IN THE COURT OF COMMON PLEAS
SANDUSKY COUNTY, OHIO

'84 MAY 29 P3:13

LEGAL SERVICE

STATE OF OHIO, EX REL. ANTHONY J. CELEBREZZE, JR, ATTORNEY GENERAL OF OHIO Plaintiff, v. WASTE MANAGEMENT, INC. and CHEMICAL WASTE MANAGEMENT, INC. Defendants.	)

SANDUSKY COUNTY COMMON PLEAS COURT FILED
1984 MAY 22 PM 2:49
ALBERTA RATHBUN CLERK

CONSENT DECREE

The Complaint in the above-captioned case having been filed herein, and the Plaintiff State of Ohio by its Attorney General Anthony J. Celebrezze, Jr. (hereafter "Plaintiff"), and the Defendants, Waste Management, Inc. (hereafter "WMI") and Chemical Waste Management, Inc. (hereafter "CWM"), having consented to entry of this Decree,

NOW, THEREFORE, without trial of any issue of fact or law, and upon consent of the parties hereto, IT IS HEREBY ORDERED, ADJUDGED, AND DECREED as follows:

I.

1. This Court has jurisdiction over the subject matter herein pursuant to Chapters 3704, 3734, 3767, and 6111 of the Ohio Revised Code and Ohio common law. The Complaint states a claim upon which relief can be granted against WMI and CWM under these statutes. This Court has jurisdiction over the parties hereto. Venue is proper in this Court.

II.

2. The provisions of this Consent Decree shall apply to and be binding upon the parties to this action, their agents, officers, employees, assigns, and successors in interest.

3. CWM shall incorporate in all contracts for work done to carry out the requirements of this Consent Decree at the Vickery Facility conditions that such work shall be done in compliance with these requirements.

III. SATISFACTION OF LAWSUIT

4. Plaintiff alleges in its Complaint that CWM has operated its Ohio Liquid Disposal hazardous waste facility near Vickery, Ohio (hereinafter the "Vickery Facility") in violation of various state hazardous waste, air pollution, water pollution, and nuisance laws. CWM neither admits nor denies those allegations. Compliance with the terms of this Consent Decree shall constitute full satisfaction of any civil or criminal liability by CWM, WMI and all their subsidiaries, employees, and former employees to the State of Ohio for all claims under such laws known to Plaintiff at this time. All such claims known to the State of Ohio have been alleged in the Complaint.

5. Nothing in this Decree shall be construed to limit the authority of the State of Ohio to seek relief for claims or conditions not alleged in the Complaint or addressed by this Consent Decree.

IV. CIVIL PENALTY

6. CWM shall pay or cause to be paid to the State of Ohio a civil penalty of five million dollars ($5,000,000) in ten (10) equal annual installments of five hundred thousand dollars ($500,000) a year for ten (10) years. The first installment of this penalty shall be paid within ten (10) days after entry of this Consent Decree and subsequent annual payments shall be made by the same date in subsequent years. Payment shall be made by delivering to the Manager of the Permits and Manifest Records Section of the Ohio Environmental Protection Agency Division of Solid and Hazardous Waste Management or to such person as may be otherwise specified in writing by the Ohio Environmental Protection Agency ("Ohio EPA"), for payment into the Hazardous Waste Cleanup Special Account created by Ohio Revised Code Section 3734.28, a certified check (or by other means acceptable to Ohio EPA) in such amount made to the order of "Treasurer of the State of Ohio".

V. REIMBURSEMENTS AND CONTRIBUTIONS

7. The State of Ohio alleges that it has incurred significant actual and imputed costs and expenses, incurred to date in the investigation of operations, records and environmental media at the Vickery Facility, and to be incurred in the future through the annual activities contemplated by this Consent Decree, including inspections, monitoring, environmental sampling and analysis, closure plan review, and waste products review process which will be necessitated by future construction, and operation of the Vickery Facility. In settlement of any claim which the State has for costs incurred as a result of such activities in 1984, CWM agrees to pay or cause to be paid to the State of Ohio compensation in the sum of three hundred thousand dollars ($300,000). In settlement of the claim of the State for such future annual costs, CWM agrees to pay or cause to be paid to the State compensation in the liquidated amount of three hundred thousand dollars ($300,000) during each calendar year from 1985 through 1993. All these payments are over and above any amounts paid by CWM pursuant to Paragraph 23 of this Consent Decree or Ohio Revised Code Section 3734.18. The first payment shall be within ten (10) days after entry of this Consent Decree, and subsequent annual compensation payments shall be made by the same date in subsequent years. All payments under this Section shall be to the Hazardous Waste Cleanup Special Account in the State Special Revenue Fund, created by Ohio Revised Code Section 3734.28, by delivering to the custodian of the Hazardous Waste Cleanup Special Account, with notice to the Manager of the Permits and Manifest Records Section of Ohio EPA, Division of Solid and Hazardous Waste Management, a certified check made to the order of "Treasurer of the State of Ohio."

8. CWM shall fulfill a Pledge of Contribution made by CWM to the Board of Commissioners of Sandusky County, Ohio and to the Sandusky County Board of Health in a total amount of $2,000,000 paid over ten years in equal quarterly payments (except for the first year, for which payment has already been made).

VI. INJECTION WELL IMPROVEMENTS

9. CWM shall not inject waste into any injection well at the Vickery Facility until:

(A) The well has been rebuilt to incorporate an annular seal system sufficient to maintain pressure on the annulus fluid independently from pressure on the waste in the injection tubing;

(B) A sight glass has been installed to monitor the annulus fluid volume;

(C) The following mechanical integrity tests have been conducted to determine that the well does not leak:

(1) a static annular pressure test of the long string casing, performed with an annular seal system set within thirty (30) feet from the bottom of the long string casing of the well; this test shall be conducted at a surface pressure of one thousand (1000) pounds per square inch gauge (p.s.i.g.) with no more than a three (3) percent loss of pressure during a one (1) hour period with the well in static and equilibrium conditions; and

(2) a radioactive tracer log test to determine points of fluid exit, if any, and possible upward migration of fluid outside the casing; and

(D) Ohio EPA has agreed in writing that the above conditions have been met, provided, however, that execution of this Consent Decree constitutes agreement that such conditions have been met for injection wells 1A, 3 and 4, which may be operated pursuant to the terms and conditions of this Consent Decree.

VII. INJECTION WELL MONITORING, REPORTING AND OPERATION

10. CWM shall:

(A) Maintain during injection of wastes at least fifty (50) p.s.i.g. positive differential pressure on the annulus fluid over injection pressure at the well annular seal system;

(B) Not exceed during injection of wastes a surface pressure in excess of seven hundred ninety (790) p.s.i.g. on wastes in the injection tubing;

(C) Not use explosives to cause fractures in any formation;

(D) Assure that a major rise or major drop in injection pressure or pipeline pressure automatically shuts down the pump to the injection well; and

(E) Not fracture any formation without written authorization from Ohio EPA.

11. During the operation of any injection well, CWM shall check and record the injection pressure, the annulus pressure, and the injection rate of each such well at least once every two (2) hours. A written and a continuous graphic record of all such injection pressures, annulus pressures, and injection rates for each well shall be kept at the Vickery Facility and made available for inspection and copying by Ohio EPA until three years after the plugging and abandonment of the well.

12. CWM shall submit to Ohio EPA a monthly report listing the daily minimum, maximum, and average injection pressures, annulus pressures, and injection rates for each well for each day during which waste was injected into the well during that month. For each minimum and maximum injection rate

reported, CWM shall list in the report the injection pressure and annulus pressure occurring during the time the well was operating at this minimum or maximum injection rate. Also included shall be a listing of the date, duration and cause of any non-operating period for each well during the month. The report for each month shall be due by the fifteenth (15th) day of the next month.

VIII. INJECTION WELL TESTING

13.(A) To ensure that all injection wells at the Vickery Facility are safely and properly operating, CWM shall perform integrity tests on each of these wells. For each of its injection wells, CWM shall perform the following tests annually (such annual period to commence from the last date on which such test(s) were performed):

(1) a static annular pressure test of the long string casing, performed with the injection seal system set within thirty (30) feet from the bottom of the long string casing of the well, to be conducted at a surface pressure of no less than one thousand (1000) p.s.i.g. with no more than a three (3) percent loss of pressure during a one (1) hour period with the well in static and equilibrium conditions; and

(2) a radioactive tracer log test to determine the points of fluid exit, if any, and possible upward migration of fluid outside the casing.

(B) During a major workover (i.e. when the injection tubing is removed from the well) on a well, CWM shall perform a static annular pressure test and radioactive tracer log test as described above, and a forty (40) arm caliper log test of the long string casing. In the event of a major workover, the testing required in Paragraph 13(B) shall constitute the testing required in Paragraph 13(A) for the twelve (12) months thereafter.

14. CWM will provide at least twenty-four (24) hours advance notice of major workovers to the Northwest District Office of the Ohio EPA and the Sandusky County Board of Health. It shall provide such notice ten (10) days in advance for the annual static annular pressure and radioactive tracer log tests. CWM will allow personnel from Ohio EPA and the Sandusky County Board of Health to observe all tests described in Paragraph 13(A) and (B). It will make all reasonable efforts to change the times of caliper tests and radioactive tracer log tests to facilitate attendance by such observers; provided, however, that it may perform such tests before the completion of a major workover on an injection well without prolonging the period such well would otherwise be out of operation.

15. Results of each test shall be reported to Ohio EPA and the Sandusky County Board of Health in writing within ten (10) days after completion of the testing period; provided, however, that test results or related reports received subsequently by CWM shall be reported within ten (10) days after receipt.

16. In observing the tests described in Paragraph 13(A) and (B), Ohio EPA shall contemporaneously inform CWM to the extent possible based upon the preliminary information and observations available at that time whether a test has been accurately or adequately performed. If Ohio EPA determines that the test has not been so performed, CWM shall conduct the test again. Within thirty (30) days after performing the tests, Ohio EPA will approve or disapprove in writing the results and field evaluation as accurate and acceptable. If the results are disapproved by Ohio EPA, Ohio EPA will specify the reasons for disapproval.

17. If any monitoring or testing described in Paragraphs 11 or 13(A) and (B) indicate that a leak may be occurring within or from an injection well, CWM shall immediately cease injecting wastes into such well and thereafter immediately inform the Division of Solid and Hazardous Waste Management of the Ohio EPA Northwest District Office and the Sandusky County Board of Health,

and shall perform sufficient tests and/or analyses to determine the cause of the testing or monitoring results. If a leak has occurred from the injection well, CWM shall not resume injection of wastes until CWM has reworked the well and Ohio EPA has agreed in writing that the tests specified in Paragraph 9(C) have demonstrated the integrity of the worked over well. If CWM or any of its employees receives information sufficient for a reasonably prudent person to recognize that the operation of an injection well violates a permit condition or applicable regulation in some other manner, CWM shall notify the Division of Solid and Hazardous Waste Management of the Ohio EPA Northwest District Office immediately and shall cease or correct such violation. In addition, if CWM or any of its employees receives information sufficient for a reasonably prudent person to recognize that continued operation of the well endangers public health, CWM shall immediately cease operation of the well until it has corrected such endangerment to the satisfaction of Ohio EPA. If Ohio EPA determines that the operation of an injection well violates applicable regulations, it may direct CWM to cease operation of the well until the violation is corrected. Notwithstanding the issuance of a permit(s) for the injection well(s) pursuant to the Underground Injection Control program under the Federal Safe Drinking Water Act, the requirements of Paragraphs 9 to 17 shall continue unless the conditions of such permit(s) are in conflict with the requirements of those paragraphs.

IX. OVERBURDEN GROUNDWATER TESTING

18. CWM shall conduct the following testing, monitoring, and reporting for the Vickery Facility surface impoundments:*

(A) Install eighteen (18) temporary overburden groundwater sampling holes and include one (1) existing monitoring well at the locations shown on Attachment A for a single sampling event to sample the groundwater

*As used in this Consent Decree, the term "surface impoundments" means Ponds 4 (both open and closed portions), 5, 7, 11, 12 and the wet well, all as marked on Attachment A.

at a depth between fifteen (15) feet and twenty (20) feet below the original, natural ground surface; the details of the installation of these holes are to be submitted to Ohio EPA within thirty (30) days of approval of this Consent Decree;

(B) The overburden groundwater samples described in (A) above will be analyzed according to U.S. EPA approved standard methods for the following parameters: pH, Specific Conductance, Total Organic Carbon, Total Organic Halogens, Arsenic, Barium, Cadmium, Calcium, Chromium, Lead, Magnesium, Mercury, Selenium, Silver, Sodium, Sulfate, Carbonate, Bicarbonate, Chloride, Cyanide, Chloroform, 1, 1, 2 - Trichloroethane, 1,1,1 - Trichloroethane, Benzene, Trichloroethylene, Tetrachloroethylene, Toluene, Ethylbenzene, Chlorobenzene, and PCBs;

(C) The results of the analyses will be submitted to Ohio EPA within ninety (90) days after Ohio EPA approval of the submittal referred to in (A) above;

(D) In the event that concentrations of any parameter listed in 40 C.F.R. 265, Appendix III in a sample from a sampling hole(s) are in excess of the standards listed in such Appendix, and in the event that concentrations of such parameters are determined by Ohio EPA to be above natural background levels or above acceptable sampling and laboratory analysis interference or error, CWM shall submit to the Ohio EPA within sixty (60) days of this concentration determination, a plan for establishing a groundwater monitoring well(s) in the vicinity of the location(s) of the sampling hole(s) where such concentrations of tested parameters exceeded those standards; these monitoring wells shall be sampled and analyzed for the parameters exceeding those standards in accordance with the CWM groundwater monitoring plan for the Vickery Facility;

(E) Such monitoring wells surrounding Ponds 4, 5 and 7 may serve as part of the monitoring system for the closure cell, if approved for such use by Ohio EPA; and such monitoring wells surrounding Ponds 11 and 12 may serve as part of the monitoring system, if any is required, for those Ponds when they are closed, if approved for such use by Ohio EPA.

X. DRINKING WATER WELL SAMPLING

19. CWM shall fund a program for the Sandusky County Board of Health to analyze off-site drinking water wells located near the Vickery Facility. The Sandusky County Board of Health shall collect the samples and pay for laboratory analysis of such samples. CWM shall reimburse the County for the costs of such analysis within thirty (30) days after the Board's submission of an invoice for these costs to CWM. The wells to be sampled, the sampling and analytical procedures, the parameters to be analyzed, and the laboratory to perform the analyses are to be mutually agreed upon from time to time by Ohio EPA, CWM, and the Sandusky County Board of Health. No more than ten (10) wells will be sampled and analyzed per quarter. This sampling and analysis shall be conducted quarterly for two (2) years after entry of this Decree, semi-annually for the next two (2) years, and annually thereafter for the next four (4) years. Analytical procedures used shall be U.S. EPA approved standard methods. Any of Ohio EPA, CWM or the Sandusky County Board of Health may observe any sampling or analyses performed pursuant to this program and may take a split sample of any sample so taken.

XI. AIR POLLUTION AND ODOR EMISSIONS

20. To abate air pollution and odor emissions at the Vickery Facility, CWM is prohibited from placing any waste receipts or allowing any waste receipts to be placed into surface impoundments at the Facility after the dates specified in this paragraph. If CWM chooses not to apply for permits or permit modifications* authorizing the installation of a tank based, enclosed

*These permits and permit modifications are the Permits to Install for the tanks, an amended federal RCRA Part A, and a modification to the Hazardous

treatment and storage system, or fails to submit applications for all such permits and permit modifications within four (4) months after entry of this Decree, CWM shall cease the receipt of waste at the Vickery Facility within four (4) months after entry of this Decree. Should CWM decide to install the tank system, CWM shall submit applications for these permits and permit modifications to the appropriate governmental agencies as soon as possible, but in no event later than four (4) months after entry of this Decree. If CWM submits such applications within four (4) months, CWM shall be prohibited from placing any waste receipts or allowing any waste receipts to be placed into the surface impoundments at the Vickery Facility more than sixteen (16) working months after receiving final agency action on such applications. In addition, CWM shall install at the Vickery Facility a truck wash and unloading facility by November 1, 1984. This truck wash and unloading facility shall be installed in accordance with Permit to Install 03-1567 issued to CWM. CWM shall treat and store malodorous waste streams in tanks equipped with odor control equipment. Such waste streams shall include those identified in CWM's letter to Ohio EPA, dated August 19, 1983 (Attachment B hereto), and other waste streams agreed upon by CWM and Ohio EPA from time to time. If Ohio EPA determines that receipt of a new waste stream subsequent to the entry of this Consent Decree causes a malodorous condition, CWM shall handle such waste stream in an enclosed manner, cease acceptance of the waste stream, or take other measures to prevent such conditions from subsequent receipts of that waste stream.

21. To control emissions of air pollutants from the Vickery Facility, CWM shall install best available technology on hazardous waste storage and treatment tanks and the facility for truck unloading and internal truck washing, as described in this Paragraph. Tanks shall be controlled by closed systems vented to emissions control devices. CWM shall amend its waste analysis plan by July 1, 1984 to include volatile organic analyses in all waste profile analyses performed after that date and in all annual recertifications of waste streams required in CWM's waste analysis plan for the Vickery Facility after that date. CWM shall place into a tank(s) vented to an activated carbon system(s) all waste streams determined by waste

profile analyses or recertifications after July 1, 1984 to contain greater than a five (5) percent concentration of volatile organic constituents. Other waste streams shall be placed in a tank(s) vented to a caustic scrubber system designed to control odor and other emissions consistent with the system described in Attachment IV of CWM's submission of February 2, 1984 to Ohio EPA (Attachment C hereto). CWM shall capture as many emissions as practicable from the truck unloading and internal washing operations and vent them to such caustic scrubber system, provided that emissions from unloading trucks with waste streams containing greater than five (5) percent concentrations of volatile organic constituents shall also be treated with an activated carbon control system. Such trucks shall not be internally washed in the facility unless emissions from that operation are similarly treated.

XII. SURFACE WATER MONITORING AND REPORTING

22. In order to assure that contaminants are not discharged from the surface of the Vickery Facility into surface waters of the state, for a period of six (6) months from entry of this Consent Decree CWM shall weekly sample and analyze the water upstream and downstream from the runoff point(s) from the Vickery Facility for pH, Chemical Oxygen Demand, Oil and Grease, Phenols, Chlorides, Cadmium, Chromium, Copper, Lead, Zinc, and Mercury and shall monthly sample and analyze this water for Total Organic Halogens. Thereafter, CWM shall sample and analyze surface water on a monthly basis unless and until Ohio EPA Permit To Install 03-1567 is amended to modify or terminate this requirement.

XIII. SITE MONITORING

23. Until six (6) months after the closure of the last surface impoundment at the Vickery Facility, CWM shall pay to Ohio EPA forty thousand dollars ($40,000.00) per year to fund inspection and monitoring of the Vickery Facility by Ohio EPA unless and until legislative authorization specifically provides funding for a full time (40 hours per week) Ohio EPA inspector at the Vickery Facility. This money will be used to reimburse Ohio EPA for employees'

salaries, equipment, transportation, and other expenses incurred in monitoring the Vickery Facility forty (40) hours per week. These payments shall be made by certified check made to the order of "Treasurer, State of Ohio" and delivered to the Manager of the Permits and Manifest Records Section of the Ohio EPA Division of Solid and Hazardous Waste Management or to such person as may be otherwise specified in writing by Ohio EPA. The first payment shall be made within ten (10) days after entry of this Consent Decree and subsequent payments shall be made by the same date in subsequent years. These payments shall be made by checks separate from the checks written pursuant to Parts IV and V of this Consent Decree.

XIV. CLOSURE OF SURFACE IMPOUNDMENTS

24. CWM shall close the existing surface impoundments at the Vickery Facility as described in Parts XIV and XV of this Consent Decree. CWM shall pump non-oily liquid wastes (hereafter "aqueous material") from the surface impoundment being closed into the remaining surface impoundments and ultimately into the injection wells at the Vickery Facility. All oily liquid material from the surface impoundments and Miscellaneous Facilities (as defined in Part XVI below) shall be disposed of off-site. Except as provided below, CWM shall provide for decontamination of hazardous wastes and for decontamination of PCBs to background levels by taking the following actions: removal of all of the sludge, contaminated debris, other solids, and at least half a foot of clay* from the bottom and sides of the surface impoundment being closed; treatment of the sludge by chemical fixation; and disposal of the fixed sludge and other removed material in a closure cell** to be

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*As used in this Consent Decree, "clay" means native soils consisting primarily of clay and/or clay mixed with silt which are included within Designation CL, ML, CH, or MH of the Unified Classification System published in Earth Manual, Water Resources Technical Publication, U.S. Department of the Interior, Bureau of Reclamation, Second Edition 1974, Appendix Designation E3.

**For purposes of this Consent Decree, closure cell should be construed as cell or cells.

constructed within the approximate boundaries of Ponds 4, 5 and 7. The method of fixation used shall be selected from those evaluated by the Battelle Memorial Institute study referred to in Paragraph 28(A)(1). A clay liner and surface run-on and run-off control shall be provided in the area east of Pond 4 and this area shall be used to stockpile fixed sludge, excavated clay, rip rap and other materials to be disposed in accordance with this Consent Decree.

25. The closure cell shall be constructed and operated in compliance with 40 C.F.R. §761.75, Ohio Administrative Code ("O.A.C.") 3745-66-10 through 3745-66-20, O.A.C. §3745-67-28, and as generally described in this Consent Decree. The closure cell shall be used for disposal of the following: (a) clay, fixed sludge, contaminated debris, and other solids from the wet well, and Ponds 4, 5 and 7; (b) rip rap or PCB contaminated surface coatings from rip rap in Ponds 4, 5, 7 and 11; (c) the temporary stockpile liner specified in Paragraph 28(A)(4); (d) other materials specified in Paragraph 29 of this Consent Decree; (e) material which may become contaminated with PCBs as a result of implementing this Consent Decree; and, (f) if sufficient airspace remains in the closure cell after such disposal, clay and solidified sludge from Ponds 11 and 12 and rip rap from Pond 12. If sufficient airspace does not remain in the closure cell, CWM shall dispose of solidifed sludge from Ponds 11 and 12 and rip rap from Pond 12 in place in one or both of those Ponds as a closure cell in accordance with federal and state regulations applicable at that time. CWM shall utilize the closure cells only for disposal of materials necessary to accomplish closures and other actions required by Paragraphs 24 to 29 of this Consent Decree. No materials other than those specified by this Consent Decree shall be disposed of in these closure cells.

26. The closure cell shall be located within the approximate boundaries of Ponds 4 (both the closed and open portions), 5 and 7. The bottom of the closure cell shall include backfill of native soil, an underdrain, a clay liner, a synthetic liner, and a leachate collection system. Fixed sludge from Pond 4 containing dioxin shall be segregated in an identified portion of the

closure cell. The cap of the closure cell shall consist of a minimum of two (2) feet of clay compacted to 1 x 10^{-7} centimeters per second permeability, a synthetic liner, and one (1) foot of native soil. CWM shall grade and seed the cap to promote runoff to the surrounding site area. CWM shall dispose of leachate collected in the leachate collection system and shall perform post-closure monitoring and maintenance. CWM shall cause the liquid from the underdrain to be collected for treatment or disposal. CWM shall analyze at the scheduled groundwater monitoring times the water from the underdrain for PCBs, conductivity, and the parameters listed in Paragraph 22 above. CWM shall submit final plans and specifications for the closure cell to Ohio EPA for approval as CWM's closure plan for Ponds 4, 5, 7, the wet well, and the Miscellaneous Facilities, and to U.S. EPA for approval as a chemical waste landfill pursuant to 40 C.F.R. 761.75.

27. Within six (6) months after entry of this Consent Decree, CWM shall implement the actions authorized by Ohio EPA Permit to Install 03-1567, except for actions which cannot be implemented until Ponds 4, 5 and 7 are closed, and as noted below. Actions which may be authorized by approved modifications to the Permit to Install, if any, shall be implemented within the time(s) contained in approvals by Ohio EPA. Actions with regard to containment structures around pump houses and surge tanks, the sampling station, and final roadway construction shall be implemented within twelve (12) months after the entry of this Consent Decree. Actions with regard to houses around wellheads for injection wells 2, 5 and 6; the oil/water unloading area; final cap, grading and vegetation over closed Ponds 1, 2, 3, 6 and 9; and final grading in the northwest field shall be implemented as soon as practicable after completion of associated construction.

XV. SCHEDULE FOR CLOSURE

28. CWM shall implement the surface impoundment closures in accordance with the following schedule, with the exceptions noted below:

(A) Present Pond Closure

(1) Submit the final study on fixation of sludges being conducted by Battelle Memorial Institute to Ohio EPA upon receipt of the study by CWM; CWM shall use its best efforts to obtain this report by May 31, 1984. In any event, CWM shall provide Ohio EPA with such information as Battelle has provided CWM by that date, and this information shall be used as the basis for determining the method of fixation of sludges for the purpose of taking the action described in Paragraph 28(A)(5);

(2) To assist in the development of a closure plan, CWM shall perform a pilot study to chemically fix and excavate sludges and at least one-half foot of clay from the wet well; and, until a clay liner has been constructed as the base for a temporary stockpile adjacent to Pond 4, place this material on the closed end of Pond 4, after grading to prevent run-on and to divert run-off into Pond 4; and to provide for this placement, CWM shall remove uncontaminated soil and rubble located above elevation six hundred nineteen (619) feet mean sea level on the closed end of Pond 4 to the borrow pit to the west of Pond 12;

(3) Submit a complete closure plan for approval to Ohio EPA for Ponds 4 (both closed and open portions), 5 and 7, and a complete application for approval of a closure cell for such closure to U.S. EPA within four (4) months after agreement on a method for fixation of sludges by CWM and Ohio EPA; these submittals shall provide for control of dust and fugitive emissions from truck traffic, equipment operation, chemical fixation, earthmoving, and other activities resulting from the closure process; the closure plan application to Ohio EPA shall be acted upon by Ohio EPA in accordance with its normal administrative procedures; execution of this Consent Decree does not impair the administrative procedures employed by Ohio EPA in evaluating this submittal;

(4) Construct a temporary stockpile area to the east of Pond 4 which shall include a clay liner and shall be bermed to prevent run-on and run-off; place contaminated portions of the liner and associated berms in the closure cell after the remedial work is accomplished; and

(5) Within twenty-four (24) working months after final approval of the submittals referred to in Paragraph 28(A)(3), empty liquid material from Ponds 4, 5 and 7; excavate and chemically fix the sludge; excavate the rip rap and at least one-half foot of the clay from the interior surfaces; construct the closure cell; place the clay, rip rap, fixed sludge, and other materials specified in the Consent Decree in the closure cell; and construct a cap over the closure cell.

(B) Future Pond Closures

(1) Submit closure plan for approval to Ohio EPA (and, if Ohio does not then have authorization under RCRA, also to U.S. EPA) for Ponds 11 and 12 within nineteen (19) months after receiving final action on permits for the tank system referred to in Paragraph 20;

(2) Empty liquid material from Ponds 11 and 12 within a period of time determined by reference to the formula set forth in Attachment D;

(3) Excavate rip rap from Pond 11, and either dispose of it off-site in conformity with 40 C.F.R. 761.75 or place it in the previously closed closure cell(s) referred to in Paragraph 28(A)(3) and (5), and re-construct the cap within three (3) working months after either:

(a) the last of the final approval(s) referred to in Paragraph 28(B)(1); or

(b) the completion of the action referred to in Paragraph 28(B)(2);

whichever occurs later; and

(4) Solidify the sludge and close Ponds 11 and 12 within the nine (9) working months after either:

(a) the last of the final approval(s) referred to in Paragraph 28(B)(1); or

(b) the completion of the action referred to in Paragraph 28(B)(2);

whichever occurs later.

(C) Exceptions

"Working months" as used in this Consent Decree is defined to exclude periods of extreme weather, as agreed by the parties. Extreme weather may include: warm weather producing excessive odor from sludge handling or inhibiting liner installation; freezing weather or heavy rains inhibiting cement work, sludge fixation, sludge or soil handling, and/or liner installation; and other extreme weather conditions. If any of the parties determine that warm weather is causing excessive odor from sludge handling, it shall immediately inform the other parties. If all parties agree, such activities may be curtailed until weather conditions no longer cause excessive odor. The schedules contained in Paragraph 28(A)(5) and (B)(3) do not include any period during which such actions are curtailed because of such determination. If CWM determines that extreme weather conditions inhibit cement work, sludge fixation, sludge or soil handling, and/or liner installation, it shall immediately inform the other parties. If all parties agree that such weather conditions inhibit cement work, sludge fixation, sludge or soil handling, and/or liner installation, such activities may be curtailed until weather conditions no longer inhibit them. The schedules contained in Paragraph 28(A)(5) and (B)(3) do not include any such period. These exceptions notwithstanding, the schedule contained in Paragraph 28(A)(3) shall not exceed thirty six (36) months and the schedule contained in Paragraph 28(B)(3) and (4) shall not exceed fifteen (15) months.

XVI. CLOSURE OF MISCELLANEOUS FACILITIES

29. CWM shall remove or decontaminate the buried oil/water separation tank, the concrete oil pit and oil water trench, that portion of a buried pipe line between sampling points designated as ORT-2 and ORT-10, and adjacent contaminated soil and berms, if any; all identified on the map attached to this Consent Decree as Attachment E (together the "Miscellaneous Facilities"). CWM shall remove all sludge with PCBs in concentrations over 500 ppm of PCBs and all free oil containing PCBs from the Miscellaneous Facilities and dispose of them off-site in accordance with 40 C.F.R. Part 761. Aqueous material from the Miscellaneous Facilities shall be pumped to the remaining surface impoundments and ultimately into injection wells at the Vickery Facility. Other material from the Miscellaneous Facilities contaminated with PCBs in regulated concentrations shall be decontaminated or shall be disposed of in the closure cell when it is constructed. Prior to construction of the closure cell, such material shall be handled in the same manner as the material from the wet well as set forth in Paragraph 28(A)(2).

XVII. WASTE OILS

30. CWM shall not accept at, reclaim at , or sell oil products from the Vickery Facility until it has developed a comprehensive program for the waste oil* facility operation which provides for implementation of the requirements in Paragraphs 31 through 35 below, and has received approval of that program from the Ohio EPA. CWM shall conduct waste oil operations according to that program and applicable regulations. CWM shall install the best available technology to control emissions from oil reclamation and storage tanks and processing units.

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*The term "waste oil" includes used oil and off-specification oil products.

31. Pursuant to this waste oil program, CWM shall comply with the following procedures relating to the acceptance of waste oil:

(A) CWM shall require the oil generator to provide to CWM a description of the oil and the process whereby it is generated;

(B) CWM shall perform an acceptance analysis on a representative sample of the oil provided by the generator. This acceptance analysis shall include the bottom sludge and water (BS&W) test, a PCB test, a chlorinated solvent gas chromatographic test, a BTU determination, a total ash determination, a specific gravity determination, and a general gas chromatograph screen; and

(C) CWM shall provide for receipt analysis of incoming loads, which shall include a BS&W test, a chlorinated solvent gas chromatographic test, and a PCB determination.

32. CWM shall not accept at the Vickery waste oil facility hazardous waste as defined by either O.A.C. Chapter 3745-51 or 40 C.F.R. Part 261, except in conformity with O.A.C. Chapter 3745-51-06 and 40 C.F.R. §261.6, or future regulations governing wastes or oils which are used, re-used, recycled, or reclaimed.

33. Pursuant to this waste oil program, CWM shall operate its waste oil facility according to the following procedures:

(A) CWM shall keep records of all transfers of waste oil within the facility;

(B) CWM shall provide for review of all waste oil streams by the Ohio EPA through the procedures set forth in Part XVIII of this agreement; Ohio EPA's approval of waste oil streams will specify permissible end uses for the reclaimed product from that waste oil stream;

(C) CWM shall not place material into the oil facility which has been taken from surface impoundments at the Vickery Facility.

34. Pursuant to the waste oil program, CWM shall comply with the following provisions relating to the sale of waste oil:

(A) CWM shall keep accurate records of all oil materials sales, including the customer, date and amount of sale, and analytical records of each oil product sold;

(B) CWM shall analyze each oil product sold to determine heat value, solid or sediment content, PCB content, chlorinated solvent content, and total ash content;

(C) CWM shall sell oil products for industrial uses only and is prohibited from selling oil products for road oiling or dust control purposes; CWM shall sell oil products only for the permissible end uses specified by Ohio EPA pursuant to Paragraph 33(B) above.

35. CWM is permanently enjoined from accepting at the Vickery Facility any waste oil which contains PCBs, determined by standard U.S. EPA approved chromatographic analytical techniques approved by Ohio EPA in the program required by Paragraph 30. This prohibition against receipt of waste oil containing PCBs shall be included in the program submitted by CWM to Ohio EPA pursuant to this Decree.

36. Before resumption of its waste oil operations, CWM shall decontaminate the oil processing facility at the Vickery Facility to remove all PCBs which are currently at the facility. This decontamination shall be done in accordance with all existing TSCA regulations. All materials generated in this process will be disposed in accordance with the TSCA regulations.

XVIII. WASTE PRODUCTS REVIEW

37. By July 1, 1984, CWM shall submit to Ohio EPA for review and approval a waste analysis plan which complies with the requirements of O.A.C. 3745-65-13. This waste analysis plan shall include, at a minimum, all of the provisions contained in the draft waste analysis plan dated October 31, 1983 which has been submitted to Ohio EPA by CWM. Before waste oil is accepted for recycling at the Vickery Facility, the plan shall be amended to provide for the implementation of all of the requirements in Part XVII above.

38. Within thirty (30) days after entry of this Consent Decree, CWM shall submit to Ohio EPA a list of all waste streams from which it had received waste loads in the twelve (12) months prior to entry of this Consent Decree. CWM is prohibited from accepting a waste load from a waste stream not on that list without giving Ohio EPA at least ten (10) days advance notice. Such notice shall include the submission of information required by Ohio EPA to make the determinations outlined in (A) through (E) below. CWM shall not accept such waste if, within ten (10) days after receiving CWM's submission of information, Ohio EPA has notified CWM of Ohio EPA's determination that:

(A) The waste is not among those which the Vickery Facility is authorized to accept by a permit issued for it by the Ohio Hazardous Waste Facility Approval Board;

(B) Acceptance of the waste at the Vickery Facility is contrary to specific regulation promulgated by Ohio EPA;

(C) The waste is incompatible with the inventory of wastes at the Vickery Facility or acceptance of the waste would cause harm to the environment or to operation of the Vickery Facility as a result;

(D) The waste differs in a material respect from other wastes accepted at the Vickery Facility in a manner that will cause harm to the environment even if properly disposed of at the Vickery Facility;

(E) The waste contains PCBs, as determined by the standard U.S. EPA approved chromatographic analytical techniques approved by Ohio EPA; or

(F) Specific additional information must be provided to Ohio EPA to characterize the waste or to make the determinations outlined in (A) through (E) above.

39. Ohio EPA shall timely review all requests from CWM for new waste streams but shall respond within five (5) days after receiving CWM's submission of information for requests made in the ordinary course of business and shall respond within twenty-four (24) hours after receiving CWM's submission of information for emergency requests. Emergency requests shall include but will not be limited to waste streams from spills, boiler cleanouts, and lagoon cleanouts.

40. CWM shall allow Ohio EPA annually to review all documents submitted to CWM pursuant to its waste analysis plan and all other documents received by CWM from waste generators to determine whether or not the acceptance of the waste streams taken at the Vickery Facility during the past year comply with the permits, laws, and rules applicable to the Vickery Facility and are compatible with the waste handling methods used at this Facility. If, as a result of such review, Ohio EPA determines that a waste stream does not meet the criteria established in Paragraph 38, CWM shall not accept further waste loads of that waste stream at the Vickery Facility.

XIX. PUBLIC INFORMATION

41. Upon the formation of a Committee consisting of the Sandusky County Health Commissioner (the Chairman of the Committee), two (2) members of the Sandusky County Board of Health, three (3) local citizens appointed by the Health Commissioner (none of which shall be litigants or representatives of litigants against CWM), and an Ohio EPA official(s), CWM shall hold a meeting at the Vickery Facility at the request of the Chairman, on a frequency of no more than once a month, in order to answer questions and complaints concerning

the operation of the Vickery Facility, to provide the Committee with an update on activities taken pursuant to this Decree, and to give the Committee a tour to observe the activities taken to implement this Decree. CWM is not obliged to disclose financial or otherwise confidential information (as defined by O.A.C. 3745-49-03) at such meetings. The requirements of this paragraph shall terminate when the Vickery Facility is closed.

XX. MANAGEMENT AUDITS

42. CWM shall conduct an annual environmental compliance audit of its operating facilities in Ohio. In addition, CWM shall appoint an independent auditor acceptable to Ohio EPA, which auditor shall annually audit the effectiveness of the compliance, audit and employee reporting mechanisms implemented by CWM at their operating facilities in Ohio. This audit shall be reported to CWM and shall recommend specific improvements in CWM's environmental compliance, environmental compliance audit, and employee and management environmental compliance reporting systems.

XXI. STIPULATED PENALTIES

43. In the event CWM violates a provision or provisions of this Decree, CWM shall automatically pay to the State of Ohio a stipulated civil penalty for each violation specified below in the following amounts:

$50,000 for any violation of Paragraphs 9(D), 13, 16, 30 (the first sentence only), 31(B), 31(C), 34(B), 34(C), 35, or 36;

$10,000 for any violation of Paragraphs 10 (except that automatic pressure recorder readings which show a differential pressure of less than 50 p.s.i.g. or a surface pressure of more than 790 p.s.i.g. due solely to power failure or recorder malfunctions are not subject to stipulated penalties), 28(A)(5), 28(B)(4), 31(A), 32, 34(A), 37, 38, or 40;

$5,000 for any violation of Paragraphs 11, 12 (except the last sentence), 18, 19, 22, or 33; and

$1,000 for any violation of paragraphs 12 (last sentence only), 14, 20, 24, 25, 26, 27, 28(A)(1), 28(A)(3), 28(B)(1), 28(B)(2), 28(B)(3), or 29.

These penalties do not apply to errors in record keeping or reporting which CWM demonstrates to Ohio EPA were unintentional, insubstantial, and immaterial.

These penalties shall be paid within ten (10) days after the occurrence of the violation by delivering to Plaintiff's counsel or a successor in his office, for payment into the Hazardous Waste Cleanup Special Account, a certified check in such amount made to the order of "Treasurer, State of Ohio." These stipulated penalties are not to be suspended in part or in whole. CWM waives all rights it may have to contest the imposition of these stipulated penalties for violations of the Consent Decree, except the defense that the violation did not in fact occur.

In addition, the parties agree that in any action to enforce the portions of this Consent Decree which are not subject to stipulated penalties pursuant to Paragraph 43, CWM may raise at that time the issue of whether it is entitled to raise a defense that its violation of the terms hereof resulted from causes beyond its control, such as, but not limited to, acts of God, of public enemies, conflicting orders of an entity having police power and jurisdiction over CWM, or impossibility of the performance of the terms hereof. While Plaintiff disagrees that such a defense exists, the parties do, however, agree and stipulate that it is premature at this time to raise and adjudicate the existence of such a defense, and that the appropriate time to adjudicate the existence of such a defense is at such time that Plaintiff seeks to enforce such provisions of this Consent Decree.

Plaintiff does not waive any rights it may have in contempt or otherwise to seek redress for violations of Ohio Revised Code Chapters 3704, 3734, 3767, or 6111 or for violations of this Decree. However, upon tender of any stipulated penalty for a violation pursuant to Paragraph 43 and acceptance thereof by the State of Ohio, CWM shall be deemed to have been subject to enforcement action for that violation and shall not thereafter be subject to any additional penalty or other relief for that violation.

XXII. MISCELLANEOUS

44. CWM shall comply with the reporting requirements of its permits for the Vickery Facility and, in addition, shall notify the Division of Solid and Hazardous Waste Management of the Ohio EPA Northwest District Office as soon as practical, but in no event later than two (2) hours after discovery of any waste spill, or unpermitted discharge of waste into waters of the State.

45. CWM shall submit to Ohio EPA a monthly progress report describing all actions which have been taken to implement Paragraphs 18, 20, 21, 28, and 29 of this Consent Decree. The report for each month shall be submitted by the fifteenth (15th) of the following month. The requirements of this paragraph shall terminate when all of the actions required in Paragraphs 18, 20, 21, 28 and 29 have been completed.

46. CWM is hereby prohibited and enjoined from violating any terms or conditions of permits issued by Ohio EPA and the Hazardous Waste Facility Approval Board which are applicable to the Vickery Facility. CWM is also prohibited and enjoined from violating Ohio Revised Code Sections 3704.05, 3734.11, 3734.12, 3767.13, 6111.043, 6111.04, 6111.07, and the hazardous waste rules promulgated pursuant to Ohio Revised Code Section 3734.12 which are applicable to the Vickery Facility.

47. CWM shall allow personnel from Ohio EPA and its authorized representatives (none of which authorized representatives shall be litigants or representatives of litigants against CWM), access to the Vickery Facility to monitor compliance with this Consent Decree without a warrant. Any person taking a sample for analysis in the implementation of or to determine compliance with the requirements of this Consent Decree shall provide the parties to this Decree, upon request, with splits of that sample.

48. Nothing in this Consent Decree shall relieve CWM of its obligations to comply with applicable federal, state or local statutes, regulations or ordinances or shall constitute a waiver or release of any right, remedy, defense or claim of CWM with regard to any person not a party to this Consent Decree.

49. The Findings and Orders of the Director of Ohio EPA dated June 30 and July 19, 1983, in the matter of Chemical Waste Management, Inc. are withdrawn and replaced by this Consent Decree. The parties shall so notify the Ohio Environmental Board of Review and withdraw from the Board the proceeding before it regarding such Findings and Orders, Chemical Waste Management, Inc. v. Maynard, E.B.R. 721049.

50. The Court shall retain jurisdiction of this matter for the purpose of enabling any party to apply to the Court for any further orders necessary to construe, carry out, modify, or enforce compliance with the term of this Consent Decree, including disputes arising out of actions or determinations of Ohio EPA taken on submissions or otherwise made pursuant to this Consent Decree.

51. All reports, requests, or information submitted to Plaintiff by CWM pursuant to this Consent Decree shall be submitted to:

Ohio EPA

Richard L. Shank, Manager
Surveillance and Enforcement Section
Division of Solid and Hazardous Waste Management
Ohio Environmental Protection Agency
361 East Broad Street
Columbus, Ohio 43215

or to such persons and addresses as may hereafter be otherwise specified, in writing, by Plaintiff to CWM. All reports, requests, or information submitted to CWM by Plaintiff pursuant to this Consent Decree shall be submitted to:

Frederick Roberts
Senior Vice President
Chemical Waste Management, Inc.
3003 Butterfield Road
Oak Brook, Illinois 60521

or to such persons and addresses as may be otherwise specified, in writing, by CWM to Plaintiff.

52. Where this Decree requires actions (including monetary payments) to be performed by CWM, Defendant WMI shall be the guarantor of CWM and shall assume the responsibility to perform such actions if not performed by CWM. WMI shall be liable under this Decree if WMI fails to perform actions not performed by CWM.

Harry A. Sargeant Jr.
Judge, Court of Common Pleas

APPROVED:

STATE OF OHIO, ex rel. Anthony J. Celebrezze, Jr., Attorney General of Ohio

By: Anthony J. Celebrezze
Anthony J. Celebrezze, Jr.
Attorney General of Ohio

By: Jack Van Kley
Jack A. Van Kley
Assistant Attorney General

By: Susan E. Flannery
Susan E. Flannery
Assistant Attorney General
Environmental Enforcement Section
30 East Broad St., 17th Floor
Columbus, Ohio 43215
(614) 466-2766

CHEMICAL WASTE MANAGEMENT, INC.

By: _____
Jeffrey G. Miller
Bergson, Borkland,
Margolis and Adler

By: _____
Joseph F. Knott
President,
Chemical Waste Management, Inc.

WASTE MANAGEMENT, INC., Guarantor

By: _____
Jeffrey G. Miller
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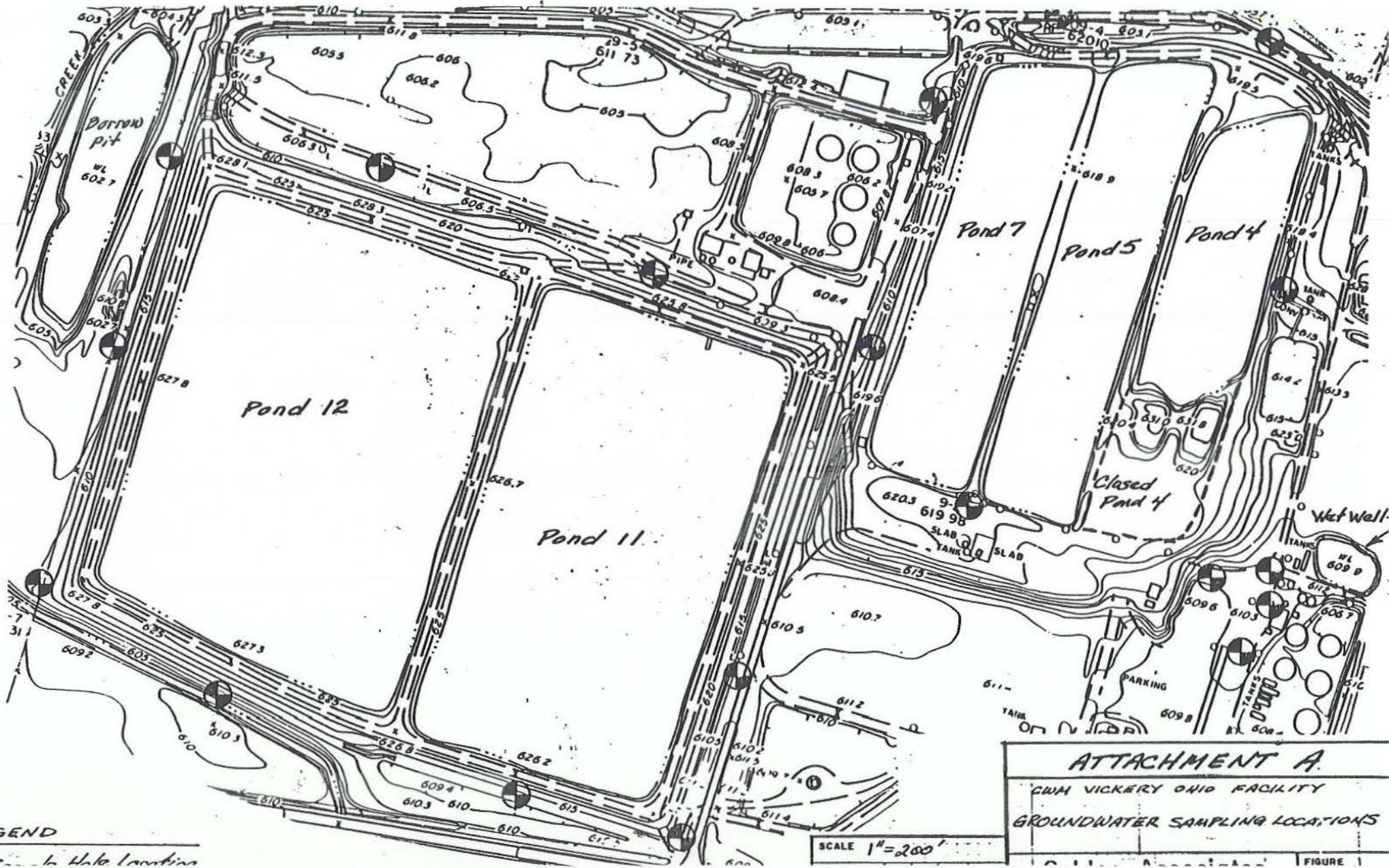
11 Du Pont Circle, N.W.
Washington, D.C. 20036
(202) 462-5930



ATTACHMENT A

CWM VICKERY OHIO FACILITY

GROUNDWATER SAMPLING LOCATIONS

SCALE 1" = 200'

FIGURE 1

ATTACHMENT B

Chemical Waste Management, Inc.
3956 State Rt. 412
Vickery, Ohio 43464
419/457-7791

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

August 19, 1983

Mr. Richard Shank
Surveillance and Enforcement Section
Ohio Environmental Protection Agency
361 East Broad Street

Re: Chemical Waste Management, Inc.
Vickery, Ohio

Dear Mr. Shank:

Our current plans are to also treat some quantities of each of the following waste streams through our odorous treatment tank system instead of through our pond system. These streams are in addition to the original waste streams we advised we would be treating; NW's 2079, 2075, 2336 and 2074.

CWM ID NUMBER	CUSTOMER
NW 2106	Bofors Nobel, Inc.
NW 2327	Diamond Shamrock Corporation
NW 2068	McKesson Envirosystems Company
NW 868	E.I. Dupont de Nemours & Co., Inc.
NW 1889	Republic Steel Corporation
NW 2187	Combustion Engineering, Inc.
NW 651	Republic Steel Corporation
NW 3050	Petrochem Processing, Inc.
NW 3051	Petrochem Processing, Inc.

I have enclosed copies of the Waste Material Profile Sheets you requested for all of the above mentioned waste streams.

If you have any questions, please let me know.

Sincerely,

CHEMICAL WASTE MANAGEMENT, INC.

Lee Archambeau
General Manager

LEA/dw

Enclosures: Waste Material Profile Sheets

ATTACHMENT C

ATTACHMENT IV

Design Objectives and Basis for the Air Scrubber
at Chemical Waste Management, Inc.
Vickery, Ohio

1.0 INTRODUCTION

The purpose of the attachment is to present a summary of the design and performance objectives, design approach/philosophy, and technical basis for the air emissions scrubber installed at Chemical Waste Management, Inc., Vickery, Ohio. The scrubber is designed to control emissions from tank truck unloading as well as storage tank vent emissions, which include both inorganic and organic pollutants. Section 2.0 addresses design and performance objectives, and Section 3.0 addresses the technical basis.

2.0 DESIGN AND PERFORMANCE OBJECTIVES

As stated in the permit applications and supporting documents, the scrubber is designed to control air emissions from the unloading of odorous wastes, from the unloading of strong acid wastes, and from the storage tanks used in the odorous waste treatment system. There were several design criteria and constraints which were inherent in the scrubber design. The principal constraints were:

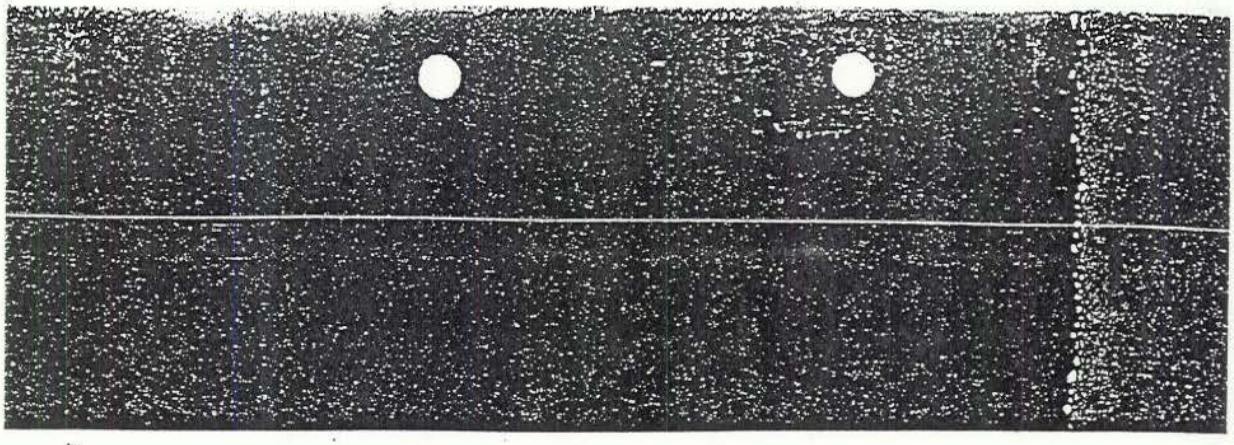
- The principal objective was odor control, where both organic and inorganic constituents contribute to odor perception.

- Although the flowrate to the scrubber is designed to be relatively constant, the pollutant loading will vary widely in both amount and chemical composition. Both organic and inorganic pollutants will be present.

- The composition of the gas to the scrubber is highly variable, and varies as a function of incoming waste types, load-to-load variation in composition for a given waste, ambient temperature changes, and plant operation cycles.

- There is a requirement to maintain safe operating conditions in the unloading operations, specifically the receiving sump tanks.

- There are structural limitations of the existing storage tanks used in the odorous waste treatment system. The existing storage tanks predominately affect allowable pressure drop through the tank vent header and the scrubber system



- It is necessary to design, construct, and commission an air pollution control system for odors within a very short time frame.

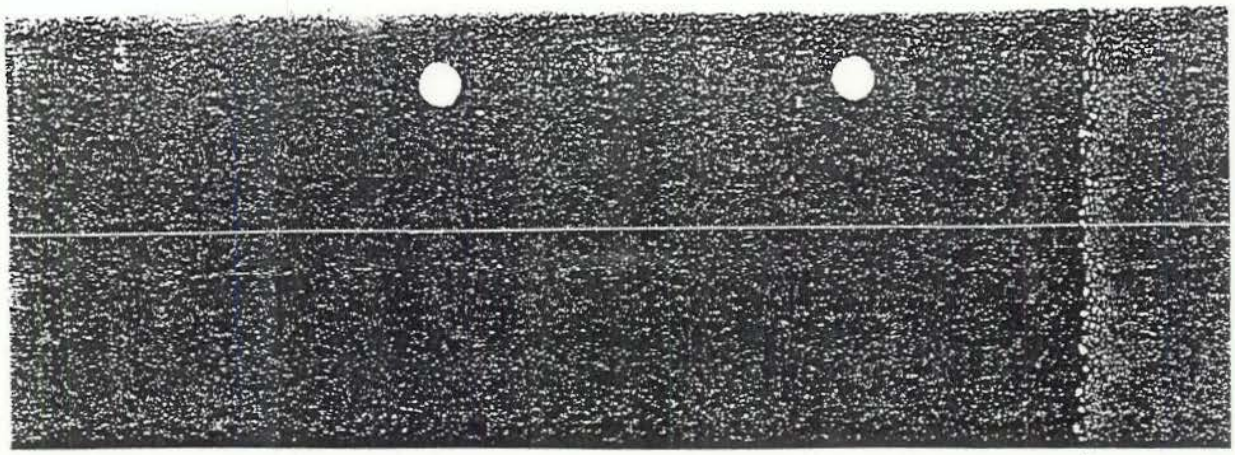
These constraints have been incorporated in the scrubber system constructed at Vickery.

As a result of these constraints, the key design objectives were:

- capability to control both organic and inorganic pollutants;
- flexibility to change scrubber solutions as the waste composition changes over time;
- large liquid reservoir with buffering capacity to be able to handle short-term, high-load conditions;
- materials of construction selection to allow for a wide range in pollutants, scrubber solutions, and operating conditions;
- safe operating practices for both the receiving sumps and for the storage tanks.

Two existing, on-site, carbon steel scrubber shells were selected for the system, to expedite construction. One shell was modified for the scrubber vessel, and the other was modified to become the scrubber liquor holding tank. Both vessels were lined with high quality acid and chemical resistant material (HT 222 manufactured and installed by Ceilcote Company), in order to substantially increase the system flexibility for gas phase constituents and for scrubber solutions.

The capacity of major equipment components was dictated by the air flow required to maintain the receiving sumps at a safe condition. The specified gas flow rate is designed to maintain less than 10% of the lower explosive limit (LEL) within the odorous waste receiving sump, assuming a worst case situation of 100% methyl alcohol as the liquor within that sump, and simultaneously accommodate the maximum potential gas evolution rate from the storage and treatment tanks.



The principal design details are:

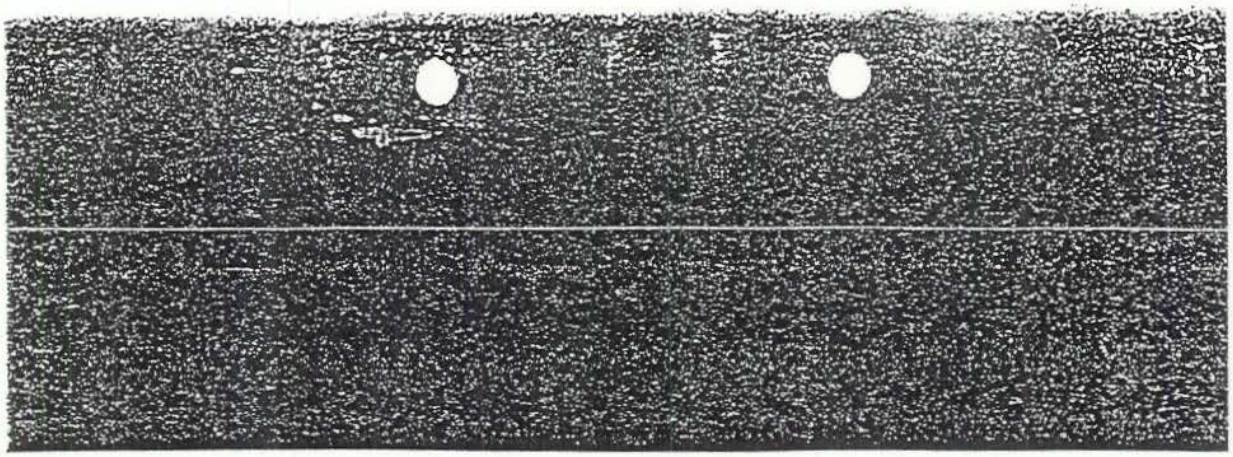
Tower Diameter (inside), ft	5
Packing height, ft	9
Vapor Rate, cfm (cfs)	3000 (50) approx.
Scrubber liquid	Dilute caustic, oxidizers and other reagents as needed. 1" polypropylene Tellerettes packing
Liquid flow rate, gpm	350
Gas phase pressure drop, in. H_2O	2.0"

The scrubber as constructed allows the flexibility to adjust operating parameters to maximize odor control performance as pollutant loading changes over time.

The system design, therefore, is primarily based on gas flow and system operations flexibility requirements. Both quantitative pollutant composition data as available and engineering estimates were also used in the design of the system. These are described in the next section.

3.0 TECHNICAL BASIS

Qualitative information and engineering analysis of similar situations were used to design the scrubber system. Comprehensive quantitative information on gas composition was not feasible within the time frame in which the system was to be installed. Further, as stated before, the variability in waste loads and subsequent emissions would preclude an exhaustive analytical evaluation. Therefore, the design proceeded on a worst-case basis. The design approach is described in more detail, with an example calculation, in the next section.

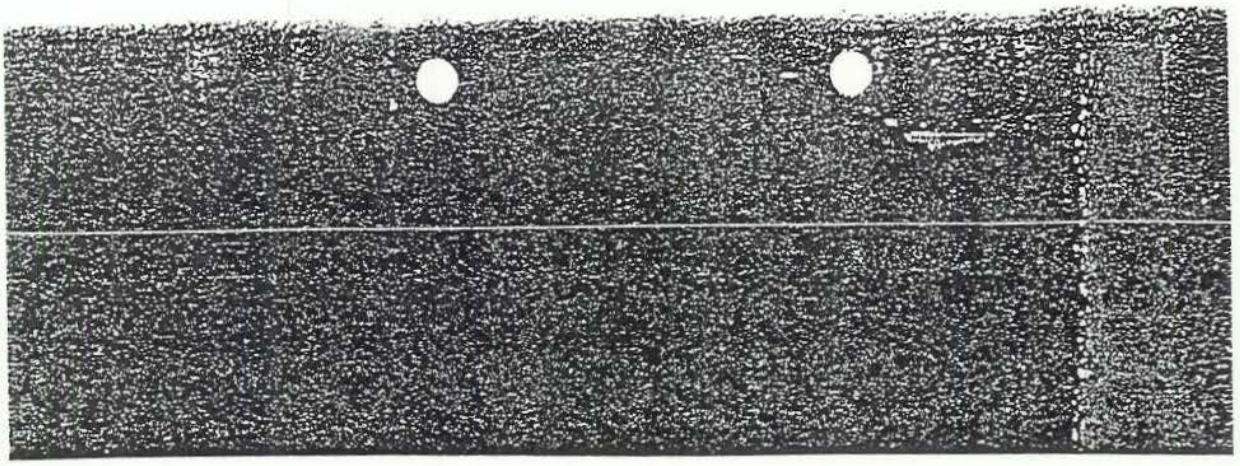


3.1 Engineering Calculations and Concentrations Used in Designing and Estimating Performance of Packed Tower Scrubber (Absorber)

Absorption is a process in which a soluble gas is transferred from a gas stream into a liquid. The gas may become physically dissolved in the liquid or may react with a dissolved constituent in the liquid. Gas absorption is a diffusional operation which depends on the rate of molecular and eddy diffusion. Ultimately, the transfer must take place across a liquid-gas interface. The interface may be formed by the use of liquid films, gas bubbles, or liquid droplets. A large variety of hardware has been devised to effect gas absorption based on either dispersed liquid or dispersed gas phase. For the CWM facility, a packed tower absorber was selected.

Gaseous solutes which are to be removed by absorption must exhibit solubility in the liquid scrubbing medium. Air contaminants most commonly controlled by absorption include both inorganic and organic compounds such as ammonia, acid gases, sulfur compounds, and light hydrocarbons. For most air pollution applications, water is the most suitable scrubbing medium based on availability, cost, level of corrosiveness, volatility, viscosity, and ease of disposal.

The most desirable gas absorption systems are those in which the dissolved solute exerts negligible partial pressure over the solution (high solubility). A common means of reducing the partial pressure of the pollutant is by reaction in the solution. Of the available scrubbing solutions, a caustic slurry, such as sodium hydroxide (NaOH), is the most suitable for acid gases and organic (especially malodorant) compounds. Since the primary species expected in the ventilation stream at the CWM facility include acid gases and organic hydrocarbons, a caustic slurry was selected as the most suitable medium. These compounds are readily oxidized and removed in a mild caustic slurry controlled to a pH level between 8 and 9.



Conversely, the absorption of ammonia is impeded at pH levels above 7. As shown in Table 3.1-1, each unit increase in pH decreases the dissociation of ammonia in the solution by one order of magnitude. Hence, an increase in pH from 7 to 8 will increase the free ammonia in the solution by a factor of 10, thereby also increasing the vapor fraction of the ammonia over the solution by a factor of 10. This is illustrated by the equilibrium curves for ammonia and water shown in Figure 3.1-1.

Since ammonia is expected to be one of the most difficult gases to absorb, ammonia was selected as a reference gas in determining the design and performance criteria of the absorber. The performance of an absorber is generally determined by the number of theoretical gas transfer units, which is the measure of the difficulty of the mass transfer operation. Given a desired removal efficiency, the number of gas transfer units in conjunction with the computed height of a transfer unit can be used to determine the overall packing height. The design calculations for the CWM scrubber are given below:

Pollutant

Type:	Ammonia(1)
Flow Rate to scrubber (acfm) (from the tank system)	135

Carrier Gas

Type:	Air
Flow Rate to Scrubber (acfm)	2500

Scrubber Design

Tower Diameter (ID, ft)	5
Gas Flow Rate (acfm)	2500
Liquid Flow Rate (gpm)	350

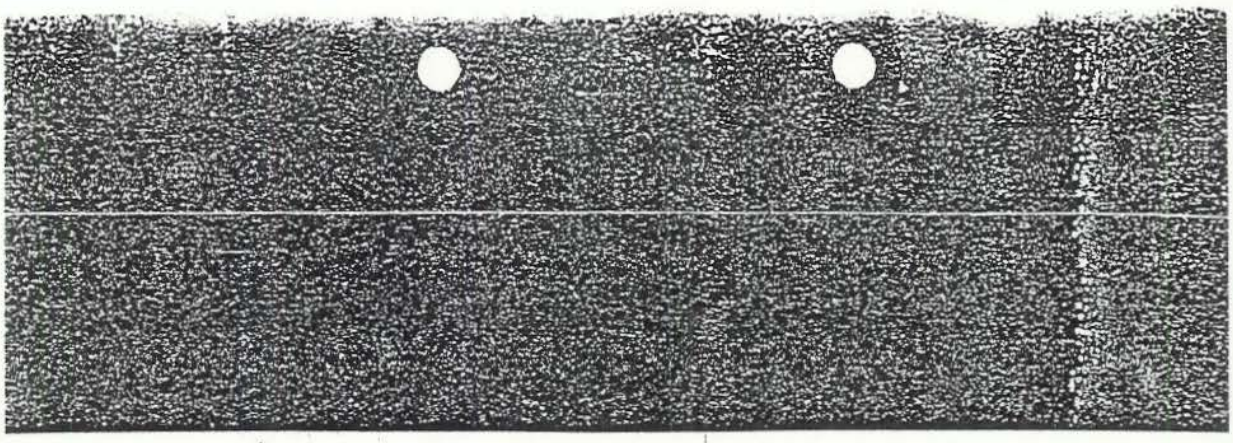


TABLE 3.1-1

Effect of pH on the Absorption
on Ammonia at 25°C

pH	x_B / NH_3
7	178.8
8	18.8
9	2.79
10	1.179
11	1.018
12	1.002

Where x_B = total ammonia in solution

NH_3 = free ammonia in solution

Design Criteria (1)

Inlet Concentration = 135/2500 = 0.054 moles NH_3/mole gas

Outlet Concentration = 0.1 (0.054)= 0.0054 moles NH_3/mole gas

Removal Efficiency = 90%

Inlet liquor Concentration = 0.0005 mole NH_3/mole liquor

	(lb/hr)	(moles/hr)
Inlet Gas (Bottom)	11,290	398.2
Outlet Gas (Top)	10,985	378.8
Inlet Liquor (Top)	174,300	9,683.3
Outlet Liquor (Bottom)	175,694	9,760.8

(1) Assumes vent flow from tank contains 100% ammonia; maximum tank vent rate = 500 gpm; ammonia evolution rate = 500 gpm; 1000 gpm = 135 acfm.

Height of a Transfer Unit

$$H_G = \frac{\alpha G^{\beta}}{L^{\gamma}} \left(\frac{\mu_G}{\rho_G D_G} \right)^{0.5}$$

where

H_G = height of a gas transfer unit, ft

G = superficial gas rate, lb/hr-ft^2

L = superficial liquid rate, lb/hr-ft^2

α = a packing constant

β = a packing constant

γ = a packing constant

μ_G = gas viscosity, lb/hr-ft

ρ_G = gas density, lb/ft^3

D_G = gas diffusivity, ft^2/hr.

The group $\left(\frac{\mu_G}{\rho_G D_G} \right)$ is known as the Schmidt number

Conversely, transfer unit height was determined from Figure 18-80, Chemical Engineer's Handbook, Perry & Chilton.

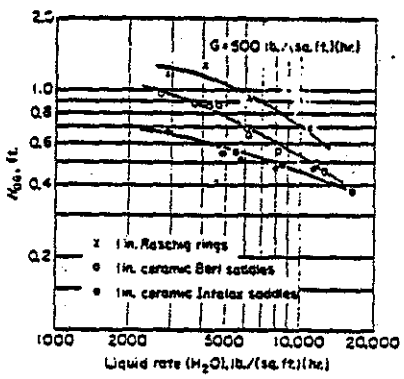


Fig. 18-80. Comparative absorption data in beds of Raschig rings, Berl saddles, and Intalox saddles, system NH_3-air-H_2O. (Wen, M.S. Thesis, University of West Virginia, 1952.)

G = 575 lb/ft^2 hr; L = 8,900 lb/ft^2 hr; H = 0.5 ft

Number of Transfer Units

$$NTU = \frac{\log \left[\frac{Y_1 - mx_o}{Y_2 - mx_o} \left(1 - \frac{1}{A}\right) + \frac{1}{A} \right]}{\log A}$$

Where: Y_1 = inlet gas concentration (mole/mole)

Y_2 = outlet gas concentration (mole/mole)

X_o = inlet liquor concentration (mole/mole)

m = slope of equilibrium curve (See Figure 1)

A = L/mG

L = liquor rate (moles/hr)

G = gas flow rate (moles/hr)

$$\frac{Y_1 - mx_o}{Y_2 - mx_o} = \frac{0.054 - 10(0.0005)}{0.0054 - 10(0.0005)} = 122.5$$

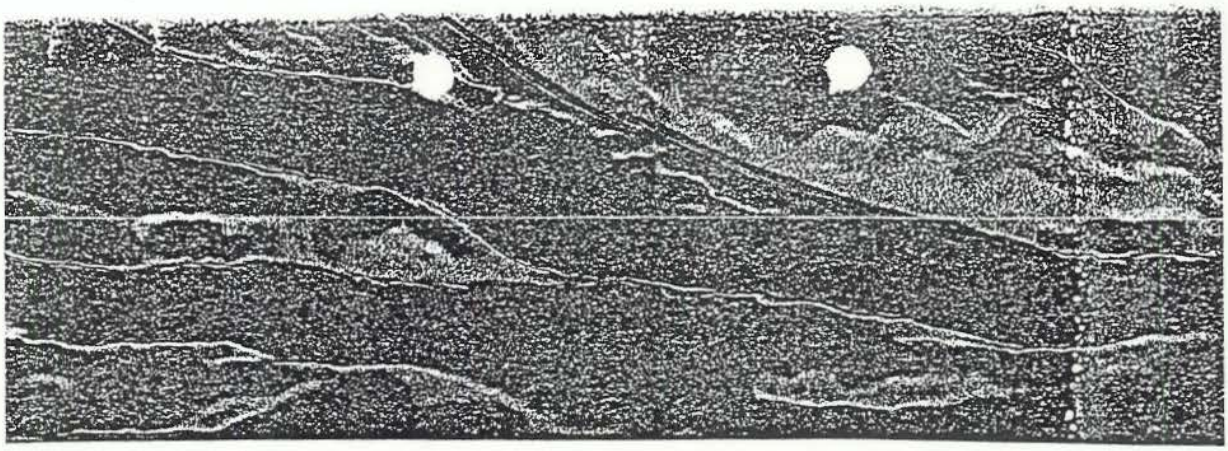
$A_{TOP} = 9683.3/10(378.8) = 2.56$

$A_{BOTTOM} = 9760.8/10(398.2) = 2.45$

$A = \left[(2.56)(2.45)\right]^{0.5} = 2.50$

$$NTU = \frac{\log \left[122.5 \left(1 - \frac{1}{2.50}\right) + \frac{1}{2.50} \right]}{\log 2.50}$$

NTU = 4.70 transfer units required for 90% ammonia removal

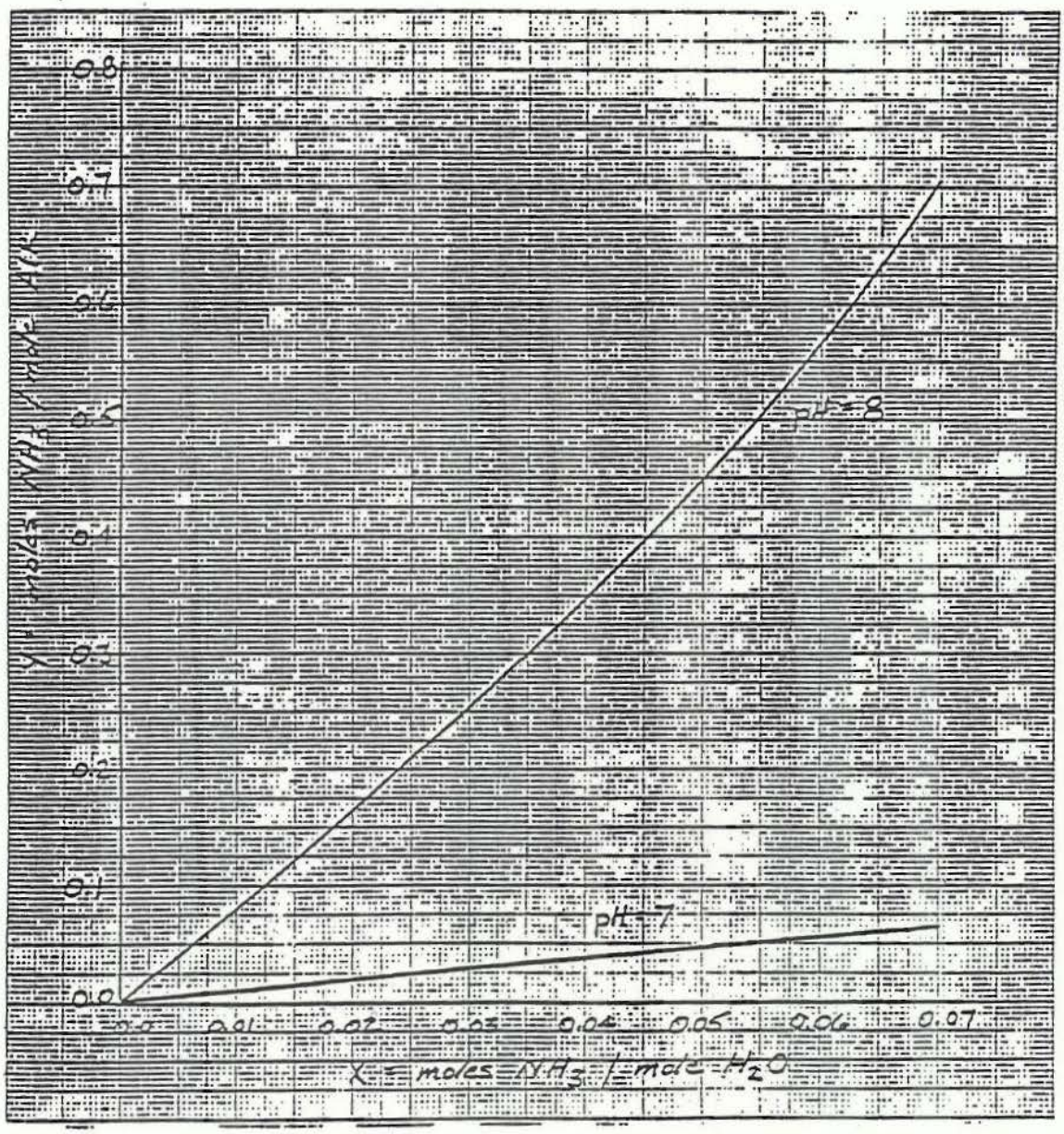


Packing Height

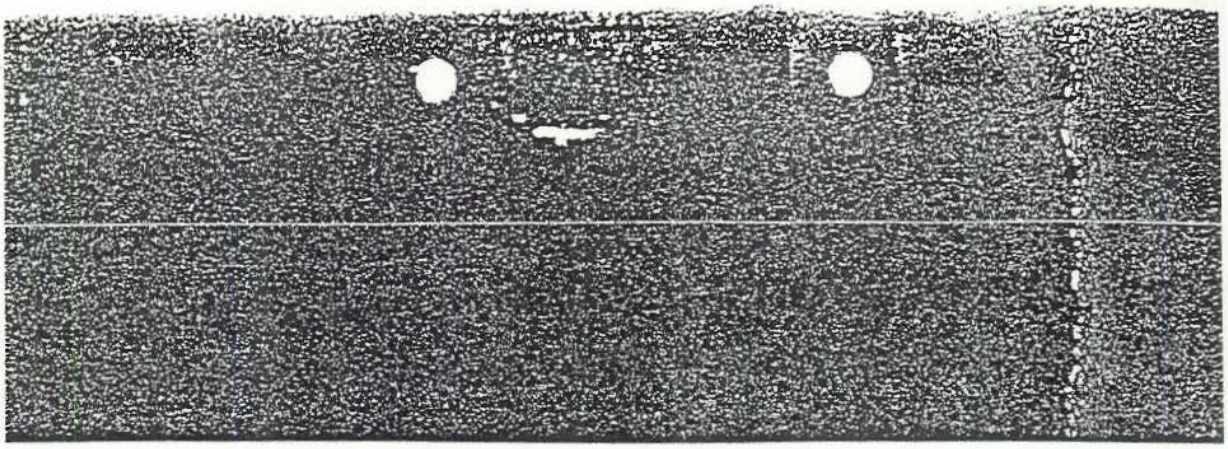
Hence, for 90% removal of ammonia, 4.70 transfer units, each with a height of 0.5 ft., are required. This results in a total packing height of 2.4 feet. To ensure high removal efficiencies of ammonia and other gas constituents, a packing height of 9 feet was specified for the CWM scrubber.

Figure 1

Equilibrium Curves for Ammonia - Water System at 70°F



ERT



3.2 Quantitive Gas-Phase Analysis

Because of construction schedule constraints, limited analytical characterization data were available for the scrubber design. Key data available were: (1) volatile components of the primary raw odorous waste (NW 2079) and Pond 12 acid; (2) organic gas phase composition for the primary raw odorous wastes; and (3) organic gas phase composition for the treated waste. These data were from bench-scale process development studies, and are summarized in this section.

A total of 13 volatile organics were detected (at greater than 0.1 mg/l) in the two NW 2079 waste samples, while four were detected in the Pond 12 acid, as shown in Table 3.2-1. The NW 2079 sample dated 9/19/83 contained the highest levels of extractable volatile organics. The primary volatile species associated with this waste included chloromethane (371 mg/l), methylpropanol (112 mg/l), methylene chloride (58 mg/l), methyl propane (24 mg/l) and acetone (23 mg/l). Methylene chloride and methyl ether were the only compounds present at significant levels in both the waste and pond samples. It should be noted that the methylene chloride concentration being reported for the filtered sample in Table 3.2-1 may be due to the use of methylene chloride as a filter wetting agent.

The procedure used to identify the extractable volatile organics did not provide quantification of the low molecular weight organics, such as alcohols, and therefore a direct injection gas chromatography (GC) procedure was used to measure these organics. The low molecular weight organics observed from this testing are shown in Table 3.2-2. None of the four compounds measured could be matched with the alcohol standards previously calibrated for the GC, and therefore an approximate range of the molecular weight for each compound has been provided in the table.

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TABLE 3.2-1

EXTRACTABLE VOLATILE ORGANICS, ppm(a)

Compound	Filtered(b) NW 2079 Waste(9/8/83)	NW 2079 Waste(9/8/83)	NW 2079 Waste(9/19/83)	Filtered(b) Pond 12 Acid(9/8/83)
Chloromethane	6.8	-(c)	371	-
Methylene Chloride	13(d)	12	58	18(d)
Acetone	8.1	8.2	23	-
Bromochloromethane	0.24	-	-	-
Methylpropanal	-	-	112	-
Butanol	0.15	-	-	-
Thiobismethane	0.85	-	-	-
Methyl Ether	-	15	-	2.0
Pentane	-	-	-	0.75
Chlorobenzene	-	-	-	8.1
Methyl Propane	-	6.6	24	-
4-Methyl-2-Pentanone	-	1.6	-	-
Phenol	-	0.3	2.0	-
Unknown, Mass 41	-	-	2.9	-
Hexamethylcyclo-trisiloxane	-	-	13	-

Notes:

(a) Methanol used for extraction.
(b) Samples filtered with 0.5 micron filter prior to analysis.
(c) "-" indicates not detected (< 0.1ppm).
(d) Cross contamination possible from using methylene chloride as a filter wetting agent.

TABLE 3.2-2

LOW MOLECULAR WEIGHT ORGANIC DETERMINATIONS BY GC ANALYSES

Compound	Molecular Weight Range	Concentration, ppm		
		NW 2079 Waste (9/8/83)	NW 2079 Waste (9/19/83)	Pond 12 Acid (9/8/83)
Unknown, Mass 1	25-30	1,500	8,000	32
Unknown, Mass 2	25-32	1,000	4,000	19
Unknown, Mass 3	32-46	2,400	13,000	63
Unknown, Mass 4	68-75	3,100	8,500	100-500

Tests were performed to assess the quantity of volatile organics released into nitrogen gas, in order to identify the gas composition that may be anticipated while the wastes are held in tank storage. In these tests, gas phase volatile organics were determined for each waste by adding a measured volume of liquid to a sealed bottle containing approximately the same volume of nitrogen gas (after nitrogen displacement). The bottle was then agitated for a period of 24 hours after which time the resulting gas mixture was analyzed for volatile organics by GC/MS. The concentration levels detected in the gas phase are presented in Table 3.2-3.

Volatile organic analyses of gases evolved from the blending of NW 2079 waste and Pond 12 acid were determined for the 1:1 and 5:1 mixtures and are reported in Tables 3.2-4 and 3.2-5., respectively. These measurements were made using the same procedure outlined before (24 hour shake test under nitrogen conditions). As noted in the tables, a large number of volatile organics could not be quantified or were present at low concentration as a result of dilution with the nitrogen gas. Also, since the samples had been filtered prior to gas testing some volatile organics may have been lost. Therefore a second test was set up to directly determine the gas species released during mixing using 1:1 ratio blend under closed conditions. The results of this test are presented in Table 3.2-6.

The rate of gas production for the 1:1, 2:1, 3:1 and 4:1 ratio blends (i.e., ratio of NW 2079 to Pond 12 acid by volume) have been estimated by using closed system liquid displacement techniques. Plots of the results are shown in Figure 3.2-1. As seen by these plots, approximately.25 cc of gas per liter of liquid are released in the first five minutes after mixing, after which time the rate of gas production decreases by over 50%. The treatment system is currently designed to operate at a volumetric ratio of 2:1 (NW 2079 waste to Pond 12 acid).

In summary, the data presented herein are based on experiments focused on the treatment of one waste. They do, however, indicate the complexity and variability of the gas phase composition.

ATTACHMENT 5

TABLE 3.2-3

VOLATILE ORGANICS DETECTED IN AN EQUAL PORTION OF NITROGEN GAS AFTER 24 HOURS

	Concentration, ug/cc		
Compound	NW 2079 Waste(9/8/83)	NW 2079 Waste(9/19/83)	Pond 12 Acid(9/8/83)
Methylene Chloride	1.3 - 5.0	0.8 - 3.1	0.02
Acetone	0.2 - 0.6	0.2 - 0.7	0.02
Methyl Ether	0.06 - 0.3	0.09 - 0.4	0.4 - 1.5
Chlorobenzene	0.02 - 0.09	0.02 - 0.04	0.04-0.2

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TABLE 3.2-4

NITROGEN GAS HEADSPACE VOLATILE ORGANICS BY GC/MS FOR A 1:1 MIXTURE OF NW 2079 WASTE TO POND 12 ACID[1,2] (9/14-15/83)

Compound	Concentration, ug/cc		
	T=0	T=1 hour	T= 1 day
Methylene Chloride[3]	13-53	5-18	13-52
Methyl Ether	< 0.02	0.2-0.6	< 0.02
Chlorobenzene	< 0.02	0.1-0.5	< 0.02
Difluorodimethylsilane	13-51	8.8-35	6.3-25
Unknown, Mass 93	< 0.02	0.1-0.4	< 0.02
Unknown, Mass 155	7.0-27	10-42	2.2-8.7
Methylester Acetic Acid	0.3-1.0	1.0-4.0	0.1-0.5
Trimethylsilane	< 0.02	0.7-2.7	< 0.02

Notes:

(1) Samples filtered prior to gas analyses testing.
(2) Gas determinations were made using head space gas above samples under closed conditions.
(3) Possible contamination from using methylene chloride as a filter wetting agent.

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TABLE 3.2-5

NITROGEN GAS HEADSPACE VOLATILE ORGANICS BY GC/MS FOR A 5:1 MIXTURE OF NW 2079 WASTE TO POND 12 ACID[1,2] (9/14-15/83)

Compound	Concentration, ug/cc		
	T=0	T=1 hour	T= 1 day
Methylene Chloride[3]	14-55	4.6-18	14-55
Methyl Propane	0.1-0.3	0.1-0.4	<0.02
Phenol	<0.02	<0.02	0.1-0.6
Unknown, Mass 155	<0.02	<0.02	0.03-0.1
4-Methyl-2-Pentanone	<0.02	0.07-0.3	<0.02
Hexamethylcyclo-trisiloxane	0.4-1.5	0.4-1.8	<0.02

Notes:

(1) Samples filtered prior to gas analyses testing.
(2) Gas determinations were made using head space gas above samples under closed conditions.
(3) Possible contamination from using methylene chloride as a filter wetting agent.

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TABLE 3.2-6

GAS PHASE VOLATILE ORGANICS BY
GC/MS FOR A 1:1 MIXTURE OF NW 2079
WASTE TO POND 12 ACID(1)
(9/28/83)

Compound	Concentration, ug/cc	
	T=0(2)	T=1 hour
Chloromethane	0.3-1.1	0.02-0.08
Methylene Chloride	0.3-1.2	0.1-0.6
Methyl Ether	0.4-1.8	0.6-2.5
Chlorobenzene	0.6-2.3	0.04-0.1
Methyl Propane	0.4-1.4	<0.02
Phenol	0.2-0.9	0.01-0.04
Difluorodimethylsilane	6-25	11-46
Unknown, Mass 93	0.3-1.2	0.9-3.5
Unknown, Mass 155	2.6-11	2.7-11

Notes:

(1) Gas sample obtained under closed conditions.
(2) Excess gas evacuated after T=0 sample collected.

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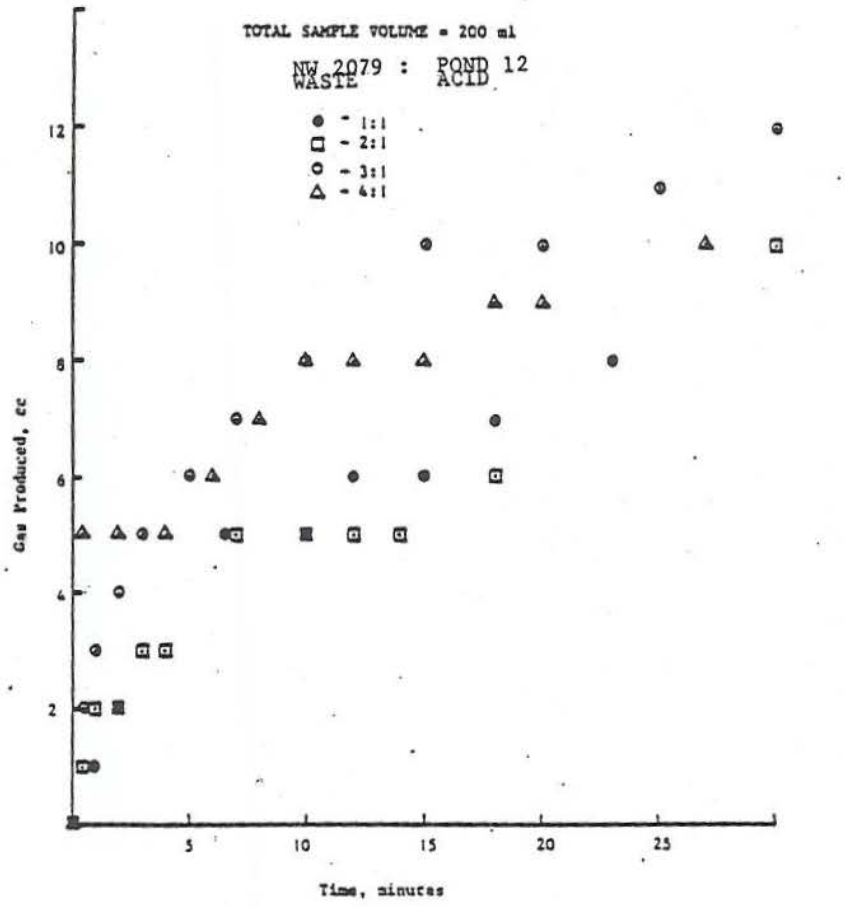
FIGURE 3.2-1 : Gas Generation Rates for NW 2079 Waste (9/8/83) and Pond 12 Acid Mixtures



ATTACHMENT D

INVENTORY DEPLETION DETERMINATION

Monthly inventory depletion is determined by the formula

$$D = 1.5W - R - P$$

where:

D = Inventory depleted for the month in millions of gallons

W = The sum of the fractions of the month each well is in full operation

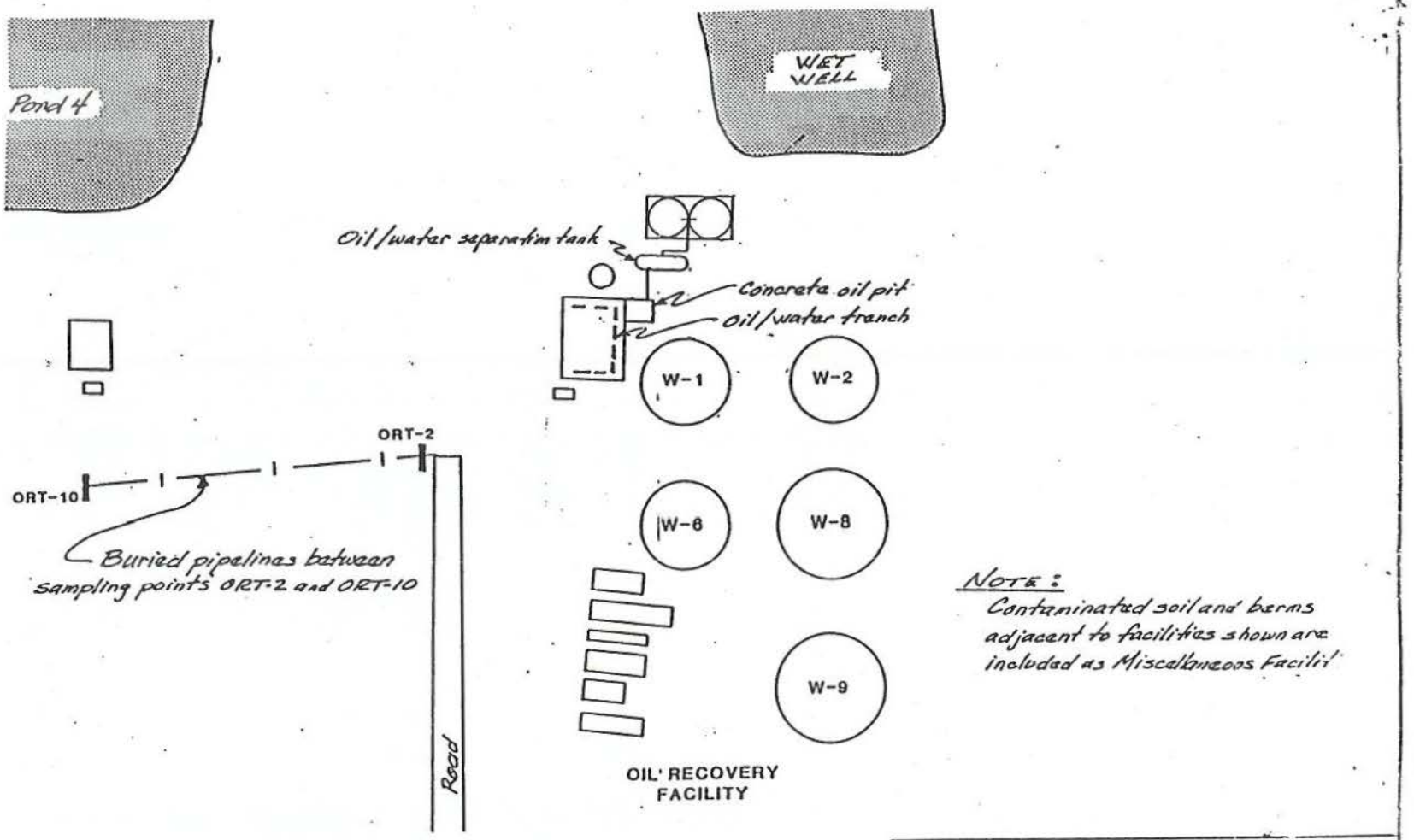
R = Waste receipts plus truck wash water volume for the month in millions of gallons (not to exceed 54 million gallons in any 12 month period)

P = $i(a+b+c+d+e+f+g)$

where:

i = precipitation in inches for the month and where a, b, c, d, e, f, and g are factors for the following areas from which precipitation is disposed of through the injection wells for the month as follows:

AREA	FACTOR
Surface Water Management Plan Area	a=1.20
Pond 4	b= .05
Pond 5	c= .05
Pond 7	d= .05
Pond 11	e= .15
Pond 12	f= .15
Stockpile	g= .15


Pond 4
WET WELL
Oil/water separation tank
Concrete oil pit
Oil/water trench
W-1
W-2
W-6
W-8
W-9
ORT-2
ORT-10
Buried pipelines between sampling points ORT-2 and ORT-10
Road
OIL RECOVERY FACILITY
NOTE:
Contaminated soil and berms adjacent to facilities shown are included as Miscellaneous Facili
0 50 100
APPROX. SCALE IN FEET
SCALE Graphic
ATTACHMENT E
CWM VICKERY OHIO FACILITY
MISCELLANEOUS FACILITIES LOCATION PLAN
Golder Associates
FIGURE —