Pump tests conducted in the spring of 1988 resulted in quasi-steady-state groundwater levels after about three days of pumping. Evaluation of these data suggest that although the river was the source of recharge, the "apparent" source of recharge (considering a fully penetrating river) would be located at a greater distance from the wellfield. Were the river a fully penetrating river, pumping water levels would stabilize more quickly than the three day period seen during testing. However, after reaching quasi-steady state conditions, water levels in the aquifer fluctuated concordantly with the river during pumping. Therefore, during this period, the river was supplying most, if not all, of the water that was being pumped from the aquifer.

During pump testing in the summer of 1989, water levels declined at a greater rate than declines in river flow/stage and steady-state conditions were not achieved. The river, therefore, was no longer supplying significant recharge to the aquifer, and the wells were drawing on aquifer storage. These observations indicated that the amount of water that can be withdrawn from the aquifer during the summer is dependent on either the amount of water in storage at the time when hydraulic communication with the river is completely lost, or a combination of storage capabilities and the ultimate amount of water that the river can provide under the summer river regime.

Test pumping of the well field has not been conducted during the spring runoff period from early May to late July, when flow and sediment loads increase. We would expect that the increased flows would maintain good hydraulic communication between the aquifer and the river. As flows decrease, we would expect a transition from full to reduced hydraulic communication between the river and aquifer. It will be necessary to monitor the performance of the well field and river flows throughout the next year to identify how aquifer/river communication changes over this period.

Aquifer/River Interaction

The cause of the reduced hydraulic communication between the river and the aquifer is still not clear from data collected to date. However, we believe that there are three factors that could be contributing to the reduction in aquifer/river communication.

1. Fluctuation in river stage and associated reduction of the wetted perimeter of the river.

2. Variable permeability of the river bed caused by fluctuations in river stage and sediment load.

3. The presence of a hydraulic barrier parallel to the river formed by either geologic materials (till or mudflow deposits) or artificial materials associated with the dike or old railroad grade embankment.

We do not feel that there are sufficient data to support or dismiss any one of these factors as the single primary cause of the reduced hydraulic communication, although fluctuations in river stage clearly have an impact on the response of the aquifer. Fluctuations in river stage may, however, be magnified in the aquifer by variations in river bed permeability and/or a