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COMMENTS ON THE
EXPANDED SITE INVESTIGATION
DEAD CREEK PROJECT SITES AT
CAHOKIA/SAUGET, ILLINOIS
FINAL REPORT - MAY 1988

CONFIDENTIAL 92-CV-204-WDS

GERAGHTY & MILLER, INC.
Ground Water Services

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CONFIDENTIAL

COMMENTS ON THE EXPANDED SITE INVESTIGATION DEAD CREEK PROJECT SITES AT CAHOKIA/SAUGET, ILLINOIS FINAL REPORT - MAY 1988

April 1989

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COMMENTS ON THE
EXPANDED SITE INVESTIGATION
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CAHOKIA/SAUGET, ILLINOIS
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INTRODUCTION

As requested by Kirkland & Ellis, Geraghty & Miller, Inc. has reviewed the report, "Expanded Site Investigation, Dead Creek Project Sites at Cahokia/Sauget, Illinois," written by Ecology and Environment, Inc. (E&E) for the Illinois Environmental Protection Agency (IEPA). Our comments are presented in this document.

General Comments

The investigation has not fulfilled the specific goals that were set forth on page 1-2 of the E&E report. In general, the study located and defined, to a greater or lesser extent (depending upon the site), the types and approximate quantities of waste materials present but it has not provided "a comprehensive catalog of wastes present at the various project sites" (which was its goal) because of cursory studies at some sites. It has demonstrated that releases occur to the environment in certain locations, such as the ground-water discharge to the Mississippi River from Site R (the Monsanto Landfill). Because of a lack of sufficient data, however, the report has not adequately assessed the pathways by which contaminants could be released into the

environment from most sites, and it has not adequately assessed the expected movements of contaminants in the various media (air, soil, and ground water) at all the sites. As a basis for a Hazard Ranking System (HRS) scoring, the study is inadequate because there are critical data insufficiencies and technical flaws.

Additionally, we are concerned about indications of inadequate quality assurance/quality control (QA/QC) procedures which cloud the validity of the data presented and about numerous conclusions in the report which appear speculative in nature as they are unsupported by the technical data presented.

In the following sections, we have expanded on the general comments made above and have provided illustrative examples of problems and inadequacies in the report. For convenience, we have organized our comments according to chapter; however, we have begun with Chapter 7 as it presents the conclusions reached in the report.

COMMENTS ON CHAPTER 7 - CONCLUSIONS AND FINDINGS

1. The first finding stated by E&E implies that Monsanto is responsible for much of the waste in several sites because many compounds from Monsanto processes found in Site R (for which Monsanto was primarily responsible) were also

found in other sites. While some compounds such as benzene, chlorobenzene, and phenols occur in association, it is not clear why these compounds occur in the locations in which they were found. The source of the compounds is unknown. How they traveled to the sites also cannot be determined and will probably never be known. In addition, several other compounds are also present which implicates other sources. For instance, toluene, ethylbenzene, xylene, and chlorinated volatile organic compounds (VOCs) were found in subsurface soils at Site G and polyaromatic hydrocarbons (PAHs) were found at Site O. The presence of benzene, toluene, ethylbenzene, and xylene (BTEX) could be the result of fuel (gasoline) contamination and the PAHs are likely associated with a former refinery operation in the area. It should also be noted that virtually every industry in the Sauget area, including several trucking firms which washed tank trailers at their sites after hauling materials from outside the Sauget area, contributed to contamination at Site O where the sludge from the Sauget Publicly Owned Treatment Works (POTW) was deposited.

2. E&E states on page 7-4 of the report that waste from the Sauget POTW and flow of contaminated leachate to the Mississippi River has led to "a general degradation of water quality in the river and has contaminated fish in the river." As support for this conclusion, the report cites a U.S. Food and Drug Administration (USFDA) study indicating

the presence of contaminants from the DCP (Dead Creek Project) area in fish collected 100 miles downstream. The USFDA study presents no data on the impact of the Sauget POTW, surface runoff from the DCP area, or ground-water discharge from the DCP area on the river. Thus, the statement in this report on degradation of water quality and fish contamination is erroneous since the USFDA study presents no data on the impact of the DCP area specifically or any other possible sources as to the findings of their study.

3. In referring Site K on page 7-5, E&E implies that the presence of a dark liquid or dark staining (as interpreted from a photograph) is indicative of contamination. Unless the IEPA has analytical results or other scientific evidence to indicate that this material is waste or hazardous, this conclusion should be deleted from the report because it is speculative and unjustified.

4. On page 7-7 of the report, E&E provides several conclusions regarding drinking water supplies. These conclusions are critical to HRS scoring because contaminated drinking water supplies weigh heavily in the score. The E&E report documents a surface water intake about 3 miles upstream from the DCP area; however, because this intake is upstream, there is no possibility that contaminants from the site could enter this system.

Of the 50 wells mentioned on page 7-7 of the report, none appears to be downgradient from DCP areas where contaminants were found. The closest wells are along Judith Lane and are listed as GW-52 through GW-55 on Figure 3-15. All of the low-level volatile organics found in these wells were either in the QA/QC sample blanks or were below method detection limits. None of these wells can be regarded as being contaminated. If, however, the IEPA is concerned about the use of these wells for potable supplies, it is suggested that the IEPA prohibit the homeowners from using these wells for potable purposes.

The nearest downstream potable public supply is identified as being located approximately 28 miles south of the DCP area at the Village of Crystal City, Missouri. Crystal City apparently relies on a Ranney Collector adjacent to the river as a source of potable water. A Ranney Collector is not technically a surface-water intake because it pumps ground water, although it does rely on induced infiltration from the river. The well is significantly more than 3 miles (the zone considered for HRS scoring) from the DCP area. No data were provided to suggest that it could ever be contaminated by any contaminants entering the river from the DCP sites. The quality of water in the Ranney Collector is the sum of all upstream sources, not just the DCP site's potential contribution, and without being able to differentiate the DCP source from other sources, the IEPA cannot estimate

the impact of a potential area on the Ranney Collector. The Ranney Collector is simply too remote from the DCP site to be a factor in HRS scoring.

The nearest downstream surface-water intake is at the river mile 10, a remote 65 miles south of the DCP area. This supply is significantly more than 3 miles from the DCP area and no data suggest that any potential contaminants which might originate from the DCP area could ever be detected at this point in the river. This intake is too remote to be considered in the HRS scoring.

5. On page 7-37 of the report, E&E refers to private wells and indicates that concentrations of toluene, ethylbenzene, carbon disulfide, and styrene were found in private wells. The table in Appendix D, however, shows that these compounds were found below method detection limits, which indicates that concentrations are so low that they cannot be quantified and indicates that they may not be present.. In addition, only one sample from each well was collected, and the analytical results have not been confirmed. Without confirmation of higher, detectable levels, the IEPA cannot conclude that the private wells are contaminated.

6. On page 7-37 (and also on page 4-163) E&E states that the contamination detected in the Clayton Chemical Company well (GW-56) indicates that the contamination originat-

ing at Site O is being transported off-site and is contaminating ground water used by the public. The Clayton well is about 70 feet deep and pumps approximately 700,000 to 1,000,000 gallons per month (16 to 23 gallons per minute) on an intermittent basis; the water is used as process water.

The Clayton Chemical Company well taps the intermediate zone and any contamination in it probably did not originate from the shallow zone in Site O, as concluded by E&E, but from another unspecified source to the east. While many compounds were found in large concentrations in Well EE-22 (sample GW-39) only two of these compounds were found above 50 micrograms per liter (ug/L) in the Clayton well. Furthermore, none of these compounds was found above 50 ug/L in the new wells installed between Site R and Site O. If the compounds in Site O were indeed migrating into the Clayton Chemical well, then these new wells should have shown much higher levels. Therefore, the "fingerprint" compounds found at Site O do not correlate with the compounds found in the Clayton well.

7. The analysis of air samples at Sites Q and R are discussed on page 7-38. E&E indicates that polychlorinated biphenyls (PCBs) were found in three samples from locations DC-19, DC-20, and DC-26; however, the levels that were found are extremely low and the report does not make clear whether these results are for filtered air samples or whether they

were from the analyses of particulate matter. The values that are given are in the parts per trillion range and the report does not indicate the confidence level of the data. The accuracy and precision of these analyses would be needed to establish what, if any, level of confidence can be ascribed to these data.

In addition to the potential problems regarding accuracy and precision, it is not clear what these analytical results mean because the sampling procedure appears to be flawed. E&E does not specify, for example, which stations are upwind and which stations are downwind of Sites Q and R. Figure 4-53 indicates that the wind was predominantly from the southeast during sampling on July 22. Therefore, the nearest potential upwind stations for sites Q and R are in the vicinity of Site G where PCBs were supposedly identified at several stations. If PCBs were indeed found upwind at Site G, then the PCBs at stations DC-19, DC-20, and DC-26 which are downwind of Site G cannot be attributed to Sites Q and R (see page 4-173).

Also on page 4-173 of the report, E&E concludes that Site R could potentially be a supplemental contributor of the PCBs and phenols detected at Site Q. It should be noted that Site R is capped with a low permeability material (permeability 5×10^{-7} cm/sec) which ranges in thickness from 2 to 10 feet. It is virtually impossible for PCBs and

phenols to leave Site R because the most likely mode of transport is via the mobilization of particulate matter, but this is prevented by the cap. In addition, phenol was detected only once (DC-20) at a low concentration (0.04 micrograms per cubic meter [ug/m^3]), and at an estimated value (J indicator) below the specified detection limit. According to E&E (page 4-173), this sample was collected during the first day of sampling when the wind direction was highly variable. Therefore, such a questionable reading cannot be attributed to Site R. In addition, there are Quality Assurance/Quality Control (QA/QC) problems with the air quality data:

- Matrix spikes are referred to on page 3-53; however, no data are provided or discussed. Only 12 low volume samples are listed in Table 3-7 (page 3-55) as compared to 14 high volume samples. There should be an equal number of samples.

- The reproducibility between sample DC-01 and its replicate (DC-06) is not good (Table 4-26 on page 4-166). Eight compounds were detected in DC-06 that were not found in DC-01. There should be an explanation as to why these compounds were detected in one sample and not in the other.

Furthermore E&E's conclusions on air emmissions are flawed by inaccurate and improperly reported analytical data:

- Isophorone was detected in sample DC-05 and it was indicated as being found in the blank (B designator); however, isophorone is not listed in the blank samples (DC-07 and DC-14) in Table 4-26.

- The B designator was not used for isophorone in sample DC-06 to indicate that it was found in the blank sample.

- Sample DC-27 does not have high volume air data due to equipment failure; however, the low-volume data should be available.

Overall, the air sampling program is not comprehensive and is inadequate for determining whether releases to the environment have occurred. The IEPA has ignored the fact that the Sauget area is a highly industrialized community with numerous potential sources of contaminants to the air. Attempts to attribute contaminants to a particular source require a very comprehensive and sophisticated sampling approach over a long period of time. This has not been done.

8. Estimated loading of organics to the Mississippi River from Areas 1 and 2 is discussed on page 7-39. These estimates are seriously flawed in a number of areas:

- E&E chose to use only the chemical results from Wells GM-27C and GM-28C to determine the deep zone loading to the river. These recalculations resulted in an average loading rate of 22 lbs/day, as shown on page 5-27 of the E&E report. In making these calculations, E&E assumed that the hydraulic gradients in the shallow and intermediate zones also apply to the deep zone, an assumption that is incorrect (Geraghty & Miller 1986a, a copy of which was previously provided to IEPA). E&E stated that "we did not want to spend the extra time required to calculate the deep zone gradients," and E&E agreed that this procedure was open to argument.

- Another concern with the report is that the 130 lbs/day figure conflicts with information in Table 5-4 (page 5-25). Assuming a maximum hydraulic gradient, and using the data in Table 5-4 only 48.57 lbs/day are being discharged to the river. E&E advised us that it could not explain this discrepancy without authorization from the IEPA. We requested a copy of the water-level data that

E&E had used to determine the ratio between the minimum and maximum hydraulic gradients, but, as of this writing, we have not received the data.

- E&E believes that the hydraulic gradient of the deep zone is six times greater during the maximum loading period when compared to the minimum loading period. For this to be possible, water levels would have to be approximately 10 to 12 feet higher in deep wells upgradient of the Site R with no change in water levels downgradient of Site R. Geraghty & Miller's (1986a) study of the site and the historical water data collected over the past 5 years indicate that this situation cannot occur (see Geraghty & Miller, 1986a).

- In its report E&E estimated that about 20 percent of the loading from Site R is due to a contribution from Site O (page 5-27). This is incorrect as the following explanation indicates:

  In July 1988, Geraghty & Miller installed a cluster of three wells between these two sites to monitor ground-water quality in the shallow, intermediate and deep zones of the aquifer. In addition, two shallow wells were installed downgradient (in the southern portion) of the la-

goon area to supplement the existing monitoring network. Water-quality data for these wells indicate that total priority pollutant compounds and nonpriority pollutants were detected in the shallow, intermediate, and deep zones at only 20, 150, and 25 ug/L, respectively. Even if it is assumed that the total organic concentration of 500,000 ug/L found in Well EE-22 is representative of the entire Site O (which it is not) and that no attenuation occurs between Site O and the river (which it does), the potential discharge from the shallow zone at Site O would by only 1.5 lbs per day. This is only about 2 percent of the total loading in the vicinity of Site R. Furthermore, constituents in the intermediate and deep zones at Site O logically do not originate at Site O because there is no vertical gradient which could cause vertical migration (Geraghty & Miller, 1986b).

9. E&E indicates on page 7-41 that the agencies have information of past discharges of process water and waste by Monsanto to Dead Creek, but does not document this information. E&E concludes that staining (discoloration) in the northern section of Dead Creek (CS-A) is visible on aerial photographs and this staining resulted at least in part from direct discharge of waste materials from Monsanto. The air

photo "evidence" E&E cites is clearly insufficient to support the claims made on page 7-41. Only chemical analyses of soils or other site-specific information will confirm whether or not the "staining" seen in the air photo is contaminated material. Without such evidence, conclusions regarding contamination are speculative.

10. Contaminant migration and fate is discussed on page 7-39. The analysis of contaminant fate is oversimplified and technically incorrect because of basic flaws in the modeling approach that was taken:

- The main problem with the flow model is that the shallow and intermediate zones were modeled separately. E&E indicates that two separate models were constructed, but by assuming a "uniform vertical gradient" the model is essentially three-dimensional. A uniform vertical gradient implies an effect equivalent to a recharge rate, that is, the interlayer flux would be calculated by multiplying the vertical permeability by the "uniform gradient." If this was done, the report should specify what value was used for the "uniform gradient."

- Due to is high permeability, the deep zone of the aquifer system in the Sauget area is the dominant flow zone. This was not included in the model.

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- Recharge was neglected by stating that it was neglible. The report should provide a sensitivity analysis or a mass balance analysis to support this assumption. Assuming a gradient of 0.0011 ft/ft, K = 6.5 ft/day (948.7 gpd/ft^2), a saturated thickness of 30 feet, and the length of the eastern boundary (8,500 ft), the total influx through the eastern boundary in the shallow zone of the E&E model (Q = KAI) is about 1,800 ft^3/day. A recharge rate of only 6 inches per year (which is less than occurrs in reality) applied to the aquifer surface equals 116,400 ft^3/d. This is 65 times greater than the influx through the eastern boundary calculated by the model. This simple mass balance calculation, demonstrates that recharge cannot be ignored. Ritchey et al. (1984) also concludes that recharge cannot be neglected.

- The report does not show or cite the regional water-level map used to estimate the eastern boundary condition. No cross sections are provided to justify the elevation of the bottom layer. Thus, basic assumptions which are essential to the accuracy of the model are not identified.

- The model assumes that vertical permeability equals horizontal permeability when calculating the flux of contaminants from the shallow zone to the intermediate zone. This is seldom justifiable for glaciofluvial aquifer system such as that in the Sauget area. Typically, the ratio of horizontal to vertical permeability is 10 to 1 or 100 to 1. Thus, the mass of contaminants moving into the intermediate zone was greatly exaggerated.

- Details of loading calculations were not given; however, they appear to be based on steady-state or average flow conditions (page 5-22). If this approach was used, then a transport model is unnecessary.

- The modeling concept is also flawed because the finite difference mesh contains far too few nodes (462) for this type of analysis. At least three times this number should have been used. More detailed analysis of residual statistics should be given to justify the flow model calibration results. This would include calculation of the residual mean, residual standard deviation, and the standard errors associated with the transmissivity and storage estimates.

11. On page 7-43, E&E indicates that the "average" total organic contaminant concentration in soil at Site G is 4,406 milligrams per kilogram (mg/kg), (calculated from three subsurface samples G5-37, G7-69, and G8-70) and implies that the average is representative of the site. Three samples are not representative of the contamination in as site as large as Site G.

12. On page 7-45 of the report, E&E concludes (presumably based on modeling results) that contaminants are migrating vertically at Sites G, H, and I. This conclusion is unwarranted because no wells were installed in the intermediate zone to assess vertical migration and the vertical hydraulic gradient was not measured. Modeling results cannot be used without confirmatory field evidence of a driving force to transport contaminants from the shallow zone to the intermediate zone.

In fact, the vertical gradient at Site O and at the Route 3 Drum Site is slight or nonexistent (Geraghty & Miller 1986a and 1986b). Ground-water flow patterns at Sites G, H, and I are likely similar to those at Site O; therefore, significant downward gradients probably do not exist at these sites.

13. E&E concludes on page 7-46 that the present distribution of contamination in Area 1 wells indicates that

historical pumpage has influenced the distribution of contaminants. This conclusion is unsupported because it is based upon data from very few wells, all of which are drilled in the shallow zone. To determine whether or not historical pumpage has had an impact on the distribution of contaminants, a much larger number of wells would be needed in the shallow zone, as well as in the intermediate and deep zones.

Although there was a general pumping center identified in the Sauget area, individual wells generate individual areas of influence and without being able to reconstruct these zones of influence, E&E cannot attribute the occurrence of contaminants to pumpage patterns. The level of detail obtained by E&E in this study is not adequate to draw the conclusion that pumpage is responsible for contaminant distributions.

14. On page 7-47, E&E indicates that contaminants originating from Area 1 sites would be preferentially transported to the intermediate zone and would reach the Mississippi River in approximately 20 years. This conclusion is unsupported based on the modeling exercises that were undertaken (see Item 8 above). As we have indicated, the modeling studies were oversimplified and technically incorrect, and the models were not calibrated.

15. In discussing Area 2, E&E (page 7-48) indicates that there is a common generator for the various wastes in the DCP area. As we have already indicated in Item 1 above, this conclusion is incorrect. The very presence of PAHs and metals, for example, indicates more than one generator is responsible for the wastes. Simply stated, Monsanto is not responsible for all of the contamination in the DCP sites.

16. Also on page 7-48, E&E concludes that the likelihood of a common generator and the presence of common pathways supports aggregating Sites O, Q, and R for HRS scoring purposes. In fact, there are many reasons why the sites should not be aggregated:

- Both Sites O and R are already covered and therefore do not represent sources of contamination to the air because particulate matter and VOCs cannot escape. This is not true of Site Q which has only been partially or inadequately covered. By aggregating sites, the HRS score would be biased by assuming that both Sites O and R are sources of contaminants to the air, which is clearly not correct.

- The Geraghty & Miller (1986a) report indicates that wastes at Site R are below the water table whereas the waste in Site O is above the water

table. Because of the different relationships of the waste to the water table at each site, the impact of Site O on the ground-water system is different than that of Site R. There is evidence that contaminants have not migrated away from Site O in any significant concentrations whereas there is evidence of ground-water contamination at Site R. The very low vertical gradients at well clusters in the vicinity of Site O indicate that vertical migration is not occurring and contaminants will remain confined to the shallow zone where contaminant transport is very slow. To combine Site O with Site R would presume significant migration from Site O which does not appear to be occurring.

- The ground-water studies in Site Q cannot be regarded as representative of ground-water conditions at that site. The site is 90 acres in area and only eight wells were installed. The ground-water quality data base for Site Q is insufficient to support HRS scoring. The boring program conducted by E&E in that small part of Site Q east of Site R cannot be considered representative of the huge areas which make up the whole site. Given the history of the site, which indicates random disposal in different areas of the site, addi-

tional wells and borings will probably yield data leading to a different conclusion regarding the average concentration of contaminants and the origin of same. In addition, with the existing well system, ground-water discharges to the river cannot be evaluated. For these reasons, Site Q cannot be combined with Sites O and R for HRS scoring purposes.

COMMENTS ON CHAPTER 2 - SITE BACKGROUND

1. On page 2-38 of the report, E&E discusses the locations of private wells and indicates that at least 50 area residents have wells which are used for drinking water or irrigation. Many of these are apparently more than 3 miles from the site and there is no evidence that any residential well is down gradient from the sites. Using "extent and severity of contamination" as the reason for extending the assessment beyond the 3-mile radius required for HRS scoring is simply not justifiable, particularly when the target areas are not downgradient of the site. There must be a substantial risk that contaminants will extend beyond the 3-mile radius to justify expanding the study area in any direction, and extending the radius sidegradient or upgradient is not justifiable unless pumpage is demonstrated to have reversed gradients. E&E failed to even provide a map show-

ing the 3-mile radius around the site in order to determine which private wells are in fact included in the study area.

The reason given for expanding the assessment beyond the 3-mile radius is not technically supportable. It suggests that it is the IEPA's goal to expand the data base to increase the chances of National Priority List (NPL) ranking rather than to evaluate the actual environmental impact of the DCP sites. The IEPA's goal of placing these sites on the NPL is explicitly demonstrated on page 3-46 where E&E states that air sampling was conducted "in order to increase the possibility of qualifying sites for inclusion on the USEPA NPL." Here again, the IEPA has conducted studies for NPL listing purposes rather than to assess environmental impact at the DCP sites.

2. E&E states that the degradation in ground-water quality in the area is "one likely reason" for the cessation of ground-water pumping, but then notes that substantiating documentation of that statement has not been located. A more logical reason why ground-water pumping declined was because "once-through" process systems became uneconomical as a result of increasingly more stringent wastewater discharge requirements. As industry switched to recycling water, the demand for water decreased dramatically. This is substantiated by the wastewater flow to the Sauget POTW

which decreased from 35.7 millions gallons per day (mgd) in 1970, to 9.6 mgd in 1977 and to 7.7 mgd in 1987.

COMMENTS ON CHAPTER 3 - EXPANDED SITE INVESTIGATION PROCEDURES

1. The well construction techniques are described on page 3-35 of the report. The paragraph at the top of page 3-35 indicates that the annulus was filled with grout after the bentonite seal had been placed around the well casing. This statement is not entirely accurate. In at least one case, an observer from Geraghty & Miller saw drilling cuttings (possibly contaminated) being kicked back into the annulus of a well at the same time the grout was being added. For more detail, please refer to the Sauget Sanitary Development and Research Association (SSDRA) letter of September 21, 1987 (Appendix A).

COMMENTS ON CHAPTER 5 - GROUND-WATER TRANSPORT MODELING

1. Figure 5-4 and Section 5.2.6.1 of the report appear to indicate that the general ground-water flow towards the river is reversed during the months of March, April, May, and November. This is not correct. River stage is related more to rainfall in the upper reaches of the Mississippi River basin than to events in the vicinity of Sauget, which means that flow reversals can occur at any time. Flow reversals must be analyzed on a probability basis in a fash-

ion similar to estimating frequency of occurrence of various river stages.

Geraghty & Miller's (1986a) report has indicated that the flow is reversed approximately 12 percent of the time, which is based on an examination of hydrographs from Monsanto's monitoring wells and the entire historical record kept by the U.S. Army Corps of Engineers for river stages in the Mississippi River. E&E estimates of contaminant loading to the Mississippi River are inaccurate because they are based on computer-generated discharges calculated by the model which, in turn, are based on the erroneous Figure 5-4.

2. On page 5-26 of the report, an incorrect method has been used for calculating loading to the river from Area 1 sites. The equation m = Q x C (average) is used, where m is the mass, Q is the flow, and C (average) is the average concentration at the site. It appears that the report is attempting to apply the conservation of mass principle, that is, the mass leaving the site will eventually discharge to the river. In this case, the principle has been incorrectly applied because it does not take into consideration processes such as adsorption, biodegradation, and hydrodynamic dispersion, which attenuate concentrations. These calculations, along with the flawed flow estimates, have resulted in an overestimate of contaminants discharging to the river.

COMMENTS ON CHAPTER 6 - CONTAMINANT MIGRATION AND FATE AND IMPACT

1. Table 6-16 (on page 6-43) is a summary of the contaminant transport pathway and exposure route assessment. Site R should be eliminated from the first column under "runoff." Contaminated runoff cannot be a problem because the site is capped. In addition Site O should be eliminated from the "dust/volatilized emission" category under "potential pathways" because the site has been covered and there is virtually no possibility that dust or VOCs are escaping.

We have already discussed the problems associated with the modeling which have led to incorrect estimates of loading to the Mississippi River. Many other sites such as G, H, and I, which are remote from the river, are not contributing to contamination in the Mississippi River and should be shifted to the column representing potential pathways.

MISCELLANEOUS COMMENTS

On page R-25 in the report's appendices, E&E states that the Geraghty & Miller data for Site R have not been made available. This statement indicates that much of this section is outdated and in need of review because E&E and

the IEPA have been in possession of our data for almost 2 years (Geraghty & Miller, 1986a and 1986b).

Respectfully submitted,

GERAGHTY & MILLER, INC.

Nicholas Valkenburg

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Project Manager

NV:dv
April 13, 1989

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Geraghty & Miller, Inc. 1986b. Assessment of Ground-Water Conditions at the Village of Sauget Treatment Plant Sites, Sauget, Illinois.

APPENDIX A

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APPENDIX A

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COMMENTS ON THE DEAD CREEK SITES
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Submitted By

Sauget Sanitary Development and Research Association

September, 1987

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COMMENTS ON THE DEAD CREEK SITES
REMEDIAL INVESTIGATION/FEASIBLITY STUDY

SCOPE OF WORK

In choosing the well and boring locations, the IEPA does not appear to have taken into consideration the Geraghty & Miller, Inc. study, which was conducted at the request of the Sauget Sanitary Development & Research Association (SSDRA). The proposed IEPA work duplicates much of the work that has already been completed. We believe that the Geraghty & Miller, Inc. study generated sufficient information for the purposes and objectives of the Dead Creek Sites study and IEPA should have scaled back its effort at the site. The savings in effort and resources could have been devoted to other sites where much less information is available.

There do not appear to be sound technical reasons for the locations of some of the wells and borings. The IEPA has drilled five soil borings in and around the four old lagoons. Three of the IEPA borings are very close to borings that were made by Geraghty & Miller, Inc. The enclosed map shows that the IEPA drilled borings close to BG-4, BG-6 and RA-G, locations for which data was already available. The Geraghty & Miller, Inc. report entitled, "Assessment of Ground-Water Conditions at the Village of Sauget Treatment Plant Sites, Sauget, Illinois", which was submitted to the IEPA in December, 1986, contains the analytical results of

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soil samples that were collected from BG-4 and BG-6 and also contains the results of analytical work that was done by the contractor responsible for the construction of the new treatment plant.

Five wells were also drilled in the area. While some wells such as EE-24 are located in areas which appear to be designed to supplement Geraghty & Miller, Inc.'s work, the well drilling program duplicates much of the work that has already been done by Geraghty & Miller, Inc. The enclosed map shows that one IEPA well (EE-22) was drilled between GM-19 and GM-22, leaving the western boundary of the site between Wells GM-23 and GM-19 without a well.

There appears to be no justification for an additional upgradient well located off the northeastern boundary of the lagoons because upgradient wells already exist at two locations on the Monsanto property to the east. Well GM-7 and cluster GM-18 monitor upgradient water quality in the shallow and intermediate hydrogeologic zones. Data from these wells have already been provided to IEPA in the Geraghty & Miller, Inc. ground-water report for the Monsanto property, which was submitted in December, 1986.

The IEPA drilled a fourth well (EE-23) south of the southern boundary of the lagoon area and a fifth well (EE-25) downgradient of the southwest corner of the lagoons.

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Presumably, these wells will determine the impact on ground-water quality of the lagoons. However, data from Well EE-25 well duplicates the information obtained from GM-23 and EE-23 is not downgradient of the lagoon area. In addition, E&E's study does not include any well clusters which makes it impossible for it to draw any conclusions about the vertical component of ground-water flow or the quality of ground water in the intermediate and deep zones.

FIELD STUDY

The following sections discuss E&E's execution of the field work which was observed part-time by Geraghty & Miller, Inc. this work consisted of observing a portion of the drilling and soil boring programs on February 26 and 27, 1987, and ground-water sampling on March 24, 1987 and July 14, 1987. In addition, Geraghty & Miller, Inc. collected replicate samples from each of the five E&E wells that were sampled on both occassions. The sampling program performed on July 14, 1987 was conducted to resample each well because 3 of the 5 sets of samples that were collected on March 24, 1987 could not be analyzed by E&E. A description of the observed activities is provided below.

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Well Installation Program - Dead Creek Area (Site G)

At the time of our site visit, all but three of the Dead Creek Sites program's wells had been installed. The three remaining wells were part of a group of 12 wells that were scheduled to replace wells installed near Dead Creek in 1981. The old IEPA monitoring wells were being replaced because they probably do not yield representative ground-water samples due to their design (i.e., hacksaw slotted well screens and glued well joints). Therefore, these 12 replacement wells were to be installed according to IEPA guidelines (see E&E work plan, page 3-14). Geraghty & Miller, Inc. observed the installation of two of these replacement wells, designated as EE-G102 and EE-G103, which are located southeast of Site G. Our observations are as follows:

- Soil samples were collected at 5-foot intervals. E&E stated that soil samples were not collected at all for some of the replacement wells installed earlier because the geology was known from the 1981 IEPA study. When he was questioned, the E&E field geologist did not know how soil samples were collected during the previous program, nor did he know the intervals of previously collected samples.

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- All soil sample collection equipment was cleaned in a single bucket of potable water for each of the two wells. As this procedure does not conform to E&E sampling protocols in the work plan, these samples should not be chemically analyzed.

- Soil samples were smelled in the field and touched with unprotected hands to facilitate sample description. Soil vapor detection equipment was not utilized to determine the level of contamination even though odors were identified by E&E's project manager at site EE-G103. After well construction drill cuttings remaining were spread on the ground around the well and used to fill in the drill rig's tracks, even though these materials may have been contaminated.

- According to E&E, the only criteria for containerization of drill cuttings is whether the site is in a grassy area or not.

- Neither hard hats nor safety glasses were worn in the field, therefore, it did not appear that E&E were working in accordance with any formalized health and safety plan.

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- The new wells were installed to the same depth as the old IEPA wells adjacent to these sites, even when the geology encountered suggested that the predetermined depth was inappropriate. For example, at site EE-G102 silt was found in the 18 to 20-foot sample. The E&E geologist directed the driller to install the well screen at 16.5 to 21.5 feet below land surface, without even consulting the project manager, who was observing the drilling.

- The well screen and casing for Well EE-G102 arrived at the site in the back of a pickup truck. It was not steam cleaned in the field prior to installation, even though other drilling equipment was being steam cleaned at that time.

- During well installation the drilling crew picked up the well screen and casing with dirty gloves and installed the well materials down the hole as the screen and casing slid through their gloves.

- Upon setting the well screens at both well locations, E&E directed the driller to wait for the formation to collapse around the well screen. As this took time, the driller ran the augers up and down the borehole to encourage further collapse of the formation. The use of a gravel or sand pack was not

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considered, even though it is part of E&E's well installation protocol (E&E work plan, page 3-15). When asked why a sand or gravel pack was not used, E&E stated that gravel packs are used only if the formation will not collapse around the well screen.

- After a pelletized bentonite seal was set in the well annulus, drill cuttings were shoveled and kicked into the remainder of the annulus as a bag of dry cement was poured down the hole. Finally, a bucket of potable water was added to the hole from a dirty bucket to complete the well seal. This protocol does not meet any formalized protocol in use at any state or federal investigation sites. It clearly does not meet the well construction protocols provided in E&E's work plan shown on page 3-15.

- Upon completion of Well EE-G103, the rig and drilling equipment were moved to the next site (Well EE-G102). At this location (Well EE-G102) the drill rig, augers, tools and rig tires were steam cleaned and the decontamination water was allowed to soak into the ground. No attempt was made to contain the water. Once the cleaning procedures were completed, the drilling of the next well (Well EE-G102) began in the decontamination area for Well EE-G103.

- At site EE-G102, gasoline was spilled on the ground by the operating engineer as he filled up a generator's gas tank. This spill occurred approximately 15 feet from Well EE-G102.

- During the installation of Well EE-G102, E&E's project manager commented that 5-foot well screens are too short and that he prefers longer ones; however, the well construction materials were purchased before he became project manager.

- Upon completion of Well EE-G102, the total depth was determined using a dirty tape measure.

Soil Boring/Well Installation Program Conducted on Village of Sauget Property

At the time of Geraghty & Miller, Inc.'s site visit, all five monitoring wells at Site O (the four old treatment lagoons) were completed. E&E installed only four of the five wells at locations of their choice, and E&E intended to install the last well in an upgradient area, however, it is Geraghty & Miller, Inc.'s understanding that E&E did not approach the representatives of SSDRA to gain access for the installation of the upgradient well. E&E's project manager said the fifth well (EE-25) was installed near Well GM-23 because the area was easily accessible. When asked if he tried to find a well location that would aid in the inter-

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pretation of existing water quality data in the possession of E&E (the Geraghty & Miller, Inc., December 1986 report), the project manager said he was not familiar with the data in the report. Well EE-25 was installed only 100 feet hydraulically downgradient from Well GM-23. This site (Site O) is approximately 25 acres in size and ground-water contamination has not been found in either well.

Soil boring (EE-9) was completed on February 26, 1987 during Geraghty & Miller, Inc.'s site visit. The boring was completed using hand-auger equipment because the site was too soft to support a drilling rig. Geraghty & Miller, Inc.'s observations are as follows:

- All tools and sampling equipment were steam cleaned in the Dead Creek area, transported to the site, and laid in the dirt and grass in lagoon No. 1.

- Two split spoon samples were collected every five feet. Between sample collection intervals the sampling equipment was rinsed in solutions in the following sequence: potable water, hexane, acetone, and two more potable water rinses. The sequence of cleaning solutions according to E&E protocol (E&E Work Plan - Appendix B, Section 9) is a trisodium phosphate or equivalent solution, deionized water, acetone, hexane, acetone, and deionized water. The

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procedures followed by E&E's field geologist and project manager were clearly not according to its own protocols. In addition, E&E did not allow the equipment to air dry after the acetone rinse, nor did it add detergent to the initial rinse water. The practice of allowing sampling equipment to air dry prior to the final deionized water rinse will prevent acetone from interfering with the volatile organic compound analysis. The final rinse water used by E&E had a sheen on the surface after the first time it was used, which may have resulted from the acetone and/or hexane. E&E used this water throughout the boring. In addition, the split spoon sampling equipment was put together when it was wet and it was used again before it was dry. These procedures are not in conformance with current USEPA protocols (RCRA Ground-Water Monitoring Technical Enforcement Guidance (TEGD), USEPA, September 1986). The guidelines in this document are to be used at RCRA facilities.

- Soil samples were placed in a wide mouth jar in the field. These samples were screened later with an HNU or OVA detector in E&E's office after they had been warmed in water. Soil samples were composited for the 0 to 10 foot zone and for the 10 to 20 foot zone, and transferred to standard VOC 40 ml vials.

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These results will ultimately indicate soil quality for over a 10-foot interval, but contamination may only be present in a zone a few inches thick. Below the water table, laboratory results may be indicative of ground-water quality and not soil quality. E&E's protocol for compositing soil samples without regard for the depth of the water table may result in misinterpretation of the data.

- There is a significant risk of losing volatile organic compounds (VOCs) by transferring the soil samples twice during the field screening procedure. The USEPA TEGD states that, "It is not an acceptable practice for samples to be composited in a common container in the field and then split in the laboratory, or poured first into a wide mouth container and then transferred into smaller containers". In addition, there is a considerable amount of field equipment in the E&E field office, dirt on the floors, and vehicles in the adjacent garage (used by E&E and others for storage) that could result in false positives being recorded during the screening procedure. A study of background concentrations of compounds in volatile compounds in the air in these areas should be made before sample screening to determine background air quality.

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Ground-Water Sampling Program

On March 24, 1987, E&E and Geraghty & Miller, Inc. collected replicate ground-water samples from E&E RI/FS monitoring wells EE-21 through EE-25. Each sample is scheduled to be analyzed for the EPA Hazardous Substances List (HSL) of compounds. In addition, both parties collected replicate samples from Well EE-24, as well as field and trip blanks. In addition, this program had to be repeated on July 14, 1987 because 3 of the 5 sets of samples collected on March 24, 1987 were frozen in E&E's laboratory. Geraghty & Miller, Inc.'s observations of this portion of the study are described below.

- On February 27, 1987, E&E's project manager stated that the wells installed by E&E cannot sustain a flow of water. This is due, in part, to the absence of a gravel/sand pack around the well screens. As a result, E&E bailed the monitoring wells to develop them. Bailing is usually inadequate for development purposes.

- Also on February 27, 1987, E&E's project manager stated that during the sampling program the wells would be bailed dry and sampled the next day. This is in violation of USEPA protocol. The USEPA TEGD recommends that low yielding wells be evacuated to

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dryness and sampled "as soon as the well recovers sufficiently". As E&E did not provide any protocol in its proposal for evacuating low yielding wells, USEPA protocols should have been followed.

- Each of the E&E wells has a five-foot well screen that was installed below the water table. The monitoring wells are not vented, therefore, water-level measurements may be inaccurate. The lack of a vent hole is in violation of E&E's protocol as shown on the well construction diagram in its work plan (Figure 3-1).

- Upon collection of ground-water samples on both occasions, Geraghty & Miller, Inc.'s representative placed the sample bottles in a precooled insulated sampling container. On March 24, 1987, E&E field personnel placed their samples in cardboard boxes until the end of the day where they were exposed to the direct sunlight. At that time the samples were placed in coolers with ice packs. On July 14, 1987, the same procedure was followed, with the exception that VOC samples were placed in ice chests shortly after sample collection. However, all other sample bottles were left in the sun in cardboard boxes as previously described.

- During the preparation of sample shipment on February 27, 1987, E&E's project manager directed his sampling team to ice only samples scheduled for organic analyses even though E&E's work plan states that "All samples will be iced prior to shipment" (Appendix B-Section 4 in the E&E work plan).

- Sampling protocols in the E&E work plan do not specifically state when samples are to be cooled; however, the USEPA TEGD (RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, September 1986) specifically states that "Preservation of samples requires that the temperature of collected samples be adjusted to 4°C immediately after collection."

- E&E analyzed ground-water samples for pH, specific conductance and temperature at the end of the day in their field office; however, the USEPA TEGD requires that these parameters be analyzed in the field immediately after sample collection. This is required because these parameters are subject to change over short time intervals.

- On February 27, 1987, E&E's metal filtration procedures involved: returning the samples to E&E's field office at the end of the day, filtering one

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sample, changing the filter paper, pumping distilled water through the filtering equipment and filtering the next sample. The silicon tubing was only changed at the end of the day, after having been used for all samples collected during the day. During the July 14, 1987 program, the first sample was filtered for metals prior to changing the filter paper, which was stained with sediment and obviously had been used before. E&E followed the same filtration procedures during the second sampling round as was used in February, 1987. E&E's standard procedures of not changing the silicon tubing after each sample is filtered and also not decontaminating the filtering equipment according to either their own protocols or USEPA protocols can result in cross contamination of the samples. Samples scheduled for metals analysis should be filtered and acidified at the time of collection in order to prevent metals precipitation from occurring as required by the USEPA "Test Methods for Evaluating Solid Waste" (SW-846).

- E&E decontamination protocols (Appendix B - Section 9 in its work plan) require that sampling equipment used at more than one location be decontaminated between locations by the following cleaning sequence: scrub with brushes in a detergent solution, rinse

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with deionized water, rinse with acetone, rinse with hexane, rinse with acetone and rinse with deionized water. These procedures were obviously not followed during either sampling round.

Infiltration Rate

On July 14, 1987, E&E conducted a field measurement to determine the infiltration rate of the silty clay cap which covers lagoon No. 2, using a double-ring infiltrometer. The standard test method for this procedure states that rates determined by ponding of large areas are considered the most reliable method of determining the infiltration rate, but the high cost makes the double-ring infiltrometer method more economically feasible. The standard test method also states that this method is difficult to use and the resultant data may be unreliable in soils with high percentages of clay. Many factors affect the infiltration rate such as the moisture content of the soil. E&E conducted its test after a week of heavy rainfall.

Because of the many variables involved, the standard test method states that tests made at the same site are not likely to give identical results and the rate should primarily be used for comparative purposes. E&E planned to conduct only one test at only one location for the 25-acre site.

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Air Sampling Program

Beginning in July 1987, E&E began conducting its air monitoring survey using air sampling devices that consisted of electric pumps which drew ambient air across charcoal tubes. These units were operated using gasoline-powered generators. The first sampling station was set up at Site G (south of Cerro Corporation). At this site, wind was generally blowing from the south and southwest; therefore, E&E set up one station south (upgradient) of Site G and two stations along the northern boundary (downgradient) of Site G. The sampling stations were to collect air samples over a 12-hour period. For these sampling stations to be representative of upgradient and downgradient locations, the wind must not change direction and the traffic along Queeny Avenue (adjacent to Site G) must not interfere with the collection of the air samples. In addition, these air sampling stations should have been operated using portable battery packs as the gasoline-powered generators produce VOCs and particulate matter that may be erroneously interpreted as originating from Site G.

The air quality study undertaken by E&E will provide data of dubious value. First of all, it will be extremely difficult to demonstrate what impact the Dead Creek Sites are having on air quality in the region and it will be very

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difficult to differentiate the affects of the sites themselves from impacts caused by other sources, such as stack emissions. Given the general level of industrial activity, other sources are likely to have a much greater impact on air quality that the sites themselves.

In addition, with the exception of Dead Creek, most if not all, the sites are covered with clean soil which should restrict emissions. Also, there is no evidence of volatile emissions from any of the sites.

SUMMARY

Scope of the IEPA RI/FS

Given the duplication of effort and the fact that Geraghty & Miller, Inc. study has generated sufficient information for a determination of the environmental impact and preliminary remedial action planning, the IEPA should have limited its work on the site to some additional sampling of the existing monitoring wells. The IEPA's approach to site O should have been similar to the approach taken for site R (the Krummrich landfill) where there is a large amount of environmental information which the agency was able to take into consideration when it planned the Dead Creek Sites Study.

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Field Work

E&E field personnel had little knowledge of the groundwater study completed by Geraghty & Miller, Inc. on the Village of Sauget property (Site O). This lack of awareness of existing water quality data precluded E&E from selecting the most logical locations for monitoring wells. In addition, E&E did not contact SSDRA representatives for any help in providing E&E with the access they required.

E&E's field crews, in many instances, did not follow accepted protocols for monitoring well construction, soil sampling and the collection and preservation of water samples. The correct procedures for the most part were outlined in E&E's work plan; however, this plan was not followed. The result of this nonconformance to accepted protocols may mean that many, if not all, water and soil sample are not representative of environmental conditions.

- END -

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