

STATE OF MICHIGAN
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
REMEDATION AND REDEVELOPMENT DIVISION

In the matter of:

The Dow Chemical Company, a corporation
organized under the laws of the state of Delaware
and doing business in the City of Midland,
County of Midland, State of Michigan

RRD Order No. 111-**-02

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CORRECTIVE ACTION CONSENT ORDER

This Corrective Action Consent Order (“Consent Order”) is being entered into between The Dow Chemical Company (“Dow”) and the Michigan Department of Environmental Quality (“MDEQ”) pursuant to Part 111, Hazardous Waste Management, of Michigan’s Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (“NREPA”), MCL 324.101 et seq.; the rules promulgated under this part; the authority vested in the MDEQ as an authorized state under the federal Resource Conservation and Recovery Act (“RCRA”); and Part 17, Michigan Environmental Protection Act, of the NREPA.

I. STATEMENT OF PURPOSE

In entering into this Consent Order, the mutual objectives of the MDEQ and Dow are:

- a. For Dow to perform certain corrective action work;
- b. To establish the applicable environmental protection standard for the human health exposure pathways of direct human contact (including soil ingestion and dermal contact), inhalation of particulates, vegetable

ingestion and beef and dairy ingestion (referred to as the "Specified Pathways") for polychlorinated dibenzodioxin and dibenzofuran isomers (hereinafter "PCDD/Fs") in residential soils in the Midland Area, as defined in Section 3.5, (also referred to in this Consent Order as an "action level"), and;

- c. For Dow to implement corrective action with respect to the Specified Pathways for PCDD/Fs in soils off the Dow plant site in the Midland Area.

This Consent Order does not address nonhuman health exposures.

II. JURISDICTION

- 2.1 Pursuant to its authority under Section 105 and Part 111 of the NREPA, the MDEQ has promulgated administrative rules pertinent to the identification, generation, treatment, storage, disposal, and transportation of hazardous wastes in Michigan. These rules are set forth in the Michigan Administrative Code, R 299.9101 – R 299.11107.
- 2.2 On October 30, 1986, the State of Michigan was granted final authorization by the Administrator of the United States Environmental Protection Agency ("U.S. EPA"), pursuant to Section 3006(b) of the RCRA, 42 U.S.C. Section 6926(b), to administer a hazardous waste program in Michigan in lieu of the federal program, Title 40 of the Code of Federal Regulations, Part 272, Subpart X, 51 Federal Register 36804 (October 16, 1986). This authorization is periodically updated to maintain authorization. Section 3008 of the RCRA, 42 U.S.C. Section 6928, provides that the U.S. EPA may enforce state regulations in those states authorized to administer a hazardous waste program.

- 2.3 This Consent Order is issued to Dow, the current owner and operator of a site whose boundaries include the manufacturing plant ("Main Plant") located in the City of Midland, County of Midland, State of Michigan.
- 2.4 Dow consents and agrees to the issuance and entry of this Consent Order and stipulates that the termination of this matter by a final order to be entered as a consent order is proper and acceptable. This Consent Order, thus, shall be considered a final order of the MDEQ and shall become effective on the date it is signed by the Director of the MDEQ.
- 2.5 Dow further consents to and agrees not to contest the MDEQ's jurisdiction and authority to issue this Consent Order and to enforce its terms. In addition, Dow will not contest the MDEQ's jurisdiction and authority to: compel compliance with this Consent Order in any subsequent enforcement proceedings, either administrative or judicial; require full or interim compliance by Dow with the terms of this Consent Order; or impose sanctions for violations of this Consent Order.
- 2.6 Dow and the MDEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by Dow that any law has been violated or an admission of any factual allegation or legal conclusion stated or implied in this Consent Order. Dow expressly reserves all rights it may have in law or in equity to maintain or defend against any claim brought by or against any person.
- 2.7 Section 20126(4)(a) of Part 201, Environmental Remediation, of the NREPA provides that the owner or operator of a hazardous waste treatment, storage, or disposal facility regulated pursuant to Part 111 of the NREPA from which there is a release or threat of release solely from the treatment, storage, or disposal facility, or a waste management unit at the facility, shall not be liable under Part 201 of the NREPA if the release or threat of release is subject to corrective action under Part 111 of the NREPA.

- 2.8 Section 11115b of Part 111 of the NREPA provides that corrective action conducted pursuant to Part 111 of the NREPA satisfies a person's obligations under Part 201 of the NREPA.
- 2.9 Section 11115a(2) of Part 111 of the NREPA and R 299.9629(3)(a) of the Part 111 rules authorize the Director of the MDEQ to specify in an operating license or a consent order schedules of compliance for corrective action, environmental protection standards, and other requirements as appropriate.
- 2.10 Pursuant to a Memorandum of Understanding dated November 3, 2000, U.S. EPA Region 5 and the MDEQ have agreed that the MDEQ's use of cleanup standards and related processes under Part 201 of the NREPA, as used in the state's hazardous waste management program under Part 111 of the NREPA, is an acceptable way of achieving the objectives of the authorized Part 111 corrective action program.
- 2.11 R 299.9629(3)(a)(iii) under Part 111 of the NREPA provides that an operating license or a consent order may specify the soil standards to be used for corrective action and that those standards are established pursuant to Part 201, if the limits are not less stringent than allowed pursuant to the provisions of the RCRA.

III. DEFINITIONS

- 3.1 Unless otherwise expressly provided herein, terms used in this Consent Order that are defined in Part 111 of the NREPA or the RCRA or the regulations promulgated under those statutes will have the definitions given to them in Part 111 of the NREPA or the RCRA or in such regulations.

- 3.2 “Facility” as used in this Consent Order and as defined in Part 111 means the Dow Main Plant located in the City of Midland, County of Midland, State of Michigan.
- 3.3 The word “contaminant” as used in this Consent Order shall mean contaminant as defined in Part 111 of the NREPA.
- 3.4 The words "soil," "soils," and “off-site residential soil” as used in this Consent Order shall refer to the soils off the Dow Main Plant in the Midland Area.
- 3.5 “Midland Area” is the City of Midland for the Specified Pathways. “Midland Area” also includes a certain area of the Township of Midland bounded on the East by Rockwell Drive and on the South by Gordonville Road and Smith Crossing Road for the direct human contact pathway only or for the Specified Pathways if appropriate restrictions are in place in those areas of those Townships. “Midland Area” does not include land within the 100-year floodplain of the Tittabawassee River downstream of Dow’s Main Plant and does not include the Main Plant.

IV. PARTIES BOUND

- 4.1 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their officers, directors, agents, employees, successors, and assigns; and upon all persons including, but not limited to, contractors and consultants acting on behalf of Dow.
- 4.2 No change in ownership or corporate or partnership status relating to the Facility will in any way alter the responsibility of Dow under this Consent Order unless agreed to in writing between the MDEQ and Dow. Any conveyance of title, easement, or other interest in the Facility, or a portion of the Facility, shall not affect the obligations of Dow under this Consent Order. Dow will be responsible

and liable for any failure to carry out all activities required of Dow by the terms and conditions of this Consent Order, regardless of use by Dow of employees, agents, contractors, or consultants to perform any such tasks.

- 4.3 Dow shall provide a copy of this Consent Order to all contractors, subcontractors, laboratories, and consultants retained after the effective date of this Consent Order to conduct or monitor any portion of the work to be performed pursuant to this Consent Order within one (1) week after the effective date of this Consent Order, or within one (1) week after the date of retention of such person(s), whichever occurs later. Notwithstanding the terms of any such contract, Dow is responsible for compliance with the terms of this Consent Order.

V. FINDINGS OF FACT

- 5.1 Dow is a person as defined by Section 301(g) of the NREPA and R 299.9106(i).
- 5.2 Dow is the current or former owner and/or operator of the Facility that generated, treated, and/or stored hazardous waste. Dow is a Delaware corporation.
- 5.3 The Facility is an industrial site occupying approximately a 1,900-acre tract of land located in Midland County, Michigan.
- 5.4 On August 12, 1980, Dow filed a Notification of Hazardous Waste Activity Form for the Facility with the U.S. EPA pursuant to Section 3010 of the RCRA. In this notification, Dow identified itself as a generator of hazardous waste, and an owner/operator of a treatment and storage facility. Dow filed a Part A hazardous waste permit application for the Facility on November 11, 1980. Dow's U.S. EPA Identification Number for this Facility is MID 000724724.
- 5.5 Dow was founded in Midland, Michigan, in 1897, as a producer of brine-derived chemicals. A large variety of over 1,000 different inorganic and organic

chemicals has been produced at one time or another at the Main Plant, and Dow's Michigan Operations continue to be a major manufacturing unit for the corporation.

- 5.6 The entire Facility has been classified as a single waste management unit for corrective action purposes. The Facility is subject to regulation and corrective action under Part 111 of the NREPA.
- 5.7 Soil sampling in 1983, 1984, 1996, and 1998 has provided data regarding the concentrations of PCDD/Fs in off-site residential soils in the Midland Area.
- 5.8 The Facility has been owned and operated by Dow as a hazardous waste management facility subject to the requirement to have an operating license under Sections 11118 and 11123 of Part 111 of the NREPA; R 299.9601; R 299.9502; and Section 3004 of the RCRA, 42 U.S.C. Section 6924. Therefore, the Facility is subject to the regulations and environmental standards of Part 111 of the NREPA and the rules promulgated under that part and is subject to the corrective action requirements of Section 3004(u) of the RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. Section 6924(u).
- 5.9 There has been a release of contaminants at or from the Facility, which is subject to corrective action.

VI. OTHER APPLICABLE LAWS

- 6.1 All action required to be taken by Dow pursuant to this Consent Order shall be undertaken in accordance with this Consent Order and the requirements of all applicable local, state, and federal laws and regulations.

VII. PROJECT COORDINATOR

- 7.1 Unless the MDEQ is otherwise notified in writing, the Project Coordinators for Dow shall be Dr. Neil C. Hawkins, Responsible Care Leader, Environment, Health and Safety, Michigan Operations.. The MDEQ Project Coordinator shall be **[Name, Title]** unless Dow is notified otherwise in writing. The Project Coordinators shall be responsible for overseeing the implementation of this Consent Order. To the maximum extent practicable, all communications between Dow and the MDEQ, and all documents, reports, approvals, and other correspondence concerning the activities performed pursuant to this Consent Order, shall be directed through the Project Coordinators. Dow or the MDEQ may change its respective Project Coordinator by providing written notice to the other party.

VIII. WORK TO BE PERFORMED AND APPROVALS

- 8.1 Dow has agreed to perform actions required by this Consent Order.
- 8.2 The MDEQ agrees that 0.831 microgram per kilogram for PCDD/Fs toxic equivalent concentrations (TEC) is the interim action level for protection of human health for the Specified Pathways for residential property soils in the Midland Area under R 299.9629 of Part 111 of the NREPA. This interim action level for Midland Area residential soils is approved based on the existing sampling and the calculation described in *Guiding Principles for Monte Carlo Analysis*, 1997, U.S. EPA, Office of Research and Development, Washington, D.C., EPA/630/R-97/001 and *Risk Assessment Guidance for Superfund: Volume 3 – (Part A, Process for conducting probabilistic risk assessment)*, 2001, U.S. EPA, Office of Emergency and Remedial Response Directive Number 9285.7-45, December, EPA 540-R-02-002 (both referred to as the “Probabilistic Risk Assessment Documents”) using the input exposure assumptions from Attachment 1 and the information in Attachment 4.

- 8.3 No later than thirty (30) days after the effective date of this Consent Order, Dow shall submit to the MDEQ a Soil Sampling Work Plan to characterize residential property soil. The Soil Sampling Work Plan shall, upon approval by the MDEQ, be incorporated into and made an enforceable part of this Consent Order. Dow shall implement the Soil Sampling Work Plan, upon approval by the MDEQ, in accordance with its schedule.
- a. The Soil Sampling Work Plan shall provide for phased surficial soil sampling on residentially zoned properties, which properties have a land use consistent with the Part 201 residential exposure scenario (referred to as “residential property”) in the Midland Area that are proximal to the northern and eastern Facility boundaries. The sampling shall also address the Corning Way neighborhood. The Soil Sampling Work Plan shall include, but is not necessarily limited to, the components outlined below.
 - b. To supplement the existing soil data, samples will be taken on residential properties not owned or leased by Dow. The properties sampled shall be selected from residential properties to the north and to the east of Dow’s Facility and based, in part, on the MDEQ guidance documents for sampling of soil.
 - c. Dow’s obligations are subject to obtaining access from the individual property owners as set forth in Section X of this Consent Order.
 - d. Samples shall be analyzed for PCDD/Fs (TEC).
 - e. If any of the soil samples exceeds the interim action level, or the revised interim action level if it has been specified at the time, then additional confirmation sampling shall be performed in the immediate vicinity of such exceedance to confirm the exceedance. If it is confirmed, additional

sampling shall be performed as specified in the Soil Sampling Work Plan, to determine the horizontal and vertical extent of soils exceeding the interim action level (or revised interim action level, if it has been specified at the time) at that location. If necessary, such sampling may extend beyond the boundary of the original property to adjacent residential properties, subject to obtaining access pursuant to Section X of this Consent Order.

- 8.4 Within thirty (30) days of completion of the Soil Sampling Work, Dow shall submit a Soil Sampling Final Report that summarizes all of the work conducted under the Soil Sampling Work Plan and includes all of the analytical data gathered as well as summary tables.
- 8.5 Attachment 2 to this Consent Order describes an In Vivo Bioavailability Study that is being performed to derive the bioavailability percentage that shall be used under this Consent Order to set the revised interim action level. The revised interim action level will be calculated using the same Probabilistic Risk Assessment Documents and all of the input exposure assumptions from Attachment 1, except the bioavailability percentage factor. Dow shall complete the In Vivo Bioavailability Study. Dow shall submit the results of the In Vivo Bioavailability Study to the MDEQ within forty-five (45) days after the final report is completed for the In Vivo Bioavailability Study, unless Dow advises the MDEQ that an extension is necessary due to the Scientific Review Committee (described in Attachment 2) having not completed its review of the results. If the Scientific Review Committee determines that the In Vivo Bioavailability Study followed the protocols in Attachment 2, the bioavailability percentage factor determined by the study, along with the input exposure assumptions in Attachment 1 (except for the bioavailability percentage factor in Attachment 1) and all of the other information and calculations used in establishing the interim action level shall be deemed, upon concurrence by the Scientific Review Committee, the best available scientific information concerning bioavailability for

setting the revised interim action level. Dow will request of the Scientific Review Committee that the committee provide the MDEQ with a written notice of its determination concerning the bioavailability percentage factor that results from the In Vivo Bioavailability Study. The MDEQ shall calculate the approved revised interim action level using the best available scientific information and the Probabilistic Risk Assessment Documents and the exposure assumptions in Attachment 1. The MDEQ-approved revised interim action level is an interim site-specific criterion for the Specified Pathways for residential soils in the Midland Area under Section 20120a(2) of Part 201 and R 299.9629 of Part 111 of the NREPA.

- 8.6 Dow shall perform corrective action at any of the residential properties identified by this sampling program to have surficial soils exceeding the interim action level or the revised interim action level after it is specified. With the consent of the property owner and any required approval from the MDEQ, Dow may select an appropriate corrective action or actions from options that include, but are not limited to, removal of contaminated soil, or placement of a reliable exposure barrier that may require the recording of a restrictive covenant or use of an acceptable institutional control. The corrective action interim measures shall be complete (subject to any applicable continuing maintenance of the corrective action) with respect to the Specified Pathways and PCDD/Fs once i) there is no longer a complete soil exposure pathway on the property, or ii) the surficial soil (as defined in the Soil Sampling Work Plan) is below the interim action level or the revised interim action level after it is specified. The corrective action shall be described in an interim corrective measures work plan ("ICM Work Plan") for the property or properties involved. The ICM Work Plan shall be submitted by Dow to the MDEQ for approval within forty-five (45) days after approval of the Soil Sampling Report by the MDEQ and after the property owner or owners consent to the ICM Work Plan. Dow shall place a copy of the ICM Work Plan in the publicly accessible repository for information regarding site activities established pursuant to paragraph 8.18.1.

- 8.6.1 Within thirty (30) days of receipt of the MDEQ's written approval of the ICM Work Plan under Section IX, Dow shall commence work and implement the approved ICM Work Plan(s). The approved ICM Work Plans are incorporated into this Consent Order.
- 8.7 If the revised interim action level set and approved under paragraph 8.5 is lower than the interim action level, Dow shall undertake sampling or corrective action as needed to comply with such revised interim action level, using the same approach described in the approved Soil Sampling Work Plan and in paragraph 8.6, above. Such sampling or corrective action shall also be done in accordance with an ICM Work Plan to be submitted by Dow within forty-five (45) days after the Soil Sampling Final Report is approved by the MDEQ, the revised interim action level is specified by the MDEQ to Dow, and permission to submit the ICM Work Plan is given by the property owner. If the revised interim action level is higher than the interim action level, Dow may revise any corrective action with respect to any properties that are or could be subject to corrective action by Dow to account for such higher revised interim action level by submitting a revised ICM Work Plan to the MDEQ for approval for the property involved.
- 8.8 Dow shall provide funds for a PCDD/Fs exposure and health effects study, pursuant to the proposal specified in Attachment 3 and entitled, *Midland, Michigan and Tittabawassee River Floodplain Comprehensive Dioxin Exposure and Health Effects Study* (Health Study). The Health Study shall be performed by scientists selected with procedures outlined in Attachment 3, who are unaffiliated with Dow, the MDEQ, the Michigan Department of Community Health ("MDCH"), the Petitioners of the Midland and Tittabawassee River Public Health Consultations, the U.S. EPA, or the Agency for Toxic Substances and Disease Registry. The Health Study shall be administered by an independent contractor as selected by the MDEQ and the MDCH. The Health Study shall begin as soon as practicable after the effective date of this Consent Order. The funds to be

provided by Dow shall be provided to an escrow or similar type account periodically during the performance of the Health Study in increments sufficient to fund the Health Study on an ongoing basis until it is completed.

- 8.9 If, during performance of the Health Study, the scientists performing it and the Scientific Advisory Committee (described in Attachment 3) both conclude that immediate corrective action regarding residential soil needs to be taken due to PCDD/Fs in residential soils in the Midland Area that are causing a demonstrable adverse health impact to residents in the Midland Area, Dow shall propose corrective action to the MDEQ, with respect to releases of PCDD/Fs by Dow, to address such conclusion by those scientists and the Scientific Advisory Committee. The proposed corrective action shall be described in a Work Plan to be submitted by Dow within forty-five (45) days after Dow receives written notification from those scientists and the Scientific Advisory Committee containing that conclusion, the reasons that support the conclusion, and the action or goal recommended by them to be achieved by the immediate corrective action. The Work Plan is to be submitted under Section IX and is subject to Dow's right to invoke Section XIV (Dispute Resolution). Upon approval of the Work Plan by the MDEQ, Dow shall implement the Work Plan.
- 8.10 Within ninety (90) days after Dow receives the final Health Study report, Dow shall review that report and propose to the MDEQ for approval a final action level for PCDD/Fs (TEC) for the Specified Pathways for residential soils in the Midland Area. The final action level shall be developed in accordance with the Probabilistic Risk Assessment Documents and the exposure assumptions used in calculating the revised interim action level except to the extent that the final Health Study report is inconsistent with such documents or exposure assumptions, in which case the Health Study controls and other methodologies may be considered if necessary.

- 8.11 If the Health Study described in Attachment 3 results in a final action level for PCDD/Fs (TEC) that is different than the interim action level or the revised interim action level, then such final action level is also approved by the MDEQ under Section 20120a(2) of Part 201 and R 299.9629 of Part 111 of the NREPA as a site-specific residential soil criterion for Specified Pathways.
- 8.12 After the final action level is approved by the MDEQ or after the final action level is determined after Dispute Resolution, and if the final action level is different than the revised interim action level, then one of the following shall apply:
- a. If the final action level is lower than the revised interim action level, Dow shall submit an ICM Work Plan under Section IX within forty-five (45) days after receiving notice of such final action level to i) evaluate the final action level compared to existing data from the Soil Sampling Report; ii) if necessary, gather further soil samples, and iii) if necessary, perform additional corrective action at affected properties, consistent with the approach described in the approved Soil Sampling Work Plan and in paragraph 8.6. The approved ICM Work Plan is incorporated into this Consent Order.
 - b. If the final action level is higher than the revised interim action level, Dow may, at any time, submit to the MDEQ under Section IX for approval a revised ICM Work Plan for any properties where corrective action under an ICM Work Plan was previously taken or proposed by Dow, to revise the corrective action taken, planned, or that is ongoing based on the higher final action level. The revised ICM Work Plan is incorporated into this Consent Order.
- 8.13 The MDEQ determines and Dow agrees that no land-use or resource-use restrictions, except as set forth in paragraph 8.16, are necessary for or will apply to the interim action level or the revised interim action level for the Specified

Pathways while the interim action level or the revised interim action levels are in effect, subject to paragraph 8.10.

- 8.14 This Consent Order shall apply to soils in the Midland Area. The residential exposure scenario for the Specified Pathways is considered to be the most conservative of any of the exposure scenarios for the Specified Pathways compared to other property uses, making the residential soil criterion for the Specified Pathways generally protective for all other exposure scenarios for the Specified Pathways.
- 8.15 Dow may apply the action level applicable to residential property under this Consent Order to other off-site properties in the Midland Area that are not residential property, or Dow may apply, subject to MDEQ approval, a higher soil action level that is appropriate to the uses and exposures at such other off-site nonresidential properties.
- 8.16 The MDEQ determines that the action level and site-specific criterion approvals under this Consent Order apply only to soils that are in and that remain in the Midland Area and the approvals include the following:
- a. The properties that meet the action level/site-specific criterion are not considered to be facilities as that term is defined in Part 201.
 - b. There is no restriction on relocation of soil within the Midland Area if the soil does not exceed the action level/site-specific criterion.
 - c. For properties in the Midland Area where soils do not exceed the action level/site-specific criterion, no notices are required to be made in connection with a transfer of that property.

- 8.17 The interim action level (subject to revision as specified in this Consent Order) applies for all off-site residential properties in the Midland Area. This interim action level, and any revised interim action level, and the final action level determined under this Consent Order, may not be appropriate for locations outside the Midland Area, depending on the results of further site-specific evaluations of the risk posed by soils outside the Midland Area.
- 8.18 Reporting and other requirements.
- 8.18.1 Dow shall establish a publicly accessible repository for information regarding work performed by Dow under this Consent Order.
- 8.18.2 Within sixty (60) days after the effective date of this Consent Order, Dow must submit a Public Involvement/Communications Plan to the MDEQ. Dow shall comply with the plan.
- 8.18.3 Dow shall provide quarterly progress reports to the MDEQ detailing work performed by Dow (including the status of funding of the Health Study) or its contractors to date, data collected, problems encountered, project schedule, and percent project completed by the 15th day after the end of the quarter for the preceding calendar quarter.
- 8.18.4 The parties will communicate frequently and cooperate in good faith to timely respond to submittals and to assure successful completion of the requirements of this Consent Order, and will meet or confer on at least a quarterly basis to discuss the work proposed and performed under this Consent Order.
- 8.18.5 All sampling and analysis conducted pursuant to this Consent Order will be performed in accordance with the Region 5 RCRA Quality Assurance Project Plan (“QAPP”) Policy (April 1998) as modified by

the MDEQ and as appropriate for the site. The MDEQ reserves the right to audit laboratories selected by Dow or require Dow to purchase and have analyzed any Performance Evaluation (“PE”) samples selected by the MDEQ for PCDD/Fs.

8.18.6 Dow will notify the MDEQ in writing at least fourteen (14) days prior to beginning each separate phase of field work performed under this Consent Order. At the request of the MDEQ, Dow will provide or allow the MDEQ or its authorized representative to take split or duplicate samples of all samples collected by Dow pursuant to this Consent Order.

8.19 Cost Estimate for Corrective Action:

8.19.1 Dow shall prepare a detailed written cost estimate for any work required to be performed by Dow under this Consent Order and place a copy in the public information repository referred to in Subsection 8.18.1.

8.19.2 Dow shall submit the detailed written cost estimate for that work with the submission of the work plan to the MDEQ for review and approval prior to implementing that work and provide an appropriate financial instrument for the cost estimate.

8.19.3 The MDEQ shall approve the cost estimate if it is a reasonable estimate or shall provide a written Notice of Deficiency on the cost estimate with written reasons explaining the basis for the Notice of Deficiency. Dow shall modify the cost estimate in accordance with such Notice of Deficiency and submit a new cost estimate to the MDEQ for approval within thirty (30) days of receipt of the Notice of Deficiency.

- 8.19.4 Until the MDEQ notifies Dow, in writing, that Dow is no longer required by R 299.9713 to maintain financial assurance for that work, Dow shall adjust the cost estimate for inflation and to reflect increases or decreases in the cost estimate for remaining work within sixty (60) days prior to the anniversary of the date of the establishment of the financial instrument[s] used to demonstrate financial assurance. If the financial instrument used is the financial test or corporate guarantee, Dow shall adjust the cost estimate for inflation and to reflect increases or decreases in the cost estimate for remaining work within thirty (30) days after the close of the firm's fiscal year and before submission of updated financial information to the MDEQ.
- 8.19.5 Dow shall keep the latest cost estimate at the Facility location in Midland, Michigan.

IX. APPROVAL OF SUBMITTALS

- 9.1 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted by Dow to the MDEQ for approval, the following process and terms of approval shall apply.
- 9.2 Any work plan, proposal, or other document required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule, and all of the information required by the applicable paragraph(s) of this Consent Order.
- 9.3 The MDEQ may approve, disapprove, or approve with specific modifications, the required work plan, proposal, or other document consistent with the provisions of this Consent Order. Upon MDEQ approval, or approval with modifications, of a

work plan, proposal, or other document, certain of such work plans, proposals, or other documents shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order if the particular work plan, proposal, or other document is specifically required by another Section of this Consent Order to be incorporated herein.

- 9.4 In the event the MDEQ disapproves a work plan, proposal, or other document, it shall notify Dow, in writing, of the specific reasons for such disapproval. Dow shall submit, within thirty (30) days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the MDEQ's disapproval.
- 9.5 In the event the MDEQ approves with specific modifications, a work plan, proposal, or other document, it shall notify Dow, in writing, of the specific modifications the MDEQ requests to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The specific modifications shall be made by Dow. The MDEQ may require Dow to submit, prior to implementation and within thirty (30) days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If necessary, Dow may request an extension of time. Such request shall not be unreasonably denied.
- 9.6 Failure by Dow to submit any work plan, proposal, or other plan on the date it was first due, pursuant to the schedules set forth in Section IX or the schedules approved as part of a work plan, proposal or other document, shall subject Dow to stipulated penalties commencing on the date the work plan proposal or other document was due and accumulating until an approvable work plan, proposal, or other document is submitted.

- 9.7 Any delays caused by Dow's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter Dow's responsibility to comply with any other deadline(s) specified in this Consent Order.
- 9.8 No informal advice, guidance, suggestions, or comments by the MDEQ regarding reports, plans, specifications, schedules or any other writing submitted by Dow will be construed as relieving Dow of the obligation to obtain written approval, if and when required by this Consent Order.

X. ON-SITE AND OFF-SITE ACCESS

- 10.1 To the extent that work being performed pursuant to this Consent Order must be done on property not owned or controlled by Dow, Dow will use its best efforts to obtain access agreements necessary to complete work required by this Consent Order from the present owner(s) or operators of such property within sixty (60) days of the date that the need for access becomes known to Dow. Dow shall, in good faith, attempt to have any such access agreement provide for access by the MDEQ and its representatives. Dow shall ensure that the MDEQ's Project Coordinator has a copy of any access agreement(s). In the event that agreements for access are not obtained within sixty (60) days, Dow shall notify the MDEQ in writing within fourteen (14) days thereafter of both the efforts undertaken to obtain access and the failure to obtain access agreements. The MDEQ may, at its discretion, assist Dow in obtaining access.
- 10.2 Nothing in this section limits or otherwise affects the MDEQ's right of access and entry pursuant to applicable law, including the NREPA and the RCRA.

XI. RECORD PRESERVATION

- 11.1 Dow agrees to preserve, during the life of this Consent Order and for five (5) years after termination of this Consent Order, unless a longer period is

required by Part 111 or its rules: all nonprivileged records and documents in its possession or in the possession of its divisions, officers, employees, agents, contractors, successors, and assigns that relate in any way to this Consent Order. Upon request from the MDEQ, Dow shall make such records available to the MDEQ for inspection or shall provide copies of any such records to the MDEQ. Dow shall obtain permission from the MDEQ, in writing, prior to the destruction of any such records by Dow and shall provide the MDEQ with the opportunity to take possession of any such records. Analytical data shall not be considered privileged.

XII. REPORTING AND DOCUMENT CERTIFICATION

12.1 Unless otherwise specified, reports, correspondence, approvals, disapprovals, notices, or other submissions relating to or required under this Consent Order, shall be in writing and shall be distributed as follows:

a. Three (3) copies of all documents to be submitted to the MDEQ should be sent to:

_____, Project Coordinator
 Remediation and Redevelopment Division
 Department of Environmental Quality
 P.O. Box 30426
 Lansing, Michigan 48909

Telephone: 517-335-1104 Facsimile: 517-373-2637

b. Documents to be submitted to Dow should be sent to:

Dr. Neil C. Hawkins
 Responsible Care Leader
 Environment, Health, and Safety
 Michigan Operations/Midland Facilities
 The Dow Chemical Company
 1261 Building
 Midland, Michigan 48667

Telephone: 989-636-2646

Facsimile: 989-638-7598

12.2 A Responsible Official, or designated Project Coordinator, if authorized in writing by a Responsible Official, shall sign each final document and certification required to be submitted by this Consent Order. Dow shall include an unsigned certification statement that meets the requirements specified below in all drafts of such documents submitted to the MDEQ. The term "Responsible Official" means as follows: (a) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (b) the manager of one or more manufacturing, production, or operation facilities employing more than 250 persons, or having gross annual sales or expenditures exceeding \$35 million (in 1987 dollars when the Consumers Price Index was 345.3), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

12.3 The certification required by paragraph 12.2 of this Consent Order shall be in the following form:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____

Name: _____

Title: _____

Date: _____

XIII. COSTS AND STIPULATED PENALTIES

- 13.1 Except as provided in Sections XIV (Dispute Resolution) and XV (Force Majeure), or unless there has been a written modification of a compliance date by the MDEQ pursuant to Section XVI (Subsequent Modification) of this Consent Order, in the event Dow fails to meet any requirement set forth in the Consent Order, the MDEQ may demand and Dow shall pay upon such demand stipulated penalties as set forth below.
- 13.1.1 For failure to submit the Soil Sampling Work Plan or the Soil Sampling Final Report within the applicable time period specified for that report: \$1,000 per day for the first fourteen (14) days and \$2,000 per day thereafter.
- 13.1.2 For failure to submit quarterly progress reports by the dates scheduled in Section VIII: \$500 per day for the first fourteen (14) days and \$1,000 per day thereafter.
- 13.1.3 For failure to submit any other document or final report by the date such document or final report is first due as prescribed in this Consent Order or for any other failure to perform any other work or comply with any other provision(s) of this Consent Order: \$1,000 per day for the first one (1) to fifteen (15) days of delay; \$2,000 per day thereafter.
- 13.2 All stipulated penalties shall begin to accrue on the date that complete performance is due or a violation occurs, and shall continue to accrue through the final day of correction of the noncompliance. Nothing herein shall prevent the simultaneous accrual of separate stipulated penalties for separate violations of this Consent Order.

- 13.3 All stipulated penalties owed to the MDEQ under this section shall be due within thirty (30) days after receipt of a written demand from the MDEQ. Such demand shall describe the noncompliance and shall indicate the amount of stipulated penalties due.
- 13.4 Dow shall reimburse the MDEQ for all actual future oversight costs incurred by the MDEQ in overseeing the activities conducted by Dow pursuant to Section VIII of this Consent Order to a maximum of \$50,000 per calendar year as specified below. As soon as possible after each anniversary of the effective date of this Consent Order, the MDEQ will provide Dow with a written demand of oversight costs incurred by the MDEQ. Any such demand shall state with reasonable specificity the nature of the costs incurred. Dow may review the MDEQ's underlying cost documentation that specifically details the basis for each cost. Dow shall reimburse the MDEQ for such costs within thirty (30) days of receipt of a written demand from the MDEQ or receipt of underlying documentation, whichever occurs later, unless Dow challenges the oversight costs pursuant to the dispute resolution procedures set forth in Section XIV of this Consent Order. If the MDEQ oversight costs for a calendar year exceed \$50,000, the excess shall roll over to and be paid in the succeeding year or years but is still subject to the \$50,000 per year payment maximum. Any oversight costs paid by Dow shall not be deemed to be stipulated penalties or monetary penalties under this Consent Order.
- 13.5 To ensure timely payment of the above stipulated penalties and oversight costs, Dow shall pay an interest penalty to the General Fund of the State of Michigan each time it fails to make a complete or timely payment. This interest penalty shall be based on the rate set forth at MCL 600.6013(6), using the full increment of amount due as principal and shall accrue on the unpaid balance at the end of the thirty (30) day period after which the penalty became due until the delinquent payment is finally made in full.

- 13.6 Dow shall pay the above stipulated penalties, interest, and oversight costs, by certified or cashier's check, made payable to the "State of Michigan" and mailed to the MDEQ, Revenue Control Unit, P.O. Box 30657, Lansing, Michigan 48909-8157, or hand delivered to the MDEQ, Revenue Control Unit, 525 West Allegan, 5th Floor, South Tower, Lansing, Michigan 48933. To ensure proper credit, all payments made pursuant to this Consent Order must include the Payment Identification Number furnished in the demand for stipulated penalties. All payments shall reference the name of the Facility, Dow's name and address, and the Consent Order number. Copies of the transmittal of payment shall be sent simultaneously to the MDEQ Project Coordinator.
- 13.7 The payment of stipulated penalties shall not alter in any way Dow's obligation to complete the performance required under this Consent Order.
- 13.8 Dow agrees not to contest the legality of any stipulated penalties assessed pursuant to paragraph 13.1, above, or the MDEQ's legal authority to impose such penalties, except as provided in Section XIV, but reserves the right to dispute the factual basis upon which a demand by the MDEQ for stipulated penalties is made.
- 13.9 The stipulated penalties set forth in this section do not preclude the MDEQ from pursuing any other remedies or sanctions that may be available to the MDEQ by reason of the failure of Dow to comply with any of the requirements of this Consent Order. Notwithstanding the foregoing, the MDEQ and Dow agree that any monetary penalties, including stipulated penalties that the MDEQ seeks for any single and discrete violation of this Consent Order, shall not exceed the statutory maximum penalty for such violation as provided in applicable Michigan law. Nothing herein shall prevent the MDEQ from seeking separate penalties for separate violations. Dow reserves the right to contest and defend against the MDEQ's pursuit of any such remedies or sanctions.

XIV. DISPUTE RESOLUTION

- 14.1 The dispute resolution procedures of this section shall be the exclusive mechanism to resolve disputes between the parties to this Consent Order arising under or with respect to this Consent Order and shall apply to all provisions of this Consent Order. However, the procedures set forth in this section shall not apply to actions by the state to enforce obligations of Dow that have not been disputed in accordance with this section.
- 14.2 Any dispute that arises under this Consent Order shall in the first instance be the subject of informal negotiations between the parties. The period of negotiations shall not exceed twenty (20) days from the date of written notice by any party that a dispute has arisen, unless the time period for negotiations is modified by written agreement between the parties. The dispute shall be considered to have arisen when one party sends the other party a written notice of dispute. If agreement cannot be reached on any issue within this twenty (20) day period, the MDEQ shall provide a written statement of its decision to Dow and, in the absence of initiation of formal dispute resolution by Dow under paragraph 14.3, the MDEQ position, as outlined in its written statement of decision, shall be binding on the parties.
- 14.3 If Dow and the MDEQ cannot informally resolve a dispute under paragraph 14.2, Dow may initiate formal dispute resolution by requesting review of the disputed issues by the MDEQ's Remediation and Redevelopment Division (RRD) Chief. This written request must be filed with the RRD Chief within thirty (30) days of Dow's receipt of the MDEQ's statement of decision that is issued at the conclusion of the informal dispute resolution procedure set forth in paragraph 14.2. Dow's request shall state the issues in dispute; the relevant facts upon which the dispute is based; any factual data, analysis, or opinion supporting its position; and all supporting documentation upon which Dow bases its position. Within thirty (30) days of the RRD Chief's receipt of Dow's request

for a review of disputed issues, the RRD Chief will provide a written statement of decision to Dow (that shall be the final agency decision), which will include a statement of his/her understanding of the issues in dispute; the relevant facts upon which the dispute is based; any factual data, analysis, reasons, or opinion supporting her/his position; and all supporting documentation relied upon by the RRD Chief's review of the disputed issues. The RRD Chief's review of the disputed issues may be extended by written agreement of the parties.

- 14.4 The written statement of the RRD Chief issued under paragraph 14.3 shall be binding on the parties unless, within twenty-one (21) days after receipt of MDEQ's written statement of decision, Dow files a petition for judicial review in a court of competent jurisdiction that shall set forth a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Order.
- 14.5 An administrative record of the dispute shall be maintained by the MDEQ. The administrative record shall include all of the information provided by Dow pursuant to paragraph 14.3, and the MDEQ's written decision and supporting information referred to in paragraph 14.3. Where appropriate, the MDEQ shall allow submission of supplemental statements of position by Dow.
- 14.6 The filing of a petition for resolution of a dispute with a court shall not, of itself, extend or postpone any obligation of Dow under this Consent Order but shall stay payment of stipulated penalties as to the disputed matter until final resolution of the dispute. Notwithstanding the invocation of the dispute resolution, stipulated penalties, with any applicable interest, shall accrue from the first day of any failure or refusal to comply with any term or condition of this Consent Order unless stayed by the court. The court shall stay the accrual of stipulated penalties if the court believes a good faith dispute exists. In the event, and to the extent that Dow does not prevail on the disputed issue, stipulated

penalties and any applicable interest shall be paid within thirty (30) business days in the manner provided for in Section XIII of this Consent Order after a final decision by a court of competent jurisdiction and the expiration of any appeal period for that decision. Dow shall not be assessed stipulated penalties for disputes resolved in its favor.

XV. FORCE MAJEURE

- 15.1 Dow shall perform the requirements of this Consent Order within the time limits established herein, unless performance is prevented or delayed by events that constitute a “Force Majeure.” Any delay in the performance attributable to a “Force Majeure” shall not be deemed a violation of obligations of Dow under this Consent Order in accordance with this section.
- 15.2 For the purpose of this Consent Order, “Force Majeure” means an occurrence or nonoccurrence arising from causes beyond the reasonable control of and without the fault of Dow, such as an Act of God, untimely review of permit applications or submissions by the MDEQ or other applicable authority, and acts or omissions of third parties that could not have been avoided or overcome by the diligence of Dow and that delay the performance of an obligation under this Consent Order. “Force Majeure” does not include, among other things, unanticipated or increased costs, changed financial circumstances, or failure to obtain a permit or license as a result of actions or omissions of Dow.
- 15.3 Dow shall notify the MDEQ by telephone within seventy-two (72) hours of discovering any event that causes a delay in its compliance with any provision of this Consent Order. Verbal notice shall be followed by written notice within ten (10) calendar days and shall describe in detail the anticipated length of delay, the cause or causes of delay, the measures taken by Dow to prevent or minimize the delay, and the timetable by which those measures shall be implemented. Dow shall adopt all reasonable measures to avoid or minimize any such delay.

- 15.4 Failure of Dow to comply with the notice requirements of paragraph 15.3, above, shall render this Section XV void and of no force and effect as to the particular incident involved. The MDEQ may, at its sole discretion and in appropriate circumstances, waive the notice requirements of paragraph 15.3.
- 15.5 If the parties agree that the delay or anticipated delay was beyond the control of Dow, this may be so stipulated and the parties to this Consent Order may agree upon an appropriate modification of this Consent Order. If the parties to this Consent Order are unable to reach such agreement, the dispute shall be resolved in accordance with Section XIV (Dispute Resolution) of this Consent Order. The burden of proving that any delay was beyond the reasonable control of Dow, and that all the requirements of this section have been met by Dow, is on Dow.
- 15.6 An extension of one (1) compliance date based upon a particular incident does not necessarily mean that Dow qualifies for an extension of a subsequent compliance date without providing proof regarding each incremental step or other requirement for which an extension is sought.

XVI. SUBSEQUENT MODIFICATION

- 16.1 This Consent Order may be amended only by mutual agreement of the MDEQ and Dow. Such amendments shall be in writing, shall be signed by both parties, shall have as their effective date the date on which they are signed by the MDEQ, and shall be incorporated into this Consent Order.
- 16.2 The Project Coordinators can agree, in writing, to extend any deadline contained in Section VIII (Work to be Performed and Approvals). An extension of more than three (3) months must also be approved by the RRD Chief, in accordance with this section of this Consent Order.

- 16.3 No informal advice, guidance, suggestions, or comments by the MDEQ regarding reports, plans, specifications, schedules or any other writing submitted by Dow will be construed as relieving Dow of its obligation to obtain written approval, if and when required by this Consent Order.

XVII. RESERVATION OF RIGHTS

- 17.1 This Consent Order is not intended to be nor shall it be construed to be a permit. This Consent Order does not relieve Dow of any obligation to obtain and comply with any required local, state, or federal permits. This Consent Order in no way affects the responsibility of Dow to comply with any other applicable state, federal, or local laws or regulations. All action required to be taken by Dow pursuant to this Consent Order shall be undertaken in accordance with the requirements of all applicable local, state, and federal laws and regulations.
- 17.2 The MDEQ reserves all of its statutory and regulatory powers, authorities, rights, and remedies, both legal and equitable, which may pertain to the failure of Dow to comply with any of the requirements of this Consent Order, including, without limitation, the assessment of penalties under Section 11151 of Part 111 of the NREPA, MCL 324.11151. This Consent Order shall not be construed as a covenant not to sue, release, waiver, or limitation of any rights, remedies, powers, and/or authorities, civil or criminal, which the MDEQ has under Part 111 of the NREPA, or any other statutory, regulatory, or common law enforcement authority of the State of Michigan with respect to the failure of Dow to comply with this Consent Order.
- 17.3 The MDEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Dow to comply with the requirements of Part 111 of the NREPA, the RCRA, and the rules promulgated under these statutes. Dow consents to enforcement of this Consent Order in the same manner and by the

same procedures for all final orders entered pursuant to Part 111 of the NREPA, MCL 324.11101 - 324.11152.

- 17.4 If, after thirty (30) days written notice by the MDEQ, Dow fails to perform any work or action required under this Consent Order, then the MDEQ may exercise its authority under any applicable state or federal law, to undertake the work at any time. Nothing herein shall be construed to limit the MDEQ's right to take action in the case of an emergency or in any situation where there is an imminent and substantial hazard to the health of persons or to the natural resources or in any situation endangering or causing damage to the public health or the environment. The MDEQ reserves its right to seek reimbursement from Dow for such additional costs incurred by the State. Dow is not released from liability, if any, for complying with the requirements of Part 111 of the NREPA, the RCRA, and rules promulgated under these statutes.
- 17.5 Nothing in this Consent Order modifies, voids, or otherwise affects any previous agreement, consent order, consent agreement, or consent decree, or judgment between Dow and the MDEQ (or its predecessors), and no reservation of rights shall render inapplicable any provision of this Consent Order.
- 17.6 Notwithstanding any other provision of this Consent Order, an enforcement action may be brought by the MDEQ pursuant to Part 111 of the NREPA, or other statutory authority where the generation, storage, transportation, treatment, or disposal of hazardous waste during investigation or corrective action activities that may present an imminent and substantial hazard to the health of persons or to the natural resources or is endangering or causing damage to the public health or the environment.
- 17.7 Dow consents to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to Part 111 of the NREPA, MCL 324.11101 - 324.11152.

XVIII. OTHER CLAIMS AND PARTIES

- 18.1 Nothing in this Consent Order shall constitute or be construed as a release from any claim, cause of action, or demand in law or equity against any person, firm, partnership, or corporation who is not a party to this Consent Order for any liability it may have arising out of, or relating in any way to, the generation, storage, treatment, handling, transportation, release, or disposal of any contaminants found at, taken to, or taken from the Facility.

XIX. OPERATING LICENSE

- 19.1 Nothing in this Consent Order shall depend on the reissuance or effectiveness of Operating License Number MID 000724724. The MDEQ shall not propose or impose any Special Condition or other provision for inclusion in Dow's Operating License No. MID 000724724 that is inconsistent with the terms of this Consent Order regarding residential soils off site in the Midland Area from Dow's Main Plant except as otherwise required by final judicial determination or as agreed to by Dow and the MDEQ. In the event of any inconsistency between the Operating License and this Consent Order, the latter shall control.

XX. INDEMNIFICATION OF THE MICHIGAN STATE GOVERNMENT

- 20.1 Dow shall indemnify and save and hold harmless the State of Michigan and its departments, agencies, officials, agents, employees, contractors, and representatives for any and all claims or causes of action by third parties arising from or on account of acts or omissions of Dow, its officers, employees, agents, and any persons acting on its behalf or under its control in carrying out work pursuant to this Consent Order. The State of Michigan shall not be held out as a party to any contract entered into by or on behalf of Dow in carrying out actions

pursuant to this Consent Order. Neither Dow nor any contractor shall be considered an agent of the state.

- 20.2 Dow waives any and all claims or causes of action against the State of Michigan and its departments, agencies, officials, agents, employees, contractors, and representatives for damages, reimbursement, or set off of any payments made or to be made to the state that arise from or on account of any contract, agreement, or arrangement between Dow and any person for performance of work at the Facility, pursuant to this Consent Order, including claims on account of construction delays.
- 20.3 Dow shall indemnify and hold harmless the State of Michigan and its departments, agencies, officials, agents, employees, contractors, and representatives for any and all claims or causes of action for damages or reimbursement from the state solely arising from or on account of any contract, agreement, or arrangement between Dow and any third person for performance of work at the Facility, pursuant to this Consent Order, including claims on account of construction delays.

XXI. TERMINATION

- 21.1 Dow may request that the RRD Chief issue a written Notice of Termination at any time after achieving compliance with this Consent Order. A request for termination shall not unreasonably be withheld. Such a request shall consist of a written certification that Dow is in compliance with and has completed all obligations of Dow under this Consent Order, including payment of any stipulated penalties required in this Consent Order. Specifically, this certification shall include:
- a. The completion date of all work required, and the date any stipulated penalties and oversight costs were paid;

- b. A statement that all required information has been reported to the Project Coordinator; and
- c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the designated location.

This Consent Order shall remain in full force and effect until expressly terminated by a written Notice of Termination issued by the RRD Chief in response to such a request from Dow.

- 21.2 The Notice of Termination shall act as a determination that Dow is in compliance with and has completed all obligations of Dow under this Consent Order with respect to PCDD/Fs in the Midland Area soils other than the Main Plant soils as specified herein.

XXII. SEVERABILITY

- 22.1 It is the intent of Dow and the MDEQ that the provisions of this Consent Order are severable. If any provision of this Consent Order or the application of this Consent Order to either party is held by any court of competent jurisdiction to be invalid or unenforceable, the application of such provision to the other party or circumstances and the remainder of the Consent Order shall remain in force and shall not be affected thereby.

Signatories

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.

The Dow Chemical Company

Michigan Department of Environmental Quality

By: _____

Russell J. Harding

Director

By: _____

Title: _____

Date: _____

Date: _____

11/06/2002

Attachment 1

Department of Environmental Quality (DEQ) October 2, 2002 Interim Decisions Regarding Factors to be Used Initially in a Probabilistic Risk Assessment (PRA) for Midland, Michigan.

Issue	DEQ Interim Decision
Cancer Slope (Potency) Factor	Dow Chemical Company (Dow) <u>should</u> use the DEQ's current policy of 75,000 (mg/kg-d) ⁻¹
Noncancer Reference Dose	Dow <u>should</u> use the DEQ's current policy of 1.3 pico grams per kg per day.
Averaging Time	Dow <u>should</u> use the standard U.S. Environmental Protection Agency (USEPA)/DEQ default value.
Dermal Bioavailability	Dow <u>should</u> use the standard DEQ default value.
Soil to Skin Adherence Factor	As an initial starting point, Dow <u>should</u> use data collected by the USEPA contractors (Holmes <i>et al.</i> , 1999) and submit this probability distribution function to a DEQ-selected third party PRA reviewer for evaluation.
Child Soil Ingestion Rate	As an initial starting point, Dow <u>should</u> use data collected by the USEPA contractors that was published in the literature (Stanek <i>et al.</i> , 2001) and the distribution derived and submit this probability distribution function to a DEQ-selected third party PRA reviewer for evaluation.
Adult Soil Ingestion Rate	As an initial starting point, Dow <u>should</u> use 50 mg/day as recommended in the USEPA's Exposure Factors Handbook and submit this to a DEQ-selected third party PRA reviewer for evaluation.
Selection of 95th Percentile	As an initial starting point for the PRA, Dow <u>should</u> use the data it proposed and submit this probability distribution function to a DEQ-selected third party PRA reviewer for evaluation. In addition, Dow should provide a discussion regarding qualitative uncertainty in its report.
Exposure Duration	Dow <u>should</u> truncate exposure at 70 years and submit this probability distribution function to a DEQ-selected third party PRA reviewer for evaluation.
Adult Skin Surface Area	Dow <u>should</u> also address lower legs and feet in this factor and submit this probability distribution function to a DEQ-selected third party PRA reviewer for evaluation.
Body Weight	Dow <u>should</u> use the value from the USEPA's <i>Exposure Factors Handbook</i> and submit this probability distribution function to a DEQ-selected third party PRA reviewer for evaluation.
Soil Ingestion Meteorological Factor	As an initial starting point, Dow <u>should</u> use a meteorological factor for soil ingestion in the PRA provided that it can demonstrate that it is more reflective of local conditions.

Department of Environmental Quality (DEQ) October 2, 2002 Interim Decisions Regarding Factors to be Used Initially in a Probabilistic Risk Assessment (PRA) for Midland, Michigan (continued).

Issue	DEQ Interim Decision
Oral Bioavailability	Dow <u>should</u> use the value resulting from a Bioavailability Study ⁽¹⁾ after it has received concurrence from the DEQ Bioavailability Study Scientific Committee.
Interspecies Extrapolation for Bioavailability	As an initial starting point for the PRA, Dow <u>should not</u> include an additional uncertainty factor at this time in the PRA. Dow will need to incorporate a qualitative discussion on this in its report on its Bioavailability study.
Relative Source Contribution for Non Cancer	As an initial starting point for the PRA, Dow should not include this relative source contribution factor in the PRA at this time. The issue should be revisited in a Dioxin Exposure and Health Effects Study ⁽²⁾ .
Home Grown Produce	As an initial starting point for the PRA, Dow should not include this relative source contribution factor in the PRA at this time. The issue should be revisited in a Dioxin Exposure and Health Effects Study ⁽²⁾ .
Fish Consumption	As an initial starting point for the PRA, Dow should not include this relative source contribution factor in the PRA at this time. The issue should be revisited in a Dioxin Exposure and Health Effects Study ⁽²⁾ .
Soil Runoff	Dow <u>should not</u> address this pathway as it will likely be a minor pathway.
Risk Communication	Dow <u>should</u> discuss this issue in any PRA report that it submits to the DEQ.

1. *Estimation of the Oral Bioavailability of Dioxins/Furans in Soil from Midland, Michigan, Using in vivo Methods Study Proposal, July 2000.*
2. *Michigan Departments of Community Health and Environmental Quality Proposal: Midland, Michigan and Tittabawassee River Floodplain Comprehensive Dioxin Exposure and Health Effects Study (Draft 7/28/02).*

Attachment 2

In Vivo Bioavailability Study

Estimation of the Oral Bioavailability of Dioxins/Furans in Soil from Midland, Michigan, Using in vivo Methods

Background

The report entitled, *Estimation of the Oral Bioavailability of Dioxins/Furans in Soil from Midland, Michigan* (Exponent[®], 2001), was submitted by the Midland, Michigan Dow Chemical Company (Company) to the Michigan Department of Environmental Quality (MDEQ) on November 9, 2001. The study was conducted to estimate the oral bioavailability of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/Fs) from soil using an *in vitro* extraction method. The *in vitro* method was designed to replicate the chemistry and function of the human gastrointestinal tract and to establish the fraction of PCDDs/Fs that could be liberated from soil and become absorbed subsequent to ingestion.

It is the Company's belief that an oral bioavailability adjustment for PCDDs/Fs in soil, beyond the default value of 50 percent currently in use by the MDEQ to develop the generic direct contact criteria under Part 201, 1994 PA 451, as amended, is warranted for Midland soils. This belief is based on the conclusions of numerous studies of dioxin bioavailability from soil in the peer-reviewed literature, and the *in vitro* study described in the above referenced report.

The MDEQ's Toxics Steering Group (TSG) reviewed the Exponent[®] *in vitro* study and provided a critique to the Company on April 8, 2002 (MDEQ, 2002). In response to the TSG comments (Dow, 2002), the Company proposed to sponsor *in vivo* studies to compare to the Exponent[®] *in vitro* study.

Framework of the Studies

The primary purpose of the *in vivo* studies will be to develop site-specific oral bioavailability values for PCDDs/Fs in Midland soils, for possible use in regulatory risk assessment.

The studies will be conducted in both rat and swine models. The rat model is used by the MDEQ and the U.S. Environmental Protection Agency (USEPA) to derive the cancer slope factor (Kociba *et al.*, 1978; Lucier *et al.*, 1986; Shu *et al.*, 1988), and the swine model is more representative of humans and is used by the USEPA to assess lead and arsenic bioavailability in soil (Casteel *et al.*, 1997a, b; USEPA, 1999).

Exponent[®] will deliver a study design that describes the specific methodology for the *in vivo* models to the Scientific Review Committee (described below) for review on or before June 18, 2002. The study design document will present the goals, rationale, and design for the *in vivo* studies of dioxin bioavailability from Midland soils. The *in vivo* studies will use soils collected from the city of Midland and will be conducted in both rats and swine (i.e., each soil would be dosed to both animal models). The soils should contain a minimum of 50 pg TCDD/g soil to ensure that detectable concentrations of TCDD will be present in the animal tissues after dosing, and should be collected from the top one inch of the soil horizon, because these are the

soils to which direct-contact exposures are most likely to occur. The test soils for the *in vivo* studies will be air-dried and sieved to <250 µm, and the <250 µm fraction will be characterized for soil parameters (pH, TOC, particle size) and the concentrations of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/Fs). The concentrations of PCDDs/Fs also will be determined in the whole soils to help establish the relation between the concentrations of PCDDs/Fs in the whole soils and the size fraction tested during the bioavailability studies.

The in-life phase of this project (both rats and swine) will be conducted by Dr. Stan Casteel, Director of the Veterinary Medical Diagnostic Laboratory at the University of Missouri in Columbia, Missouri and has extensive experience in conducting bioavailability studies in both swine and rat models. A copy of his resume is attached.

Prior to the implementation of the *in vivo* studies, a pilot study using both rats and swine will be conducted as recommended by the Scientific Review Committee. Based upon the results of the pilot study, the final study protocols will be developed.

Dr. Casteel, with the assistance of Exponent[®], as needed, will prepare the formal study protocols based upon the comments of the Scientific Review Committee and the results of the pilot study to ensure that study objectives will be met. Exponent[®] will supply the test soils to Dr. Casteel, and also will prepare the control dosing materials (custom mixtures of PCDD/F congeners matched to each of the test soils).

All study samples will be analyzed for concentrations of PCDDs/Fs by high-resolution gas chromatography/mass spectrometry (HR-GC/MS) at Alta Analytical Laboratory, Inc. in Eldorado Hills, California. The Calux assay (Xenobiotic Detection Systems, Inc.) also will be used to provide a measure of total TEQ concentrations in the liver, fat, and feces of rats and swine used in the pilot study, to evaluate this assay against HR-GC/MS for use in the full *in vivo* studies.

Upon receipt of the analytical data, Exponent[®] will prepare a study report. This report will describe the manner in which the animal studies were conducted, and will present the analytical results and the oral bioavailability values for PCDDs/Fs from the test soils in both rats and swine. The report and the analytical data will be provided to the Scientific Review Committee.

Scientific Review Committee

A Scientific Review Committee will be formed and administered by the MDEQ to provide scientific input to the study design, and will review the study protocols, analytical results, and the final report. The Scientific Review Committee will provide written comments on the scientific credibility and conclusions of the study. The Scientific Review Committee will consist of the following scientists:

Dr. Eric Wayand, Rutgers College of Pharmacy;
Dr. Steven Roberts, University of Florida;
Dr. Linda Birnbaum, USEPA;
Dr. Lawrence Fischer, Michigan State University;
Dr. Steven Boyd, Michigan State University; and
Mr. Keith Harrison, MDEQ.

Dr. Wayand has expertise in pharmacology and the absorption of PAHs and subsequent mechanisms of PAH metabolism and carcinogenesis. Over the last 10 years he has developed a model in mice that has been used to assess the oral bioavailability of PAHs from soils.

Dr. Roberts has previously designed and conducted *in vivo* bioavailability studies for contaminants in soil, and both are currently serving on the National Research Council's Committee on the Bioavailability of Contaminants in Soils and Sediments. Dr. Birnbaum is Director of the Experimental Toxicology Division at the USEPA and has extensive experience with dioxins. Dr. Fisher has expertise in toxicology and pharmacology, and is the Director of the Institute for Environmental Toxicology at Michigan State University and the current chair of the Michigan Environmental Science Board. Dr. Boyd is a soil scientist with expertise in soil binding of pollutants. Mr. Harrison has expertise in biology/ecology and environmental health and is the current Executive Director of the Michigan Environmental Science Board and the senior environmental scientist at the MDEQ. Mr. Harrison will chair the Scientific Review Committee.

All meetings of the Scientific Review Committee will be held in accordance with the Michigan Open Meetings Act (1976 PA 267, as amended).

References

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Attachment 3

Exposure and Health Effects Study

Michigan Departments of Community Health and Environmental Quality Proposal

Midland, Michigan and Tittabawassee River Floodplain Comprehensive Dioxin Exposure and Health Effects Study

Background

Two draft Public Health Consultations (PHCs) – *Dioxin Contamination in Soil, Dow Chemical Company, Michigan Division Midland Location, Midland, Midland County, Michigan, EPA Facility ID: MID000724724* and *Dioxin Contamination in the Tittabawassee River Floodplain, South of Midland, Michigan, Tittabawassee River, Midland, Midland County, Michigan, EPA Facility ID: MID980994354* – were issued March 4, 2002, by the U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry (ATSDR) after a review of public health issues and community concerns over potential dioxin contamination in these areas. In the draft PHCs, the ATSDR states that, even with previous soil sampling and community health studies, insufficient data exist to determine whether the soils in Midland and Tittabawassee River Floodplain south of Midland pose a public health threat, and that additional site-specific information will be necessary to evaluate the two sites.

Study Questions & Basic Proposal

The Michigan Departments of Community Health (MDCH) and Environmental Quality (MDEQ)--with technical assistance from the ATSDR and in consultation with the Midland County Health Department and the Saginaw County Department of Public Health--propose a comprehensive dioxin exposure and health effects study in order to fully answer the following questions:

1. Are the levels of dioxins in serum samples obtained from Midland and Tittabawassee River Floodplain residents statistically significantly elevated compared to levels found in samples taken from residents of a comparison area?
2. Is there a correlation between dioxin levels in serum samples and levels of dioxin in residential soils?
3. Is there any evidence that Midland residents or Tittabawassee River Floodplain residents have experienced elevated rates of diseases that have been scientifically linked to dioxins exposure?

A university or combination of universities with recognized scientific expertise and objectivity would be selected to efficiently conduct this comprehensive study as briefly outlined hereafter.

Study Financing

The Dow Chemical Company has expressed support for and willingness to fund the study through a yet to be determined mechanism that would ensure scientific independence for the researchers and credibility of the study product.

General Study Parameters

Pending concurrence and/or modification by the Scientific Advisory Committee (See next section), the study would include the following:

1. Comprehensive dioxin exposure pathway assessments, focusing particularly on food and soil sources, for residents in Midland, in the Tittabawassee River Floodplain south of Midland, and in a suitable comparison community;
2. Dioxin measurements in foods and soils to which these same residents have been and/or are being exposed; and
3. Blood serum sampling for dioxin testing of the same residents.

Data from the exposure pathway assessments, the food and soil sampling, and the blood tests would be carefully cross tabulated and analyzed to answer the afore stated study questions. For any individual, regardless of his/her place of residence, found to have an elevated body burden of dioxin, a careful health status assessment would be conducted and recommendations made for on-going monitoring.

Oversight of the Study

Two advisory committees would be formed to oversee the study, a Scientific Advisory Committee and a Stakeholder Advisory Committee. Both advisory committees will be staffed and supported by an Independent Contactor selected by the MDCH and the MDEQ.

The Scientific Advisory Committee would ensure that:

1. The study is well designed, adequate to answer the study question, and approved by the applicable Institutional Review Boards;
2. The researchers adhere to the study protocol;
3. The interpretation of the data and the resulting conclusions are scientifically defensible from an epidemiological, statistical, and toxicological perspective; and
4. The study reports are complete and clearly written.

The Scientific Advisory Committee also would be responsible for preparing and issuing a request for proposals to three or more universities, and for selecting the most scientifically qualified university (or combination of universities) to perform the study.

The Stakeholder Advisory Committee would ensure that:

1. The study design and execution are both understood and accepted by the residents of the study communities;
2. Regular communications from the Scientific Advisory Committee are reviewed and presented to the residents of the study communities; and
3. The residents of the study communities have on-going opportunities for input.

Composition, Selection and Operation of the Scientific Advisory Committee

There would be five members on the Scientific Advisory Committee. The petitioners, MDCH, MDEQ, and Dow would each provide three names of internationally recognized scientists with expertise in environmental epidemiology, toxicology, exposure assessment, or risk assessment who have demonstrated scientific expertise in application to dioxin or dioxin-like compounds that would be acceptable to the stakeholder. The ATSDR will review and provide comments to the MDCH and MDEQ selected Independent Contractor on the scientific credentials of each nominee. The Independent Contractor will review each nominee for potential conflict of interest and advise the stakeholder if any nominee may appear to have conflicts of interest based on their employment, contractual affiliation or other financial interests. The Independent Contractor will make the determination of potential conflict of interest based upon yet to be adopted standards.

The Independent Contractor would then contact each of the nominees with verified scientific credentials and who were found to be free of obvious conflict of interest to determine interest and availability. If none of the three scientists recommended by a stakeholder were interested or available, then the stakeholder would be contacted by the Independent Contractor to select alternate nominations. If more than one of the three scientists is available and interested, then the stakeholder would select the representative scientist for the Scientific Advisory Committee from the available and interested scientists. The fifth scientist on the Scientific Advisory Committee will be selected by the ATSDR in consultation with other members of the Scientific Advisory Committee. The chair of the Scientific Advisory Committee would be selected by the membership in the Scientific Advisory Committee. If the Scientific Advisory Committee is unable to agree upon a chair, the MDCH and MDEQ will select a chair.

Actions and recommendations by the Scientific Advisory Committee would be by consensus. Meetings of the Scientific Advisory Committee would be held pursuant to Michigan's Open Meeting Act (1976 PA 267, as amended), and regular progress reports prepared by the Chair, and reviewed by the Scientific Advisory Committee, would be provided to the Stakeholder Advisory Committee.

Composition, Selection and Operation of the Stakeholder Advisory Committee

There would be seven members on the Stakeholder Advisory Committee: a representative of the petitioners, an elected official representing Midland residents, an elected official representing Tittabawassee River Floodplain residents, the local health officer from Midland County, the local health officer from Saginaw County, a local health official from the county of

the comparison community, and Dow. The health officers from Midland and Saginaw Counties would co-chair the Committee. The Stakeholder Advisory Committee members would be expected to review and provide comments on the regular reports of the Scientific Advisory Committee, and to report back to the constituencies that they represent. The actions and recommendations by the Stakeholder Advisory Committee would be by vote of the majority. Meetings of the Stakeholder Advisory Committee would be conducted pursuant to Michigan's Open Meetings Act (1976 PA 267, as amended).

Roles of Various Stakeholders and Agencies

Petitioners. The petitioners would have a representative on the Stakeholder Advisory Committee and would nominate three scientists (from which one will be selected) to serve on the Scientific Advisory Committee.

MDCH. The MDCH would nominate three scientists (from which one will be selected) to serve on the Scientific Advisory Committee, and, in consultation with the MDEQ, secure the services of an Independent Contractor to administer the study.

MDEQ. The MDEQ would nominate three scientists (from which one will be selected) to serve on the Scientific Advisory Committee, and, in consultation with the MDCH, secure the services of an Independent Contractor to administer the study.

Local County Health Departments. The local health officers for Midland County and Saginaw County will co-chair the Stakeholder Advisory Committee. The county of the comparison community will have a health official on the Stakeholder Advisory Committee.

Independent Contractor. The Independent Contractor will (1) administer the study, (2) obtain and verify conflict of interest statements from the Scientific Advisory Committee nominees, (3) facilitate the selection of the Scientific Committee membership, (4) secure all appropriate institutional review board approvals, (5) convene and staff meetings of both the Scientific and Stakeholder Advisory Committees, and (6) facilitate communications of all parties involved in the study.

Elected Officials. Elected officials (one representing Midland, and one representing Tittabawassee River Floodplain residents) would be on the Stakeholder Advisory Committee.

Dow. The Dow Chemical Company would provide funding for the study through some mechanism that would ensure scientific independence and credibility. It also would have a representative on the Stakeholder Advisory Committee and would nominate three scientists (from which one will be selected) to serve on the Scientific Advisory Committee.

ATSDR. The ATSDR would provide technical assistance to the Scientific and Stakeholders Advisory Committees throughout the study. The ATSDR also would select the fifth member of the Scientific Advisory Committee.

Attachment 4

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