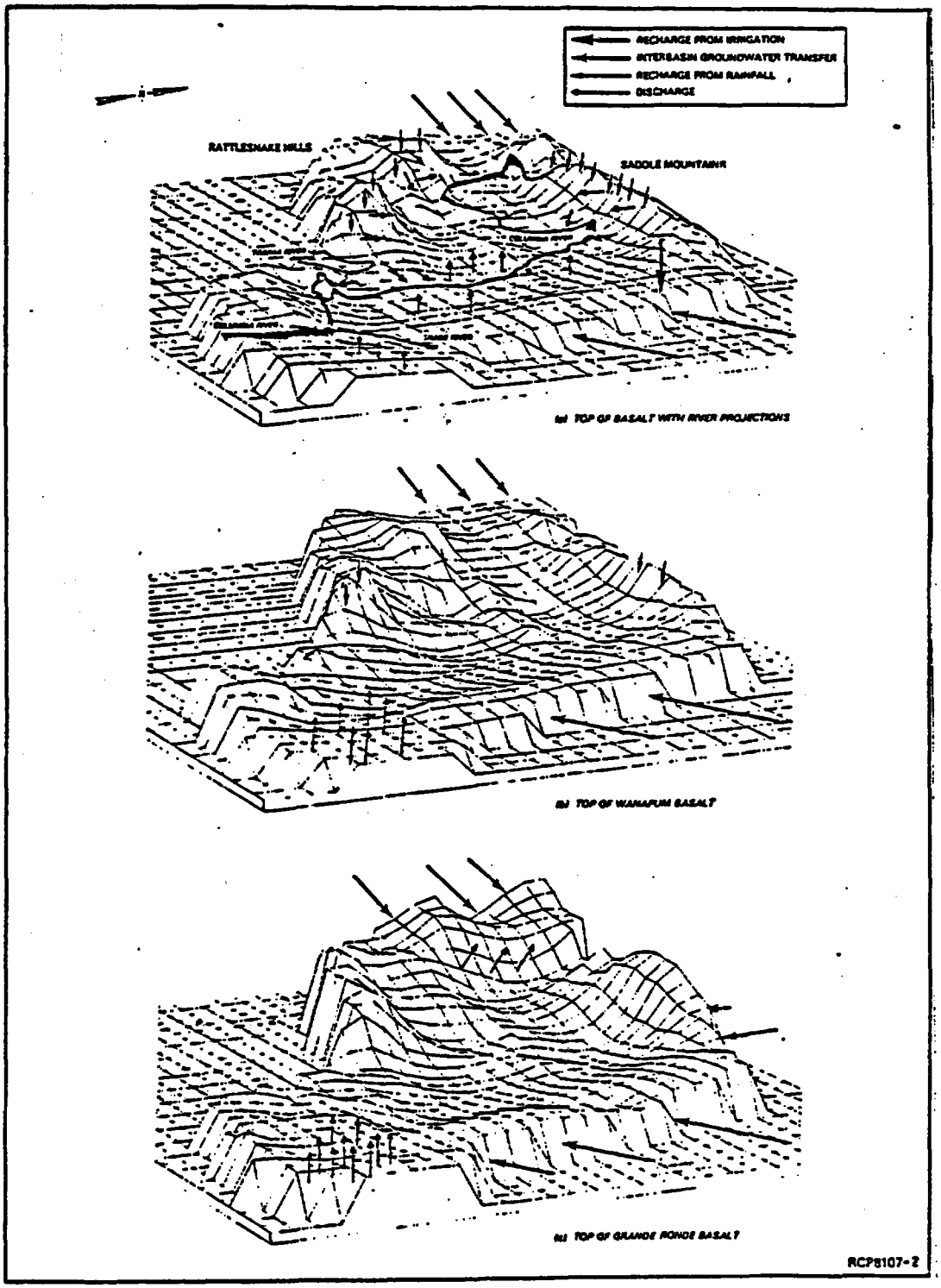

Figure 2. Pasco Basin Conceptual Groundwater Flow - RHO (After, RHO- BWI-LD-44)

Discharge is occurring:

1) to the Columbia River in the top layer;
2) at the southeast corner (Wallula Gap area) in all layers; and
3) along the flanks of Rattlesnake Hills in the Grande Ronde Basalt.

Figure 3 shows the plan view of the Pasco Basin grid network used by RHO in their simulation. All numerical values are boundary conditions expressed as hydraulic head in meters above mean sea level. It can be seen that along the eastern boundary a recharge condition is shown to exist in the conceptual model; head values used in the simulation, however, indicate either horizontal flow (head constant with depth) or discharge, i.e., head increasing with depth. Conversely, the southeastern corner of the conceptual model is designated as a discharge area; but in the numerical model pressure heads either are constant with depth or decrease with depth as is typical of recharge pressures.

Additionally, Rockwell has forced the water table to maintain a specific configuration through the use of constant head boundaries.

The following discussion regarding boundary conditions is taken directly from RHO-BWI-LD-44:

> The boundary conditions for the initial MAGNUM-3D simulation were developed in part from the broad criteria listed below.
>
> - The heads for the upper boundary nodes lying below the Columbia, Yakima, and Snake Rivers are assumed to be equal to the average river stages. By implication, the head in the unconfined region lying between the rivers and the basalt groundwater system is assumed to be hydrostatic. The average river stages are obtained from Plate III-4 of Gephart et al. (1979).

Comparison of Boundary Conditions

The boundary conditions used in the NRC simulations used were the same pressures that were assumed to exist at the margins of the basin by RHO and PNL. The bottom surface in all cases was assumed to be a no-flow boundary. In simulating the RHO and PNL models, the NRC did not restrict the water table configuration. Instead, the NRC simulations allowed the water table to equilibrate naturally in response to the boundary pressures. This resultant surface was then used as a double check on the accuracy of the initial boundary pressures.

The major differences between the boundary conditions of the PNL and RHO models were as follows:

1. The Rockwell model used a recharge boundary condition along the northwest corner of the grid for approximately 25 miles. The pressure head (1,099 feet above sea level) was significantly higher than than anywhere else in the model. So high, in fact, that it caused all water to flow away from this area, across the basin, and out the eastern boundary. The eastward flow of water was exactly opposite to that of PNL, who had primarily a westward and upward flow component.
   Figure 24.

   PNL used a no flow boundary condition along the same 25 mile area, and had only small amounts of precipitation as recharge.

2. Rockwell set the head at the bottom of the Grande Ronde to 550 ft. above sea level for approximately 42 miles along the northern basin boundary. No flow boundaries were assigned to all units above this; thereby restricting flow from entering the basin from the north. Figure 25.

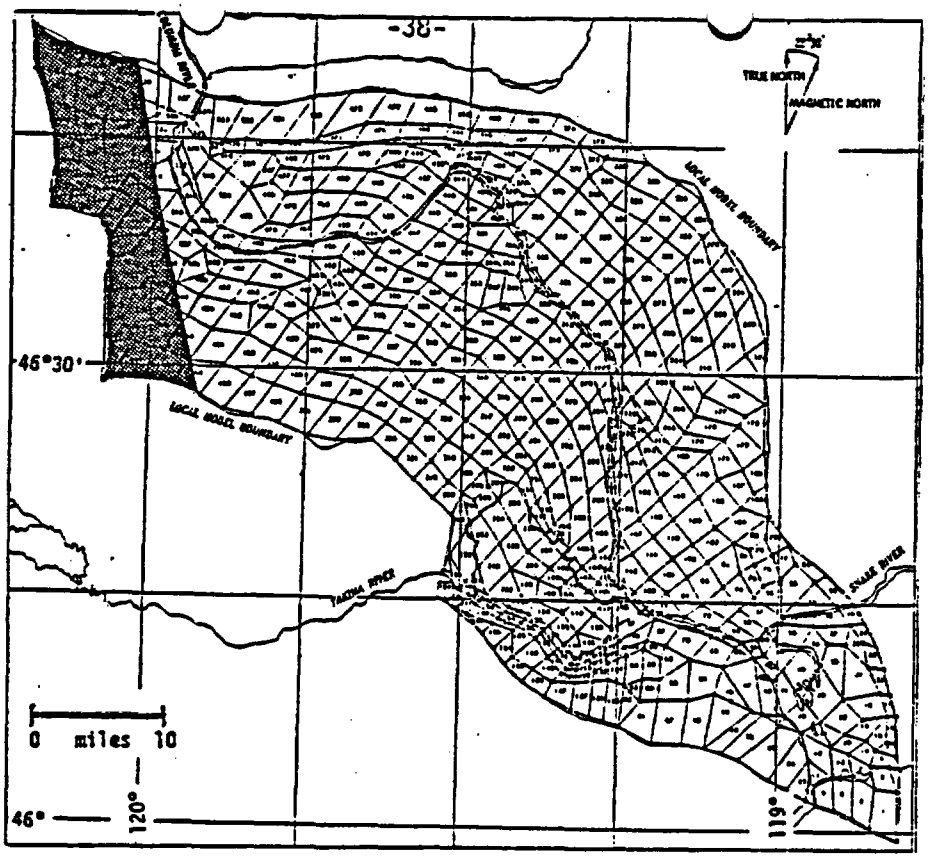

Figure 24. Major Areas of Model Input Disagreement (Northwest Pasco Basin)

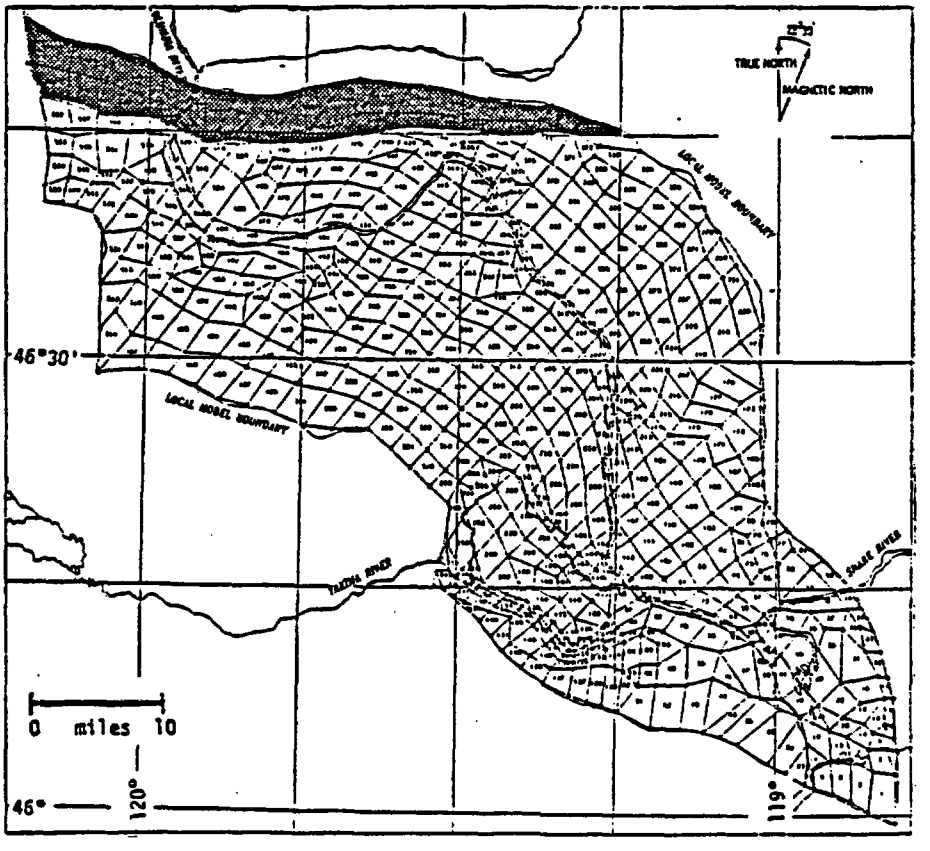

Figure 25. Major Areas of Model Input Disagreement (Northern Pasco Basin)

PNL assigned a flow boundary along this same area. Head values ranged from 675 to 880 ft. above sea level - increasing to the east. No-flow boundaries were assigned to the Saddle Mountains Formation only. The head difference between the two models ranged from 125 ft to 330 ft.

3. The eastern basin boundary of the RHO model, from the northern edge for approximately 25 miles southeastward, was set at 600 ft; and was considered to be at hydrostatic equilibrium (head constant with depth, i.e., flow is horizontal). (Figure 26).

   The PNL heads along the boundary, ranged from approximately 700 ft to 1100 ft above sea level-creating a head difference that ranged from 100-500 ft between the two models. Also, the PNL boundaries were recharge areas, i.e., head decreased with depth. It should be noted that in the PNL model the highest heads occured in this area.

4. In the RHO model, for approximately 12 miles along the southeastern corner to Wallula Gap, heads were set at approximately 400 ft, again with the hydrostatic equilibrium assumption. (Figure 27).

   In the PNL model this area was a discharge boundary with heads in the lower units set at 650 feet and at the upper units 437 ft.

   The head differences between the two models result in a discrepancy of approximately 250 ft in the lower units. Since the RHO model does not permit an upward gradient in this area, no upward discharge can exist. This is significant to RHO's conclusion that particles do not leave the Grande Ronde formation.

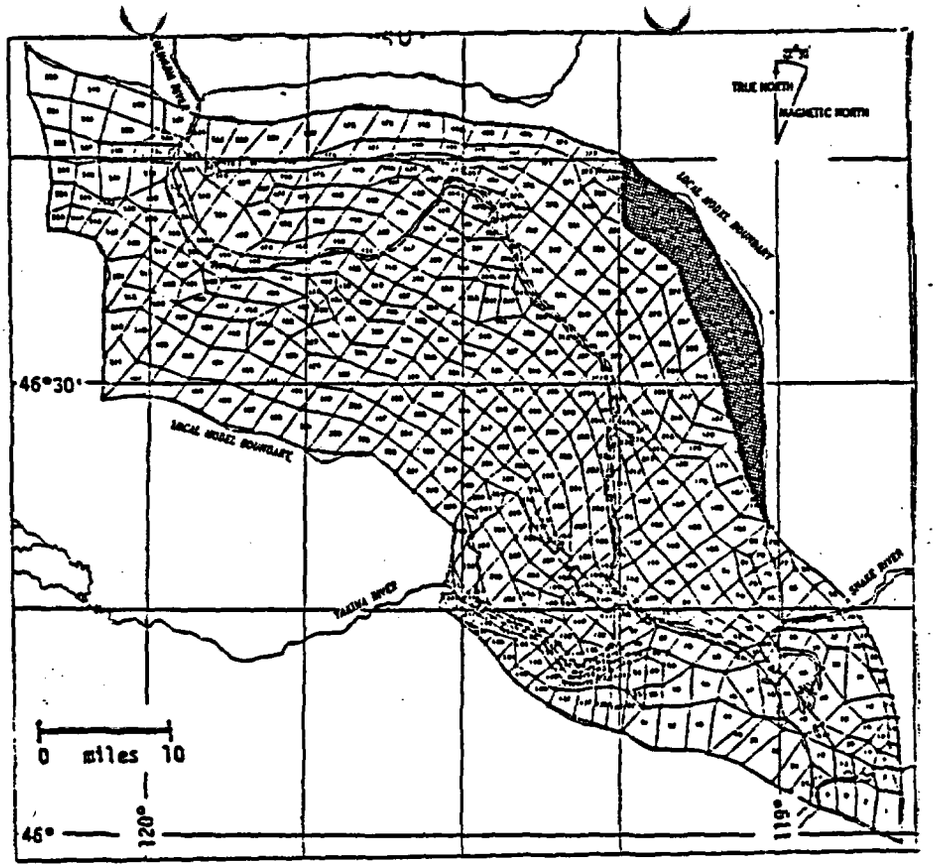

Figure 26. Major Areas of Model Input Disagreement (Eastern Pasco Basin)

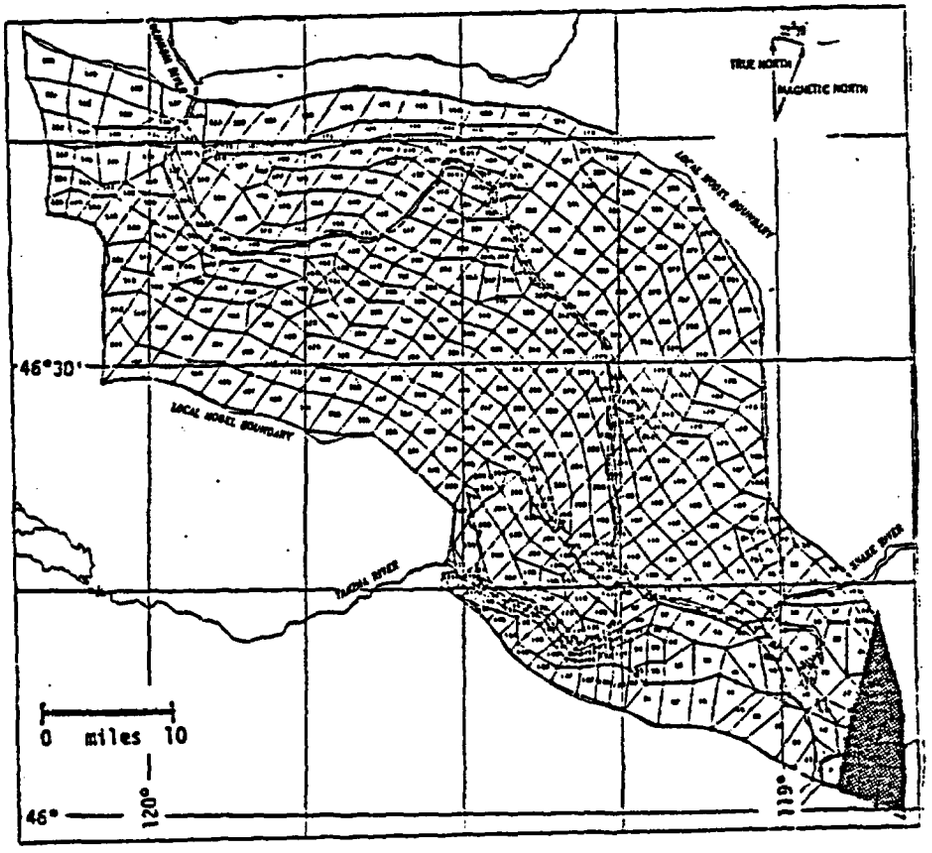

Figure 27. Major Areas of Model Input Disagreement (Southeastern Pasco Basin)

5. In the RHO model, in the area beginning just west of Wallula Gap and continuing clockwise around the southwestern boundary for approximately 30 miles, a recharge boundary condition was imposed. Heads in this area drop from 700 ft in the upper units to 500 ft in the lower units. This created a significant downward gradient, which was strong enough to be felt across the entire width of the basin (approximately 24 miles). The recharge effect forced water downward in the Wallula Gap area, instead of upward as would be expected in a discharge area. (Figure 28).

   The PNL model assumed a no flow boundary condition along this same stretch.

The major similarities in the two models were as follows:

1. Water table surfaces were very similar and were both forced by use of constant head pressures in both models.

2. River elevations were approximately the same in both simulations.

3. In the area of Rattlesnake Hills, both models had essentially a no flow boundary condition. (Figure 29).

4. In the area surrounding the Snake River (for approximately 12 miles) both models had discharge boundary conditions. (Figure 30).

NRC Results - RHO Model

The output of the NRC computer runs were particle tracking plots and pressure contours. Figure 31 shows that particles released east of the

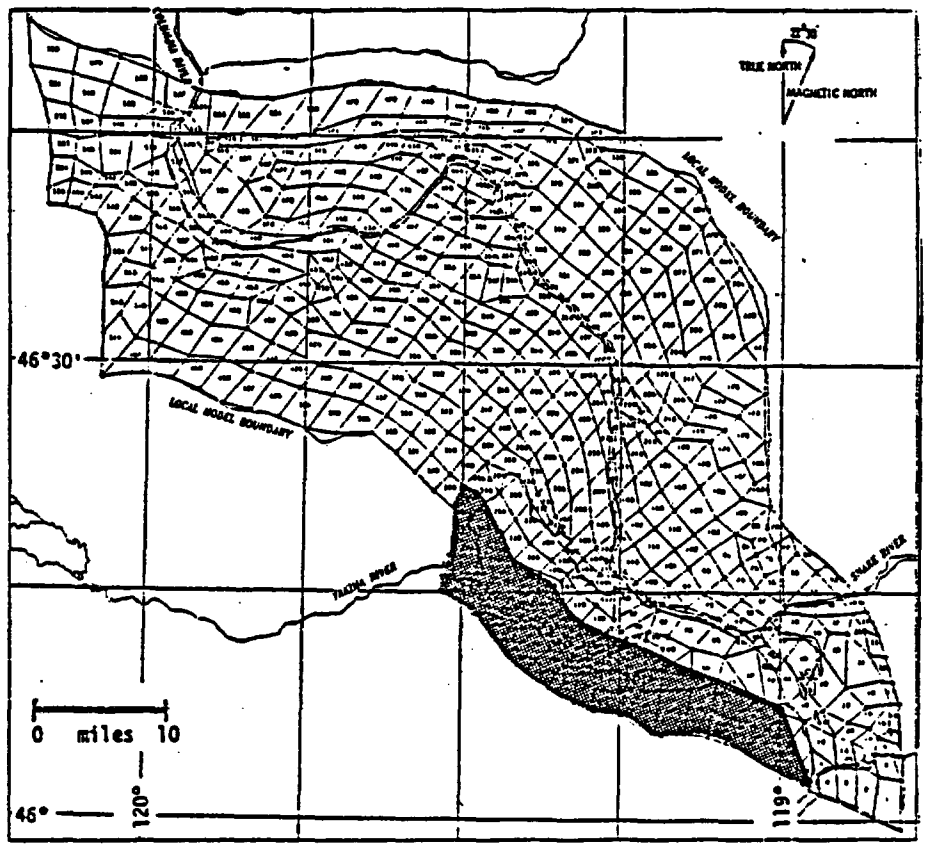

Figure 28. Major Areas of Model Input Disagreement (Southwestern Pasco Basin)

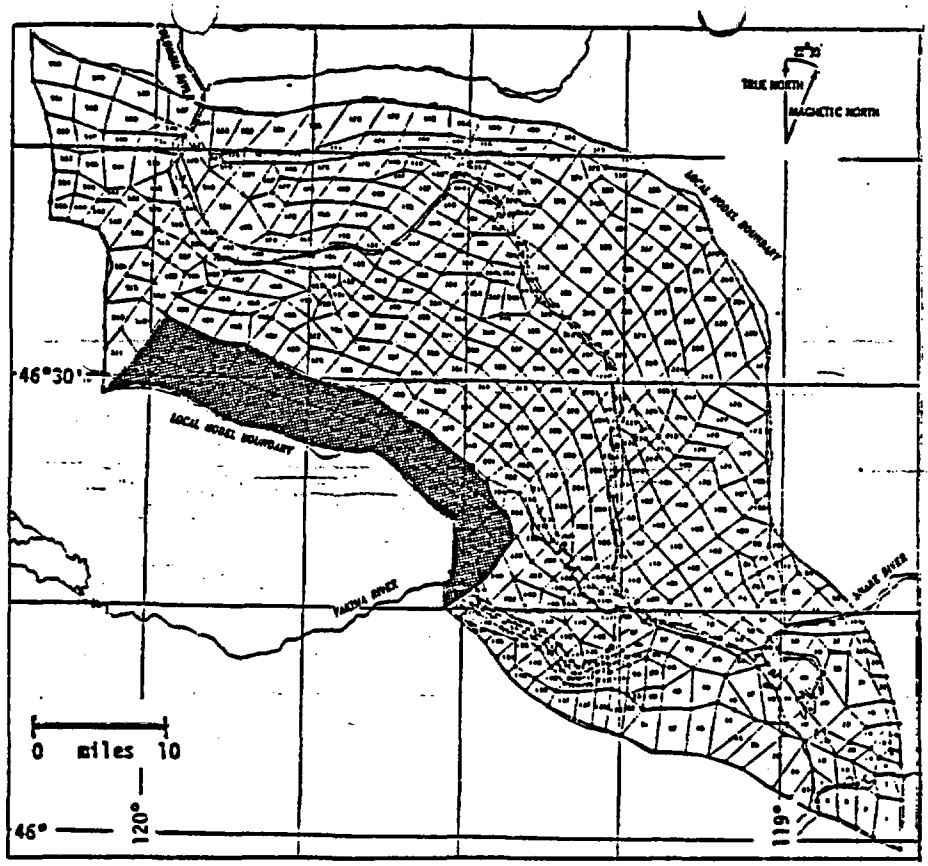

Figure 29. Major Areas of Model Agreement (Western Pasco Basin)

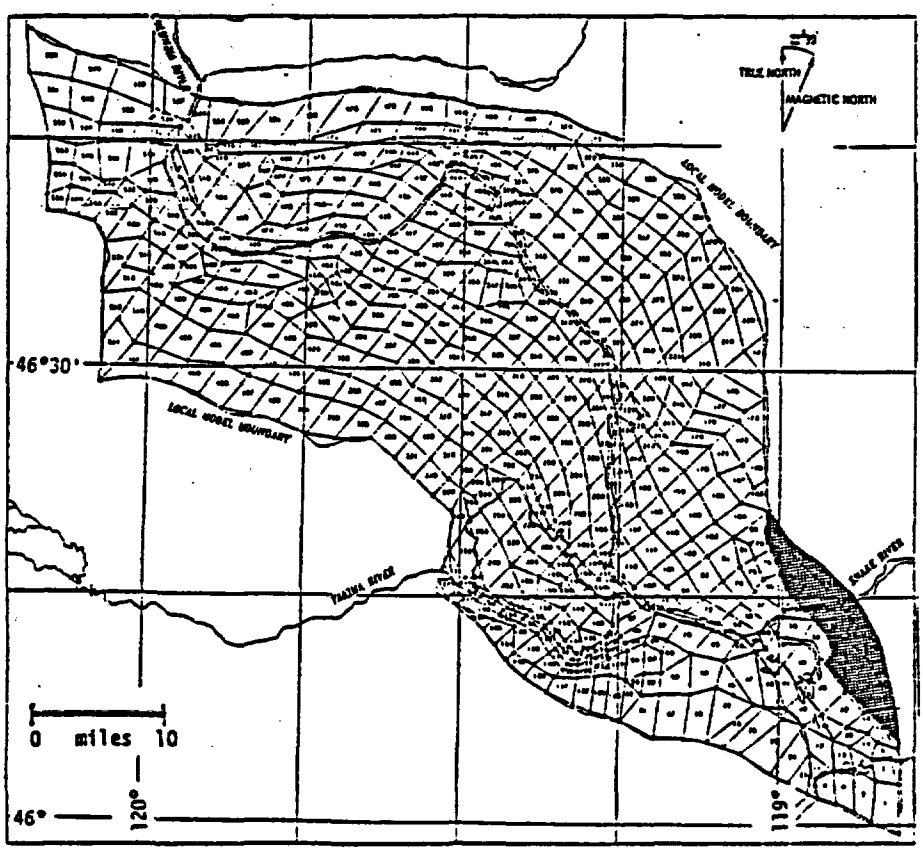

Figure 30. Major Areas of Model Agreement (Southeastern Pasco Basin)