MONSANTO ENVIRONMENTAL OPERATIONS - MONSANTO CHEMICAL GROUP

FROM: Steven D. Smith, G4WM, 4660

DATE: August 17, 1993

cc. M. R. Foresman
(w/o drawings)

SUBJ: Sauget Site R

REF: Attached Report

TO: Russ Sackett / Keith Miller
Loren Wassell / Kevin Cahill (w/o drawings)

The attached report may provide some useful background information in dealing with future press or public inquires concerning the impact of the Mississippi flood on Site R.

The paragraph on page 3 provides a good summary.

Any questions, please call.

Steven Smith

DSW 134770

Monsanto

The Chemical Group
800 N. Lindbergh Boulevard
St. Louis, Missouri 63167
Phone (314) 694-1000

August 17, 1993

Mr. Paul E. Takacs
Project Manager
Remedial Project Management Section
Division of Land Pollution Control
Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, Illinois 62794-9276

RE: River's Edge Project

OVERNIGHT MAIL

Dear Paul:

Attached are the water level elevations and modeling results from our investigation into the short term groundwater impact of the Mississippi flood on Site R.

Please call if you have any questions concerning the report or drawings.

Sincerely,

Steven D. Smith
Manager, Remedial Projects

cc. Laurie Musiker (w/o attachments)

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GERAGHTY & MILLER, INC.
Environmental Services

AUG 17 1993

Ground Water *Hydrocarbon* *Remediation* *Education*

August 16, 1993

Mr. Steven Smith
Monsanto Chemical Company
800 North Lindbergh Blvd. - G4WM
St. Louis, MO 63167

Dear Mr. Smith:

As requested, Geraghty & Miller collected water-level measurements at Sauget Site R during the recent severe flood conditions and performed additional groundwater modeling. This work was conducted to evaluate the potential effects of this flood on groundwater flow conditions in the vicinity of Site R, as requested by the IEPA.

Water-level measurements were collected on July 24, 1993 in wells located to the east of the levee wall. These water-level measurements are summarized in Table 1. The river stage on that date was 46.5 ft on the U.S. Corps of Engineers gauge in St. Louis, which is equivalent to 426.44 ft above mean sea level (msl). This information was used to prepare groundwater contour maps of the shallow, intermediate, and deep zones within the unconsolidated deposits in the Sauget area (Figures 1 through 3, respectively). In each of the three zones, the groundwater flow gradient at Site R is toward the east during the flood conditions present at the time the measurements were made.

Although the groundwater gradient in all three zones is eastward, this condition is the result of the flood conditions and is short-lived. Regional flow is toward the river and groundwater flow will begin flowing to the west again once the river recedes. Furthermore, groundwater flow velocities during these flood conditions in the three zones varies from less than 0.1 ft per day (shallow zone) to approximately 6 to 7 ft per day in the intermediate and

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deep zones. These velocities represent the worst case since they were calculated using the steepest gradients near the river on each figure.

To evaluate constituent travel time during flood conditions, the groundwater flow model for the Sauget area was modified to simulate this extreme flood condition. An extra layer was added to the aquifer system to represent the Mississippi River during the flood and it was assumed to extend to the levee wall, east of the Expanded Study Area. A flood stage of 48 ft (428 ft above mean sea level) was conservatively assumed to last for 60 days to represent worst case conditions. The flow field at the end of the 60-day period was then used to evaluate travel times in the intermediate and deep zones.

Flow within the shallow zone could not be evaluated by the model because water levels did not achieve equilibrium within the 60-day period. Due to the presence of the landfill cap, water levels within Site R were lower than the surrounding areas. Based on water-level measurements obtain on July 24, 1993, we calculated a groundwater velocity of about 0.06 ft per day. Therefore, groundwater could only migrate 6 feet in 100 days and flow in the shallow zone would not migrate off site.

The modeling results for the intermediate zone indicate that groundwater travels approximately 6.5 ft per day and will, therefore, travel approximately 650 ft in 100 days should flood conditions persist that long (Figure 4). Groundwater in the deep zone will migrate approximately 830 ft in 100 days (Figure 5). The measured water levels mapped for the intermediate and deep zones (Figures 2 and 3) closely match the modeled flow system for these two zones (Figures 4 and 5). Figures 4 and 5 show travel times in days and represent the time for groundwater from the center of the Site R landfill to migrate east, assuming that the gradients are maintained indefinitely. This scenario represents worst case conditions because, in reality, these gradients will begin to decrease and shift to the west as the flood recedes. Finally, no retardation coefficients were considered. All of the above assumptions results in migration rates that are extremely conservative at a river stage which is the highest in recorded history.

The results of the water-level measurements and the groundwater modeling show that even under these flood conditions, groundwater will not migrate off site in the shallow zone. In the intermediate and deep zones, groundwater will not migrate more than 850 feet to the east in 100 days and water in these two zones does not represent any risk since exposure pathways do not exist. Based on the results of the remedial investigation's well inventory, the closest wells to the site are located at Trade Waste, Inc. and Clayton Chemical Company. Representatives from these companies stated that they are served by a municipal water supply and their industrial wells are not used for any potable purposes including taking showers. Therefore, a temporary reversal of groundwater flow conditions will have no impact on the risk assessment.

If you have any questions, please call us.

Sincerely,

GERAGHTY & MILLER, INC.

Laurie B. Musiker
Project Manager
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Table 1. Water-Level Elevations in Monitoring Wells on July 24, 1993, at Mississippi River Flood Stage of 46.5 Feet (426.44 feet above mean sea level) on July 24, 1993, Sauget, Illinois.

Well Number	Measuring Point Elevation (feet above mean sea level)	Depth to Water (feet below measuring point)	Water Level Elevation (feet above mean sea level)
Shallow Zone			
GM-1	413.65	8.82	404.83
GM-5	414.94	5.39	409.55
GM-6A	414.59	6.82	407.77
GM-7	414.95	5.67	409.28
GM-9A	414.47	9.87	404.60
GM-10A	412.97	8.23	404.74
GM-11	412.95	8.12	404.83
GM-12A	416.47	11.55	404.92
GM-15	413.71	8.50	405.21
GM-17A	411.72	3.84	407.88
GM-31A	418.63	9.92	408.71
GM-38	411.65	3.79	407.86
GM-62A	425.75	10.13	415.62
Intermediate Zone			
GM-6B	416.04	8.21	407.83
GM-9B	412.36	7.16	405.20
GM-10B	413.90	8.87	405.03
GM-12B	416.80	11.48	405.32
GM-17B	412.07	4.21	407.86
GM-31B	418.92	10.46	408.46
GM-62B	426.16	10.53	415.63
Deep Zone			
GM-9C	411.97	6.42	405.55
GM-10C	413.78	8.62	405.16
GM-12C	416.79	11.96	404.83
GM-17C	411.57	2.98	408.59
GM-31C	419.29	10.24	409.05
GM-62C	427.03	11.58	415.45

Figure 4. Travel time from the Site R Landfill with the Mississippi River at a flood stage of 428 ft msl. (Particles released in the Intermediate Zone)

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Figure 5. Travel time from the Site R Landfill with the Mississippi River at a flood stage of 428 ft msl. (Particles started in the Deep Zone)

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