UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

IN THE MATTER OF	:	
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Michigan Waste Systems, Inc.	:	Dkt. No. RCRA-V-W-84-R-054
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Respondent	:	
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Resource Conservation and Recovery Act, 42 U.S.C. §6901, et seq. 40 C.F.R. §§265.90(a), 265.90(b), 265.91(a)(2), 265.92(c)(2), 265.93(a), 265.93(c)(2), 265.93(d)(1), 265.93(d)(2), 265.93(d)(3), 265.93(d)(4), 265.93(d)(5). For failure to implement a ground-water monitoring program capable of determining the facility's impact on the quality of ground-water in the uppermost aquifer underlying respondent's hazardous waste landfill, and for failure to install a ground-water monitoring system which consists of at least three downgradient monitoring wells at the limit of the waste management area which would immediately detect migrations of hazardous waste or hazardous waste constituents into the uppermost aquifer, the appropriate civil penalty is $5400.00, in the circumstances of this case. The penalty assessed for respondent's failure to develop and implement a specific plan for a ground-water quality assessment program, and to determine adequately the rate and extent of migration and concentrations of hazardous waste constituents in the ground-water, is $3750.00. The appropriate penalty for failure to make such a first determination and submit a report of the ground-water quality assessment as soon as technically feasible is $400.00. For failure to verify statistically significant changes in indicator parameters immediately, the civil penalty assessed is $300.00.

APPEARANCES:

Larry L. Johnson, Esquire, Office of Regional Counsel, United States Environmental Protection Agency, Region V, 230 South Dearborn Street, Chicago, Illinois 60604, for complainant.

Peter J. Kelly, Esquire, Waste Management, Incorporated, 3003 Butterfield Road, Oak Brook, Illinois 60521, for respondent.

BEFORE: J. F. Greene
Administrative Law Judge

INITIAL DECISION

This proceeding was brought pursuant to section 3008(a) of the Resource Conservation and Recovery Act (RCRA, the Act), 42 U.S.C. section 6928(a), and regulations promulgated thereunder pursuant to authority contained therein.

The complaint charges respondent with numerous violations of the ground-water monitoring regulations, 40 C.F.R. Part 265 Subpart F, which are applicable to owners and operators of hazardous waste treatment, storage and disposal facilities. Specifically, respondent is alleged to have violated 40 C.F.R. sections 265.90(a), 265.90(b), 265.91(a)(2), 265.93(a), 265.92(c)(2), 265.93(c)(2), 265.93(d)(1), 265.93(d)(2), 265.93(d)(3), 265.93(d)(4) (three violations) and 265.93(d)(5). For these alleged violations, complainant proposed a civil penalty of $35,300 and a compliance order. Respondent denied the violations.

Respondent, a Michigan corporation, owns and operates a landfill facility located at 4620 Hannan Road, Wayne, Michigan. The 61 acre landfill at issue in this case[1] has been operated under interim status since November 18, 1980 as a hazardous waste disposal facility, pursuant to the filing by respondent of a Part A application. Respondent continued to receive hazardous waste

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[1] The hazardous waste landfill at issue will sometimes hereinafter be referred to as "the facility" or "the site." Respondent also owns and operates a solid waste landfill ("Woodland Meadows South") adjacent to the landfill at issue ("Woodland Meadows North"), in which ground-water is monitored by another network of wells to conform with Michigan solid waste regulations. Respondent's Proposed Findings of Fact, filed June 5, 1987 (Respondent's Proposed Findings) at 1.

until January 1983. Although respondent has not received hazardous waste into the landfill since then, compliance with 40 C.F.R. Part 265, Subpart F is nevertheless required. 40 C.F.R. section 265.90(b).

BACKGROUND

Respondent installed a ground-water monitoring system in 1980, which consisted of four ground-water monitoring wells. During the first year of operation in 1981, respondent monitored the system quarterly for four indicator parameters[2] to establish a baseline characterization of ground-water. Complainant's Exhibits (hereinafter "CX-") 1A,1B,1C,1D. After the first year, respondent conducted semi-annual sampling, and compared the results with the background data by means of a statistical test, the Student's T-test. On June 20, 1983, respondent reported the results of its first semi-annual sampling and analysis and provided EPA with written notice that the landfill may be affecting ground-water quality. Joint Exhibits 2A, 2B. Respondent submitted a ground-water assessment plan on July 8, 1983 (Joint Exhibits 3A, 3B), pursuant to the regulations at 40 C.F.R. Subpart F which require the owner or operator of the facility to prepare a plan for assessing whether and to what extent the facility has in fact affected ground-water, to implement the plan, and to report the

[2] The four indicator parameters, which are required to be monitored under 40 CFR section 265.92(b)(3), are pH, specific conductance, total organic carbon, and total organic halogen. Significant changes in these parameters indicate that contamination may be migrating from the hazardous waste facility into the ground-water.

results to EPA. However, EPA determined that the plan was inadequate, and, on July 29, 1983, issued respondent a letter of warning which required respondent to inform EPA of action taken to correct the violations within 15 days. [3] CX-4. Respondent submitted results of additional ground-water sampling and analysis that showed significant changes, which would indicate that the facility might be affecting ground-water quality. CX-6A,6B,6C. On September 26, 1983, respondent submitted a second ground-water quality assessment plan. CX-7A,7B.

Complainant requested by letter dated February 9, 1984, that respondent submit within five days the concentration, rate and extent of migration of hazardous waste in the ground-water that had been obtained since Sepember 26, 1983. CX-9. In response, respondent submitted a draft "Groundwater Quality Assessment Phase I" report dated February 29, 1984. CX-10B. In its attached letter, respondent asserts that it reached a conclusion that the site had

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[3] The letter identified the following areas of non-compliance: (1) failure to obtain additional ground-water samples from downgradient wells where a significant difference was detected, split the samples in two and obtain analyses of all additional samples to determine whether the difference was caused by laboratory error; (2) failure to provide written notice to EPA within seven days of confirmation of the significant change;(4) failure to submit a timely specific plan for a ground-water quality assessment program , certified by a qualified geologist or geotechnical engineer; and (4) failure to submit a plan which specifies the number, location and depth of wells to be used, specifies the basis for selecting the hazardous wastes listed in the plan and excluding others, sufficiently describes evaluation procedures, specifies a schedule of implementation, and describes an assessment program capable of determining whether hazardous wastes have entered the ground-water, and the rate, extent of migration and concentration of hazardous waste constituents in the ground-water. CX-4.

not had an impact on ground-water through a "priority pollutant scan" analysis and statistical verification that the Student's T-test results were false positives, as shown in its draft report. CX-10A.

Thereafter, the complaint in this matter was filed, essentially charging respondent with failure to install an adequate ground-water monitoring system and with several other failures and deficiencies in notifying EPA and preparing and implementing a ground-water quality assessment plan. Following issuance of the complaint, the parties conducted negotiations relating to how respondent would implement a ground-water monitoring program acceptable to EPA. Respondent hired another group of environmental engineering consultants to characterize the hydrogeology of the site, to install piezometers for determining ground-water flow, and to propose a new RCRA ground-water monitoring system. Respondent's Exhibit (hereinafter "RX-") 5; RX-11; RX-13. In addition, respondent submitted ground-water quality assessment reports and a pump test report which further characterized the hydrogeology of the site. CX-11B; CX-12; RX-13. Analytical results from ground-water sampling in February, 1986, showed the presence of hazardous waste or hazardous waste constituents[4] but results from the May, 1986, sampling showed no such presence, according to respondent. Transcript of Hearing (hereinafter cited as "TR." followed by page number) 268-270; RX-1; Respondent's Proposed Findings of Fact at

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[4] "Hazardous waste and hazardous waste constituents," as used in 40 C.F.R. Subpart F, will be referred to herein simply as "hazardous waste."

12. Complainant alleges that these post-complaint efforts still did not meet the regulatory requirements.

DISCUSSION

I. Violation of 40 C.F.R. § 265.90(a)

A. Arguments of the parties

The first two violations charged in the complaint, i. e. violations of 40 C.F.R. sections 265.90(a) and (b), refer to very general "umbrella" provisions, which encompass several more specific regulatory requirements. The former establishes a general standard for the ground-water monitoring system. The latter mandates compliance with more specific standards set forth at 40 CFR §§ 265.91-265.94.

Section 265.90(a) provides as follows:

> Within one year after the effective date of these regulations, the owner or operator of a surface impoundment, landfill, or land treatment facility which is used to manage hazardous waste must implement a ground-water monitoring program capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility, except as §265.1 and paragraph (c) of this section provide otherwise.[5]

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[5] The uppermost aquifer means "the geological formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary." Aquifer means "a geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs." 40 CFR §260.10. An EPA final policy document defines uppermost aquifer as the "geologic formation, group of formations, or part of a formation that contains the uppermost (Footnote continued on next page)

The record is clear, and the parties agree, that the uppermost aquifer underlying respondent's facility is, or at least consists mostly of, the basal till stratum. Respondent's Response to Complainant's Post Trial Brief (Response) at 5,16; TR. 167-173, 536, 600, 614, 687, 694. An expert witness for EPA, qualified as an expert in hydrogeological and groundwater matters, testified that other components of the uppermost aquifer beneath respondent's facility are sand formations and possibly other subsurface portions that have not yet been identified. TR. 168-169, 171-172. The fundamental question here is whether the basal till, and any other formations which constitute the uppermost aquifer, were monitored by wells, and if so, whether the number and location of such wells was adequate to determine the facility's impact on the uppermost aquifer as required by section 265.90(a). Two sets of ground-water monitoring wells are at issue: the original wells installed at the site in 1980 (well numbers E-6, E-12, E-24, and E-7-A), and the wells proposed by Golder Associates, respondent's later consultant, in its RCRA monitoring program proposals of November 1985 and June 1986 (well numbers GA 34A, GA 31B, GA 32C, GA 33C, GA 35A , GA 36A and GA 46W).

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potentiometric surface capable of yielding a significant amount of groundwater to wells or springs and may include fill material that is saturated. There should be very limited interconnection, based on pumping tests, between the uppermost aquifer and lower aquifers. Consequently, the uppermost aquifer includes all interconnected water-bearing zones capable of significant yield that overlie the confining layer." RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD), Office of Solid Waste and Emergency Response directive no. 9950.1, September 4, 1986, Glossary and Index.

Complainant argues that respondent has not completed its site hydrogeological characterization and identification of the uppermost aquifer, which is required in order to achieve compliance with 40 CFR § 265.90(a). Complainant's Proposed Findings of Fact, dated June 5, 1987, at 10 (Complainant's Proposed Findings). Complainant asserts that hydrogeologic conditions underlying the facility are relatively complex, including large sand formations which constitute potential pathways of contaminant migration, and that the sand formation in the southwest corner of the facility may intersect the bottom of the landfill. Complainant's Brief in Support of Proposed Order (Complainant's Brief) at 5-7. Therefore, both the existing (1980) well system and the well system proposed in November 1985 (Golder Report, RX-5,), and June 1986 (RX-13), are inadequate for reasons amounting to failure to monitor the large sand formation overlying the basal till underneath the east and northeast portion of the facility, failure to monitor the full thickness of the basal till, and for other reasons such as insufficient number of upgradient and downgradient wells [see alleged violations of 40 CFR section 265.90(b), discussed infra]. Proposed Findings at 11-12. Complainant believes that because the ground-water under the facility flows radially, contamination from the waste management area could migrate undetected through the large distances between the monitoring well locations. Complainant's Brief at 8. Complainant is especially concerned that the northeast sand formation is largely uncharacterized and unmonitored, yet it would detect contamination more quickly than

the underlying basal till, and could carry contamination off-site before it reaches the basal till and the proposed monitoring wells. Id. at 9. Moreover, complainant asserts that the silty clay layer directly beneath the unlined landfill, which respondent claims is non-permeable and uniformly thick, is permeable and varies in thickness. Id. at 8.

Respondent concedes that the four original monitoring wells that were in place as of 1980 (well numbers E-6, E-24, E-12, and E-7-A) were not in the uppermost aquifer, the basal till, but asserts that they were located in such a way as to provide immediate detection of contamination, perhaps sooner than wells placed in the basal till, according to the testimony of respondent's expert witnesses. TR. 530-538, 541, 714. Respondent points out that those expert witnesses never suggested in their testimony that the four wells represent an insufficient number of wells to meet the regulatory requirements. Response at 4.

Respondent believes that the geology of the site is well understood, and that it consists of three distinct layers: bedrock, basal till, and silty clay. Respondent's Proposed Findings of Fact (Respondent's Proposed Findings) at 9-10; TR. 588-89, 645. Respondent asserts that the uppermost aquifer, identified as the basal till and the physically and hydraulically connected sand unit in the southwest corner of the site, has been adequately characterized. Response at 5. Respondent argues that except for the sand in the southwest area, the sand units are thin,

discontinuous, and hydraulically isolated,[6] that any leakage from the landfill would be areal in nature, i.e., across the entire width of the landfill because it is unlined, that hydraulic gradients are primarily vertically downward, and that piezometric information indicates that ground-water flow in the basal till would be radial to all margins of the site. Therefore, respondent concludes that the spacial distribution of wells in the basal till which were proposed by Golder Associates (wells 31B, 32C, 33C, 34A, 35A, and 36A) are more than adequate to provide immediate detection of contamination of the uppermost aquifer.

As for the sand unit in the southwest corner of the property, respondent argues that it has been completely characterized, as shown in the Golder Report dated June 1986 (RX-13); it is isolated in extent, and does not intersect the bottom of the landfill. Conceding that the sand unit is physically and hydraulically connected to the basal till, respondent has proposed well number GA-46W to monitor that sand lense. RX-11Y.

Respondent argues that there is no evidence to suggest that

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[6] Respondent supports its argument that sand units are hydraulically isolated with rising head tests, a pump test, aerial photography, Michigan Geological Survey literature, and geochemistry analyses. TR. 582,687-693;RX-Group 9; RX-12. Respondent's geotechnology and hydrogeology expert testified, based on raw isotope geochemistry data, that the age of ground-water from samples at boreholes GA-32G, GA-34A and GA-32D, is between 2500 and 6000 years old. TR. 495-500; Respondent's Proposed Findings at 10. Respondent's expert in geology testified about the origin of the various soil layers underneath the facility. With respect to the sand lenses, as a retreating glacier melted, blocks of ice containing sand fell from the glacier and then were encapsulated by the silty clay. TR. 603-608, 621-622. RX-9D, RX-9K. The larger sand lenses, while located in the lower part of the silty clay layer, were formed in the same way as the smaller ones. TR. 607-608, 622.

the entire thickness of the uppermost aquifer must be monitored; wells must merely be located in the uppermost aquifer. Response at 9. Respondent further argues that there is no evidence to suggest that the excavation of the facility has extended into the sand units. Moreover, respondent asserts that there is no evidence that the landfill has leaked.

B. Discussion

It is clear that the original four monitoring wells did not adequately monitor the uppermost aquifer, and that the facility's impact upon the quality of ground-water in that aquifer could not be determined. This was admitted by one of respondent's expert witnesses. TR 533, 537-538. Whether or not monitoring in other aquifers or non-aquifers may detect hazardous waste leakage from the landfill (and even if such monitoring might detect migration sooner), it is the uppermost aquifer which must be monitored during the detection phase of ground-water monitoring under RCRA. In re Landfill Service Corporation, RCRA (3008) Appeal No. 87-14 Final Decision, October 3, 1990), at 4,9. Failure to do so is a violation of 40 C.F.R. section 265.90(a).

One of respondent's experts in geotechnical and hydrogeological matters testified that wells E-12 and E-24 were screened in silty fine sand, well E-7A was screened in silty clay, and well E-6 was screened in a sand lense within the silty clay

till.[7] TR. 533,535. These areas are above the basal till. See, RX-11D; RX-11G; RX-11L. The silty clay till is the least permeable unit underlying the site and is not an aquifer. TR. 173, RX-5 p. 19; CX-16 p. 16. The evidence is unclear as to whether the sand areas are aquifers. Respondent's evidence indicates that wells E-6 and E-12 are screened in sand lenses encapsulated by the silty clay till, and are not hydraulically connected to the basal till. RX-11G, RX-11P, TR. 608-609, 693. Complainant's expert witnesses believe that the sand formations may be hydraulically interconnected and may constitute the uppermost aquifer in some areas. TR. 171-173, 801-802, 808-811.

Regardless of the possibility that some of those original four wells may have in fact monitored parts of the uppermost aquifer, they did not adequately monitor the basal till, which, as has been noted, the parties agree is the predominant formation constituting the uppermost aquifer underlying the facility. Respondent also failed to monitor the sand area in the southwest portion of the facility, which the parties agree is hydraulically connected to the

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[7] However, a table of piezometer installation data in the 1985 Golder Report indicates that well E-7A primarily monitors the basal till and well E-6 primarily monitors the upper silty clay till. RX-5, Table 1. Examination of the boring log for Boring 6, later converted to monitoring well E-6, reveals that the effective screened interval (as recorded in the table in the 1985 Golder Report) is in the silty clay till, just bordering a sand formation below. RX-3, Appendix A. Comparison of the effective screened interval (also recorded in that table) with the Respondent's graphic representations of stratigraphic layers beneath the facility indicates that well E-7A monitors the basal till.RX-11K.

underlying basal till (RX-13, p. 11; CX-16, p. 17; TR. 491, 609),[8] and which appears to be part of the uppermost aquifer. TR. 486-487, 536-537, 615.

Furthermore, the southwest corner area was not characterized adequately prior to the filing of the complaint, and compliance with 40 CFR §265.90(a) requires identification and characterization of the uppermost aquifer.[9] While geotechnical and hydrologic investigations had been carried out prior to 1984, the information "varied in detail and was occasionally inconsistent with information from other reports." An additional field investigation to characterize further the hydrogeologic regime of

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[8] Respondent was aware of the sand formation in the southwest area during the time prior to the date the complaint was filed, because some borings, such as numbers E-3 and E-15, encountered sand. RX-3, Appendix A; RX-4, I-7. While other borings, MC-1, E-3A, and BM-30, in the area did not encounter the thick sand lense, they were a considerable distance away or were not drilled deep enough, and could not provide a solid basis for concluding that the sand lense was hydrologically insignificant. See, RX-4, p. I-7, I-9. Therefore respondent did not further investigate or monitor an area which it knew or should have known was highly permeable and therefore was a potential pathway for migration of hazardous waste.

[9] See, Final RCRA Comprehensive Ground-Water Monitoring Evaluation (GME) Guidance Document, OSWER Directive No. 9950.2, Office of Solid Waste and Emergency Response, December 19, 1986, Appendix A, p. 31; p. 47, Figure 4.3 Examples of technical inadequacies that may constitute violations of 40 CFR §265.90(a) are (1) the failure to consider aquifers hydraulically connected to the uppermost aquifer, (2) failure to use a sufficient number of piezometers or wells to determine ground-water flow rates and directions, (3) well network covers uppermost but not interconnected aquifers, (4) failure to adequately characterize subsurface hydrogeology, and (5) likely pathways of contamination, e.g. areas of high permeability, are not intersected by wells. Examples of basic elements required by performance standards for 40 CFR §265.90(a) are that the uppermost aquifer must be correctly identified, and ground-water flow directions and rates must be properly determined. Id. This guidance document is not being relied upon, but is cited here as a matter of information.

the site was necessary, according to the Golder Associates 1985 report. RX-5, p. 2; see, RX-4, p. I-9, I-10, I-11. That investigation was not initiated until after the complaint was filed. Therefore, respondent failed to characterize and monitor adequately the uppermost aquifer, as that term is defined at 40 C.F.R. section 260.10. It is concluded that respondent failed to implement a ground-water monitoring program capable of determining the facility's impact upon the quality of ground-water in the uppermost aquifer.

C. Post-complaint efforts to comply.[10]

After the complaint was filed on July 6, 1984, respondent's new consultants proposed a RCRA ground-water monitoring plan which provided for monitoring wells placed in the basal till and southwest sand unit. The hydrogeology of the site was characterized based upon a field investigation, which included six detailed sampled boreholes around the perimeter of the site, packer tests, installation of several piezometers at the borehole locations, and tests of rising head hydraulic conductivity.[11] Because extensive laboratory testing was performed during previous hydrogeological and geotechnical investigations, only a "limited laboratory testing program was carried out . . . to verify that the soils encountered were similar to those encountered previously." RX-5, p. 14.

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[10] Respondent's post-complaint efforts to comply are relevant to assessment of civil penalties and to such compliance order as may be necessary.

[11] Some of the piezometers, 31B, 32C, 33C, 34A, 35A, and 36A, were to be later designated as monitoring wells. RX-5, p. 8.

Permeability tests were performed on the silty clay and a remolded sample of a sand lense, grain size distribution analyses were performed on sand lense materials, and particle size analyses, index tests and moisture content determinations were performed. RX-5, p.15-16.

Thereafter, in 1986, a pumping test for hydraulic conductivity was performed to analyze further the sand unit in the southwest corner of the site. Specifically, the purpose of the test was to determine the transmissivity and hydraulic conductivity of the unit, and whether it is hydraulically connected with other sand lenses in the area. Eleven borings were drilled in that area, well GA-46W was installed, and the results were analyzed using various techniques[12] to measure transmissivity, hydraulic conductivity, and storativity.

The parties disagree as to the interpretation of piezometric data ("hydraulic head"), which indicates ground-water flow direction and elevation. Complainant asserts that the data supports the interpretation that the sand formations constitute a ground-water "sink," or a point where ground-water is discharged laterally -- that is, that there are significant horizontal flows in the sands as large or larger than the vertical flow of ground-water. Complainant's Brief at 23,26; TR. 816-819. This assertion is based upon the higher water level elevations in certain piezometers which are screened at elevations lower than piezometers which have

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[12] Jacob Method, Theis Type Curve Method, Theis Recovery Method, and Distance-Drawdown Method .RX-13, p. 7;Table 1.

lower hydraulic head.[13] Applying hydraulic theory, which states that ground-water flows from a point of high energy, or higher hydraulic head, to a point of lower energy, complainant concludes that ground-water flows horizontally under respondent's facility not only in the basal till, but also in other structures. In support of that conclusion, complainant's expert in hydrology testified that the silty clay till is not a classical confining layer (which would, render the basal till a confined aquifer)[14] because there are no artesian or confined conditions in the basal tills, and only the vertical gradient decreases. TR. 817.

Respondent claims that certain piezometers were not stabilized (because of low permeability of the silty clay and bedrock) and therefore general trends in data are determinative, with some data not strictly adhering to those trends. RX-5, p. 24; Response at 18-23. The general trend indicates a vertical hydraulic gradient downward through the silty clay stratum to the basal till (decreasing hydraulic head with depth), although respondent's experts in hydrology and geotechnology acknowledged that there was also some horizontal low component to the hydraulic gradient. TR.

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[13] Water level elevation in GA-36C is lower than in GA-36E, but the latter is screened at an elevation lower than the former, and similarly, hydraulic head in GA-32F is higher than GA-32G which is screened higher than GA-32F, and hydraulic head in GA-33G is higher than GA-33E and GA-33D, which are screened in the southern area at higher elevations than GA-33G. This indicates higher hydraulic head at lower elevations. RX-11K, RX-11P, RX-11U.

[14] A confined aquifer is an "aquifer under greater than atmospheric pressure bounded above and below by impermeable layers with distinctly lower permeabilities (aquitards) than the aquifer itself." TEGD, Glossary and Index.

458, 483, 503-4, 675,685, RX-5, p.27. Respondent's hydrogeology expert testified that contaminated ground-water will not move horizontally in sand stringers simply because they have higher hydraulic conductivity than the surrounding clay. Rather, the primary control of flow is the overall gradient of the system; the sand stringers are separate, relatively thin and are not connected to the basal aquifer. TR. 652-653. Therefore, respondent avers that the site has rather simple hydrogeologic conditions, where the ground-water moves downward until it reaches the basal till, where it moves laterally to the margins of the site so that the monitoring wells located on the margins of the site in the basal till would immediately detect contamination. RX-5, p. 28, 35.

However, piezometric conditions in the the basal till stratum were not reported in detail. The 1985 Golder Report states:

> The limited number of data points precludes the construction of a realistic contour plan of the piezometric surface within the basal till stratum. The following gross trends can, however, be established based on the existing information. Based on the results of the on-going measurements the piezometric levels in the basal till are relatively stable. The piezometric surface is the highest at borehole 32C. Whether this piezometric surface is part of a pressure response due to the overlying landfill is unknown. In the absence of additional information, however, from the piezometric high in borehole 32C, the groundwater flow is indicated to be radial to all margins of the site.

RX-5, p. 28; see also, p. 33. With respect to piezometric conditions in sand lenses, "data suggests that the sand lenses/seams identified in boreholes 31A, 33A and 34A may be interconnected." RX-5, p. 30. According to testimony of a hydrology

expert witness for complainant, ". . . . the evidence that we have seen suggests that these [sand] units are correlated because their water levels are consistent across these units. The compositions of these materials are similar. Their descriptions are similar, despite several different contractors having performed these borings. The primary thing I do believe is really just the thickness of them, which is against there being the small isolated stringers that [respondent's hydrology expert] discussed . . . ." TR. 801-802.

The parties also dispute the interpretation of data from the pump test performed on well GA-46W. While both parties presented evidence that the largest recorded sand units (in the northeast and southwest) are separate formations (CX-16, p. 8; Figure 2 p. 9; RX-11N, RX-11Q), they disagree on whether boundaries of the sand units have been established. An expert witness for respondent testified that the southwest sand area was not hydraulically connected to the northeast sand area based on rising head tests and on the pump test and the lack of response in certain wells. TR. 688-689, 716-717, 723-724. Complainant's hydrology expert testified that he disagrees with respondent's interpretation of data from the pump test as indicating boundaries of the sand units (TR. 808-810). Rather, complainant believes the silty sands at the site appear both as isolated stringers and as more massive continuous units. CX-16 p. 8.

However, only wells in the southwest corner were monitored for the pump test, and the boundaries of the southwest sand unit

are not established. RX-13, Appendix A; RX-11X; TR. 717, 727, 807-808. A piezometer, GA-45, completed in a sand unit approximately 500 feet east of well GA-46W, appeared to be completed in the same sand unit as that well, according to the Golder report of 1986. RX-13, p. 9; but see, TR. 723 (respondent's expert testified that GA-45 was nonresponsive). Golder Associates' review of boring logs from 1975 indicates sandy zones may exist in the central area of the landfill (borings E-4 and E-10, also E-3 and E-16). RX-5 p. 30. Some of the boreholes which encounter sand are quite a distance from each other, roughly 1000 feet between 33A and 34A, and 1600 feet between 31A and 34A, according to the scale in Respondent's Exhibit 11-X.

Testimony of a principle author of the Golder Associates reports reveals further that sand areas under the site are not adequately characterized. He refused while being cross-examined to specify a size or direction of a sand lense in the northeast area of the landfill, and, while he characterizes it as "limited," he merely states that it probably extends "at least under the edge of the landfill." TR. 539-541. He admits that the model of the site hydrogeology in the Respondent's Exhibit Group 11 is based on representative stratigraphic information from the site, "gross thickness of the silty clay" and of the basal till and bedrock, "major hydraulic boundaries," "representative hydrogeological parameters, gradients, hydraulic conductivities, et cetera," with "small isolated sand lenses like we may have encountered in other bore holes" inserted, using "as much real information as we had

available." TR 527-528. With regard to a statement in the Golder Report (1985) that ground-water flow is indicated to be radial in the basal till to all margins of the site, it is admitted that there is no information on certain areas of the site on which to base ground-water flow contours. TR 542-543, 546; RX-5,p. 28; RX-11Z. [15]

The testimony of another author of the Golder Reports does not provide much more support for demonstrating the adequacy of the characterization of the uppermost aquifer. He does not think that there is any meaningful purpose to be served by monitoring the sand areas (other than the one in the southwest area) because any leaks from the unlined landfill would be generalized everywhere under the landfill (as opposed to a pinhole leak from a liner), and therefore detected by the proposed wells. TR. 694-698, 735. However, he provided no explanation for failing to perform pump tests in other sand areas except for than the conclusory statement that, in their professional opinion, and because of the data which already existed, it was unnecessary -- "like wearing a belt and suspenders". TR. 735-736.

The testimony and other evidence support a conclusion that the data utilized by Golder Associates was insufficient for a full analysis of the hydrogeology of the site. Because lenses or pockets of sand may complicate the direction and rate of ground-water flow

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[15] Furthermore, the bedrock discharges into the basal till, but the lateral flow direction of ground-water in the bedrock has not been established, because of the availability of only two data points (a third piezometer in the bedrock was not stabilized yet). RX-5, p. 29.

(RX-5, p. 35; TR. 818; CX-16, p.18), any extensive areas of highly permeable material such as sand are very significant as possible pathways of contaminant migration, and indicate a complex hydrogeology beneath respondent's landfill.[16] The data is insufficient to support a conclusion that contamination could not migrate off-site without detection, between the existing and proposed monitoring wells. Furthermore, the significant variability in thickness of the silty clay till, which has been measured to be approximately 20 feet to approximately 70 feet thick,(TR. 814; RX-5, p. 18), and the possibility that it may be more permeable in the more weathered upper area (TR. 816,823, CX-16, p. 16; RX-5, p. 18), further supports a conclusion that more investigation and testing is required to determine possible pathways of contaminant migration, and whether the sand formations constitute part of the uppermost aquifer. Therefore, the ground-water monitoring program proposed by Golder Associates in its 1985 and 1986 reports does not adequately determine the facility's impact upon the quality of ground-water in the uppermost aquifer. More field investigations and analyses are required to characterize the hydrogeology of the site adequately, and additional ground-water wells should be

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[16] According to the 1985 Golder Report, the hydraulic conductivity of sand lenses in the upper silty clay till is between 1 x 10(-4) to 8 x 10(-6) cm/sec, and hydraulic conductivity in the basal till ranges from 4 x 10(-5) to 4 x 10(-7) cm/sec, as contrasted with hydraulic conductivity in the silty clay till from 1 x 10(-8) to 4 x 10(-9) cm/sec. RX-5,Table 2. The 1986 report, however, states that the new data derived from the pump test results indicates hydraulic conductivity of sand in the southwest area to be 30 to 50 times greater than that estimated from the earlier single-hole permeability testing in 1985; that is, values obtained were between 3 x 10(-4) and 5 x 10(-4) cm/sec.

installed to ensure immediate detection of hazardous waste or hazardous waste constituents migrating from the landfill to the uppermost aquifer. Further discussion of measures which must be taken to bring respondent's ground-water monitoring system into compliance with the regulatory requirements is set forth infra, pp. 27-38.

II. Violation of 40 C.F.R. §§ 265.90(b) and 265.91(a)(2)

A. The existing monitoring well system

The conclusion that the initial ground-water monitoring system consisting of well numbers E-6, E-12, E-24, and E-7-A was inadequate to monitor accurately any migration of hazardous waste or hazardous waste constituents from the facility is further supported by an analysis of evidence pertaining to the alleged violation of 40 C.F.R. §265.90(b). This regulation requires installation, operation, and maintenance of a ground-water monitoring system which meets the requirements of section 265.91, and further requires compliance with sections 265.92, 265.93, and 265.94.

Section 265.91(a) states as follows:

> A ground-water monitoring system must be capable of yielding ground-water samples for analysis and must consist of:
>
> (1) Monitoring wells (at least one) installed hydraulically upgradient (i.e. in the direction of increasing static head) from the limit of the waste management area. Their number, locations, and depths must be sufficient to yield ground-water samples that are:

> (i) Representative of background ground-water quality in the uppermost aquifer near the facility; and
>
> (ii) Not affected by the facility; and
> (2) Monitoring wells (at least three) installed hydraulically downgradient (i.e., in the direction of decreasing static head) at the limit of the waste management area. Their number, locations, and depths must ensure that they immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer.

Complainant claims that neither the original RCRA monitoring wells nor those proposed by Golder Associates, meet the requirements of that section.

With respect to the four original wells, complainant asserts that four RCRA ground-water monitoring wells are insufficient to meet the requirements of section 265.91(a) for a 61-acre hazardous waste landfill. Moreover, wells E-7A and E-24 are approximately 200-400 feet from the limit of the waste management area, and therefore because they are not "at the limit of the waste management area" they cannot immediately detect migration of hazardous waste and cannot satisfy the requirement for well location.[17] Complainant points out the inconsistency of respondent's positions concerning which wells were upgradient and

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[17] TR. 102, 207-209. Complainant cites 45 Fed. Reg.33191, 33192-93, 47 Fed. Reg. 32299, and Chemical Waste Management, Inc. v. U.S. EPA, Civ. No. 843433 (D. D.C., October 29, 1986), Reply Brief, Exhibit A.

which were downgradient.[18] Discounting respondent's witness' explanation of such inconsistency, that well E-7A historically had the highest ground-water elevation (TR. 277), complainant points out that in 1980 ground-water surface elevation in well E-24 was higher than that of E-7A. RX-3, Figure 7. Complainant contends that neither well E-6 nor E-12, and neither E-7A nor well E-24, was or is hydraulically upgradient from the limit of the waste management area.

Respondent does not respond fully to complainant's argument with respect to the requirements of section 265.91(a), as they apply to the original four wells, but rather emphasizes the subjectivity of the phrase "at the limit of the waste management area" and its dependence upon the goal of immediate detection in the uppermost aquifer. Respondent's Post-Hearing Memorandum at 4. Respondent asserts that the wells were located as close to the limits of the waste management area as local geography and facility operations permitted, and calls attention to its engineering manager's testimony that (1) well E-12 was located at the only place where space was available; and (2) that well E-24 is located so as to avoid damage from heavy equipment. TR. 298; Respondent's

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[18] In respondent's ground-water assessment report of 1984, which respondent contends is erroneous (Respondent's Post Hearing Memorandum, filed June 5, 1987, at 5), wells E-7A and E-24 are designated as upgradient, and E-6 and E-12 as downgradient. (CX-10B, § 1.2.1). The report (dated January 25, 1985), and respondent's hydrogeology expert, state that well E-6 is upgradient, and wells E-7A, E-12, and E-24 are downgradient. CX-11B, p. 3; TR. 532. Respondent's engineering manager testified that well E-7A was upgradient, and the others downgradient (TR. 276-277, 326-327).

Proposed Findings at 6. Respondent explains that well E-7A was formerly considered upgradient, according to phreatic surface in the silty clay, but is downgradient according to the piezometric levels in the basal till, and that well E-6 is upgradient from the limit of the waste management area according to piezometric levels in the basal till. TR. 533.

Complainant has carried its burden of showing that the original four monitoring wells are inadequate to meet the requirements of section 265.91(a). Despite some conflicting evidence regarding which stratigraphic layer the wells monitor,[19] it is clear, as previously noted, that the basal till, the predominant formation of which the uppermost aquifer beneath respondent's facility consists, is essentially unmonitored by respondent's existing monitoring wells. Therefore these wells could not immediately detect migrations of hazardous waste to the uppermost aquifer.

Furthermore, wells E-24 and E-7A are too distant from the limits of the waste management area to be considered as installed "at the limit of the waste management area," as complainant has pointed out. Restrictions on placement of wells due to geographical characteristics or the facility's features or operations do not relieve the owner or operator from the requirement to locate at least three wells at the perimeter of the waste management area; additional wells may be installed to ensure adequate monitoring in such situations. Chemical Waste Management v. U.S. Environmental

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[19] See, supra at 10 and n. 7.

Protection Agency, Civ. No. 843433 (D. D.C. October 29, 1986) at 20.

With respect to the two wells which respondent has claimed were upgradient, according to respondent's own expert's testimony, neither well E-6 nor well E-7A would yield ground-water samples that are representative of ground-water quality in the uppermost aquifer because neither of those wells were located in the uppermost aquifer. TR. 533-538. Respondent's expert testified that well E-6 would be the upgradient well, but that it would potentially pick up contaminant migration paths before it gets to the uppermost aquifer. TR. 532,538-539. However, that is exactly contrary to what an upgradient well is supposed to do, which is to provide background samples that are not affected by the facility, according to the regulation. In addition, the upgradient well should be screened in the same stratigraphic horizon as the downgradient wells so that the ground-water quality data is comparable,[20] yet the evidence shows that the four wells are not all screened in the same layer. TR. 533-535; RX-5, Table 1; RX-11G, RX-11L. It is concluded that the original ground-water monitoring system at respondent's facility does not meet the regulatory requirements with respect to number, location, or depth of downgradient wells. It is further concluded that the system is not

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[20] As a matter of common sense, for the background sample to be representative of ground-water in the uppermost aquifer and fulfill its purpose of providing background water quality data, it should come from a sampling depth which would provide data similar to the comparison data from downgradient wells. See, e.g., RCRA Ground-water Monitoring Technical Enforcement Guidance Document (TEGD), dated September 4, 1986, at 50-51.

in compliance with section 265.91(a), and therefore does not meet the requirements of section 265.90(b).[21]

B. Post-complaint efforts to comply.

Turning to the well system proposed by Golder Associates, complainant maintains that this system also does not meet the requirements of 40 CFR 265.91(a). Specifically, complainant asserts that there is an insufficient number of proposed downgradient wells because account has not been taken of the the variable thickness in the silty clay till, or of the radial flow of groundwater to all boundaries of the facility, and further because large linear distances are unmonitored, especially along the western and northern boundary of the waste management area. Complainant contends that respondent failed to establish wells "which are hydraulically upgradient from the limit of the waste management area, and shown to have a higher static head than the static head corresponding to the point at the limit of the waste management area closest to the location of the proposed upgradient well(s)." Complainant's Proposed Findings at 12. As previously noted, complainant believes the system is also inadequate because it fails to monitor the sand formation in the east and northeast area, does not adequately monitor the southwest area (because well GA-46W is not at the limit of the waste management area and has not been established to be hydraulically downgradient), and does not monitor the full thickness of the basal till.

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[21] See, infra, pp 39-61 for analysis of compliance with sections 265.92 through 265.94, which addresses further non-compliance with section 265.90(b).

The arguments set forth by respondent in relation to section 265.91(a) also apply to section 265.90(a), and are set forth, infra p.p. 8-9. However, specifically with respect to the issue of the upgradient well, respondent asserts that well GA-32C is at the limit of the waste management area and has a higher static head (elevation 662.3 feet) than all other points on the perimeter of the facility, and therefore satisfies the requirements of an upgradient well. Respondent points out that the northeast sand area is monitored by wells E-6 and E-12.

The requirement to locate downgradient wells "at the limit of the waste management area" has not been defined in the regulations. EPA policy documents do not have the force of law, and they are not being relied upon for purposes of determining respondents compliance with the regulations at issue in this matter. However, they are often helpful in understanding the purposes, theories and policies behind the regulations. One EPA policy document states that "(I)n a practical sense, this means the owner/operator must install detection monitoring wells as close as physically possible to the edge of hazardous waste management unit(s)," and notes that this placement of wells relative to the units "shifts as a function of the direction of ground-water flow." TEGD at 46. Another EPA policy document describes a "point of compliance" which is a "vertical plane in the uppermost aquifer where pollution would first appear if a leak were to occur" and the number of wells along or near this point of compliance line is influenced by the number of potential contaminant paths that are

defined. Executive Summary, TEGD, Office of Solid Waste and Emergency Response Directive No. 9950.1-a, dated July 1, 1987, at 5. With respect to horizontal placement of downgradient wells, "[e]ach zone of potential migration must be identified and monitored." TEGD at 48. Factors which would require closer intervals between individual wells within a potential migration pathway include a complicated geology, which lists as an example "discontinuous structures;" heterogeneous conditions, e.g. variable hydraulic conductivity; and sites having a steep or variable gradient. Id. at 49.

The proposed wells, GA-31B, GA-32C, GA-35A, GA-36A, GA-33C, GA-34A and GA-46W, appear evenly spaced along the perimeter of the hazardous waste landfill limits, with the exception of GA-46W, which appears to be over 100 feet from the boundary. However, they are insufficient to ensure immediate detection of migration from the waste management area to the uppermost aquifer, as discussed below.

With respect to the northeast area of the facility, the purported upgradient well, GA-32C, monitors the basal till (RX-5, Table 1; Appendix B). However, above the basal till are sand layers which complainant suspects may be part of the uppermost aquifer, but which respondent believes are hydrologically isolated within the silty clay till and therefore are not aquifers.

The evidence from borings encountering the sand area in the northeast area is as follows. A piezometer, boring number GA-32G, encounters a sand area between elevations 611 and 615. RX-5, p. 30.

Also in that area, along the limit of the waste management area, is existing well E-6, which monitors with a five foot screen a layer of sand approximately five or six feet thick, located in the silty clay till, between the approximate elevations of 608 and 613. TR. 731;RX-11L; RX-3, Appendix A and Table 1; RX-5, Appendix A. Existing well E-12, further to the east, monitors with a five foot screen a sand layer approximately 9 or 10 feet thick between elevations of approximately 606 and 615.[22] TR. 729; RX-11J; RX-5, Table 1. Far to the east, boring GA-36 encounters thinner sand layers around elevations 610 to 620.4. RX-11J; RX-5, Appendix A.

Respondent depicts boundaries of two sand areas in the northeast: one around well E-6 and boring GA-32G, and the other around well E-12 and boring GA-36B (RX-11J; RX-11L; RX-11P), supported by evidence that the piezometric levels between GA-32G and GA-36B were not the same [23] (TR. 558) and by results of the pump test.[24] TR. 559-560. Expert testimony that the sand area around boring GA-32G "was probably very small and isolated," was based upon a change in chemistry noted between samples taken in March 1986 and May 1986, indicating that the sand was dewatered, causing inflow from the silty clay, because of the sand seam's

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[22] Wells E-6 and E-12 do not fully penetrate the sand layer, as one of respondent's experts admits. RX-3, Appendix A; TR. 729, 731.

[23] However, piezometer levels in GA-36B were unstable. RX-5, Table 1 and Appendix D.

[24] However, the pump test was only performed in the southwest area, investigating sand over a radius of approximately only 300 feet from well GA-46W. RX-13, p. 10.

limited extent. TR. 568-569. Another of respondent's hydrogeology experts testified that the sand stringers do not serve as a point where water is diverged out laterally because there were no significant pressure differences between the sand and the silty clay till above and below it. TR. 683-685. Respondent's expert in geology, however, while believing that the sand lenses (other than the one in the southwest) are encapsulated, cast some doubt on such characterization of the sand formations, in the following testimony:

> Now, the lenses in the north or in the rest [not the southwest area] of the landfill, as far as we can determine, are relatively small and encapsulated by the diamict. Therefore, extremely limited amounts of water could be developed from them if you actually put a well into those sand beds, and I heard testimony here that a gallon per minute. That would be in my opinion even a substantial amount of water from one of those limited sand beds vertically of aerial extent.

TR. 615-616. Furthermore, his description of the glacial origins of the sand areas does not distinguish the origin of the small sand lenses from the large sand lense in the southwest area. TR. 622. Therefore, respondent's expert testimony does not support a finding that there are no sand areas at the site (other than the southwest sand formation) which are hydrologically significant, possible pathways of contaminant migration.

Complainant's evidence indicates that the sand in the northeast area is not well defined by site data, but appears to be one very extensive sand unit, with a thickness ranging from two to

at least nine feet. CX-16, p. 17; Figure 2. Complainant's hydrology expert questions the interpretation of the change in geochemistry, stating that the rising head tests, or slug tests, which were performed tested only very small vicinities around the well bore, and that the data suggests that the sand unit is in fact hydraulically connected to the silty clay till. TR. 812-813. Complainant's experts believe that the ground-water gradient of that sand area appears to be to the northeast or off-site, the downgradient side of the facility, and consequently is a crucial area for RCRA monitoring purposes. CX-16 p. 17; TR. 811, RX-11Y. Therefore, and because of the lack of information on this area, complainant concludes that further characterization, and, if necessary, further monitoring must be done in the northeast sand areas.

Complainant's assertion as to the importance of monitoring the northeast area is persuasive, and respondent's evidence tending to show that the sand is isolated is not sufficient to overcome this conclusion. The evidence does not support a firm conclusion that the northeast sand areas do not constitute part of the uppermost aquifer. It appears especially crucial to monitor large sand areas which overlie the basal till because of the fact that a layer of stiff silty clay till, approximately 11 feet thick, lies between the northeast sand formations and the basal till (RX-5, Appendix A), and apparently has such low permeability that respondent's hydrogeologic report estimates it would take an average of several hundred years for vertical flow of ground-water to reach the basal

till; even for a sand lense located about 20 feet below the landfill, the estimated average time for ground-water to reach that lense would be greater than a hundred years. RX-5 p. 35. It is possible that contamination may migrate into the sand formation and be carried horizontally, rather than vertically through the relatively impermeable silty clay to the underlying basal till. Therefore, in view of the uncertainty and conflict in existing data and its interpretation, the northeast sand areas must be more fully characterized, including horizontal and vertical boundaries, and ground-water flow direction and velocity[25]. If the characterization indicates that any of the sand areas are potential contaminant pathways, additional monitoring wells would be required.

Complainant alleges the failure of respondent to establish that well GA-32C is hydraulically upgradient from the limit of the waste management area, and suggests that a piezometer installed between well GA-32C and the boundary would establish whether that well conforms with 40 C.F.R. section 265.91(a). Complainant's Reply at 31. Respondent asserts that well GA-32C is at the limit of the waste management unit and is hydraulically upgradient from the other wells in the basal till.[26] Response at 8. Respondent further

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[25] Not only is ground-water flow not clearly established due to the complexity of ground-water flow patterns at the site, but the facility's leachate collection system changes ground-water flow around the facility. CX-16 p. 18.

[26] However, the November 1985 report notes, "[a]t this time it appears that the entire perimeter of the landfill could be viewed as being 'downgradient' and, therefore, monitoring wells should be located around the entire perimeter. Because of this, background wells will have to be located away from the landfill, outside any
(Footnote continued on next page)

asserts that GA-32C "has been shown to have a higher static head than all other points on the perimeter."

While respondent is correct inasmuch as the static head measurement of GA-32C was higher than the static head measurements in the downgradient wells (RX-5, Table 1), respondent's interpretation of 40 C.F.R. section 265.91(a) as applied to its proposed system is somewhat garbled. The downgradient wells must be located at the limit of the waste management area. 40 C.F.R. § 265.91(a)(2). The upgradient wells, however, must be located in the direction of increasing static head from the boundary of the waste management area, and in a location so that samples from it are not affected by the facility. 40 C.F.R. § 265.91(a)(1). Considering that respondent's property line appears to be within 100 feet from the limit of the landfill, and that the area around GA-32 is in the general direction of increasing piezometric levels (RX-11Y), well GA-32C may indeed be in the most practical general location for upgradient monitoring. However, its close proximity to the landfill limits, coupled with the possibility that ground-water may move toward the east (TR. 685; RX-5 p. 25-26, 34 (indicating ground-water flow from northwest to southeast), that is, from the waste disposal area toward the well, suggests that samples from it may be affected by the facility and therefore not representative of background ground-water quality. Therefore, respondent must install one or more additional wells for upgradient monitoring, if

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potential influence it may have on the hydrologic system." RX-5 p. 36.

further investigation of the hydrogeology of the site indicates that the placement of well GA-32C does not conform to the standards of 40 C.F.R. section 265.91(a) for upgradient wells.

Regarding the southwest area of the facility, complainant contends that (1) well GA-46W is not at the limit of the waste management area and has not been established to be hydraulically downgradient; and (2) that respondent should propose a "sufficient number" of downgradient monitoring wells to be screened in that sand area. Complainant's Proposed Findings at 12 . Wells GA-34A and GA-33C monitor the basal till in a downgradient position near the boundary of the landfill -- the former in the southwest corner and the latter further east along the southern boundary.

The facts in favor of respondent's position are that the basal till is hydraulically connected to the sand formation, and both layers are relatively permeable. Therefore, any migrating contaminants would likely to be detected in both the basal till and sand formation. Each zone or pathway of potential contaminant migration, the sand and the basal till, are identified and monitored in the southwest area according to the plan by Golder Associates. Moreover, the area is a very low energy environment, with very low slopes, very slow moving ground-water, the structures are continuous, and there is no steep gradient or other complication in the southwest area which would suggest installation of additional monitoring wells. TR. 794.

However, both the sand layer and the basal till should be monitored in accordance with 40 C.F.R. section 265.91(a), because

they are discrete potential contaminant migration zones which constitute the uppermost aquifer in the southwest area.[27] Consequently, the question is whether the well monitoring the sand zone, GA-46W, which is located approximately 130 feet from the boundary of the landfill, is "at the limit of the waste management area," and whether it would "immediately detect" hazardous waste migrating from the landfill. It has been held that wells were not "at the limit of the waste management area" and do not have the capacity to "immediately detect" any hazardous waste migration where the downgradient wells were located at least 100 feet from the waste management area and the flow rate was such that it would take a minimum of 100 years for migration to reach the downgradient monitoring well. In re Landfill, Incorporated, Docket No. RCRA-IV-85-62-R (Initial Decision, September 16, 1986, and Final Decision, RCRA (3008) Appeal No. 86-8, November 30, 1990).

It is not clear from the record why such a distant location, approximately 130 feet from the landfill boundary, was chosen for monitoring the southwest sand area. See, RX-13, Appendix E. It would take approximately 23 days for migration to travel 130 feet

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[27] A layer of silty clay till, 6.8 feet thick at the GA-34 boring cluster location, lies between the sand layer and the basal till. RX-11U; RX-5, Appendix A. Respondent's evidence states that the sand lense is only partially hydraulically connected to the
(Footnote continued on next page)
basal till, and that the "the sandy zone located in the southwest corner of the site is typical of a confined system," based on the storativity of the sand being of a coefficient within the range for most confined aquifers. RX-13, pp. 10-11. By definition, a confined aquifer is one which is bounded above and below by impermeable layers with distinctly lower permeabilities than the aquifer itself. TEGD, Glossary and Index.

horizontally through the sand from a point underneath the edge of the waste disposal boundary to well GA-46W, based on a horizontal hydraulic conductivity value of 2 x 10(-4) cm/sec, or 0.002 cm/sec. [28] It would take approximately nine days for such migration to a well located 50 feet from the landfill boundary, such as well GA-34B. However, the evidence in the record that ground-water in the southeast area may flow slightly toward the east (TR. 685; CX-16, p. 15) would lengthen the time of detection of hazardous waste migrating into the sand layer. A period of at least 23 days after hazardous waste has entered the uppermost aquifer is not consistent with the regulatory standard of immediate detection. Therefore it is concluded that the wells proposed for monitoring the southwest area do not meet the requirements of 40 C.F.R. section 265.91(a) for downgradient monitoring.

Complainant's argument that respondent's proposed well system does not monitor the full thickness of the basal till is not supported with any authority which sets forth a requirement for monitoring the full thickness of the uppermost aquifer. The regulations do not specify any such requirement, but an EPA background document presented as one of respondent's exhibits, does provide support for EPA's argument, as follows:

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[28] Hydraulic conductivity values for the sand in the southwest area range from 1 x 10(-4), from field rising head tests, to 6 x 10(-4), from the pump test. RX-5,Table 2; TR. 522-523; RX-13, Table 1. Respondent's hydrogeology expert testified that he would not expect significant differences in vertical versus horizontal hydraulic conductivity within the sand. TR. 523.

(Footnote continued on next page)

> The requirement that the downgradient wells be sunk to different depths were contamination is most likely to occur was based on the physical behavior (e.g., density) of contaminants as related to sampling of different vertical levels within an aquifer. For example, oily leachate would float on topy of ground water. If the physical behavior of a contaminant is not fully known, it is difficult to anticipate the depth at which a contaminant will flow within an aquifer. Therefore, the proposed requirement specified that the downgradient wells be installed at different depths.[29]

Any leachate which percolates from the landfill to the underlying aquifer would sink to the bottom of the aquifer if it is of a higher specific gravity, or float at or near the top of the aquifer if the leachate is predominantly hydrocarbon in nature. Guswa, J.H., Lyman, W.J., Donigian, A.S., Jr., Lo, T.Y.R., and Shanahan, E.W., Groundwater Contamination and Emergency Response Guide 99 (1984). It would arguably follow that for the number, location and depths of monitoring system wells to "ensure that they immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate . . . to the uppermost aquifer," [emphasis added], the uppermost aquifer should be monitored for ground-water contamination at various depths within the aquifer at each sampling location. This would be important especially in situations where the aquifer is significantly thick, where there is some indication that the facility may be affecting

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[29] RX-14, Background Document, Subpart F, Ground-Water Monitoring, dated May 2, 1980 (describing the rationale for the proposed regulation, 40 C.F.R. section 265.91). While the proposed system has clusters of piezometers which are small diameter, non-pumping wells that monitor ground-water elevations, it does not have clusters of wells which would each monitor ground-water quality by continuous sampling. RX-5, p. 5, 7; Table 1; Appendix B.

ground-water, and/or where the hydrogeology of the site is relatively complex.

Respondent's proposed RCRA monitoring wells all have five foot screens except well GA-46W, which has a ten-foot screen. RX-5, Appendices A and B; RX-13, Appendix B. The basal till is much thicker than five feet; in some areas it is over 30 feet thick. RX-11J; RX-5, Appendix A; TR. 590. The southwest sand area is also at least 30 feet thick in some areas. RX-11Q; RX-5, Appendix A. Based upon the circumstances of the site hydrogeology the heterogeniety of the hazardous waste deposited in the landfill, (CX-11B, Table 9) and the possibility that respondent's facility may affect ground-water quality, it is concluded that ground-water monitoring wells in addition to those proposed by Golder Associates should be installed as follows, and accordingly, the relevant provision in complainant's proposed compliance order will be adopted: at each location where the downgradient limit of the waste management area overlies sand formations, monitoring wells should be clustered, with their screened portions at such depths as to ensure that all appropriate aquifer flow zones of the uppermost aquifer are monitored, and to ensure immediate detection of any statistically significant amount of hazardous waste that migrate from the facility.

The remaining alleged inadequacy of the proposed system is that there are an insufficient number of downgradient wells along the western and northern boundary of the waste management area, considering that large linear distances are unmonitored in those

areas and that there is a radial flow of ground-water to all boundaries of the facility. Complainant's Proposed Findings at 11. In support of that allegation, complainant cites testimony of complainant's hydrogeological expert to the effect that there are approximately 1000 feet of the perimeter of the landfill in which another randomly occurring thick sand formation could exist. TR. 847-848. There is a considerable linear distance between monitoring wells on the western boundary, over 1000 feet between wells E-3A and E-7A, and approximately 1000 feet on the northern boundary, between GA-31B and GA-35A. RX-11Y. There is also a considerable linear distance between the boreholes in the northern and western areas, numbers E-8, E-10, E-11 and MC-1. Those borings are relatively shallow (approximately 50 feet, 40 feet, 63 feet and 50 feet deep respectively) (RX-3, Appendix A), and do not provide information on the entire thickness of the silty clay layer or any permeable formations which may be located therein at lower levels, above the basal till.[30]

However, the boring logs for the four wells in those areas do not reveal any significant layers of sand. RX-5, Appendix A. The other borings in the northern and western area, numbers E-8, E-10, E-11, and MC-1, do not encounter any significant sand layers. RX-3,

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[30] It is noted that the silty clay till ends and the basal till begins at a depth of approximately 67 to 70 feet in the area around wells GA-31 and GA-35, and that there are sand formations recorded in some areas of the site at depths of around 40 to 60 feet (or elevations of 611 to 631 feet), namely the sand formation in the northeast area. RX-11J, RX-11L RX-5, Appendix A. Expert testimony on the geology of the site reveals that the larger sand lenses occur in the lower part of the silty clay till, i.e., the lower 20 to 40 feet. TR. 607-608.

Appendix A, Plates A-8 and A-10; RX-5, p. 20.

In conclusion, with respect to the northern and western areas of the site, the record provides an inadequate basis for immediate installation of additional monitoring wells. The soil analyses and field investigations performed do not reveal data which would suggest that the silty clay layer is so permeable or thin, or that sand formations extend to such high elevations in the silty clay layer, that it would not function adequately as an aquitard to impede hazardous waste from migrating into the ground-water. However, due to the instability of some site information (TR. 517-518) and the scarcity and shallowness of borings around the northern and western areas, additional and deeper borings should be taken along the limits of the landfill to provide information on any permeable soil layers which might be hydrologically significant and constitute the uppermost aquifer. If such permeable layers are not found, then respondent's conclusion that no additional monitoring wells are needed in the northern and western areas would be confirmed. If such permeable layers are found, then further testing must be undertaken to determine whether they are aquifers and potential contaminant pathways; if so, installation of additional downgradient monitoring wells would be necessary.

III. Violation of 40 C.F.R. § 265.93(a)

Paragraph (c) of the complaint alleges that respondent failed to prepare an acceptable outline of a ground-water quality assessment program as required by 40 CFR section 265.93(a). That

section states that the owner or operator must prepare, within one year of the effective date of these regulations, an outline which "must describe a more comprehensive ground-water monitoring program (than that described in sections 265.91 and 265.92)," which sections set forth the requirements for the ground-water monitoring system and sampling and analysis. Section 265.93(a) also requires that the outline be capable of determining (1) whether hazardous waste constituents have entered the ground-water [(§ 265.93(a)(1)], (2) the rate and the extent of migration of hazardous waste or hazardous waste constituents in the ground-water [(section 265.93(a)(2)], and (3) the concentrations of hazardous waste or hazardous waste constituents in the ground-water [(§ 265.93(a)(3)]. The outline is to be used as the basis of a specific plan for a ground-water quality assessment program, which must be submitted if the detection phase of ground-water monitoring reveals evidence of a release of hazardous waste or hazardous waste constituents. 40 CFR § 265.93(d)(2).

Complainant alleges and presents expert testimony asserting that a review of respondent's ground-water assessment plans (CX-3B; CX-7B) and report (RX-10B), reveals that respondent could not possibly have used an outline which met the regulatory requirements as a basis for those plans because the plans themselves did not meet the requirements for an outline. TR. 119-124, 253-254. Complainant asserts that respondent did not submit an outline in its prehearing exchange or into evidence at the hearing. Complainant's Brief at 16-17.

Respondent's position, as set forth in the testimony of a district engineering manager, is that it did indeed prepare, and had available at the facility since November, 1980, an outline of a ground-water quality assessment plan. TR. 303-304; Respondent's Proposed Findings of Fact at 2; Respondent's Post-Hearing Memorandum at 7. Respondent asserts that the outline was Document No. 34 of its prehearing exchange and Respondent's Exhibit 14. In its Post-Hearing Memorandum (at 6-8), respondent apparently quotes from the outline, which purports to meet the requirements of sections 265.93(a)(1), (a)(2), and (a)(3).

However, the document marked "Respondent's Exhibit 14" in the record is an EPA "Background Document, Subpart F, Ground-Water Monitoring" with an attached cover letter addressed to counsel for respondent. There is no document in the record marked Respondent's Exhibit 15. Neither Respondent's Exhibit 14 nor Exhibit 15 was referred to in the transcript of hearing, except counsel for respondent's description of documents to be offered into evidence. TR. 33. Respondent listed the outline as an addendum to the prehearing exchange, number 34, but did not file it prior to hearing. See, Motion for Continuance, dated July 8, 1986, at 3; U.S. EPA's Reply to Respondent's Objection to Continuance, dated July 21, 1986, at 4-5. Respondent admits that it did not furnish the outline to complainant until after June 3, 1987, after the hearing in this proceeding. Response at 24.

The regulations do not require respondent to submit an outline to EPA, nor do they specifically state that such an outline is to

be maintained at the facility. TR. 252; 40 C.F.R. § 265.94. Once the ground-water quality assessment plan has been completed, it would seem that the outline no longer serves any purpose, and one might reasonably assume that it could be discarded. Complainant has the "burden of going forward with and of proving that the violation occurred as set forth in the complaint." 40 C.F.R. § 22.24. Complainant has not presented any evidence to establish that respondent failed to prepare an outline. TR. 252. Complainant also has failed to establish that the outline was deficient in any respect; complainant has merely drawn an inference that an initial document is deficient based on the inadequacies of another document which was drafted based upon the initial document. An inference does not compel a finding of violation.[31] Rather, complainant may establish its case either through direct evidence or through a regulatory presumption. In re Samsonite Corp., TSCA Appeal No. 87-6 (Order on Reconsideration, May 29, 1990) at 5-6. The situation at hand does not call for application of a presumption, considering policy, fairness, and probability.[32] Therefore, and because

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[31] An inference is "a conclusion which the trier of fact is permitted, but not compelled, to draw from the facts." Legille v. Dann, 544 F.2d 1,5 (D.C. Cir. 1976). In contrast, a presumption, which shifts the burden of going forward with evidence to rebut the presumption (Federal Rule of Evidence 301), is "an inference which the law directs the trier of fact to draw if it finds a given set of facts." Id. ; Bray v. United States, 306 F.2d 743, 747(D.C. Cir. 1962). See also, 9 J. Wigmore, Evidence § 2491 at 303-304.

[32] See, 10 Moore's Federal Practice, section 301.02. Regulatory presumptions applied to situations in other EPA administrative proceedings, involving PCBs regulated under the Toxic Substances Control Act, 15 U.S.C. sections 2601 et seq., are not analogous to the situation at hand. See, In re Ketchikan Pulp Co., Docket No.
(Footnote continued on next page)

complainant has provided no direct evidence of the outline or its contents, it is concluded that respondent did not violate 40 C.F.R. section 265.93(a).

IV. Violation of 40 C.F.R. § 265.92(c)(2)

The complaint charges respondent with failure to obtain the initial background arithmetic mean and variance by pooling replicate measurements of the concentrations or values of groundwater contamination indicators obtained from upgradient wells.[33] Respondent's laboratory director acknowledges that he did not pool the results of the analyses of the upgradient wells E-7A and E-24. TR. 380. It is noted also that respondent's draft report, "Groundwater Quality Assessment Phase I," dated February 29, 1984, lists wells E-7A and E-24 as upgradient. CX-10B section 1.2.

Respondent explains that the draft report was erroneous; there actually was only one upgradient well. The data from that well was pooled, so respondent had complied. Respondent's Post-Hearing Memorandum at 9. In the draft report, as well as in the submission

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Docket No. TSCA-X-86-01-14-2615 (Initial Decision, December 8, 1986); In re City of Detroit, Public Lighting Department, et al., Consolidated Docket Nos. TSCA-V-C-82-87, et al.(Initial Decision, August 25, 1989); In re Samsonite Corp., TSCA Appeal No. 87-6 (Order on Reconsideration, May 29, 1990); In re University of Delaware, Docket No. TSCA-III-432 (Order Granting in Part Motion for Accelerated Decision, February 15, 1991).

[33] 40 C.F.R. § 265.92(c)(2) provides as follows: "For each of the indicator parameters specified in paragraph (b)(3) of this section, at least four replicate measurements must be obtained for each sample and the initial background arithmetic mean and variance must be determined by pooling the replicate measurements for the respective parameter concentrations or values in samples obtained from upgradient wells during the first year."

dated June 20, 1983, of statistical results of semi-annual sampling, background values of the required parameters [40 CFR section 265.92(b)(3)] for each of the four wells are provided in a separate chart for each well. Joint Exhibit 2B; CX-10B, appendix

In a subsequent ground-water quality report dated January 25, 1985, after issuance of the complaint, respondent designates well E-6 as its upgradient well, and the other three as downgradient, and provides tables summarizing background data for each of the four wells separately. CX-11B section 2.2.1; Tables 1-4.

Respondent apparently did pool the replicate measurements, and determined the initial background arithmetic mean and variance, as required by section 265.92(c)(2), for wells E-7A and E-24 individually, as respondent's witness testified. TR. 359, 379-380. The question is whether, prior to the complaint, there was actually one upgradient well or two.[34] If there was one, then it appears from the language of the regulation that respondent would merely be required to pool the four (or more) replicate measurements from that one upgradient well.

There is evidence in the record that there was only one upgradient well prior to the complaint. A ground-water quality assessment plan dated September 26, 1983 states that "(O)ne well is

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[34] The issue of the effectiveness of the upgradient well in providing ground-water samples that are representative of background ground-water quality in the uppermost aquifer, discussed supra, at 24, will not be addressed here. Because respondent is being assessed a penalty for the inadequacy of the ground-water monitoring system under 40 C.F.R. section 265.90(b), the allegation concerning section 265.92(c)(2) will be considered without regard to the inadequacies of the purported upgradient well.

hydraulically upgradient from the three other wells." CX-7B p. 8. Respondent's district engineering manager testified that well E-7A was the upgradient well at the time that report was being prepared, because that well "appeared to most consistently represent the highest groundwater elevation." TR. 276-277, 328. See also, Joint Exhibit 3B p. 1 (Monitoring wells E-24, E-12 and E-6 are to be sampled for T-test analysis according to ground-water assessment plan dated July 8, 1983.).

While the evidence is in conflict, complainant has not demonstrated that respondent failed to pool "the replicate measurements for the respective parameter concentrations or values in samples obtained from upgradient wells," because complainant has not established by a preponderance of the evidence that there was more than one upgradient well for which values were not pooled.

V. Violation of 40 C.F.R. § 265.93(c)(2)

Where a significant increase in the indicator parameters (or pH decrease) is detected for downgradient wells pursuant to 40 C.F.R. section 265.93(b), which requires analyses of the indicator parameter measurements from the well samples using the Student's T-test, the owner or operator is required to confirm the results of these initial analyses. Specifically, the owner or operator must immediately obtain additional ground-water samples from the wells that show a significant difference, split the samples in two, and obtain analyses of all additional samples to determine whether the significant difference was due to laboratory error, according to 40

C.F.R. section 265.93(c)(2). Complainant alleges that respondent failed to comply with those requirements, because it did not do so immediately, as the regulation mandates.

When the significant statistical changes were detected, on June 8, 1983, respondent submitted a letter to EPA, dated June 20, 1983, stating that it was confident in its analytical results and that it did not intend to verify its results as required, but that within fifteen days it would submit a ground-water assessment plan including a critique of the required statistical analysis (the Student's-T test). Joint Exhibit 2A. Respondent asserts that when it became clear that the requirements of section 265.93(c)(2) were unwaivable, it complied. Respondent's Post-Hearing Memorandum at 11. On September 12, 1983, after EPA issued the letter of warning dated July 23, 1983, and after EPA granted respondent's request for an extension of time until September 12, 1983, to comply with the warning letter, respondent submitted the required Student's T-test verification. CX-4, CX-5, CX-6A, CX-6B, CX-6C; Complainant's Brief at 18.

While the regulations do provide for a waiver of ground-water monitoring requirements, 40 C.F.R. section 265.90(c), the owner or operator must demonstrate that there is a low potential for migration of hazardous waste from the facility via the uppermost aquifer, and that this demonstration must be kept at the facility.[35] Respondent has not shown any such document, nor does

[35] Respondent also cannot waive the regulatory requirement for verification of the statistical results on the basis that the
(Footnote continued on next page)

it claim to have prepared one. Respondent merely asserts that it met with complainant on June 16, 1983. Respondent's Post-Hearing Memorandum at 9-10. Absent a valid waiver, respondent was required to verify its T-test results immediately, regardless of how confident it may have been with the initial test results. Because there is no evidence that respondent verified the results until three months after the initial sampling results (CX-6A,6B). Considering also that such verification was made in response to a letter of warning, respondent did not comply with the requirement to "immediately" obtain samples and analyses.

VII. Violation of 40 C.F.R. 265.93(d)(1)

The complaint alleges that respondent failed to provide written notice that the facility may be affecting ground-water quality within seven days of confirmation of the significant difference in indicator parameters. Complainant argues that because respondent did not immediately confirm the results of the initial sampling as required by section 265.93(c)(2), it could not have properly complied with 40 C.F.R. section 265.93(d)(1). Complainant's Reply Brief at 9. Essentially, complainant contends

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Student's T-test was flawed. There is no regulatory provision which would support such a waiver. Respondent merely depends upon some critiques of the Student's T-test which support respondent's opinion that its Student's T-test results falsely indicated significant changes in indicator parameters. An EPA guidance document which respondent presents in support of such opinion also does not refer to any waiver of statistical verification. RX-10B, Appendix 5; infra, p. 59. However flawed the T-test may be, respondent was required to verify its Student's T-test results immediately. 40 C.F.R. section 265.93(c)(2).

that compliance with the latter provision is dependent upon compliance with the former.

That interpretion does not follow inescapably from the language of section 265.93(d)(1), which provides: "If the analyses performed under paragraph (c)(2) of this section confirm the significant increase (or pH decrease), the owner or operator must provide written notice to the Regional Administrator - within seven days of the date of such confirmation - that the facility may be affecting groundwater quality."

Respondent did confirm a significant difference, apparently between September 8 and September 12, 1983, because the T-statistic computations which were submitted to EPA are dated September 7 and 8, 1983. CX-6B. Respondent submitted these results with a letter stating that "(T)hese results (completed as of September 12, 1983) indicate that some of the wells at Woodland Meadows Landfill showed a significant increase (or decrease in the case of pH) when concentrations of pH, conductivity, and/or TOH are compared both to background and to the upgradient wells. WMI [Respondent] is notifying you of these re-test results as required by 40 CFR 265.93(d)(1)." CX-6A. That letter, received by EPA on September 12, 1983, adequately provides EPA notice that the wells may be affecting ground-water quality in spite of respondent's statement in the letter that it "believes that the re-test results failed the Student's T-test because of major flaws in its statistical method rather than laboratory error or groundwater contamination." Because respondent provided the notice within seven days of confirmation of

the significant change in indicator parameters, albeit the confirmation itself was untimely, respondent did not violate the requirements of 40 CFR section 265.93(d)(1).

VIII. Violation of 40 C.F.R. § 265.93(d)(2)

The complaint alleges that respondent failed to submit a specific plan for a ground-water quality assessment program, certified by a qualified geologist or geotechnical engineer, within 15 days of the notification required by section 265.93(d)(1). Complainant argues with reference to the two ground-water quality assessment plans submitted by respondent, one dated July 8, 1983, (Joint Exhibits 3A and 3B), and other dated September 26, 1983 (CX-7A and 7B), that the former plan was not certified, that neither plan was based upon an outline, that they were not specific, and were otherwise inadequate in terms of content. Complainant's Brief at 18-19. Complainant also asserts that because there was no proper notification as required by section 265.93(d)(1), respondent could not have submitted its plan within fifteen days of "that nonexistent notification." Complainant's Reply Brief at 11. This argument fails for the reason that respondent has been found to have provided the required written notice on September 12, 1983, and, fourteen days later, respondent submitted the plan (CX-7A, CX-7B).

40 C.F.R. section 265.93(d)(2) provides as follows:

> Within 15 days after the notification under paragraph (d)(1) of this section, the owner or operator must develop and submit to the Regional Administrator a specific plan, based

> on the outline required under paragraph (a) of this section and certified by a qualified geologist or geotechnical engineer, for a ground-water quality assessment program at the facility.

The questions presented here are whether the plans were specific, based on the required outline, and properly certified. The allegations referring to other aspects of the content of the plans are relevant to sections 265.93(d)(3) and (d)(4) and are addressed below.

Respondent contends that the relevant plan to be considered for compliance with this section is the one dated September 26, 1983, submitted after the respondent notified EPA of the results of the confirmatory sampling and analysis. Respondent's Post-Hearing Memorandum at 13. Therefore, it is that plan which will be evaluated herein.

Complainant does not dispute that the plan dated September 26, 1983, was properly certified, but argues that it was neither specific nor based on an outline which must describe a more comprehensive ground-water monitoring program than that described in sections 265.91 and 265.92, and which must be capable of determining whether hazardous waste has entered the ground-water and the rate and extent of migration and concentrations of hazardous waste in the ground-water. 40 C.F.R. § 265.93(a); Complainant's Reply Brief at 11. Because the plan did not meet that description, it could not have been based upon the required outline. Complainant's Proposed Findings of Fact at 8-9; Complainant's Brief at 18-19.

Respondent contends that the plan describes a phased approach to ground-water monitoring, including an analysis of historical data, to determine whether the Student's T-test had falsely triggered assessment. Respondent's Post-Hearing Memorandum at 17-18. Respondent asserts that the plan addressed the rate and extent of migration of hazardous waste in the ground-water, and cites the following statements: "The extent of migration of the possible contamination would be evaluated using the field data gathered and possibly employing the use of plume dispersion mathematical models (for instance, the Gaussian diffusion approximation);" new monitoring wells will be utilized based upon the needs concluded from the planned evaluation; "The leachate collection system will be sampled to establish the water quality characteristics;" "Identification of the rate of movement of ground water and the possible contamination will be made using the Darcy equation;" and "Additional techniques to approximate possible groundwater contamination movement using tracer techniques may be employed." CX-7B at 10-11. With respect to concentration, respondent cites page 12, para. III.D.4., which states in pertinent part: "A determination of the presence of Parameters listed at 40 CFR 265.92(b)(3) will be completed. If these are present at levels which would suggest possible groundwater contamination then a detailed organic and metals analysis will be completed based on the constituents in the hazardous wastes disposed of at the facility. Levels of contamination versus background concentrations will be reviewed based on probable levels indicative of leachate . . . ."

While the regulations do not define the term "specific plan," except for the items to be specified pursuant to section 265.93(d)(3), respondent's plan as a practical matter is not specific. Submission of a "specific plan" permits EPA to evaluate the sufficiency of the plan for that facility and point out any deficiencies so that the will be effective in assessing the facility's impact on the ground-water. Accordingly, the plan must be specific, definite, and clear enough for EPA to evaluate the adequacy of the plan for the particular facility.

The plan dated September 26, 1983, is not sufficiently clear, definite, and detailed to establish that it is capable of determining the rate and extent of migration and concentration of hazardous waste in the ground-water. Those three factors are obviously necessary elements of a ground-water quality assessment program. It is concluded that respondent's plan for a ground-water quality assessment program does not meet the requirements of 40 C.F.R. section 265.93(d)(2).

IX. Violation of 40 C.F.R. § 265.93(d)(3)

Section 265.93(d)(3) sets forth the following three criteria which the ground-water quality assessment plan must specify: (1) the number, location, and depth of wells; (2) sampling and analytical methods for those hazardous wastes or hazardous waste constituents in the facility; (3) evaluation procedures, including any use of previously-gathered ground-water quality information; and (4) a schedule of implementation. Complainant does not dispute

that respondent met the first criterion. Complainant's Reply Brief at 12.

Complainant's arguments with respect to the sampling and analytical methods and evaluation procedures are that they are not specific. Complainant's Reply at 12-15. The plan states that sampling and analysis will be performed in accordance with guidance from five documents, which include four EPA guidance documents. CX-7B, pp. 2, 11, 14. Respondent concedes that it did not attach those five documents. Respondent's Post-Hearing Memorandum at 15. These five documents set forth several alternative sampling and analytical methods, but respondent did not specify which sampling and analytical methods it planned to use in its ground-water quality assessment program. Moreover, the plan did not specify which particular hazardous wastes or hazardous waste contituents are in the facility. Such a lack of specificity defeats the purpose of the plan.

The evaluation procedures set forth in the plan are either vague, too general, or unclear. See, TR. 329-331, 87-93. The plan is supplemented with descriptions, critiques and discussions of statistical tests for ground-water quality analysis, including a document from the Michigan Department of Natural Resources, "Industry Recommendations," and Respondent's "Latest Proposed Alternate," an alternate statistical method for analyzing ground-water data. CX-7B, Appendices A, B, C. As complainant described in its Reply Brief (at 13-15), and as complainant's expert in hydrogeology and RCRA enforcement procedures testified (TR. 85-92),

the plan does not specify which evaluation procedures are to be utilized for the various items in the plan which must be evaluated.

With respect to respondent's schedule of implementation, which is in the form of a flowchart, complainant asserts that it is flawed and inconsistent with the requirements of sections 265.93(d)(5), which requires a first determination of rate and extent of migration and concentration of hazardous waste to be made "as soon as technically feasible." Complainant's Reply at 15. While the schedule may or may not be flawed, or allow a long time for completion of the implementation, the regulation at issue merely requires that the plan specify a schedule of implementation. It does not require an "acceptable schedule of implementation," which the complaint alleges respondent failed to do. Therefore, respondent's plan met the criterion of specifying a schedule of implementation. However, because respondent's plan was not specific in terms of the sampling and analytical methods and evaluation procedures that respondent planned to use, it is concluded that respondent violated 40 C.F.R. section 265.93(d)(3).

X. Violation of 40 C.F.R. section 265.93(d)(4)

The complaint charges respondent with the failure to install, operate and maintain additional ground-water monitoring wells and failure to analyze ground-water samples from existing wells for the presence of hazardous waste or hazardous waste constituents in the facility as required by 40 CFR 265.93(d)(4).

Respondent correctly points out that the regulations do not specifically require installation of additional ground-water monitoring wells. Complainant agrees, but asserts that if the results of analyses show hazardous waste in any well, and pursuant to the plan it is determined that such results are not laboratory error or naturally occurring concentrations of chemicals, respondent is required to install additional wells immediately, and analyze concentrations, rate and extent of hazardous waste migration.

The provision of the regulations at issue here provides as follows:

> The owner or operator must implement the groundwater quality assessment plan which satisfies the requirements of paragraph (d)(3) of this section, and, at a minimum, determine:
> (i) The rate and extent of migration of the hazardous waste constituents in the ground water; and
> (ii) The concentrations of the hazardous waste or hazardous waste constituents in the ground water.

40 C.F.R. section 265.93(d)(4). At the outset, it would appear that respondent could not technically be in compliance with this regulation because the ground-water quality assessment plan does not satisfy the requirements of paragraph (d)(3).

Furthermore, the implementation of respondent's plan appears to be dependent upon its conclusion that the Student's T-test results, which did indicate significant changes in indicator parameters, were inaccurate. That is, the results indicated that the facility might have contaminated the ground-water, but

respondent asserts that they were invalid "false positive" results due to a flaw in the statistical method as applied.[36] Respondent has expended great effort in showing the problems with the Student's T-test and the virtues of alternative statistical methods, including presentation of testimony of an expert in statistics. See, TR. 394-446; CX-10B, Appendices 3 and 5. However, the regulations clearly require use of the Student's T-test for analyzing changes in indicator parameters, and the possibility that the test is flawed does not relieve respondent of its obligation to conduct further assessment, including testing for hazardous waste constituents in the ground-water, under section 265.93(d).

Respondent supports its belief that the Student's T-test results were inaccurate, and that the facility is not affecting ground-water quality, by results from alternate statistical methods and by analyses of "priority pollutants." However, the results of alternate statistical methods do not clearly indicate that there is no contamination entering the ground-water. For example, results of sampling in May 1983 analyzed using a "joint industry proposed T-test" indicates significant changes in pH for wells E-7A, E-12 and E-6, in specific conductance for wells E-6 and E-12, in total organic halogen for wells E-24, E-6, and E-12. CX-10B, Appendix 4; TR. 112, 333-335. Results of the same statistical test submitted

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[36] There were significant changes in the first semi-annual ground-water samples, applying to the Student's T-test, in the indicator parameters of pH (wells E-6 and E-12), specific conductance (for well E-12), and total organic halogen (for well E-12). CX-10B; CX-2B. The verification of those results, from another ground-water sampling, also indicate changes in pH, specific conductance, and total organic halogen. CX-6B; CX-6C.

after issuance of the complaint show significant increases in the indicator parameter of specific conductance for wells E-7A, E-12 and E-24. CX-11B, Appendix 4. Respondent's lab director explains that these changes may be natural or seasonal variations, sample contamination, or chemical interference. TR. 360-367. However, the significant increase in organic halogen is especially significant because it is not a naturally occurring substance in ground-water. TR. 366, 434.

If statistically significant changes are noted and confirmed, the regulation [40 C.F.R. section 265.93(d)], requires submission and implementation of a plan to sample, analyze and evaluate hazardous wastes or hazardous waste constituents in the facility, and requires a determination of the rate and extent of migration and concentrations of hazardous wastes or hazardous waste constituents in the ground-water. Respondent sampled ground-water on October 4, 1983, and analyzed it for some, but not all, of the hazardous waste and hazardous waste constituents in the facility, the so-called priority pollutants.[37] TR. 99-100, 278, 305; CX-10B section 2.2, Appendix 7. These results, and resampling results, indicate that all of the chemicals tested were below the detection limit. CX-10B, Appendix 7; TR. 367-368, 369. Respondent had also sampled and analyzed ground-water for several parameters from as

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[37] Respondent's engineering manager testified that the priority pollutant analysis is well established and that "you can get those results back a lot faster than looking at the constituent analysis," so it only analyzed priority pollutants. TR. 278, 321. Respondent's lab director testified that there were no standardized and approved laboratory and analytical techniques for all of the hazardous wastes and hazardous waste constituents. TR. 371.

far back in time as 1976, and provided the raw data, without analysis (except for some graphs showing the indicator parameters of pH and specific conductance), in its 1984 report. CX-10B, Appendix 6; TR. 288.

However, respondent is required to specify in its ground-water quality assessment plan "[s]ampling and analytical methods for those hazardous wastes or hazardous waste constituents in the facility" [section 265.93(d)(3)]. That phrase cannot be interpreted as referring to an analysis of some hazardous wastes or hazardous waste constituents in the facility; it must be interpreted as referring to all hazardous wastes or hazardous waste constituents that are contained in the landfill. Construing paragraph 265.93(d)(4) in the context of the entire section of the regulation, section 265.93, it follows that the implementation of that plan, pursuant to section 265.93(d)(4), must include an analysis of all hazardous wastes or hazardous waste constituents which exist in the landfill, so that a complete and accurate determination may be made of the rate and extent of migration and concentrations of hazardous waste or hazardous waste constituents in the ground-water.

Even after the complaint was filed, respondent's 1985 ground-water assessment report states that respondent had not yet analyzed each hazardous waste or hazardous waste constituent that was disposed of at the landfill, but that respondent intended to perform such a complete analysis 30 days after EPA would accept the 1985 report. CX-11B p. 11. For that report, respondent had sampled

and analyzed ground-water quality parameters required by 40 C.F.R. section 265.92(b)(2) and some heavy metals, had conducted a priority pollutant analysis, and had concluded that no detectable concentrations of the chemicals tested were evident. RX-11B pp. 10-11, Tables 5-8, Appendix 7. That report states that no hazardous wastes or hazardous waste constituents have migrated through the clay liner, but that the expected rate of leachate migration, assuming total failure of the leachate collection system, would be about 0.03 feet per year. Respondent did not analyze all hazardous wastes in the facility until 1986. RX-1; CX-19; TR. 267-270, 296, 827-828. Those results do not indicate contamination of ground-water according to testimony of respondent's engineering manager. TR. 270. However, according to testimony of complainant's hydrogeology expert, there are certain hazardous waste constituents which have been detected in the ground-water; for example, chromium which was found in well E-6. TR. 828-840, 851-852; CX-19; RX-1.

In general, respondent has not implemented an adequate ground-water quality assessment program in a situation where there is evidence of ground-water contamination. Respondent conducted incomplete analyses of hazardous wastes in the ground-water, even where an alternative statistical test indicated significant increases in indicator parameters. Asserting that the Student's T-test results were false positives, respondent relied, inter alia, on an EPA guidance document, dated November 30, 1983, prepared by Mr. John H. Skinner, Director of the Office of Solid Waste, which acknowledges potential problems with the Student's T-test, namely

false positive results. CX-8; RX-10B, Appendix 5. This guidance document also prescribes procedures to follow for owners and operators claiming false positive results: if the averaged replicate value statistical test results indicate significant increases in indicator parameters, as respondent's did, the plan should focus upon hazardous waste constituents, which are defined in 40 C.F.R. section 260.10 and listed in 40 C.F.R. Part 261, Appendix VII and Table I of section 261.24. TR. 110-111. The document further states that facilities with insufficient or poorly located wells must resolve these problems in order to demonstrate whether there has been any discharge from the facility. CX-8, p.3.[38]

By failing to adequately determine the presence of hazardous waste or hazardous waste constituents in the ground-water, and then properly assess the rate and extent of migration and concentrations, respondent did not meet the requirements of 265.93(d)(4), and furthermore did not follow the guidance provided in the Skinner document.

XI. Violation of 40 C.F.R. § 265.93(d)(5)

The final allegation in the complaint charges respondent with failure to make a first determination under section 265.93(d)(4),

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[38] The Skinner memorandum explains that inadequate monitoring data, resulting in false positives, may result from the situation in which the minimum system required by the regulations is implemented, e.g. four wells, minimum frequency of sampling, when the site is not is not extremely simple; more than those minimums will be necessary at the typical facility. CX-8, p. 1.

and, within 15 days of that determination, submit to EPA a written report containing an assessment of the ground-water quality. In respondent's letter accompanying the ground-water quality assessment plan, dated September 26, 1983, respondent stated that it anticipated making its first determination in about 30 days. CX-7A. On February 9, 1984, when EPA had not received any report of such determination, EPA sent respondent a letter requesting submission of the concentrations, rate and extent of migration of hazardous waste in the ground-water. CX-9. Later that month, respondent submitted its draft Ground-water Quality Assessment Report. CX-10A, 10B.

Laying aside the issues discussed above, of whether respondent's conclusion that the facility is not contaminating the ground-water is an adequate first determination, and whether there was an adequate assessment of ground-water quality in the report dated February 29, 1984 (CX-10B), the question here is whether respondent made a first determination according to paragraph (d)(4) "as soon as technically feasible." It does not seem reasonable to consider a period of almost five months as meeting that standard in the circumstances of this case. Consequently, respondent has not complied with 40 C.F.R. section 265.93(d)(5).

Broadly speaking, respondent has skated too close to the edge of compliance with the ground-water monitoring requirements. A good faith owner or operator of a hazardous waste facility should consult with EPA or otherwise investigate to be sure they are not violating the requirements, if theres are any doubts. The

interpretations herein of those regulatory requirements are based upon a common sense application of the regulatory language to the circumstances at hand. While excerpts from EPA policy and guidance documents are cited for informative reasons, they are not relied upon for determination of liability, penalty or the compliance order.

PENALTY

The complaint does not include any detail regarding the calculation of the proposed penalty of $35,300. However, complainant has submitted penalty computation worksheets (CX-14) and supporting testimony which will be considered, along with the Final RCRA Civil Penalty Policy, dated May 8, 1984 (Penalty Policy), which policy must be considered by the administrative law judge in determining the amount of civil penalty, according to the Consolidated Rules of Practice, 40 C.F.R. section 22.27(b). The penalty must be assessed in accordance with section 3008(a)(3) of RCRA, which provides: "Any penalty assessed in the order shall not exceed $25,000 per day of noncompliance for each violation of a requirement of this subchapter. In assessing such penalty, the Administrator shall take into account the seriousness of the violation and any good faith efforts to comply with applicable requirements."

With respect to the violations of 40 C.F.R. sections 265.90(a)

and (b),[39] complainant proposes a penalty of $7475, based upon application of the Penalty Policy matrix with an upward adjustment of 15% for willfulness or negligence. That matrix is a method of arriving at a gravity-based penalty based upon the factors of potential for harm and extent of deviation from the requirement, and upon minor, moderate, and major degrees. Each cell in the matrix specifies a penalty range. The Penalty Policy provides that the gravity-based penalty may then be adjusted by factors of economic benefit of noncompliance, good-faith efforts to comply or lack of good faith, degree of willfulness or negligence, history of noncompliance, ability to pay, or other unique factors which may arise on a case-by-case basis.

Complainant arrived at a gravity-based penalty of $6500 for the violations of section 265.90(a) and (b), ranking the factors of potential for harm and extent of deviation as moderate. The potential for harm was appropriately assessed as moderate will be adopted here, because the failure adequately to monitor the

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[39] The complainant's assessment of a single penalty for the violations of paragraghs (a) and (b) of section 265.90, and similarly for the violations of paragraghs (2), (3) and (4) of section 265.93(d) is reasonable, because those violations are not independent or substantially distinguishable. However, the violation of section 265.91(a)(2) will be added to the penalty assessment for sections 265.90(a) and (b), because the latter violations are partially dependent on the former, do not require an element of proof not needed by the former, and pose the same risk, that is, hazardous waste migrating undetected into the uppermost aquifer. Penalty Policy at 11-12. The violation of section 265.93(d)(5) will be combined with sections 265.93(d)(2), 265.93(d)(3), and 265.93(d)(4) for the purpose of penalty assessment for the same reasons. The risk posed by noncompliance with those paragraphs of section 265.93(d) is that EPA would not be adequately informed of the presence and extent of contamination in the ground-water.

uppermost aquifer poses a significant likelihood of exposure of the ground-water to hazardous waste from the facility. However, the extent of deviation is major, considering that the three violations, sections 265.90(a), 265.90(b), and 265.91(a)(2), make up this portion of the penalty assessment,[40] and considering that respondent significantly deviated from the requirements of the regulation in terms of identifying, characterizing, and monitoring the uppermost aquifer, at least until after the complaint was filed. The gravity-based penalty is $9000 around the middle of the range specified in the matrix.

The penalty will be adjusted downward considering the unique factor in this case that respondent has not only spent a great deal of money since the complaint was filed, attempting to come into compliance with this requirement, but must spend still more to come into compliance. So far, respondent has performed site investigations and has installed piezometers pursuant to the monitoring program proposed by Golder Associates. Respondent's engineering manager testified that it had contracts in place with Golder Associates totalling $290,000. TR. 287. Because of the greater importance of applying respondent's financial resources to installing additional wells and conducting further hydrogeologic investigations, as outlined in the following compliance order, the gravity-based penalty is reduced by 40% to $5400.

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[40] The Penalty Policy (at 12) provides that the fact that more than one section was violated is taken into account in choosing higher "potential for harm" and "extent of deviation" categories on the matrix.

The 15% upward adjustment, which complainant justifies on grounds that "respondent should have knowledge of the regulatory requirements and the hazards associated with this violation" (CX-14) is not appropriate here. It is not clear that respondent knew that its monitoring system was not adequately monitoring the uppermost aquifer prior to engaging its new consultant, Golder Associates. The factor of good faith efforts to comply, which respondent believes merits a downward adjustment, is not applicable here because respondent did not make significant good faith efforts to assure that the system of wells adequately monitored the uppermost aquifer until after the complaint was filed, and therefore such efforts were not made promptly. Sandoz, Inc., RCRA (3008) Appeal No. 85-7 (Final Decision, March 2, 1987), at 18-20; Penalty Policy at 17.

For the violation of 40 C.F.R. section 265.91(a)(2), complainant calculates an economic benefit of noncompliance of $3015.50 which complainant adds to its proposed gravity-based penalty. It does not appear, however, that there is a significant economic benefit to respondent,[41] in light of the post-complaint expenditures on the Golder Associates borings and the expenditures which must still be made to install an adequate downgradient monitoring system.

For the violations of sections 265.93(d)(2), (d)(3) and (d)(4), complainant proposes a gravity-based penalty of $6500,

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[41] The Penalty Policy provides (at 12) that the economic benefit of noncompliance should be added to the penalty if the violation results in significant economic benefit to the violator.

increased by 15% for degree of willfulness or negligence. The potential for harm was appropriately assessed as moderate, because the inadequacy of the ground-water quality assessment plan and implementation of that plan has a significant adverse effect on the regulatory purposes or procedures for implementing the RCRA program. To allow such poorly supported conclusions that the facility is not affecting ground-water defeats the purpose of the ground-water assessment program. The extent of deviation will be ranked as moderate because the implementation of the ground-water quality assessment plan and report deviated significantly from the requirements, and the because several violations, paragraphs 265.93(d)(2), (d)(3), (d)(4) and (d)(5), comprise this penalty assessment. The gravity-based penalty will be set at the low end of the penalty range in the moderate-moderate matrix cell, $5500, because the ground-water assessment plan deviated somewhat, rather than significantly, from the requirements. However, a 25% reduction in the penalty for unique factors is appropriate, and the proposed reduction of 15% for willfulness or negligence is inappropriate, because of the evidence that the Student's T-test results can produce false positives. A downward adjustment for good faith based upon respondent's efforts to get feedback from EPA on the adequacy of its plans is not warranted here. Therefore the penalty for these violations of section 265.93(d) is $4125.

The violation of 40 C.F.R. 265.93(c)(2) is determined to have a minor potential for harm, because respondent notified EPA immediately following its May 1983 sampling of the Student T-test

results (Joint Exhibit 2A, 2B), and stated its intentions of not verifying the results. The extent of deviation is minor, being a three month delay in confirming the test results. The appropriate penalty for this violation is $300. The total civil penalty assessed against respondent for the violations enumerated above is $9,825.00.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

1. Respondent Michigan Waste Systems, Inc. owns and operates a hazardous waste disposal facility, and is subject to RCRA and the interim status standards applicable to owners and operators of hazardous waste treatment, storage and disposal facilities, which standards are found at 40 C.F.R. Part 265.

2. The ground-water monitoring program utilized by respondent, which involved monitoring four wells at respondent's hazardous waste facility, was not capable of determining the facility's impact on the quality of ground-water in the uppermost aquifer underlying the facility, and therefore respondent violated 40 C.F.R. section 265.90(a).

3. Respondent's ground-water monitoring system did not consist of at least three monitoring wells which are installed hydraulically downgradient at the limit of the waste management area, and which are adequate in number, location and depth to ensure that they immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer, as required by

40 C.F.R. section 265.91(a)(2).

4. Following the Student's T-test analysis, pursuant to section 265.93(b), showing significant changes in indicator parameters for downgradient wells, respondent failed to obtain additional ground-water samples from the downgradient wells immediately where a significant difference was detected, split the samples in two, and obtain analyses of all additional samples to determine whether the significant differnce was the result of laboratory error, as required by 40 C.F.R. section 265.93(c)(2).

5. Respondent failed to submit, within 15 days after notifying EPA that the facility may be affecting ground-water quality, a specific plan, based on the outline required by section 265.93(a), for a ground-water quality assessment program at the facility, and therefore violated 40 C.F.R. section 265.93(d)(2).

6. Respondent's ground-water quality assessment plan, dated September 26, 1983, did not specify sampling and analytical methods for those hazardous wastes or hazardous waste constituents in the facility, and did not specify evaluation procedures, and therefore did not meet the requirements of 40 C.F.R. section 265.93(d)(3).

7. Respondent did not implement a ground-water quality assessment plan which satisfies the requirements of section 265.93(d)(3), and did not properly determine the rate and extent of migration and concentrations of the hazardous waste or hazardous waste constituents in the ground-water, as required by 40 C.F.R. section 265.93(d)(4).

8. Respondent failed to make its first determination under section

265.93(d)(4), and then submit the ground-water quality assessment report, as soon as technically feasible, and therefore violated 40 C.F.R. section 265.93(d)(5).

9. By failing to install, operate, and maintain a ground-water monitoring system which meets the requirements of section 265.91, and by failing to comply with sections 265.92 through 265.94, respondent violated 40 C.F.R. section 265.90(b).

10. Complainant's evidence did not establish violations of 40 C.F.R. sections 265.92(c)(2) (determining background arithmetic mean and variance by pooling measurements from upgradient wells), 265.93(a) (preparing an outline of a ground-water quality assessment program), or 265.93(d)(1) (providing written notice within seven days of confirmation of statistical verification that the facility may be affecting ground-water). Therefore it is concluded that respondent did not violate these provisions.

11. The appropriate civil penalty for the violation of 40 C.F.R. sections 265.90(a), 265.90(b), and 265.91(a)(2) found herein is $5400.00.

12. The appropriate civil penalty for the violation of 40 C.F.R. sections 265.93(d)(2), 265.93(d)(3), 265.93(d)(4) and 265.93(d)(5) found herein is $4125.00.

14. For the violation of 40 C.F.R. section 265.93(c)(2), the appropriate civil penalty is $300.00.

15. All arguments not specifically addressed herein are rejected as not sufficiently persuasive to warrant comment.

ORDER

It is hereby ORDERED that respondent shall comply with the following requirements:

1. Respondent shall complete the ground-water quality assessment plan and program required by 40 C.F.R. sections 265.93(d)(2), (d)(3), (d)(4), and (d)(5), including the following:

A. Within 30 calendar days of the effective date of this Order, respondent shall prepare and submit to EPA a document to be entitled "Ground-water Quality Assessment Program Plan," which must

(1) specify the number, location, and depth of each well from which a sample of ground-water will be taken (or, since July 1983, has been taken);

(2) specify the sampling methods for obtaining each sample from each well from which a sample of ground-water will be (or has been) taken;

(3) specify, by chemical names, the entire set of hazardous wastes and hazardous waste constituents in the facility, including each constituent listed in Table 1 of 40 C.F.R. section 261.21 and, for each hazardous waste listed in 40 C.F.R. section 261.31 or section 261.32, that has been disposed of in the landfill, the corresponding constituents listed in Appendix VII to 40 C.F.R. Part 261.

(4) specify laboratory analytical methods used since July, 1983, or to be used, to provide a numerical value for the concentration of each hazardous waste or hazardous waste constituent in the facility;

(5) specify evaluation procedures to be used to prove that the

facility is not the source of any hazardous waste or hazardous waste constituent detected in any sample above the limit of detection associated with the specified analytical method(s);

(6) specify evaluation procedures necessary to establish the rate and extent of migration for each hazardous waste or hazardous waste constituent detected in any sample above the limit of detection associated with the specified analytical method(s);

(7) specify a schedule of implementation not to exceed sixty (60) days for sampling, analysis and evaluation of all samples which remain to be taken, and for evaluation of analytical results for all samples for which analytical results have already been obtained by respondent;

(8) provide for collection of ground-water samples from all monitoring wells which exhibited a statistically significant difference in indicator parameters during 1983, and provide for analysis of formaldehyde, phenylmercuric acetate, and pthalic anhydride;

B. Within 105 calendar days of the effective date of this Order, submit to EPA the written report required by 40 C.F.R. section 265.93(d), containing respondent's assessment of the ground-water quality and respondent's determination of the rate and extent of migration of the hazardous wastes or hazardous waste constituents in the ground-water, and the concentrations of the hazardous waste or hazardous waste constituents in the ground-water.

2. Respondent shall, within 180 calendar days of the effective date

of this Order, conduct soil borings and hydrogeological investigations to establish:

A. horizontal and vertical extent of sand formations present in the southwest, east, and northeast portions of the facility;

B. the presence and horizontal and vertical extent of or absence of sand formations along the western perimeter of the waste management area between the locations of borings MC-1 and GA-31;

C. the magnitude and direction of any horizontal and vertical component of the hydraulic gradient within sand formations underlying the facility;

D. the identification of the portion(s) of the limit of the waste management area which overlie such sand formations and are hydraulically downgradient, that is, in the direction of decreasing static head, within such sand formations;

E. the identification of whether the portion of the limit of the waste management area between the location of borings MC-1 and GA-31 is hydraulically upgradient or downgradient with respect to ground-water flow within the basal till; and

F. the locations, depths and effective screened intervals for all wells required under Paragragh 4 of this Order.

3. Respondent shall, within 210 calendar days of the effective date of this Order, submit a written report to EPA containing the conclusions of, and all data generated in, the implementation of the soil borings and hydrogeological investigations in Paragragh 2.

4. Based on the soil borings and hydrogeologic investigations, respondent shall, within 270 calendar days of the effective date of

this Order:

A. Install a system of monitoring wells at the downgradient limit of the waste management area, which may include but must not be limited to, wells E-6, E-12, GA-31B, GA-32C, GA-33C, GA-34A and GA-35A, provided each well is established to be screened in ground-water which is hydraulically downgradient. Where the downgradient limit of the waste management area overlies sand formations and the basal till, monitoring wells must be clustered and the depths of said clustered wells must be such that their screened portions intercept all appropriate aquifer flow zones within the uppermost aquifer, as defined by 40 C.F.R. section 260.10, and enable the collection of ground-water samples to ensure immediate detection of any statistically significant amount of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer, which includes the basal till and any overlying sand formations which are aquifers. The number of said wells shall be of sufficient quantity to account for variations in the thickness of the silty clay till underlying the waste management area, the amounts and spatial distribution of leachate in the landfill, radial ground-water flow in the basal till, and the length of segments along the limit of the waste management area which are underlain by sand formations.

B. Install a system of monitoring well(s) confirmed to be hydraulically upgradient from the limit of the waste management area. The depth(s) of said well(s) shall be such that the screened portions intercept appropriate aquifer flow zones in the uppermost

aquifer and enable the collection of ground-water samples that are representative of background ground-water quality in the sand formations and basal till near the facility, and not affected by the facility.

5. Within one year of the installation of each monitoring well installed pursuant to paragragh 4 of this Order, determine from ground-water samples obtained from each such well the concentration or value of each parameter contained or referred to in 40 C.F.R. section 265.92(b)(1), (b)(2), and (b)(3), in the manner and frequency required by 40 C.F.R. section 265.92(c) and (d).

6. Thereafter evaluate, keep records and report the ground-water monitoring results from the monitoring well system installed pursuant to paragragh 4, as required by 40 C.F.R. sections 265.93 and 265.94.

7. Notwithstanding compliance with the terms of this Order, respondent may be required to take such further actions as may be necessary, including additional ground-water monitoring, assessment, and/or corrective action, to come into compliance with RCRA.

8. A civil penalty of $9,825.00 is assessed against respondent for violations of RCRA and regulations promulgated thereunder. Respondent Michigan Waste Systems, Inc. is hereby ordered to pay within thirty (30) days from the date of service of this Order a

civil penalty in the sum of $9,825.00. Payment shall be by certified or cashier's check made payable to the Treasurer, United States of America, and mailed to: Environmetnal Protection Agency, Region 5 (Regional Hearing Clerk), P. O. Box 70753, Chicago, IL 60673.

J. F. Greene
Administrative Law Judge

Dated: September 30, 1991
Washington, D.C.

CERTIFICATE OF SERVICE

I hereby certify that the Copies of the Initial Decision of the Michigan Waste Systems, Inc., Docket No. RCRA-V-W-84-R-054 was sent to the Regional Hearing Clerk on September 30, 1991.

Shirley Smith
Secretary to Judge J. F. Greene

September 30, 1991