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DECLARATION FOR RECORD OF DECISION AMENDMENT

SITE NAME AND LOCATION

Midco II
Gary, Indiana

STATEMENT OF BASIS AND PURPOSE

This decision document presents a description of an amendment to the selected remedial action for Midco II developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent possible the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document amends the Record of Decision dated June 30, 1989.

This decision is based on the contents of the administrative record for the Midco II site. The attached index identifies the items which comprise the administrative record for this Record of Decision Amendment.

The State of Indiana concurs in this amendment to the remedy selection by U.S. EPA for the Midco II site.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the Record of Decision (ROD) Amendment, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY (AS AMENDED)

The primary reasons for amending the selected remedy at Midco II relate to: 1) a change in the method for determining how much soil will be treated; 2) further definition of the degree of treatment of contaminated ground water that EPA will require prior to deep well injection including a proposal to delist the extracted ground water (the ground water contains listed hazardous wastes as defined in the Resource Conservation and Recovery Act) through this Record of Decision Amendment provided that the extracted ground water is treated to meet specified maximum allowable concentrations (MACs) prior to disposing of the extracted ground water by deep well injection.

The selected remedial action includes:

- On-site treatment of a minimum of approximately 12,200 cubic yards of contaminated soil and waste material, and possibly more dependent upon the results of further sampling, by soil vapor extraction and in-situ solidification/stabilization.

- Excavation and on-site solidification/stabilization of approximately 500 cubic yards of contaminated sediments from the ditch adjacent to the northeast boundary of the site.

- Installation and operation of a ground water pumping system to intercept contaminated ground water from the site. Contingency measures have been added in case it is technically impracticable from an engineering perspective to meet the ground water cleanup action levels.

- Installation and operation of a treatment system (as required) to remove hazardous substances from the extracted ground water, and deep well injection of the extracted ground water following any required treatment. Ground water treatment will be required to the extent necessary to attain maximum allowable concentrations (MACs), which are levels equivalent to those required for delisting a hazardous waste under the Resource Conservation and Recovery Act (RCRA). Treatment beyond the MACs will be required under certain conditions if either the lower Eau Claire or Mount Simon Formation (which are more than approximately 1800 feet below the surface of the site) is an underground source of drinking water (USDW) as defined in 40 CFR 144.3. Alternatively, the ground water could be treated to remove hazardous substances followed by reinjection of the ground water into the Calumet aquifer in a manner that will prevent spreading of the salt plume.

- Construction of a cover over the entire site that is consistent with the closure requirement under Subtitle C of RCRA

- Restriction of site access, and deed restrictions.

- Long term monitoring and maintenance.

The ground water treatment or underground injection portions of the remedial action may be combined with the remedial action for Midco I. For example, the ground water from Midco II may be transported to Midco I for treatment or injection, or vice versa. In this case, the combined treatment or injection shall constitute an on-site action, for purposes of the Off-site Policy and compliance with applicable or relevant and appropriate standards.

DECLARATION

The selected remedy, as modified herein, and including the contingency measures in case EPA determines that it is technically impracticable to meet the ground water cleanup action levels, is protective of human health and the environment, and is cost effective. The selected remedy also attains Federal and State requirements that are applicable or relevant and appropriate to this remedial action, except that some primary Maximum Contaminant Levels will be waived for portions of the Calumet aquifer, provided that it is demonstrated that it is technically impracticable from an engineering perspective to attain these standards and appropriate contingency measures are implemented.

This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on-site, pursuant to Section 121 (c) of CERCLA, a review will be conducted at the site within five years after commencement of the remedial action and at least every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

April 13th, 1992
Date

Valdas V. Adamkus
Regional Administrator
Region V

ADMINISTRATIVE RECORD

(Index and Documents)

for the

MIDCO II SUPERFUND SITE
RECORD OF DECISION AMENDMENT

GARY, INDIANA

United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, IL 60604

INTRODUCTION

These documents comprise the Administrative Record for the Midco II Superfund Site-Record Of Decision Amendment . An index of the documents in the Administrative Record is located at the front of the first volume along with an acronym index and an index of guidance documents used by EPA Agency Staff in selecting a response action at the site.

The Administrative Record is also available for public review at 77 West Jackson Blvd., Chicago, Illinois, 60604. Questions concerning the Administrative Record should be addressed to the EPA Administrative Record Coordinator.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

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The U.S. Environmental Protection Agency Incorporates into the Administrative Record for the Record of Decision Amendment, all documents listed in the Administrative Record index for the Record of Decision for Midco II dated June 30, 1989, and all documents listed in the Administrative Record Index for the Unilateral Administrative Order for Midco II effective December 29, 1989, including the original index and updates 1 - 4 and the Liability Document index. The original index and updates 1 - 4 for the Midco II Record of Decision and updates 3 and 4 and the Liability Document index for the Unilateral Administrative Order for Midco II are attached.

Midco II Superfund Site - Record Of Decision Amendment

Administrative Record

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	19	91/04/11	On-Scene Coordinator's Report - CERCLA Removal Action at Midco II, Phase II Gary, IN	William Simes & Lennard Zintak - U.S. EPA	U.S. EPA HQ & Region V	Reports/Studies	57
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TO THE ROD AMENDMENT

FOR

MIDCO II

04/09/92

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8	02/07/92	Martin, K., U.S. EPA	Novak, R., Hammond Dept. of Environmental Mgt.	Transmittal letter for placement of Consent Decree & Proposed ROD Amendments for the Midco I & Midco II Superfund sites in the Public Information Repository in Hammond, In.	1
9	02/07/92	Martin, D., U.S. EPA	Moore, B., Gary Public Library	Transmittal letter for placement of Consent Decree & Proposed ROD Amendments for the Midco I & Midco II Superfund sites in the Public Information Repository in Gary, In.	1
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9	00/00/71	Wilman, H.		Illinois State Geological Survey Circular #460: 'Summary of the Geology of the Chicago Area'	0
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SITE NAME	CASE NUMBER	DATA SET NUMBER	CONTRACT LABORATORY	DATE SHIPPED	NUMBER OF SAMPLES
** SITE/CODE= 27Y9?5					
MIDCO II	1402	S1924 13	CHEMTECH	01/01/82	0
MIDCO II	1403	S1924 74	WEST COAST	01/01/82	0
MIDCO II	1478	S2[illegible] 74	WEST COAST	01/01/82	0
MIDCO II	623	SF507 61	RMAL	01/01/82	0
MIDCO II	[illegible]	SF717	CRL	01/01/82	0
MIDCO II	3677SAS1703E	S2068137	VERSAR/HAR	02/20/85	13
MIDCO II	3877	S2048227	SSRI/HART	02/20/85	12
MIDCO II	6419	S3575073	TEXACO	09/04/86	12
MIDCO II	6419	S3575181	RMAL	09/04/86	12

red.

clear

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(SAMPLE DATA AVAILABLE AT U.S.EPA
CENTRAL REGIONAL LABORATORY)

SITE NAME	CASE NUMBER	DATA SET NUMBER	CONTRACT LABORATORY	DATE SHIPPED	NUMBER OF SAMPLES
** SITEDLCODE= WFY505					
MIDCO I & II RES WELL SAMPLING	NONE	S376:100	CRL	02/13/87	4
MIDCO I & II RES WELL SAMPLING	6217SAS83EEE	S326:100	CRL	07/16/85	9
MIDCO I & II RES WELL SAMPLING	6217SAS83EEE	S336:000	CRL	07/16/86	4
MIDCO I & II RES WELL SAMPLING	6217SAS83EEE	S345AV43	SRI	07/16/85	6

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	1	85/11/05	Requirement that the 10-foot monitoring well in cluster E at the site be replaced.	Rich Boice-USEPA	Robert Aten-Geosciences	Correspondence	1
	1	85/11/14	Recommendation that a 90-foot monitoring well be installed on the north or northeast of the site to check for a deep sand aquifer.	Rich Boice-USEPA	Robert Aten-Geosciences	Correspondence	2
	1	86/03/13	Documentation of a 3/11/86 phone reaching agreement that a clay cover on the test pits is unnecessary.	Robert Aten-Geosciences	Rich Boice-USEPA	Correspondence	3
	1	86/04/11	Revised schedule for deliverables.	Robert Aten-Geosciences	Rich Boice-USEPA	Correspondence	4
	1	86/05/16	Phase II groundwater samples collected for metal analysis will be filtered.	Robert Aten-Geosciences	Rich Boice-USEPA	Correspondence	5
	39	86/05/19	Letter and table reflecting changes in the treatment of groundwater samples for metals.	James Keith-Geosciences	Rich Boice-USEPA	Correspondence	6
	1	86/06/03	Documentation of a phone call where a request by Geosciences for a reduction of the Phase II groundwater parameter list was denied by Boice of the USEPA.	Robert Aten-GeosciencesResearchA sso	Richard Boice-USEPA	Correspondence	7

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			tests, transducers will be used to record recovery and a pneumatic method used to record water levels. Also, a detailed aquifer pump test will be performed.				
	3	86/06/24	List outlining status of tape downs conducted during residential well sampling.	Robbin Lee Zeff-Geosciences	Rich Boice-USEPA	Correspondence	9
	10	86/07/23	Revised schedules for completing work.	Robert Aten-Geosciences	Rich Boice-USEPA	Correspondence	10
	2	87/01/07	Final revisions required in the Midco II RI.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	11
	7	88/01/08	Comments on Array of Alternatives documents.	Rich Boice-USEPA	Roy Ball - ERM	Correspondence	12
	10	87/01/13	Review of Midco I & II RI Reports.	K.W.Brown-Texas A&M University	Rich Boice-USEPA	Correspondence	13
	17	87/01/15	Review comments on the Midco I & II RI Reports.	David Homer-PRC	Rich Boice-USEPA	Correspondence	14
	43	87/01/16	Review and analysis of the first drafts of the Midco I and II RI Reports.	Donald Smith-Pratt&Lambert,Tech. Com	Rich Boice-USEPA	Correspondence	15
	9	87/01/29	Review and written comments on the Draft Midco II RI Report dated 12/2/86.	David Hudak-U.S. Dept. of Interior	Rich Boice-USEPA	Correspondence	16
	3	87/03/06	Determination that additional sampling, analyses and evaluation are necessary.	Basil Constantelos-USEPA	Olian,Klettke,Harker	Correspondence	17
	3	87/03/13	Comments on Midco I and II Draft Remedial Investigations Reports.	Reginald Baker-IDEM	Rich Boice-USEPA	Correspondence	18

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	3	87/04/13	Midco I and Midco II Progress Reports.	Arthur Slesinger-Morton Thiokol	Rich Boice-USEPA	Correspondence	19
	2	87/04/17	Proposed area for the soil gas survey as an extension of the Midco II remedial investigation.	Robert Aten-Geosciences	Robert Hess, Hammond, IN	Correspondence	20
	27	87/05/05	Installation of new monitoring wells at Midco II.	Robert Aten-Geosciences	Rich Boice-USEPA	Correspondence	21
	1	87/05/29	Midco II soil gas study.	Robert Aten-Geosciences	Rich Boice-USEPA	Correspondence	22
	1	87/05/29	Midco II, ground water, surface water and surface sediment sampling activities.	Robert Aten-Geosciencecs	Rich Boice-USEPA	Correspondence	23
	2	87/07/21	Concerns over the third round of sampling.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	24
	3	87/08/19	Letter attempting resolution of RI/FS issues.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	25
	15	87/09/03	Comments on the final RI.	K.W.Brown-KWB&A Env.Consultants	Rich Boice-USEPA	Correspondence	26
	2	87/09/18	Clarification of the United State's position that the development of the remedial action alternatives is a technical task based on an objective evaluation of those remedial actions which are most conducive to minimizing or mitigating the threat to public health, welfare	Joel Gross- U.S. DOJ	R.Olian-Sidley & Austin	Correspondence	27

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			or the environment.				
	18	87/09/22	Technical review comments on the Remedial Options Documents.	Kurt Stimpson-Roy F. Weston	Rich Boice-USEPA	Correspondence	28
	9	87/09/29	Comments on the draft preliminary list of remedial technologies and final comments on the RI.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	29
	2	87/12/08	Corrections and revisions to the final RI.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	30
	1	87/12/17	Review of the RI.	Dave Homer-PRC	Rich Boice-USEPA	Correspondence	31
	2	87/12/29	Comments on Feasibility Study.	Dave Homer-PRC	Rich Boice-USEPA	Correspondence	32
	5	88/01/06	Comments on the FS ARAR's.	Kurt Stimpson-Roy F. Weston,Inc.	Rich Boice-USEPA	Correspondence	33
	14	88/01/12	Ground Water Contribution to Surface Water Concentrations at the Midco Site.	Elsie Millano-ERM	Rich Boice-USEPA	Correspondence	34
	2	88/05/17	Review of Progress Report No. 34.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	35
	9	88/07/06	Comments on the FS.	Dave Homer-PRC	Rich Boice-USEPA	Correspondence	36
	22	88/07/07	Review of the FS and Dissipation of Groundwater Contaminants.	Frederick Test-Roy. F. Weston,Inc.	Rich Boice-USEPA	Correspondence	37
	43	88/07/17	Review of Midco II draft FS.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	38
	9	88/08/25	Comments on new alternatives requested by the USEPA for the FS.	Roy Ball-ERM	Rich Boice-USEPA	Correspondence	39
	3	88/09/29	Preliminary review of the	Rich Boice-USEPA	K.Vaughn - Dames &	Correspondence	40

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			QAPP for the solidification tests.		Moore		
	6	88/09/30	Review of cleanup action levels for Midco II.	Dave Homer-PRC	Rich Boice-USEPA	Correspondence	41
	4	88/10/07	Review of the QAPP for the solidifcation tests.	Rich Boice-USEPA	Roy Ball-ERM	Correspondence	42
	5	88/10/14	Technical review of cleanup action levels for Midco II.	Frederick Test-Roy F. Weston, Inc.	Rich Boice-USEPA	Correspondence	43
	10	88/10/31	Additional Indiana Air Pollution Regulations for Indiana ARAR's.	Reginald Baker-IDEM	Karen Vaughn-Dames&Moore	Correspondence	44
	9	88/11/11	Tecnical review of revised draft FS.	Frederick Test-Roy F. Weston,Inc.	Rich Boice-USEPA	Correspondence	45
	6	88/11/18	Review of Appendices A & D in the FS's for Midco I & II.	David Homer-PRC	Rich Boice-USEPA	Correspondence	46
	4	88/12/02	Revisions and additions to the FS.	Rich Boice-USEPA	Roy Ball-Env.Resouce Mgmt	Correspondence	47
	5	89/01/03	Clarification of the criteria that will be used to evaluate the effectiveness of in-situ vapor extraction followed by in-situ solidification/ stabilization.	James Mayka-USEPA	Roy Ball-ERM	Correspondence	48
	5	89/01/23	Review comments on the Midco I and II FS.	Rich Boice-USEPA	Karen Vaughn-Dames&Moore	Correspondence	49
	5	89/01/26	Review of 1/13/89 Editions	Richard Boice-USEPA	Dames&Moore & EnvResource	Correspondence	50

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	1	89/01/27	Technical review of the FS.	Frederick Test-Roy F. Weston	Rich Boice-USEPA	Correspondence	51
	1	89/02/13	Letter stating that if wastes are excavated, mixed with reagents and then placed back on the site, then landban regulations may be applicable.	James Mayka-USEPA	Roy Ball-ERM	Correspondence	52
	4	85/06/19	"EPA Announces Agreement On Midco I & II Sites In Gary"	USEPA		Fact Sheet	53
	2	85/07/00	"EPA Announces Midco II Work Plan"	USEPA		Fact Sheet	54
	3	87/11/00	"Midco I & II Remedial Investigation Update November 1987"	USEPA		Fact Sheet	55
	2	88/00/00	"Midco I & II Remedial Investigation Update Winter 1988"	USEPA		Fact Sheet	56
	2	88/12/00	"Midco I & II Remedial Investigation Update"	USEPA		Fact Sheet	57
	3	00/00/00	List of site visits to 3/8/83.	Bevely Kush-USEPA	Karen Waldvogel-USEPA	Memorandum	58
	5	79/08/07	Reconnaisance inspection of Midco I and II on 8/2/79.	Eugene Meyer - USEPA	Jay Goldstein-USEPA	Memorandum	59
	7	80/12/01	Report of site activities in late 1980.	Mike McCarrin-Ecol. & Envir.	File	Memorandum	60
	5	83/06/02	Report on site inspection.	C.F.Bieze-Ecol. & Envir.	File	Memorandum	61
	2	83/08/04	List of site visits	Alan Baumann-USEPA	Karen	Memorandum	62

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	3	83/08/10	Trip Report on site visit.	Dave Homer-PRC	File	Memorandum	63
	2	86/03/20	Midco II Groundwater Sampling Phase I-summary of operations.	Robert Aten - Geosciences	Rich Boice-USEPA	Memorandum	64
	3	86/06/06	Trip Report,PRP Audit/ Training-Geosciences Resaerch Assoc.-May 13-15, 1986.	Wesolowski & Churilla-USEPA	Files	Memorandum	65
	5	86/06/16	Response to comments made by Jay Thakkar, Dennis Wesolowski and Patrick Churilla regarding contract laboratory analysis.	James Kieth-Geosciences	Robert Aten-Geosciences	Memorandum	66
	2	86/09/05	Midco Slug Test Computations.	John Bassett-Geosciences	Robert Aten-Geosciences	Memorandum	67
	2	87/01/14	Review comments on Remedial Investigation Reports Completed in Nov. and Dec. 1986 - Midco I & II.	C.Kurt Lamber-USEPA OWPE	Linda Cooper-USEPA OWPE	Memorandum	68
	3	87/01/21	Review of Midco I and II sites using Ground Water Classification Guidelines.	Charles Suftin-USEPA	Basil Constantelos-USEPA	Memorandum	69
	4	87/01/28	Review of Midco II RI Report dated 12/2/86.	James Wheat-IDEM	Jayne Browning-IDEM	Memorandum	70
	7	87/01/29	Documentation of Midco I and II RI Review meeting.	Carole Wolff-Weston	Kurt Stimpson-Weston	Memorandum	71
	5	87/02/20	Additional Sediment Sampling at Midco II - Attachment No. 1.	Kurt Stimpson-Roy F. Weston,Inc.	Rich Boice	Memorandum	72
	9	87/12/03	ACTION MEMORANDUM-Ceiling Increase Request for the Removal Action at the	Valdas Adamkus-USEPA	J.Winston Porter-USEPA	Memorandum	73

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	7	88/07/13	ACTION MEMORANDUM-Ceiling Increase Request for the Remeoval Action at the Midco II Site,Gary,Indiana.	Valdas Adamkus-USEPA	J.Winston Porter-USEPA	Memorandum	74
	3	88/08/01	Review of the FS - Remedial Alternatives Screening.	Charles Suftin-USEPA	Basil Constantelos-USEPA	Memorandum	75
	2	00/00/00	Midwest Region Environmental News.	USEPA		News Release	76
	28	00/00/00	Newspaper articles.			Newspaper Articles	77
	14	00/00/00	Listed Hazarous Waste Disposal At Midco I and Midco II.			Other	78
	43	00/00/00	Examination of Marion D. Robinson.			Other	79
	99	80/01/04	Deposition of Charles A. Licht	Charles A. Licht		Other	80
	75	80/01/04	Deposition of Marrin Dale Robinson	Marrin Dale Robinson		Other	81
	94	81/07/28	Deposition of Ernest DeHart.	Ernest DeHart		Other	82
	2	82/11/09	Original Maps by DeHart & Robinson.	DeHart & Robinson		Other	83
	25	85/01/17	Interrogatories Of The Defendant The Penn Central Corp. To The United States Of America along with Request For Production.	Michael Blankshain-Wildman,Harrold,	See service list	Pleadings/Orders	84
	250	85/04/02	Partial Consent Decree.	USEPA	Midco Trustees, et al.	Pleadings/Orders	85

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	35	85/08/26	Response To Objections Of The United States To The Interrogatories Of The Defendant Penn Central Corp. To The United States Of America.	Joel Gross et al-U. S. DOJ	See service list	Pleadings/Orders	86
	71	00/00/00	Sample Collection Procedures For Solidification Treatability Study For Midco I and Midco II.	Dames & Moore		Reports/Studies	87
	4	00/00/00	Documentation of the geology and an assessment of the potential for groundwater pollution.	Karyl Schmidt-ISBH		Reports/Studies	88
	15	79/10/30	Report on Survey at Midco II, 5900 Industrial Highway, Gary, Indiana.	L.E.Townsend-USEPA	Alan Baumann-USEPA	Reports/Studies	89
	1	81/03/09	Report on Survey at Midco II; 5900 Industrial Highway, Gary, Indiana.	Erin Moran-USEPA	Alan Baumann-USEPA	Reports/Studies	90
	29	81/10/00	Aerial Photographic Analysis Of Hazardous Waste Study Sites.	EMSL-USEPA		Reports/Studies	91
	86	84/00/00	Population Survey Of Groundwater Usage In The Vicinity Of Midco II, Gary, Indiana.	CH2M Hill	USEPA	Reports/Studies	92
	410	84/00/00	On-Scene Coordinators Report.	USEPA		Reports/Studies	93
	11	84/11/00	Site Assessment For House's Junk Yard.	Weston-Sper TAT	USEPA	Reports/Studies	94
	88	86/12/31	Quality Assurance Project Plan - Survey of	U.S.Fish & Wildlife Service	USEPA	Reports/Studies	95

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			Contaminant Levels in Biota Near the Midco I, Midco II and Ninth Avenue Dump Hazardous Waste Sites in Gary, Indiana, Lake County, Indiana.				
	3	88/01/26	Technical Memorandum: Midco II, Round 4 analytical results.	Robert Aten-Geosciences	Roy Ball-ERM	Reports/Studies	96
	385	88/03/00	Remedial Investigation Report Appendices G Through I.	ERM	Midco Trustees	Reports/Studies	97
	409	88/03/00	Midco II Remedial Investigation Report	ERM	Midco Trustees	Reports/Studies	98
	465	88/03/00	Remedial Investigation Report Appendices A Through F.	ERM	Midco Trustees	Reports/Studies	99
	278	88/03/00	Remedial Investigation Report Appendices J Through P.	ERM	Midco Trustees	Reports/Studies	100
	129	88/08/00	Quality Assurance Project Plan For Solidification Treatability Study Midco I and Midco II.	Dames & Moore	Midco Trustees	Reports/Studies	101
	46	88/08/24	Health and Safety Plan Solidification Treatability Study Midco I and Midco II.	Dames & Moore		Reports/Studies	102
	11	88/12/01	Health Assessment for the Midco II Site.	ATSDR	USEPA	Reports/Studies	103
	412	89/02/10	Public Comment Feasibility Study	Dames & Moore	Midco Trustees	Reports/Studies	104

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	28	89/03/07	Addendum To Public Comment Feasibility Study.	ERM	Midco Trustees	Reports/Studies	105
	15	83/12/08	Review and data package Case #2189, SAS# 825E - Low Water and Medium Soil Metals and Cyanide.	Cynthia Bachunas-Ecol. & Envir.	Clarence Bieze-Ecol&Envir	Sampling/Data	106

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Guidance Documents are available for review at
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Guidance on Implementation of the "Contribute to Remedial Performance" Provision.	OSWER Dir. 9360.0-13	87/04/00
Final Guidance for the Coordination of ATSDR Health Assessment Activities with the Superfund Remedial Process.	OSWER Dir. 9285.4-02	87/04/22
Superfund Selection of Remedy: Background Documentaion on Remaining Issues.		87/05/12
Superfund Public Health Evaluation Manual.	OSWER Dir. 9285.4-01	87/07/00
Interim Guidance on Compliance with Applicable or Relevant and Appropiate Requirements. 52 FR 32496 (8/27/87).	OSWER Dir. 9234.0-05	87/07/09
Interim Guidance on PRP's participation in RI/FS.	OSWER Dir. 9835.1a	87/10/02
Interim Guidance on Administrative Records for Decisions on Selection of CERCLA Response Actions.	OSWER Dir. 9833.4	87/11/09
Revised Procedures for Planning and Implementing Off Site Response Actions.	OSWER Dir. 9834.11	87/11/13
FY '88 Region V ROD Process Guidance. Memo from Chief of the Emergency & Remedial Response Branch - Waste Mgmt. Div.	Mary Gade-USEPA	88/01/20
Draft Guidance on Preparing Superfund Decision Documents: The Proposed Plan and ROD.	OSWER Dir. 9355.3-02	88/03/00
Draft Guidance on PRP Participation in the RI/FS.	OSWER Dir. 9835.1A	88/04/00
Record of Decisions Questions & Answers - Draft.		88/04/01
Community Relations During Enforcement Activities and Development of the Administrative Record.	OSWER Dir. 9836.0-1a	88/11/03
Redelegation of Authority Under CERCLA/SARA and Superfund Internal Delegation of Authority.	OSWER Dir. 9012.10	
Quality Assurance Plan For Superfund (Draft).	OSWER Dir. 9200.1-05	
Guidelines for Producing Superfund Documents.	OSWER Dir. 9200.4-01	
Superfund Community Relations Policy.	OSWER Dir. 9230.0-02	

GUIDANCE DOCUMENTS : INDEX
MIDCO I & II SITES, GARY, INDIANA.
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
Community Relations Handbook.	OSWER Dir. 9230.1-03	
Community Relations Activities At Superfund Enforcement Sites - Interim Guidance.	OSWER Dir. 9230.0-03A	
Community Relations In Superfund - A Handbook Interim Guidance.	OSWER Dir. 9230.0-03B	
Community Relations Guidance For Evaluating Citizen Concerns At Superfund Sites.	OSWER Dir. 9230.0-04	
CERCLA Compliance With Other Laws Manual Vols. 1-3. (Draft)	OSWER 9234.1-01 to 03	
Interim Guidance On Compliance With Applicable Or Relevant And Appropiate Requirements (ARAR).	OSWER Dir. 9234.0-05	
User's Guide To The Contract Laboratory Program.	OSWER Dir. 9240.0-01	
Analytical Support For Superfund.	OSWER Dir. 9240.0-02	
Superfund Analytical Data Revision And Oversight (Draft).	OSWER Dir. 9240.0-03	
REM II Contract Award Fee Performance Evaluation Plan.	OSWER Dir. 9242.3-05	
c		
Implementation Of The Decentralized Contractor Performance Evaluation And Award Fee Process For Selected Remedial Program Contracts.	OSWER Dir. 9242.3-07	
Procedures Manual For Superfund Community Relations Contractor Support (Draft).	OSWER Dir. 9242.5-01	
Delegations Of Remedy Selection To Regions (Under Delegation #14-5)	OSWER Dir. 9260.1-09	
FWPCA Delegations Of Authority - Complete Set.	OSWER Dir. 9260.3-00	
Policy On Flood Plains And Wetlands Assessments.	OSWER 9280.0-02	
Recommendations For Groundwater Remediation At The Millcreek, Pennsylvania Site.	OSWER Dir. 9283.1-01	
Guidance On Remedial Actions For Contaminated Groundwater At Superfund Sites (Draft).	OSWER Dir. 9283.1-02	
Standard Operating Safety Guide Manual.	OSWER Dir. 9285.1-01B	

GUIDANCE DOCUMENTS : INDEX .
MIDCO I & II SITES, GARY, INDIANA.
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TITLE	AUTHOR	DATE
Occupational And Health Technical Assistance And Enforcement Guidelines For Superfund.	OSWER Dir. 9285.3-01	
Employee Occupational Health And Safety.	OSWER Dir. 9285.3-02	
Superfund Public Health Evaluation Manual.	OSWER Dir. 9285.4-01	
Guidance For Coordinating ATSDR Health Assessment Activities With The Superfund Remedial Process.	OSWER Dir. 9285.4-02	
Health Assessments By ATSDR In FY-88.	OSWER 9285.4-03	
Superfund Exposure Assessment Manual (Draft).	OSWER Dir. 9285.5-01	
Memorandum Of Understanding Between ATSDR And EPA.	OSWER Dir. 9295.1-01	
Guidance For Establishing The NPL.	OSWER Dir. 9320.1-02	
RCRA/NPL Listing Policy.	OSWER Dir. 9320.1-05	
Requirements For Selecting An Off-Site Option In A Superfund Response Action.	OSWER Dir. 9330.1-01	
Evaluation Of Program And Enforcement-Lead RODS For Consistency With RCRA Land Disposal Restrictions.	OSWER Dir. 9330.1-02	
Discharge Of Wastewater From CERCLA Sites Into POTWS	OSWER Dir. 9330.2-04	
CERCLA Off-Site Policy: Providing Notice To Facilities.	OSWER 9330.2-05	
CERCLA Off-Site Policy: Eligibility Of Facilities In Assessment Monitoring.	OSWER 9330.2-06	
Guidance For Conducting Remedial Investigations And Feasibility Studies Under CERCLA (Draft).	OSWER 9335.3-02	
Guidance On Preparing Superfund Decision Documents: The Proposed Plan And Record Of Decision (Draft).	OSWER 9335.3-02	
Participation Of Potentially Responsible Parties (PRPs) In Development Of RIs And FSs.	OSWER 9340.1-01	
Preparation Of Decision Documents For Approving Fund-Financed And PRP Remedial Actions Under CERCLA.	OSWER 9340.2-01	
Preliminary Assessment Guidance, FY-88.	OSWER 9345.1-01	
Interim RCRA/CERCLA Guidance On Non-Contiguous Sites And On-Site	OSWER 9347.0-01	

GUIDANCE DOCUMENTS : INDEX
MIDCO I & II SITES, GARY, INDIANA.
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TITLE	AUTHOR	DATE
Management Of Waste Residue.		
Implementation Guidance For Solvent, Dioxin, And California List Wastes Subject To RCRA/HSWA Land Disposal Restrictions.	OSWER 9347.0-02	
Uncontrolled Hazardous Waste Site Ranking Systems (HRS) - A Users Manual.	OSWER 9355.0-03	
Superfund Remedial Design And Remedial Action Guidance (RD/RA).	OSWER 9355.0-04A	
Guidance On Feasibility Studies (FS) Under CERCLA.	OSWER 9355.0-05C	
Guidance In Remedial Investigations (RI) Under CERCLA.	OSWERR 9355.0-6B	
Data Quality Objectives Development Guidance For Remedial Response Actions.	OSWER 9355.0-07B	
Interim Guidance On Superfund Selection Of Remedy.	OSWER 9355.0-19	
RI/FS Improvements.	OSWER 9355.0-20	
The RPM Primer.	OSWER 9355.1-02	
Guidance For Conducting RI/FS Under CERCLA.	OSWER 9355.3-01	
Relationship Of The Removal And Remedial Program Under The Revised NCP.	OSWER 9360.06A	
RI/FS Improvements Followup.	OSWER 9355.3-05	
Guidance On Implementation Of The 'Contribute To The Efficient Remedial Performance' Provision.	OSWER 9360.0-13	
Use Of Expanded Removal Authority To Address NPL And Proposed NPL Sites.	OSWER 9360.0-14	
Slurry Trench Construction For Pollution Migration Controls.	OSWER 9380.0-02	
Guidance For Cleanup Of Surface Tank And Drum Sites.	OSWER 9380.0-03	
Remedial Action At Waste Disposal Sites Handbook.	OSWER 9380.0-04	
Leachate Plume Management.	OSWER 9380.0-05	
Guidance Document For Cleanup Of Surface Impoundment Sites.	OSWER 9380.0-06	
54 FR. No. 7, 1055-1120	Federal Register	

GUIDANCE DOCUMENTS : INDEX
MIDCO I & II SITES, GARY, INDIANA.
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
USEPA Technology Screening Guide For Treatment Of CERCLA Soils And Sludges.	EPA/540/2-88/004	
USEPA Guidelines For Groundwater Classification Under The EPA Groundwater Protection Strategy.	USEPA	86/12/00

ADMINISTRATIVE RECORD SAMPLING/DATA INDEX
MIDCO I & II SITES - GARY, INDIANA
Sampling/Data Documents have not been copied,
but are available for review at the locations noted below.

DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
87/00/00	Data Packages, Custody Sheets, Field Notes for data in the Remedial Investigation. Available at Geosciences Research Associates, Bloomington, Indiana.	Geosciences & Compuchem	Geosciences	Sampling/Data
87/00/00	Data Packages, Custody Sheets and Field Notes for data in Biota Study. Available in RPM and CRL files, Region V-Chicago, IL, USEPA.	Hazelton & U.S.Fish & Wildlife	U.S.Fish & Wildlife	Sampling/Data

ACRONYM GUIDE FOR THE ADMINISTRATIVE RECORD
MIDCO I & II SITES
GARY, INDIANA

ACRONYM	DEFINITION
USEPA	United States Environmental Protection Agency
DOJ(USDOJ)	United States Department of Justice
RI	Remedial Investigation
FS	Feasibility Study
IDOH	Indiana Department of Highways
IDEM	Indiana Department of Environmental Management
USDOI	United States Department of Interior
QAPP	Quality Assurance Project Plan
PRP	Potentially Responsible Party
ATSDR	Agency for Toxic Substance and Disease Registry
TAT	Technical Assistance Team
ERM	Environmental Research Management, Inc.
PRC	Planning Research Corporation
E & E	Ecology & Environment, Inc.

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ADMINISTRATIVE RECORD INDEX - UPDATE #2
MIDCO II
GARY, INDIANA

FR/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	2	89/06/09	Comments on Responsiveness Summary	Frederick Test Weston, Inc.	R.Boice - USEPA	Correspondence	1
	2	89/06/12	Request for information to determine the viability for discharge to the Grand Calumet River	Mary Gade USEPA	C.Bardonner - IDEM	Correspondence	2
	2	89/06/20	Letter to concerned citizen regarding quality of drinking water and potential affect of proposed deep well injection	Richard E. Boice USEPA	D.Williford-Simpson	Correspondence	3
	2	89/06/30	Department of Environmental Management (DEM) Record of Decision (ROD) concurrence letter	Kathy Prosser IDEM	V.Adamkus - USEPA	Correspondence	4
	2	89/08/23	Follow up to comments in the letter of concurrence as well as to answer questions posed in a USEPA letter of June 12, 1989	T.Rarick - IDEM	M.Gade - USEPA	Correspondence	5
	4	89/10/23	Letter approving Quality Assurance Project Plan for Soil Solidification Treatability Study contigent upon enclosed revisions	Richard E. Boice USEPA	Dr.E.Millano - ERM	Correspondence	6
	12	89/04/00	Fact Sheet for Midco I & II; includes: site	USEPA		Fact Sheet	7

ADMINISTRATIVE RECORD INDEX - UPDATE #2
MIDCO II
GARY, INDIANA

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			background, diagrams, remedial alternatives, contaminants and risk to public health and environment, public meeting and comment period, glossary				
	[illegible]	89/03/01	Resource Conservation and Recovery Act (RCRA) comments on the proposed plans and briefing held on February 23, 1989 for Midco 1 & 2 sites	Diane M. Spencer USEPA	R.Boice - USEPA	Memorandum	8
	2	89/05/23	Water Division review of the Record of Decision Draft	Charles E. Sutfin USEPA	V.Constantelos - USEPA	Memorandum	9
	2	89/06/20	Input on the comments on the RI/FS study for the Midco I & II	Kenneth A. Fenner USEPA	W.Niedergang - USEPA	Memorandum	10
	3	89/09/01	Memo addressing questions concerning options for disposal of the groundwater purged from the Midco I & II sites	Charles E. Sutfin USEPA	B.Constantelos - USEPA	Memorandum	11
	1	89/05/30	Conversation Record	Richard R. Boice USEPA with Lavell Gatewood Gary City Airport		Other	12
	39	89/09/06	Proposed attachments (3 through 7) to the Consent Decree with a two page cover letter	Elsie F. Millano ERM - North Central	R.Boice - USEPA	Other	13
	37	87/08/12	National Pollutant Discharge	Jane Magee IDEM	T.Mehan-Hammond Sani/Dist	Permits	14

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ADMINISTRATIVE RECORD INDEX - UPDATE #2
MIDCO II
GARY, INDIANA

F/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			Elimination System Permit for the Hammond Sanitary District				
	7	87/10/02	Reissued National Pollutant Discharge Elimination System Permit (NPDES) with cover letter for the East Chicago Sanitary District	John L. Winters IDEM	Spratt-E.Chicago San/Dist	Permits	15
	7	87/10/25	National Pollutant Discharge Elimination System for the Gary Sanitary District	John L. Winters IDEM	Gary Sanitary District	Permits	16
	7	00/00/00	A survey for contaminants in Biota near the Midco I, Midco II and Ninth Avenue Dump Hazardous Waste Sites	Donald W. Steffeck Fish and Wildlife Service U.S. Department of the Interior		Reports/Studies	17
	182	89/06/30	Record of Decision (ROD)	USEPA		Reports/Studies	18
	79	89/09/25	Health and Safety Plan Soil Solification Treatability Study Field Sampling for Midco I and II	Environmental Resources Management North Central, Inc.		Reports/Studies	19
	395	89/09/26	Quality Assurance Project Plan for Soil Solidification Treatability Study Midwest Solvent Recovery, Inc. (Midco I), and Midwest Disposal Company, Inc. (Midco II)	Environmental Resources Management North Central, Inc.		Reports/Studies	20

ADMINISTRATIVE RECORD INDEX - UPDATE #3
MIDCO II
GARY, INDIANA

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	1	89/05/01	Letter from a Gary resident expressing concern over USEPA's preferred option to inject hazardous wastes underground	Deborah Williford -Simpson A concerned citizen	A.Gasior - USEPA	Correspondence	1
	2	89/05/15	Letter commenting on USEPA's proposed remedies for Midco I & II	Arthur E. Slesinger Morton Thiokol, Inc.	A. Gasior - USEPA	Correspondence	2
	5	89/05/15	Letter expressing the City of Hammond's concern regarding the preferred alternatives that USEPA selected with enclosed ordinance	Ronald L. Novak Hammond Department of Environmental Management	A.Gasior - USEPA	Correspondence	3
	29	89/05/18	Letter expressing concern over the approach and progress of USEPA regarding the MIDCO I & II Sites with contractor's advertisements attached	Fred C. Schmednecht Slurry Systems, Inc.	A.Gasior - USEPA	Correspondence	4
	85	89/04/27	Transcript of Public Meeting for Midco I & Midco II held on April 27, 1989	USEPA		Meeting Notes	5
	2	75/00/00	Environmental Geology of Lake and Porter Counties, Indiana An Aid to Planning; Environmental Study 8	R.Hartke, J.Hill, & M.Reshkin Department of Natural Resources		Reports/Studies	6

ADMINISTRATIVE RECORD INDEX - UPDATE #3
MIDCO II
GARY, INDIANA

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	123	88/06/00	Public Review Draft-Phased Feasibility Study Ninth Avenue Dump RI/FS Gary, Indiana	Warzyn Engineering, Inc.	USEPA	Reports/Studies	7
	225	88/06/00	Public Review Draft-Remedial Investigation Report Ninth Avenue Dump RI/FS Gary, Indiana Volume 2, Tables and Figures	Warzyn Engineering, Inc.	USEPA	Reports/Studies	8
	[illegible]37	88/06/00	Public Review Draft-Remedial Investigation Report Ninth Avenue Dump RI/FS Gary, Indiana Volume 1, Text	Warzyn Engineering, Inc.	USEPA	Reports/Studies	9
	445	88/06/00	Public Review Draft-Remedial Investigation Report Ninth Avenue Dump RI/FS Gary, Indiana Volume 3, Appendix Part 1	Warzyn Engineering, Inc.	USEPA	Reports/Studies	10
	[illegible]71	88/06/00	Public Review Draft-Remedial Investigation Report Ninth Avenue Dump RI/FS Gary, Indiana Volume 4 Appendix Part 2	Warzyn Engineering, Inc.	USEPA	Reports/Studies	11
	51	89/00/00	Preliminary Analysis of the Shallow Ground-Water System in the Vicinity of the Grand Calumet River/Indiana Harbor Canal, Northwestern	U.S. Geological Survey		Reports/Studies	12

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MIDCO II
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FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			Indiana				
	267	89/01/00	Feasibility Study Ninth Avenue Dump Superfund Site Gary, Indiana Public Review Draft Full Site Remedy	Warzyn Engineering, Inc.	USEPA	Reports/Studies	13
	56	89/05/19	Comments on the USEPA Proposed Plan for Remediation of the MIDCO I & II Sites	Environmental Resources Management-North Central, Inc.	MIDCO Steering Committee	Reports/Studies	14

ADMINISTRATIVE RECORD GUIDANCE DOCUMENTS: INDEX UPDATE #3
MIDCO I & II SITES, GARY, INDIANA
Guidance Documents are available for review at
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TITLE	AUTHOR	DATE
Health Effects Assessment Documents	EPA/540/1-86/001-58	84/09/11
Water Quality Criteria for USEPA 1986	EPA/440/5-86-001	86/00/00
Class I Permit Conditions Guidance	EPA/ UICPG #46	86/02/28
List (Phase 1) of Hazardous Constituents for Ground-Water Monitoring; Final Rule Part II	F.R./Vol.52, No. 131	87/07/09
Hazardous Waste Controls Over Injection Well Disposal Operations	GAO/RCED-87-170	87/08/00
Underground Injection Control Program; Hazardous Waste Disposal Injection Restrictions; Amendments to Technical Requirements for Class I Hazardous Waste Injection Wells; and Additional Monitoring Requirements Applicable to All Class Wells; Proposed Rule; Part III	F.R./Vol. 52, No. 166	87/08/27
Best Demonstrated Available Technology	EPA/530-SW-88-0009-(a-g)	88/04/00

ADMINISTRATIVE RECORD GUIDANCE DOCUMENTS: INDEX UPDATE #3
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TITLE	AUTHOR	DATE
(BDAT) Background Documents (Proposed) Volumes 1-18 (Available in EPA Library)		
Identification and Listing of Hazardous Waste Treatability Studies Sample Exemptions; Final Rule; Part IV	F.R./Vol. 53, No. 138/27290 - 27302	88/07/19
Underground Injection Control Program; Hazardous Waste Disposal Injection Restrictions and Requirements for Class I Wells; Final Rule; Part II	F.R./Vol.53, No. 143/28118 - 28157	88/07/26
Land Disposal Restrictions for First Third Scheduled Wastes; Final Rule; Part II	F.R./Vol. 53, No. 159	88/08/17
The Superfund Innovative Technology Evaluation Program: Technology Profiles	EPA/540/5-88/003	88/11/00
Exposure Factors Handbook (Available in EPA library)	EPA/600/8-89-043	89/00/00
Integrated Risk Information System (IRIS); (a computer based health risk	USEPA, OHEA	89/0[illegible]/00

ADMINISTRATIVE RECORD GUIDANCE DOCUMENTS: INDEX UPDATE #3
MIDCO I & II SITES, GARY, INDIANA
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TITLE	AUTHOR	DATE
information system available through E-mail. Brochure on access included)		
Status of Contaminated Groundwater and Limitations on Disposal and Reuse	USEPA, OSWER	89/01/24
Reduction in Mobility for Individual Treatment Technologies (Attached to the Record of Decision ROD)	USEPA	89/03/00
Land Disposal Restrictions as Relevant and Appropriate Requirements for CERCLA Contaminated Soil and Debris	EPA/OSWER Directive No. 9347.2-01	89/06/05
A Guide to the Underground Injection Control Program in Indiana (Attached to the Record of Decision (ROD))	USEPA	00/00/00
Overview of RCRA Land Disposal Restrictions (LDRs), Superfund LDR Guide #1	EPA/OSWER Directive No. 9347.3-01FS	89/07/00
Complying With the California List Restrictions Under	EPA/OSWER Directive No. 9347.3-02FS	89/07/00

02/05/90

ADMINISTRATIVE RECORD GUIDANCE DOCUMENTS: INDEX UPDATE #3
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TITLE	AUTHOR	DATE
Land Disposal Restrictions (LDRs), Superfund LDR Guide #2		
Treatment Standards and Minimum Technology Requirements Under Land Disposal Restrictions (LDRs); Superfund LDR Guide #3	EPA/OSWER Directive No. 9347.3-03FS	89/07/00
Complying With the Manner Restrictions Under Land Disposal Restrictions (LDRs); Superfund LDR Guide #4	EPA/OSWER Directive No. 9347.3-04FS	89/07/00
Determining When Land Disposal Restrictions (LDRs) Are Applicable to CERCLA Response Actions; Superfund LDR Guide #5	EPA/OSWER Directive No. 9347.3-05FS	89/07/00
Obtaining a Soil and Debris Treatability Variance for Remedial Actions; Superfund LDR Guide #6A	EPA/OSWER Directive No. 9347.3-06FS	89/07/00

DEFINITION OF ACRONYMS FOUND WITHIN THE ADMINISTRATIVE RECORD INDEX FOR MIDCO I & II SITES GARY, INDIANA

ACRONYM	DEFINITION
CERCLA	Comprehensive Enviornmental Response, Compensation, and Liability Act of 1980
IRIS	Integrated Risk Information System
LDR	Land Disposal Restrictions
PRPs	Potentially Responsible Parties
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
UAO	Unilateral Administrative Order
USEPA	United Environmental Protection Agency

ADMINISTRATIVE RECORD INDEX - UPDATE #3
DOCUMENTS FOR UNILATERAL ADMINISTRATIVE ORDER
MIDCO II
GARY, INDIANA

NR PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
22	89/05/09	Letter to notify certain parties of USEPA's intent to enter into negotiations concerning the implementation of remedial action at the MIDCO I & II sites; with attachments	B.Niedergang USEPA	All PRPs	Correspondence	1
24	89/12/11	Letter with comments on behalf of Insilco Corporation in regards to the Unilateral Administrative Order with attachments	Susan Parker-Bodine Covington & Burling	M.Berman - USEPA	Correspondence	2
5	89/12/11	Letter with comments on behalf of John Miletich and Mary Miletich, owners of certain realty which constitutes a portion of Midco II, in regards to the Unilateral Administrative Order with attachments	David R. Pavlowski Stults, Custer & Kutansky	M.Berman - USEPA	Correspondence	3
11	89/12/12	Letter with comments on behalf of Respondent Standard T Chemical Company, Inc. Company with attachment memorandum	Harvey M. Sheldon McDermott, Will & Emery	M.Berman - USEPA	Correspondence	4
34	89/12/12	Letter with comments on behalf Rust-Oleum Corporation, American National Can Company and Zenith Electronics in regards	Timothy L. Harker The Harker Firm	B.Constantelos - USEPA	Correspondence	5

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DOCUMENTS FOR UNILATERAL ADMINISTRATIVE ORDER
MIDCO II
GARY, INDIANA

?HE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			to the Unilateral Administrative Order with attachments				
	37	89/12/12	Comments submitted on behalf of Pre Finish Metals, Inc. in regards to the Unilateral Order with attachment	Robert M. Olian Sidley & Austin	M.Berman - USEPA	Correspondence	6
	9	89/12/12	Letter with comments on behalf of Penn Central Corporation in regards to the Unilateral Administrative Order	Michael R. Blankshain Wildman, Harrold, Allen & Dixon	M.Berman - USEPA	Correspondence	7
	9	89/12/12	Letter with comments on behalf of Motorola Inc. in regard to Unilateral Administrative Order	Carol L. Dorge Seyfarth, Shaw, Fairweather & Geraldson	M.Berman - USEPA	Correspondence	8
	1	89/12/13	Letter regarding the fences surrounding the Midco I & II sites	R.Baker Indiana Department of Environmental Management	R.Boice - USEPA	Correspondence	9
	24	89/12/19	Penn Central Coporation's supplemental comments on Midco II in response to the Administrative Order	Michael R. Blackshain Wildman, Harrold, Allen & Dixon	M.Berman - USEPA	Correspondence	10
	9	89/12/20	Rust-Oleum Corporation, American Can, and Zenith Electronic's supplemental	Timothy L. Harker The Harker Firm	B.Constantelos - USEPA	Correspondence	11

ADMINISTRATIVE RECORD INDEX - UPDATE #3
DOCUMENTS FOR UNILATERAL ADMINISTRATIVE ORDER
MIDCO II
GARY, INDIANA

ER/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			comments on Midco I & II in response to the Administrative Order				
	4	89/11/00	Midco I & II Gary, Indiana Superfund Remedial Program Fact Sheet	USEPA		Fact Sheets	12
	2	79/10/30	Report on Survey at Midco II; 5900 Industrial Highway; Gary, Indiana (laboratory results attachment not included)	L.E. Townsend USEPA	A.Baumann - USEPA	Memorandum	13
	7	89/12/11	Memo with technical comments on the Midco I & II 106 Orders	Roy O. Ball/ Elsie F. Millano ERM-North Central, Inc.	106 Orders Respondents	Memorandum	14
	1	90/01/11	Discussion of Groundwater at Ninth Avenue Dump	Rich Boice USEPA		Memorandum	15
	181	89/12/12	Comments submitted on behalf of Desoto Inc. regarding the Midco I & II Unilateral 106 Orders with cover letter and attachments	Bradley R. O'Brien Gardner, Carton & Douglas	M.Berman - USEPA	Other	16
	42	89/12/26	Responses of the USEPA to Comments from Respondents on the MIDCO I & II Unilateral Administrative Orders	USEPA		Other	17

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DOCUMENTS FOR UNILATERAL ADMINISTRATIVE ORDER
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ME/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			(UAOs) with cover letter				
	97	89/11/15	Administrative Order pursuant to section 106 of the Comprehensive Environmental Response Compensation, and Liability Act of 1980 for the Midco II Site	Basil G. Constantelos USEPA		Pleadings/Orders	18
	2	89/12/26	First Amendment To Order for Midco II	B.Constantelos USEPA		Pleadings/Orders	19
	2	87/10/08	Progress Report No. 27 through September 30, 1987 for Midco I & II	Roy O. Ball ERM-North Central, Inc.	R.Boice - USEPA	Reports/Studies	20
	79	89/06/30	Record of Decision (ROD) Ninth Avenue Dump Gary, Indiana	USEPA		Reports/Studies	21

UNILATERAL ADMINISTRATIVE ORDER GUIDANCE: INDEX UPDATE #3
MIDCO I & II SITES, GARY, INDIANA
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
Establishing Soil-Lead Cleanup levels at Superfund Sites Interim Guidance	EPA/OSWER Directive No. 9355.4-02	89/09/07
Risk Assessment Guidance for Superfund Human Health Evaluation Manual, Part A Interim Final	EPA/540/1-89/002	89/12/00

DEFINITION OF ACRONYMS FOUND WITHIN THE ADMINISTRATIVE RECORD INDEX FOR MIDCO I & II SITES GARY, INDIANA

ACRONYM	DEFINITION
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IRIS	Integrated Risk Information System
LDR	Land Disposal Restrictions
PRPs	Potentially Responsible Parties
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
UAO	Unilateral Administrative Order
USEPA	United States Environmental Protection Agency

ADMINISTRATIVE RECORD INDEX - UPDATE #4
MIDCO II
GARY, INDIANA

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	36	86/00/00	Phone Conversation Record for Midco I and Midco II From 1985-1986	Weston	R.Boice - USEPA	Conversation Records	1
	23	89/00/00	Conversation Records From 1986 through 1989 for Midco I and Midco II	Richard Boice USEPA	File	Conversation Records	2
	2	86/01/06	Letter Re: Weekly Report - Midco I and II 12-2/12-6, 1985	Dan Kalinowski Weston	R.Boice - USEPA	Correspondence	3
	1	86/10/22	Letter Re: Midco I & II	Richard E. Boice USEPA	R.Aten	Correspondence	4
	4	87/09/10	Letter Re: TES III Work Assignment No. 589, Midco I and II with attachment	David Homer PRC Environmental Management, Inc.	R.Boice - USEPA	Correspondence	5
	5	87/09/23	Letter Re: a request to review the August, 1987 draft Remedial Investigation (RI)	David C. Hodak United States Department of Interior	R.Boice - USEPA	Correspondence	6
	4	88/02/12	Letter Re: meeting of February 3, 1988 - Midco Sites Feasibility Studies (FS)	Roy Ball ERM-North Central, Inc.	Weston/Dames & Moore	Correspondence	7
	8	88/02/26	Letter Re: Indiana's official Applicable	Nancy A. Maloley Indiana Department of Environmental	V.Adamkus - USEPA	Correspondence	8

ADMINISTRATIVE RECORD INDEX - UPDATE #4
MIDCO II
GARY, INDIANA

F/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			or Relevant and Appropriate Requirements (ARARs) for the 9th Avenue Dump Hazardous Waste Site with attachment	Management			
	2	88/03/04	Letter Re: Conference Call of February 23, 1988 - Midco Feasibility Study (FS)	Roy O. Ball ERM-North Central, Inc.	R.Boice - USEPA	Correspondence	9
	2	88/09/13	Letter Re: Midco I and II Feasibility Study	Arthur E. Slesinger Morton Thiokol, Inc.	R.Boice - USEPA	Correspondence	10
	1	88/10/03	Letter Re: Midco I and II Sites	Richard E. Boice USEPA	R.Ball - ERM	Correspondence	11
	12	88/10/31	Letter Re: the state ARARs for Midco I and Midco II Sites	Reginald O. Baker Indiana Department of Environmental Management	E.Vaughn - Dames & Moore	Correspondence	12
	4	89/02/22	Letter Re: review of Proposed Plans for Midco I and Midco II Sites	Frederick L. Fest Roy F. Weston, Inc.	R.Boice - USEPA	Correspondence	13
	2	89/05/08	Letter Re: review of draft RODs for Midco I and Midco II Sites	Frederick L. Fest Roy F. Weston, Inc.	R.Boice - USEPA	Correspondence	14
	3	89/05/08	Letter Re: review of draft ROD for Final Remedy Selection at Midco I	David E. Homer PRC Environmental Management, Inc.	R.Boice - USEPA	Correspondence	15

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			Midco II Sites				
	2	89/05/16	Letter Re: Midcc I & II	James E. Mayka USEPA	A.Slesinger - M-T, Inc.	Correspondence	16
	4	86/01/21	Memo Re: Magnetometer Survey Profile Line Conducted at Midco I Site with cover letter	Kurt S. Stimpson Weston	R.Boice - USEPA	Memorandum	17
	3	86/03/25	Memo Re: Trip Report, PRP Training/Audit - Geoscience Research Associates March 6 to 7, 1986	Dennis Wesolowski USEPA	Files	Memorandum	18
	3	86/06/03	Memo Re: Data Assessment for Midcc I and II Remedial	Jay Thakkar USEPA	Files	Memorandum	19
	2	86/07/14	Memo Re: Midcc I and II Studies, Additional work to collect data necessary for completing RI/FS's	Robert E. Aten Geosciences Research, Associates, Inc.	R.Boice - USEPA	Memorandum	20
	3	87/03/26	Memo Re: discussion of results of pump tests and slug tests at Midco I and Midco II	Kurt Stimpson Weston	R.Boice - USEPA	Memorandum	21
	3	87/05/26	Inter-Office Memo Re: Midcc I Remedial Investigation (RI) Review Meeting	Kurt Stimpson Weston	R.Boice - USEPA	Memorandum	22

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			(Second Draft)				
	5	87/11/25	Memo Re: Midwest Solvent Recovery, Inc./Midco I Site	Diane M. Spencer USEPA	R.Boice - USEPA	Memorandum	23
	4	88/01/15	Memo Re: report on Midco I and Midco II Meeting with attachment (handwritten)	Richard Boice USEPA	R.Diefenbach - USEPA	Memorandum	24
	6	88/02/17	Memo Re: review of Ninth Avenue Dump Site Remedial Investigation Report and Identification of ARARs	Charles E. Sutfin USEPA	B.Constantelos - USEPA	Memorandum	25
	27	88/02/18	Comments in the Feasibility Study for the Midco I Site	Steve Rothblatt USEPA	M.Gade - USEPA	Memorandum	26
	2	88/07/01	Memo Re: comments on Feasibility Study (FS) - Evaluation of Remedial Alternatives for the Midwest Waste Disposal Company, Inc.	Sheri L. Bianchin USEPA	G.Wittman - USEPA	Memorandum	27
	2	88/11/14	Memo Re: Laboratory Evaluations for Midco I & II (handwritten)	Steve Ostradker USEPA	B.Niedergang - USEPA	Memorandum	28

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	46	00/00/00	Material Re: ERM capabilities and experience	ERM		Other	29
	40	87/07/14	Material Re: Dames & Moore Capabilities and Experience with cover letter	Gary F. Vajda Dames & Moore	R.Boice - USEPA	Other	30
	9	85/09/00	Work Plan Memorandum Midco II Site Gary, Indiana	Camp Dresser & McKee, Inc.	USEPA	Reports/Studies	31
	12	86/01/00	Work Plan Midco II Site Gary, Indiana Volume I - Technical Scope of Work	Camp Dresser & McKee, Inc.	USEPA	Reports/Studies	32
	/	88/11/00	Technical Oversight Work Plan Midco II Site Gary, Indiana Volume 1	Roy F. Weston, Inc.	USEPA	Reports/Studies	33

ADMINISTRATIVE RECORD INDEX - UPDATE #4
DOCUMENTS FOR UNILATERAL ADMINISTRATIVE ORDER
MIDCO II
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F/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	2	89/08/23	Memo Re: Discharge of groundwater for the Midco I and Midco II sites to a Publicly Owned Treatment Work (POTW)	Basil Constantelos USEPA	C.Sutfin - USEPA	Memorandum	
	2	89/09/13	Telephone Memo Re: Proposed Underground Injection Well for Midco I and Midco II	Richard Boice USEPA	J.Chiu - USEPA	Memorandum	

ADMINISTRATIVE RECORD INDEX - UPDATE #4
DOCUMENTS WITH CONFIDENTIAL BUSINESS INFORMATION (CBI)
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/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	11	00/00/00	Weston Project Staff Profiles	Weston		Other	

ADMINISTRATIVE RECORD SAMPLING/DATA - INDEX #4
MIDCO I AND MIDCO II SUPERFUND SITES
DOCUMENTS NOT COPIED, MAY BE REVIEWED AT THE
USEPA REGION V OFFICES, CHICAGO, ILLINOIS.

DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
00/00/00	Data validation work sheets available at Geosciences Research Associates, Bloomington, Indiana	USEPA		Sampling Data
	Discharge Monitoring Reports from the City of Gary, the City of Hammond, and the City of East Chicago for April, May and June 1989 available Compliance File, Water Division, USEPA, Region V, Chicago, Illinois			

05/18/90

ACRONYM GUIDE for the Administrative Record Index #4
MIDCO I & II SUPERFUND SITES
GARY, INDIANA

ACRONYM	DEFINITION
ARAR	Applicable or Relevant and Appropriate Requirements
ERM	Environmental Resource Management
FS	Feasibility Study
GW	Groundwater
M-T,Inc.	Morton Thiokol, Inc.
POTW	Publicly Owned Treatment Work
PRC	Planning Research Corporation
RI	Remedial Investigation
ROD	Record of Decision
TES	Technical Enforcement Support
USEPA	United States Environmental Protection Agency

MIDCO II LIABILITY DOCUMENTS

(THESE DOCUMENTS ARE NOT AVAILABLE AT THE GARY CITY HALL OR HAMMOND PUBLIC LIBRARY BUT ARE AVAILABLE AT U.S. EPA'S OFFICE AT 230 SOUTH DEARBORN STREET, CHICAGO, ILLINOIS 60604)

PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
25	11/75-11/76	Midco Log	Midco	File	Other
	07/75-02/78	Shipping documents for Midco including Midco pick-up tickets, generator tally and dray tickets, invoices, check receipts, purchase orders, shipping orders	Midco	File	Other
		Responses to request for information, issued by U.S. EPA pursuant to Section 104(e) of CERCLA from:			
4	07/27/83	De Soto, Inc.	De Soto, Inc.	U.S. EPA	Correspondence with attachments
11	11/08/83			U.S. DOJ	
11	11/09/83			U.S. EPA	
7	09/19/83	Enterprise Paint Mfgr. Co.	Insilco Corp.	U.S. EPA	Correspondence with attachments
2	07/25/83	Industrial Tectonics, Inc.	Industrial Tectonics, Inc.	U.S. EPA	Correspondence
34	07/29/83	Motorola	Motorola	U.S. EPA	Correspondence with attachments
16	02/01/84	Motorola	Motorola	U.S. DOJ	Correspondence with attachments

PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
44	12/12/83	Premier Paint	Boodell, Sears Sugrue, Giambalvo & Growley	U.S. DOJ	Correspondence with attachments
197	09/29/83	Rust-Oleum	Rust-Oleum, Corp.	U.S. EPA	Correspondence with attachments
1	12/15/76	Standard T Chemcial (Reissue of 01/11/77 check)	Montgomery Ward	U.S. EPA	Other
57	08/01/83		Montgomery Ward	U.S. EPA	Correspondence with attachments
4	08/23/83		Montgomery Ward	U.S. EPA	Correspondence with attachments
3	09/26/83		Montgomery Ward	U.S. EPA	Correspondence
19	12/02/83		Montgomery Ward	U.S. DOJ	Correspondence with attachments
23	08/05/83	Zenith Radio Corp.	Zenith Radio Corp.	U.S. EPA	Correspondence with attachments
1	09/12/83		Zenith Radio Corp.	U.S. EPA	Correspondence
91	09/26/83		Zenith Radio Corp.	U.S. EPA	Correspondence with attachments
2	10/12/83		Zenith Radio Corp.	U.S. EPA	Correspondence plus enclosure
3	07/28/83	Luther G. Bloomberg	Enslen, Enslen & Matthews	U.S. EPA	Correspondence
1	05/25/89		Enslen, Enslen & Matthews	U.S. EPA	Correspondence
25	09/28/83	Pre-Finish Metals Metals	Pre-Finish	U.S. EPA	Correspondence with attachments
75	01/04/80	Deposition of Marrin Dale Robinson	Marrin Dale Robinson	Hammond Federal District Court	Other
14	08/17/85	Deposition of Lovie DeHart	Lovie DeHart	Hammond Federal District Court	Other

PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
20	08/11/83	Title Search and Attachments for Chicago Title Insurance Company	Chicago Title Insurance Company	Techlaw, Inc.	Other
2	08/24/81	Order	Lake Circuit Court	Ernest DeHart	Pleadings/Orders
2	09/02/82	Motion for Contempt Order	State of Indiana	Lake Circuit Court	Pleadings/Orders
2	04/08/83	Trial Stipulations	State of Indiana	Lake County Court	Pleadings/Orders
94	07/28/81	Deposition of Ernest DeHart	Ernest DeHart	Hammond Federal District Court	Other
66	11/20/85	Transcript of Proceedings		Hammond Federal District Court	Pleadings/Orders
452	01/07/80-01/09/80	Transcript of Proceedings		Hammond Federal District Court	Pleadings/Orders
19	01/24/80	Deposition of John Miletich	John Miletich	Hammond Federal District Court	Pleadings/Orders
4	04/15/83	Penn Central	Michael L. McCluggage	U.S. EPA	Correspondence
8	01/31/80	Order, U.S.A. v. Midwest Solvent Recovey, et. al.	U.S. District Court, Northern District of Indiana	Parties	Pleadings/Orders

MIDCO II

PRIVILEGED DOCUMENTS WITHHELD FROM PUBLIC PORTION OF ADMINISTRATIVE RECORD

Pages	Dates	Title	Author	Recipient	Type
3	July 1, 1983	Midco Notes from Interview with potential witness	Michael R. Berman		Memorandum

SUMMARY FOR RECORD OF DECISION AMENDMENT

Midco II, GARY, INDIANA

I. INTRODUCTION (for more detailed information on the site location, site description, and the site history, enforcement activities and community relations prior to June 30, 1989 refer to the Record of Decision (ROD) signed on June 30, 1989, Sections I-III)

Midco II operations were primarily conducted on an approximately seven acre area at 5900 Industrial Highway in Gary, Indiana (see Figures 1 and 2) from approximately 1976 through 1978. Operations included temporary bulk liquid and drum storage of waste and reclaimable materials, neutralization of acids and caustics, and on-site disposal via dumping into pits, which allowed percolation into the ground water. One of theses pits, called the filter bed, had an overflow pipe leading into the ditch. Many of the wastes disposed of on-site were from the paint industry, and many contained hazardous substances. In addition, during the operations, wastes were dumped and spilled onto and into the ground at the site. A large fire in August 1977 destroyed thousands of drums containing chemicals on the site, and resulted in additional spillage of chemicals onto the site.

The United States Environmental Protection Agency (EPA) installed a fence at the site in 1981, and completed a removal action from 1984 through 1989 that included removal of all surface wastes including thousands of drums of chemical wastes, and a number of tanks containing chemical wastes, and excavation and off-site disposal of subsurface soils and wastes in the sludge pit and filter bed. Other than the sludge pit and filter bed, the contaminated subsurface soil and ground water were not addressed in the removal action.

A Remedial Investigation/Feasibility Study (RI/FS) was completed by a group of potentially responsible parties (PRPs) (generally PRPs are entities who owned or operated Midco II or sent or transported hazardous substances to the Midco II site) under EPA oversight from 1985 to 1989. The Indiana Department of Environmental Management (IDEM) also participated in oversight of the RI/FS. The RI showed that portions of the subsurface soils, including natural soils and fill material, located within the area outlined in Figure 2 are highly contaminated by a large number of hazardous substances (including volatile organic compounds (VOCs), semivolatile organic compounds, PCBs, metals and cyanide). The fill material consists of sand, slag, cinders, granular material, and a grey silty material mixed with some cultural debris including scrap metal, concrete, wood, bricks, Reprinted from "Remedial Investigation of Midwest (te Disposal Company, Inc. (Midc I), Gary, Indiana" by Environmental Resources Management-North Central

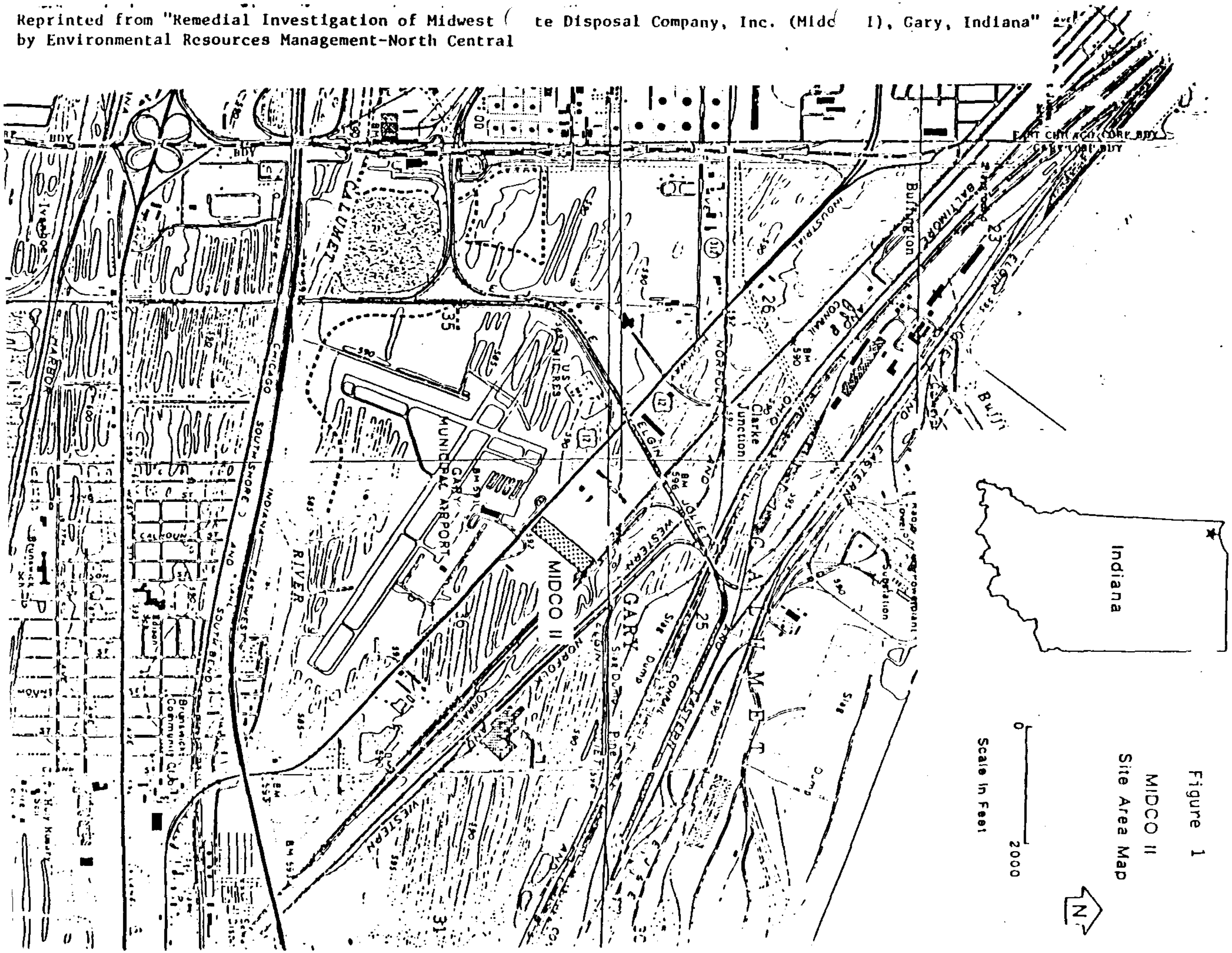

Figure 1
MIDCO II
Site Area Map

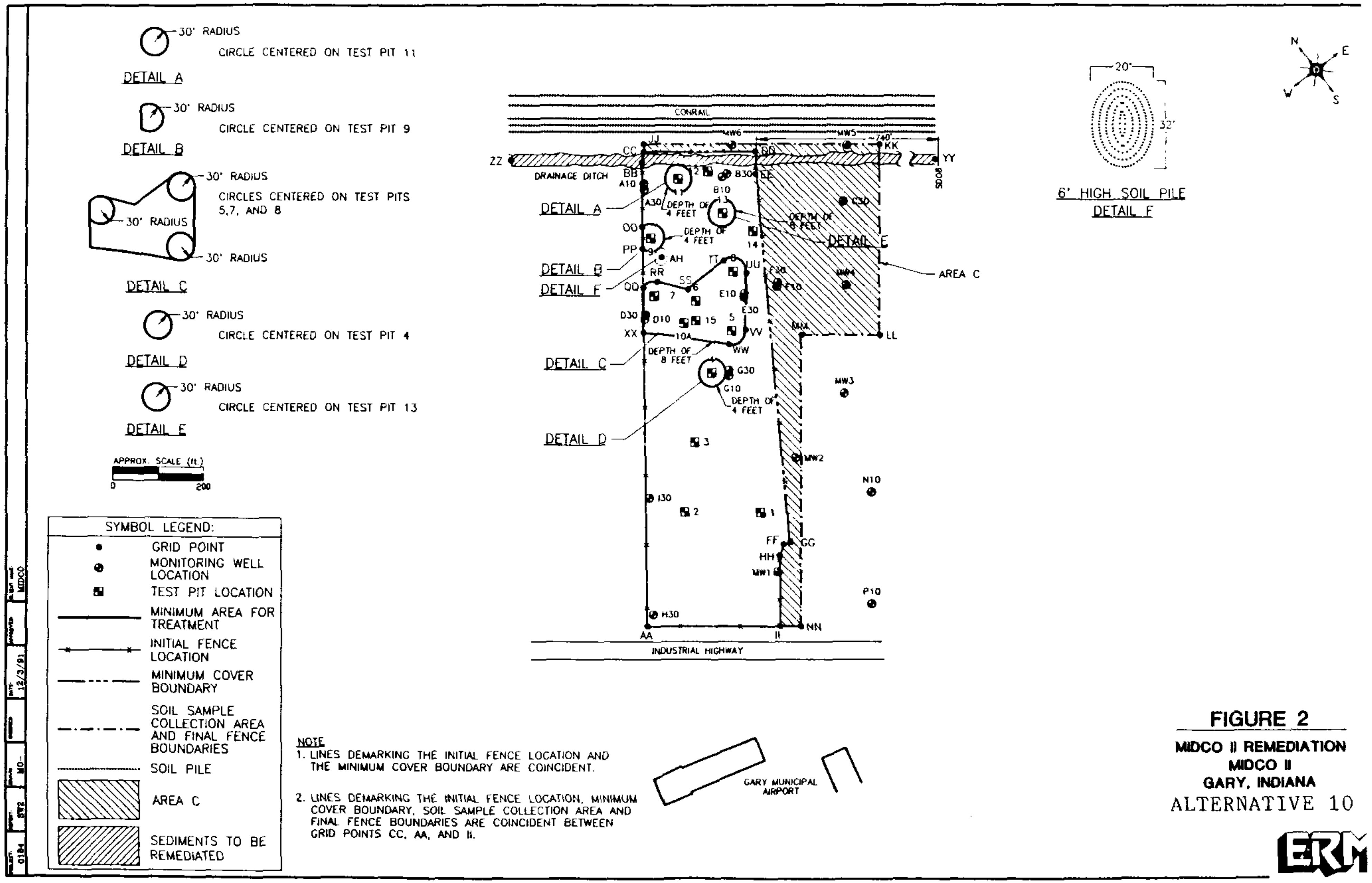
30' RADIUS
CIRCLE CENTERED ON TEST PIT 11
DETAIL A
30' RADIUS
CIRCLE CENTERED ON TEST PIT 9
DETAIL B
30' RADIUS
CIRCLES CENTERED ON TEST PITS 5,7, AND 8
30' RADIUS
30' RADIUS
DETAIL C
30' RADIUS
CIRCLE CENTERED ON TEST PIT 4
DETAIL D
30' RADIUS
CIRCLE CENTERED ON TEST PIT 13
DETAIL E
APPROX. SCALE (ft.)
0
200
SYMBOL LEGEND:
GRID POINT
MONITORING WELL LOCATION
TEST PIT LOCATION
MINIMUM AREA FOR TREATMENT
INITIAL FENCE LOCATION
MINIMUM COVER BOUNDARY
SOIL SAMPLE COLLECTION AREA AND FINAL FENCE BOUNDARIES
SOIL PILE
AREA C
SEDIMENTS TO BE REMEDIATED
CONRAIL
DRAINAGE DITCH
DETAIL A
DETAIL B
DETAIL F
DETAIL C
DETAIL D
DETAIL E
DEPTH OF 4 FEET
DEPTH OF 8 FEET
AREA C
INDUSTRIAL HIGHWAY
GARY MUNICIPAL AIRPORT
20'
32'
6' HIGH SOIL PILE
DETAIL F
N
E
W
S
NOTE
1. LINES DEMARKING THE INITIAL FENCE LOCATION AND THE MINIMUM COVER BOUNDARY ARE COINCIDENT.
2. LINES DEMARKING THE INITIAL FENCE LOCATION, MINIMUM COVER BOUNDARY, SOIL SAMPLE COLLECTION AREA AND FINAL FENCE BOUNDARIES ARE COINCIDENT BETWEEN GRID POINTS CC, AA, AND II.
FIGURE 2
MIDCO II REMEDIATION
MIDCO II
GARY, INDIANA
ALTERNATIVE 10
ERM
12/3/91

FIGURE 2

crushed drums and other debris. Ground water below the site is highly contaminated with VOCs, semivolatile organic compounds, metals and cyanide, but at the time of sampling the contaminated ground water did not extend very far from the site cover boundaries outlined in Figure 2. Some surface sediments have also been contaminated. Much of the ground water affected by the Midco II operations is highly saline.

After preparing a Proposed Plan and considering public comments, EPA selected the final remedial actions for the site in the Record of Decision (ROD) signed on June 30, 1989. IDEM concurred in the selected remedy. The final remedial actions were to address the remaining contamination at the site including contaminated subsurface soil, contaminated ground water and contaminated surface sediments. The major components of the remedy selected by EPA in the 1989 ROD included:

- On-site treatment of an estimated 35,000 cubic yards of contaminated soil and waste material by solidification/ stabilization followed by on-site deposition of the solidified material;

- Excavation and on-site solidification/stabilization of approximately 500 cubic yards of contaminated sediments from the ditch adjacent to the northeast boundary of the site;

- Installation and operation of a ground water pumping system to intercept contaminated ground water from the site;

- Installation and operation of a deep, class I, underground injection well for disposal of the contaminated ground water; or if a no-migration petition is not approved by EPA, treatment of contaminated ground water to remove hazardous substances followed by deep well injection; or treatment of the contaminated ground water to remove hazardous substances followed by reinjection of the ground water into the Calumet aquifer in a manner that would prevent spreading of the salt plume;

- Installation of a conduit in the ditch along the site, a final site cover, access restrictions, deed restrictions, and monitoring.

EPA with participation by IDEM conducted a 120 day negotiation period with the PRPs from May until September 1989, but no agreement was reached. In November 1989, EPA issued a Unilateral Administrative Order to a group of PRPs requiring them to implement the remedial action called for in the ROD. This Order became effective on December 29, 1989. However, the PRPs did not agree to implement the Order without addition of conditions that were unacceptable to EPA. On January 8, 1990, the United States filed an Amended Complaint seeking to enforce the Unilateral

Administrative Order, as well as to recover EPA's response costs, punitive damages, and fines.

In 1991, EPA determined that the arsenic data from the Midco II Remedial Investigation was mostly unusable because of an interference with high concentrations of aluminum in many of the samples (see Section III). Because arsenic was an important factor in determining the extent of soil treatment by S/S at Midco II, EPA considered the new information on the arsenic data to be fundamental new information. EPA has therefore reconsidered the 1989 ROD's provisions relating to the extent of soil treatment by S/S, and has at the same time in this ROD Amendment applied new Agency regulations (e.g. the revised NCP issued March 8, 1990, 40 CFR 300.430(a)(iii) "(A) EPA expects to use treatment to address the principal threats posed by the site wherever practicable.... (B) EPA expects to use engineering controls such as containment for waste that poses a relatively low long-term threat....") dealing with the extent of soil treatment at Superfund sites. This ROD Amendment also provides further detail regarding the implementation of various other components of the 1989 ROD. The revisions to the 1989 ROD are discussed in more detail later in this document.

EPA, IDEM, and a group of PRPs have since reached a proposed settlement consistent with this ROD Amendment. This settlement has been embodied in a Consent Decree that is being submitted for public comment concurrently with this proposed ROD Amendment. A detailed Statement of Work that would implement the remedial action that is the subject of the ROD Amendment is incorporated in the Consent Decree that is being lodged with the Federal District Court in Hammond, Indiana for public comment. This ROD Amendment incorporates the elements of the proposed remedial action, as well as providing updated information on the site.

The remedy selected in this ROD Amendment includes the following major components:

- On-site treatment of a minimum of approximately 12,200 cubic yards of contaminated soil and waste material, and possibly more dependent upon the results of further sampling, by SVE and in-situ S/S.

- Excavation and on-site S/S of approximately 500 cubic yards of contaminated sediments from the ditch adjacent to the northeast boundary of the site.

- Installation and operation of a ground water pumping system to intercept contaminated ground water from the site. Contingency measures shall be implemented in case it is determined that it is technically impracticable from an engineering perspective to attain the ground water cleanup action level.

- Installation and operation of a treatment system (as required) to remove hazardous substances from the extracted ground water, and deep well injection of the extracted ground water following any required treatment. Ground water treatment will be required to the extent necessary to attain maximum allowable concentrations (MACs), which are levels equivalent to those required for delisting a hazardous waste under the Resource Conservation and Recovery Act (RCRA). Treatment beyond the MACs will be required under certain conditions if either the lower Eau Claire or Mount Simon Formation (which are more than approximately 1800 feet below the surface of the site) is an underground source of drinking water (USDW) as defined in 40 CFR 144.3. Alternatively, the ground water could be treated to remove hazardous substances followed by reinjection of the ground water into the Calumet aquifer in a manner that will prevent spreading of the salt plume. See Section V.A of this ROD Amendment Summary.

- Construction of a cover over the entire site that is consistent with the closure requirement under Subtitle C of RCRA, access restriction, deed restrictions, and monitoring.

The ROD Amendment is similar to the 1989 ROD to the extent that it utilizes the same remedial technologies for soil and ground water remediation (ie. soil solidification/stabilization, soil vapor extraction, ground water extraction, treatment and deep well injection, and final site cover). The ROD Amendment utilizes different methods from the 1989 ROD for determining the amount of soil that must be treated, further defines the requirements for an effective site cover over soils with low levels of contamination that are not being treated, and further defines the requirements for treatment of ground water prior to deep well injection. It is expected that less soil and ground water treatment (see Section V.A) will be required under the ROD Amendment. In spite of this, the ROD Amendment achieves a level of protection of public health and the environment that is not considered significantly different from what would have been achieved by the 1989 ROD. The ROD Amendment's provisions provide such protection by providing for treatment of principal threats (that is the highly contaminated soils) and mandating an effective site cover over untreated soils that pose a relatively low long-term threat. The site cover will substantially reduce the threat from the soils presenting a relatively low long-term threat: for the direct contact threat by covering the soil with a five foot thick cover; and for the threat of further ground water contamination from the soils above the water table by reducing infiltration through the soils and production of leachate. To maintain its effectiveness, the site cover and solidified/ stabilized material will have to be monitored and maintained.

In contrast, the 1989 ROD provided for treatment of soils posing a relatively low long-term threat by SVE and S/S. This may have resulted in permanent treatment of some additional contaminants and would have resulted in a reduction of leaching and control of the direct contact threat by the treatment and a cover. However, in spite of the additional treatment, unrestricted future usage of the site would not have been allowed because long term maintenance and monitoring of the solidified/stabilized material and the cover would have been required. Any reduction in protectiveness from the change in the ROD Amendment's soil treatment action levels (see Section V.C) from the 1989 ROD's soil cleanup action levels (see Section IV) are compensated for by taking into account the risk reducing effect from the site cover over untreated soils posing low level threats. The ROD Amendment includes new requirements for the final site cover to ensure its effectiveness. Because the risk reduction and reduction in toxicity or mobility of the additional treatment required in Alternative 8 compared to Alternative 10 is small, it is not considered to be cost effective compared to Alternative 10.

A Proposed Plan has been prepared that briefly describes the remedial alternatives analyzed by EPA, proposes the revised alternative, and summarizes the information relied upon to select this alternative. This proposed ROD Amendment as well as the Proposed Plan will be subject to a public notice, public comment period, and the opportunity for a public meeting, in accordance with the requirements of 40 CFR 300.435(c). In addition, the ROD Amendment and supporting information will be made available to the public in the Administrative Record for this action.

II. PURPOSE OF ROD AMENDMENT

The major purpose of this ROD Amendment is to modify the 1989 ROD's provisions relating to the extent of soil treatment by S/S, as a result of new information on the arsenic data. At the same time, the ROD Amendment applies new EPA regulations (e.g. the revised NCP issued March 8, 1990, 40 CFR 300.430(a)(iii) "(A) EPA expects to use treatment to address the principal threats posed by the site wherever practicable.... (B) EPA expects to use engineering controls, such as containment for waste that poses a relatively low long-term threat....") dealing with the extent of soil treatment at Superfund sites.

This ROD Amendment provides for direct treatment of soils at what are believed to be the more highly contaminated areas of the site, which are the source of the principal threats to ground water, air and dermal contact. Large volumes of soils presenting a relatively low long-term threat will not be treated since (in the context of the conditions at this site) the threats from such soils can be reliably controlled using an effective site cover.

A minimum of approximately 12,200 cubic yards (depicted in Figure 2) will be treated without further sampling, and additional amounts may have to be treated depending upon the results of further sampling.

The action levels for additional soil treatment outside of the areas outlined in Figure 2 are as follows:

cumulative lifetime carcinogenic risk	= 5×10^{-4}
cumulative chronic non-carcinogenic risk index	= 5.0
lead concentration (mg/kg)	= 1000

These action levels were selected taking into account treatment of the minimum area for treament identified in Figure 2, site characteristics and hazardous substances, and current EPA regulations, policies, and guidance. The cover will be over the entire site and will be consistent with RCRA Subtitle C closure requirements. The extent and quality of the site cover under the 1989 ROD was left open (depending upon the success of the treatment).

Another purpose of this ROD Amendment is to further define the requirements for treatment prior to deep well injection of the extracted ground water, including a proposal to delist extracted ground water (following treatment as required) meeting specified maximum allowable concentrations (MACs) in accordance with "A Guide To Delisting of RCRA Wastes For Superfund Remedial Responses" (September 1990) so that the ground water can be injected into the lower Mount Simon formation in compliance with the requirements of RCRA and the Underground Injection Control Program (see Section V.A for further explanation of MACs). In effect, treatment to the MACs would take the place of the 1989 ROD's requirement of treatment to RCRA Land Disposal Restriction (LDR) treatment standards prior to the deep well injection. Treatment beyond the MACs will be required under certain conditions (see Section V.A) if either the lower Eau Claire or Mount Simon Formation (which are more than approximately 1800 feet below the surface of the site) is an underground source of drinking water (USDW) as defined in 40 CFR 144.3.

This ROD Amendment also further defines the remedial actions as follows:

definition of phases and sequencing for ground water and soil treatment;

further definition of performance standards for S/S;

a decision that the in-situ S/S option allowed in the 1989 ROD will be implemented rather than the excavation option;

a decision that the option of deep well injection without prior treatment, which would require EPA approval of a no-migration petition will no longer be considered (Alternative 7);

contingency measures have been added in case it is technically impracticable to attain the ground water cleanup action levels;

further definition of construction requirements for the site cover;

a determination that air emissions during in-situ S/S and during SVE conducted with the in-situ S/S equipment shall be controlled by carbon adsorption or by another technology that is equally effective;

a determination that in addition to the above if cumulative air emissions from all operations other than excavation at the Facility exceed 3 pounds per hour, carbon adsorption or another technology that is equally effective shall be used in the ground water treatment system and all SVE;

further definition of actions that will be taken to comply with the requirements for protection of wetlands in Executive Order 11990 and Section 404 of the Clean Water Act.

This ROD Amendment also provides updated information on the site in the following section.

III. <u>SITE CHARACTERISTICS AND SUMMARY OF RISKS</u> (this Section updates information on site characteristics and risk in Sections V and VI of the 1989 ROD)

Some new information has been obtained regarding Midco II since the 1989 ROD was signed. This new information is reported in this portion of the ROD Amendment.

Subsequent to completion of the 1989 ROD, EPA became aware that the arsenic concentrations reported for some soil and sediment samples in Midco II the Remedial Investigation, could be inflated due to an analytical interference from high aluminum concentrations in these samples. This was significant because any arsenic concentrations exceeding background would exceed the 1×10^{-5} carcinogenic risk level and require soil treatment by SVE and S/S under the 1989 ROD. In response, EPA investigated this concern and determined that the higher arsenic soil concentrations reported in the RI were unreliable. As a result the actual extent of soil treatment by SVE and S/S required in the 1989 ROD would likely have been considerably less than estimated in the Feasibility Study dated February 1989.

From an EPA audit of some of the soil data, EPA determined that the arsenic measurements in soil samples with aluminum concentrations greater than 10,000 mg/kg should be considered unusable because an adequate background correction for the aluminum interference was not applied. At Midco II, four soil boring samples, twenty test pit samples and six surface sediment samples exceeded aluminum concentrations of 10,000 mg/kg. These samples generally had the highest arsenic results. Sampling conducted at Midco II during February 1991 confirmed that the aluminum interference caused inflated arsenic results if an adequate background correction was not applied. Without the background correction, arsenic was reported from 313 to 1780 mg/kg in the Midco II soil samples, with the proper background correction (using a Zieman detector) arsenic was reported from less than 9 to 24 mg/kg. This sampling and the analyses of these samples were conducted by some PRPs with EPA oversight and in accordance with procedures approved by EPA.

If arsenic values in the soil samples with aluminum concentrations greater than 10,000 mg/kg are excluded from the risk calculations, the estimated averaged, site-wide, lifetime, cumulative, carcinogenic risk due to ingestion of soils using the future development scenario decreases from 3.3×10^{-4}, as reported in the 1989 ROD, to 5.7×10^{-5} (Table 4-22 of the Addendum to Public Comment Feasibility Study, February 10, 1989). The non-carcinogenic risk index for exposure to soils would change from 2.99 to 1.7. The revised soil risks without arsenic were taken into account in determining the minimum areas for S/S defined in Section V.C, and Figure 2 of this ROD Amendment.

To update the risk assessment calculation procedures for soil risks, EPA asked Planning Research Corporation (PRC) to conduct additional risk calculations using the data from the Midco II Remedial Investigation. The risks reported in the 1989 ROD did not include dermal contact or inhalation modes of exposure to the soils. The results of PRC's calculations are presented in a letter report dated June 21, 1991. The risks were calculated using the average soil concentrations in samples from test pits dug into what was suspected to be the most contaminated areas of the site during the Remedial Investigation and using a dermal contact and inhalation mode of exposure as well as the ingestion mode of exposure used in the Remedial Investigation. It was assumed that a home with a basement would be built on the site and that as a result the residents would be exposed to soil gas from the site. Very high carcinogenic risks to on-site residents were calculated due to inhalation exposures to volatile organic compounds including: methylene chloride (risk = 0.0142); and trichloroethylene (risk = 0.032). Very high non-carcinogenic risks to on-site residents were also calculated due to inhalation exposures to volatile organic compounds including: methylene chloride (risk index = 2.1); 2-butanone (risk index = 4.1); and toluene (risk index = 440). Not including arsenic or the inhalation mode of exposure, the calculations indicate a cumulative carcinogenic risk from the dermal contact and ingestion modes of exposure to be 1.7 X 10^{-4}; and the cumulative non-carcinogenic risk index to be 5.61. The calculations indicate a cumulative carcinogenic risk to hypothetical construction workers to be 1.1 X 10^{-6} and a cumulative non-carcinogenic risk index to be 2.1. These revised risk calculations provide further support of EPA's remedial action decisions for the Midco II site.

Since the 1989 ROD was completed, the United States Fish and Wildlife Service (U.S. F&W) completed a report entitled: "Summary Addendum Report for the Midco I, Midco II, and Ninth Avenue Dump Hazardous Waste Sites in Gary, Lake County, Indiana", September 1990. In this report, the U.S. F&W concluded that "the various contaminated habitats/media at Midco I, Midco II, and the 9th Avenue Dump sites present a threat to fish and wildlife resources utilizing or exposed to them." This additional documentation provides further support of EPA's remedial action decisions for the Midco II site.

IV. DESCRIPTION OF THE REMEDY SELECTED IN THE 1989 ROD (ALTERNATIVE 8): GROUND WATER PUMPING, TREATMENT AND DEEP WELL INJECTION WITH SOLIDIFICATION/STABILIZATION

The remedy selected in the 1989 ROD (Alternative 7 or 8) combined either ground water Alternative 4A (Alternative 7) or 4B (Alternative 8), with soil treatment Alternative 5E. Implementation of Alternative 7 was contingent upon EPA approval of a no-migration petition pursuant to 40 CFR 268.6 and 40 CFR 148 Subpart C. After the ROD was approved, EPA obtained information from review of the Inland Steel and U.S. Steel no-migration petitions that indicated that it is very unlikely that a no-migration petition would be approved for deep well injection at the Midco II site. Therefore, the subsequent discussion uses only Alternative 8.

Alternative 8 included installation and operation of ground water extraction wells to intercept the contaminated ground water that exceeds the ground water cleanup action levels (CALs) identified in Section X of the 1989 ROD, and installation of a Class I hazardous waste underground injection well into the Mount Simon formation for disposal of the highly saline waste water.

The extracted ground water was to have been treated to remove hazardous substances to the extent required by EPA prior to the deep well injection. While the extent of treatment that would be required by EPA was not fully defined, it was anticipated that this would at least require meeting Land Disposal Restriction (LDR) treatment standards for listed hazardous waste categories F001, F002, F003, F005, F007, F008, F009. This was anticipated to require treatment of the extracted ground water by air stripping and carbon absorption. However, Alternative 8 included provisions for treating to drinking water standards if required in order to gain approval of the deep well injection. Treating to drinking water standards was anticipated to require metals precipitation, and cyanide oxidation in addition to the air stripping and carbon absorption.

In the 1989 ROD, no mention was made of delisting the ground water because at that time no guidance was available on the level of treatment required to delist ground water. It was anticipated that delisting the ground water would require more stringent treatment than meeting the LDR treatment standards.

Another option that was allowed under Alternative 8 was treatment of the hazardous substances followed by reinjection of the treated ground water back into the Calumet aquifer in a manner that would not spread the salt plume in the Calumet aquifer. The pump, treatment and injection system would be operated until ground water CALs are attained in the Calumet aquifer.

Contaminated subsurface soils located above the water table were to have been treated by S/S (and by SVE if necessary). At the end of the action, all soils exceeding the soil CALs (Section X of the 1989 ROD) located above the water table had to be treated. In addition, S/S would be conducted on highly contaminated materials below the water table that could be handled by localized dewatering. Contaminated soils below the water table that were not treated would be slowly remediated by the ground water extraction system through ground water flushing. The soil CALs were based on contaminant concentrations that would allow for unrestricted future usage of the site, and were defined as follows:

cumulative lifetime carcinogenic risk = 1×10^{-5}
cumulative chronic non-carcinogenic index = 1.0

Under Alternative 8, the S/S of the subsurface soils could have been conducted either by excavation followed by S/S, or by in-situ S/S. Under the excavation option, SVE was required if necessary to meet the LDR treatment standards. Under the in-situ S/S option, SVE was required prior to in-situ S/S to the extent necessary to assure that leachate from the solidified mass would not cause exceedance of the ground water CALs.

Sediments in the areas shown in Figure 2, would be excavated and treated on-site by S/S along with the contaminated soils.

Following the S/S treatment, a conduit would be installed in the ditch north of the site, and the area treated by S/S would be covered to meet the requirements of RCRA if the excavation and S/S option was used, otherwise the quality of the site cover would depend on the success of the S/S operation. Ground water use restrictions, access restrictions and long term monitoring were also required.

V. DESCRIPTION OF NEW ALTERNATIVE (ALTERNATIVE 10): GROUND WATER PUMPING, TREATMENT AND DEEP WELL INJECTION WITH SOIL VAPOR EXTRACTION AND SOLIDIFICATION/STABILIZATION

A. Ground Water Pumping, Treatment and Disposal

Like Alternative 8 in the 1989 ROD, the new Alternative 10 includes installation and operation of a ground water extraction system to intercept the contaminated ground water that exceeds the ground water CALs, and installation of a deep underground injection well for disposal of the ground water. As stated before, Alternative 10 proposes to delist extracted ground water by meeting specified maximum allowable concentrations (MACs) in accordance with "A Guide To Delisting of RCRA Wastes For Superfund Remedial Responses" (September 1990) so that the ground water can be injected into the lower Mount Simon formation in compliance with the requirements of RCRA and the Underground Injection Control Program. Although the 1989 ROD did not mention delisting of the ground water, it is probable that this same delisting procedure would have been used under Alternative 8, because Alternative 8 was worded broadly enough to allow this procedure, for the same reasons that it is now being proposed for Alternative 10.

The MACs are defined below. For purposes of compliance with RCRA, treatment to the MACs would take the place of the 1989 ROD's requirement of treatment to RCRA LDR treatment standards prior to the deep well injection.

In accordance with the delisting guidance, a Superfund waste can be delisted if it attains or is treated to attain levels that will not cause exceedance of health based levels (HBLs) used for delisting decisions at a hypothetical receptor well using generic assumptions and an appropriate ground water transport model such as the vertical and horizontal spread (VHS) model. The HBLs are set at concentrations of constituents that provide protection for drinking water usage (primary Maximum Contaminant levels (MCLs) from 40 CFR Part 141 are the HBLs when available, otherwise the HBL is set at the 1×10^{-6} carcinogenic risk level or the level that will not cause a non-carcinogenic risk assuming that 2 liter per day is ingested over a 70 year lifetime). The HBLs for this action are listed in Appendix I. The VHS model is often accepted in the RCRA delisting program for use in estimating the extent to which toxicant leaching from a Subtitle D landfill will be diluted within a surficial aquifer before it reaches a hypothetical receptor well 500 feet down gradient. While these modeling conditions are not designed to fit the conditions for deep well injection at Midco I, they will be used for the delisting demonstration in this ROD Amendment because the delisting determination is generic and is not a site specific determination, and because the results using these modelling conditions are conservative for the disposal in a deep well in this location.

Using the VHS model, the dilution factor derived from the model depends on the volume of the liquid entering the ground water. Because the volume of ground water that will be deep well injected is large, the resulting dilution factor using the model is 6.3. It follows that the Midco II ground water can be delisted if the hazardous substances contained in it are or are treated to be less than 6.3 times the HBLs. The quantity 6.3 times the HBLs will be referred to as the maximum allowable concentrations (MACs). Under Alternative 10, EPA proposes to delist the extracted ground water through this ROD Amendment by providing for treatment of the extracted ground water to below the MACs prior to deep well injection. This delisting satisfies the substantive requirements of 40 CFR 260.20 and 260.22.

The Midco II FS dated February 10, 1989 and the reviews conducted for the FS provide documentation that the ground water can be treated to the MACs. Related information is included in a report entitled Midco I and II Delisting Demonstration, May 16, 1991. In addition, a pilot study shall be conducted using the actual extraction well network. Information from the pilot study will be used to properly design the treatment system to assure that the MACs will be met in the treated ground water. After initiation of the operation, sampling will be conducted on the treated ground water to verify that MACs are being met. This sampling shall be fully defined during the design phase of this project. Since the ground water will be delisted, the deep underground injection well for Alternative 10 will meet the requirements for a non-hazardous injection well rather than requirements for a hazardous injection well. In particular, siting requirements in 40 CFR 146.62 will not be an applicable or relevant and appropriate requirement (ARAR) for Alternative 10.

Some MACs are higher than the LDR treatment standards for the same compound, and some are lower. Generally for the less toxic compounds, the MACs are less stringent than the LDR treatment standards, while for the more toxic compounds the MACs are more stringent. This is summarized for some compounds of concern at Midco I in the following comparison:

COMPOUND	MACS (MG/L)	LDR (MG/L)
acetone	25.2	0.05
chlorobenzene	0.63	0.15
ethylbenzene	4.4	0.05
methylene chloride	0.0315	0.2
methyl ethyl ketone	12.6	0.05
tetrachloroethylene	0.0315	0.079
toluene	6.3	1.12
1,1,1-trichoroethane	1.26	1.05
trichloroethylene	0.0315	0.062
xylene	63	0.05
cyanide	1.26	1.9
chromium	0.63	0.32
lead	0.95	0.04
nickel	0.63	0.44

More compounds are regulated under the delisting procedures than have applicable LDR treatment standards.

The end result of using the delisting procedures is that, while the action is still protective, it may be possible that the MACs can be attained by air stripping alone, while compliance with the LDR treatment standards was expected to require treatment by carbon adsorption in addition to air stripping. However, it is possible that further treatment by carbon adsorption and metal precipitation, or alternative treatment processes will be required to meet the MACs. Waivers of some siting requirements for deep well injection of hazardous wastes (40 CFR 146.62) will not be required once the ground water is delisted.

After the ground water has been delisted and has met the MACs, it will be injected into the lower Mount Simon Formation without further treatment by means of a deep well constructed according to Class I non-hazardous underground injection well requirements if either of the conditions (1 or 2) below is met:

1. Neither the Lower Eau Claire nor the Mount Simon Formations below the well site is a USDW as defined in 40 CFR 144.3.

2. The injection of the ground water will not cause (for each constituent for which a Safe Drinking Water Act Maximum Contaminant Levels (MCL) exists): a) the exceedance of Safe Drinking Water MCLs at the point of entry of the injected ground water into any portion of the Lower Eau Claire Formation or Mount Simon Formation that is a USDW pursuant to 40 CFR 144.3; or b) the exceedance of natural background levels present in any portion of the Lower Eau Clair or Mount Simon Formation that is a USDW pursuant to 40 CFR 144.3--whichever level is least stringent.

Preliminary modelling indicates that injection of the ground water meeting the MACs into the Lower Mount Simon Formation will meet the requirements of 2 above. However, this must be confirmed using information from sampling and testing conducted at the injection well location. If the sampling and testing confirms that the technical premises of the preliminary modelling are reasonably conservative, the delisted ground water meeting the MACs will be injected without further treatment. However, if additional treatment is required to ensure that the requirements of 2 above will be met, sufficient treatment will be provided to ensure that the injection of the ground water will meet the requirements of condition 2 above.

Based on preliminary modelling of the deep well injection, EPA believes that it is unlikely that deep well injection into the lower Mount Simon Formation would cause the exceedance of natural background levels of TDS in the lowermost USDW. However, in the unlikely event that it is determined based on modelling that deep well injection into the lower Mount Simon Formation would cause such an exceedance, this ROD amendment may be reconsidered. This ROD may also have to be reconsidered in the unlikely event that the Lower Mount Simon Formation is a USDW.

Alternative 10 also includes the following:

1. Like Alternative 8, Alternative 10 includes the option of treatment of the extracted ground water for hazardous substances followed by reinjection of the treated ground water into the Calumet aquifer, if the reinjection is conducted in a manner that will not cause spreading of the salt plume.

2. <u>Midco I, Midco II, and the Ninth Avenue Dump may be treated as one site for purposes of permitting and compliance with EPA's Off-site Policy.</u>

   Where two or more noncontiguous facilities are reasonably related on the bases of geography or on the basis of the threat or potential threat to the public health or the environment, the two facilities may be treated as one for purposes of permitting and compliance with EPA's Off-site

Policy (see Section 104(d)(4) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA)). Midco I and Ninth Avenue Dump are located within 200 yards of each other and are 2.5 miles from Midco II. All three facilities are located in the same industrial area on former wetlands that have been partially filled. Midco I and Midco II were part of the same disposal and treatment operation. All three facilities had organic solvents, heavy metals and other hazardous substances disposed on the facility. In addition, Midco I and Midco II have the same requirements for treatment and deep underground injection of the ground water. Therefore, based on the similar geography and threat, the three facilities may be treated as one facility for purposes of permitting and compliance with EPA's Off-site Policy if ground water treatment or deep well injection is combined with Midco II or Ninth Avenue Dump at the Midco I or Midco II sites, or if a pipeline is constructed to transport the extracted ground water (before or after treatment) from Midco I to Midco II or vice versa. Since combined treatment, deep well injection, and transport in a pipeline between facilities would be considered on-site actions, permits and compliance with EPA's Off-site Policy for these actions will not be required since the substantive and administrative requirements of the permits will be incorporated into the review process for this CERCLA action (see Section 121(e) of CERCLA and 40 CFR 300.400(e)).

3. It will be advantageous to place the deep injection well(s) outside of the main areas of contamination from the Midco I and Midco II site because this may lessen the potential for contamination of aquifers below the Calumet Aquifer during the installation of the well, and it will be advantageous to place the deep injection well and ground water treatment facility outside of the main areas of contamination from the Midco I and Midco II sites because that may lessen the potential for conflict with the construction and operations for soil treatment and the site cover. Therefore construction and operation of the deep injection well, and ground water treatment facility on areas in very close proximity but outside of the areas of contamination will be on-site (consistent with the NCP 40 CFR 300.400(e)(1). This will include property at the Indiana Department of Transportation facility located at 7306 West 15th Avenue in Gary, Indiana.

4. The injection well must be constructed, installed, tested, monitored, operated, closed and abandoned in accordance with the substantive requirements and conditions of Subparts A, B, D, and E of 40 CFR 144, and Subparts A, B, and F of and 40 CFR 146.

5. Responses to operational problems and implementation of corrective actions must be in accordance with the substantive requirements of 40 CFR 146.64, 146.67, 144.12, 144.51(d) and 144.55. This includes the requirements for construction, monitoring, reporting, well plugging, and injection well closure as necessary to prevent movement of any contaminant into a USDW, due to operation of the injection well. It also includes implementation of remedial actions to restore any USDW that becomes contaminated as a result of the operation of the underground injection well pursuant to Section 3004(u) and 3008(h) of the 1984 Hazardous and Solid Waste Amendments, and Section 1431 of the Safe Drinking Water Act.

6. Air emissions from an air stripper (or similar device) shall meet the requirements defined in Section V.D.

7. Until the extracted ground water meets the MACs, the extracted ground water shall be managed as a hazardous waste in accordance with the substantive requirements of RCRA.

B. Ground Water Cleanup Action Levels (CALs) and Contingency Measures in Case of Technical Impracticability:

The ground water CALs in Alternative 10 are unchanged from Alternative 8. The ground water CALS are summarized below and calculated in accordance with procedures defined in Appendix II:

> Ground water throughout the Calumet aquifer affected by Midco II that exceed any of the following risk-based levels will be recovered and treated (except as provided for in the procedures defined in Appendix II). The ground water pump, treatment and injection system shall be operated until the hazardous substances throughout the Calumet aquifer affected by Midco II have been reduced below each of these risk-based levels (except as provided for in the procedures defined in Appendix II). Applying the CALs throughout the contaminated plume is consistent with F.R., Vol. 53, No. 245, P. 51426.
>
> Cumulative Lifetime Carcinogenic Risk = 1 X 10^{-5}
> Cumulative Non-carcinogenic Index = 1.0
> Primary Maximum Contaminant Levels (40 CFR 141)
>
> Chronic Ambient Water Quality Criteria for aquatic life (AWQC) multiplied by a factor of 3.6

The ground water CALs have been selected to be protective for use of the aquifer for residential purposes including drinking water consumption, and to protect aquatic life from recharge of ground water affected by the Midco II site.

Based on information in the Administrative Record, EPA believes that a ground water extraction system can attain the ground water CALs. However, the technical practicability of achieving the ground water CALs from an engineering perspective throughout the Calumet aquifer cannot be fully determined until the extraction system has been implemented and the plume response monitored over time. Before concluding whether it is technically impracticable to attain the ground water CALs, modifications to the design and operation of ground water extraction system will be considered, including:

a) discontinuing operation of extraction wells in areas where ground water CALs are attained;

b) alternative pumping at wells to eliminate stagnation points and to increase contaminant reductions;

c) varied or intermittent operation of the system (pulse pumping) to allow aquifer equilibration and encourage adsorbed contaminants to partition into ground water;

d) physical repositioning of extraction wells to capture alternative flow line/transport pathways to increase contaminant reductions;

If a ground water extraction system cannot meet the ground water CALs after ten years of operation and it is determined based on a demonstration that it is technically impracticable from an engineering perspective to attain the ground water CALs even considering the potential changes to the design and operation of the system listed above, the ground water CALs may be changed to the lowest acheivable levels attainable using ground water extraction technology. In addition, the selected remedy may include the contingency measures described below.

a) additional institutional controls to prevent human access to contaminated ground water (institutional controls may include deed restrictions sought voluntarily from owners or compelled to the extent authorized under any applicable local and State laws);

b) low-level pumping as a long-term gradient control or containment measure to prevent recharge of the surrounding wetlands from exceeding the Ambient Water Quality Criteria for aquatic life, and to prevent human access to the ground water exceeding the CALs that are based on drinking water usage.

Any ARARs based on the primary MCLs that exceed the lowest achievable levels attainable by the ground water extraction technology, will be waived by EPA, if EPA in the future makes a finding of technical impracticability.

C. Soil Treatment:

Alternative 10, like Alternative 8, includes provisions for treatment of the subsurface soils by SVE and in-situ S/S. Highly contaminated subsurface soils located above the water table will be treated by solidification/stabilization (S/S) and soil vapor extraction (SVE). Contaminated soils below the water table will be slowly remediated by the ground water extraction system through ground water flushing. Following is a description of the soil treatment requirements in order of the phases for the soil treatment.

1. Ground water pump and treatment:

The pump and treatment system will operate for a period of up to 36 months before direct soil treatment by in-situ S/S or SVE is initiated. The purpose of this is to attempt to reduce volatile organic compounds (VOCs) prior to the direct soil treatment operations.

2. In-situ S/S and SVE:

Following the initial period of pumping and treatment and successful completion of a treatability study and pilot study on S/S and SVE, portions of the subsurface soils shall be treated by SVE and in-situ S/S. At least the soils in the areas and to the depths labeled minimum area for treatment on the map in Figure 2 (which are believed to include the more highly contaminated soils) will be treated first by SVE and then by in-situ S/S. In addition, soils outside the mapped areas will be sampled to determined whether further SVE and S/S will be conducted.

Sampling will be conducted as defined in Appendix III to determine the full extent of soil treatment outside of the mapped areas. Using these sampling results, the cumulative risks at each sample location will be calculated for the ingestion, dermal contact, and inhalation modes of exposure using the procedures outlined in the Appendix IV. Based on these results, treatment by SVE and S/S will be conducted outside of the minimum areas to be treated delineated in Figure 2 if the following soil treatment action levels are exceeded:

Soil Treatment Action Levels:

cumulative lifetime carcinogenic risk =5×10^{-4}
cumulative chronic non-carcinogenic risk index=5.0
lead concentration (mg/kg) =1000

These action levels were selected taking into account treatment of the minimum area for treatment identified in Figure 2, site characteristics and hazardous substances, and current EPA regulations, policies and guidance.

If these action levels are exceeded for a sample, the soil within the 20 foot square or 60 foot square (if the square is not subsampled) represented by this sample will be treated to a depth of 8 feet, unless sampling indicates that the soil does not exceed the action levels at depths between 4 and 6 feet, in which case the soil will be treated to a depth of 4 feet.

The treatment will be first by SVE and then by S/S unless the exceedance of the Soil Treatment Action Level can be corrected by removing VOCs, in which case only SVE need be used.

In Area C identified on Figure 2, in lieu of conducting SVE and in-situ S/S, the soil may be excavated and consolidated within the boundaries of the minimum area for treatment indicated on Figure 2, and the excavated soil treated by in-situ S/S along with the soils in such areas if the following conditions are met: 1) it is demonstrated that VOC emissions from the excavation and consolidation will not exceed the criteria for air emission in Section V.D; 2) the exceedance of the Soil Treatment Action Levels cannot be corrected by SVE; and 3) the total quantity excavated is limited.

If the sample from the soil pile (as shown on Figure 2 exceeds the Soil Treatment Action Levels, this pile will be spread onto other areas that require S/S and treated by in-situ S/S along with the soil below it.

If the treatability study and a pilot study show that the equipment used for the in-situ S/S has potential to achieve a 90% reduction in the soil concentrations of the following VOCs: benzene, methylene chloride, trichloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, 1,1-dichloroethylene, trans-1,2-dichloroethylene, and vinyl chloride, and that the air emission requirements in Section V.D can be satisfied using the S/S equipment, SVE could be conducted using the same equipment and air pollution controls as used for the S/S.[1] In this case, the fresh air (or possibly heated air or steam) would be injected into the soil while the blades of the auger mix the soil and while the contaminated air is drawn off with the induced draft fan into an air pollution control device. Following the SVE operation, the same soil that was treated by SVE could be treated by S/S. The SVE must continue until there is a 97% reduction in total VOCs (but not less than three times the ambient level) in the off-gas prior to any air pollution control device during

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[1] In conjunction with the treatability study on S/S discussed in this section, EPA is conducting treatability tests simulating use of in-situ equipment for conducting the SVE.

vigorous agitation of the soils. Air emissions must be controlled in accordance with the requirements defined in Section V.D.

Alternatively, SVE would be conducted as a separate operation from S/S using vacuum and air injection pumps connected by pipes to a series of air injection and extraction wells. In addition, a low permeability cover may be required over the area being treated. The air pressure gradient would draw VOC-contaminated air from the soil pores. The removed VOCs would be required to be processed in a liquid-vapor separator and the air emissions would have to meet the requirements in Section V.D. The SVE must continue until treatment by in-situ S/S can be conducted in compliance with the air emission requirements in Section V.D, and there is a 97% reduction in total VOCs in the soils being treated (but not to a concentration less than ten times the detection limit of each constituent).

It is anticipated that the in-situ S/S system would utilize a crane-mounted mixing system. The mixing head would be enclosed in a bottom-opened cylinder to allow closed system mixing of the treatment chemicals with the soil. The bottom-opened cylinder would be lowered onto the soil and the mixing blades started, moving through the depth in an up and down motion, while chemicals are introduced. An induced draft fan would draw the contaminated air from the container into an air pollution control device and exhaust the treated air to the atmosphere. Because there is potential for causing substantial VOC emissions, the contaminated air must be treated by carbon adsorption or by another treatment process that is equally effective, and meet the criteria in Section V.D. At the completion of mixing at one location, the blades would be withdrawn and the cylinder removed. The cylinder would then be operated adjacent to and overlapping the previous cylinder. This would be repeated until the entire area is treated.

The formulations and ratios of reagents used for the S/S process will be established to provide permanent treatment, substantially reduce release of contaminants due to leaching, substantially reduce permeability, and to assure long term durability of the solidified material.

EPA is currently undertaking a treatability study on approximately ten binders being considered for use in S/S at Midco II. Those binders selected for use at the Facility must meet the below listed Minimum Performance Standards. In addition, based on the results of the treatability study, EPA may establish Final Performance Standards that are more stringent than or supplementary to the Minimum Performance Standards.

MINIMUM PERFORMANCE STANDARDS

STABILIZATION OF METALS

Using the Synthetic Precipitation Leaching Procedure (SPLP) test (method 1312 of SW-846 using extraction fluid #1) the following percentage reduction in the leachate concentrations shall be attained using the formula:

$SPLP_{treated}$ X DF / $SPLP_{raw\ waste}$ X 100

$SPLP_{treated}$ = concentration of constituent (i) in the leachate from sample treated by S/S

DF =dilution factor = (weight of waste being treated + weight of S/S blend added to that waste) / (weight of waste being treated)

$SPLP_{raw\ waste}$ = concentration of constituent (i) in the leachate from untreated waste sample

Alternatively, the $SPLP_{treated}$ can be reduced to the following Concentration Limits. If a parameter in the untreated sample is below its Concentration Limit listed below, no further reduction in leachate concentration is required, although the treated sample should not increase in leachate concentration to above the Concentration Limit.

CONSTITUENT	PERCENTAGE REDUCTION	CONCENTRATION LIMIT (ug/l)
arsenic	90	50[2]
barium	90	2000[2]
cadmium	95	5[2]
chromium	95	100[2]
copper	95	43[3]
lead	99	15[2]
nickel	95	100[2]

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[2] These values are from the final or proposed Primary Maximum Contaminant Standards, 40 CFR Part 143.

[3] This value equals the 4-day average fresh water ambient water quality criteria for copper for protection of aquatic life times 3.6 at a hardness equal to 100 mg/l. The 4-day average fresh water ambient water quality criteria is from Ambient Criteria for Water 1986, EPA 440/5-86-001. The factor 3.6 is the estimated factor for dilution of the ground water by the surface water at Midco II.

vanadium	90	233[4]
zinc	90	1150[5]

STABILIZATION OF ORGANICS

Using total waste analyses (using methylene chloride extraction for semivolatile organics, and methanol extraction for volatile organics), a 50% reduction in concentrations shall be attained based on total waste analyses of the sample of untreated waste ($TWA_{raw\ waste}$) and the sample treated by S/S ($TWA_{treated}$) calculated in accordance with the formula: $TWA_{treated}$ X DF / $TWA_{raw\ waste}$ X 100 for the following compounds: anthracene; bis(2-ethylhexyl) phthalate; ethyl benzene; fluoranthene; naphthalene; phenanthrene; phenol; toluene; xylene.

PHYSICAL TESTS

i. Using method EPA 9100 from SW-846 (constant head, tri-axial with back pressure and air free water), the hydraulic conductivity of the material treated by S/S shall be less than or equal to 1 X 10^{-7}.

ii. Using method ASTM D1633-84, the unconfined compressive strength of the material treated by S/S shall be greater than 50 psi.

iii. Using ASTM D4843, the wet-dry durability test on the material treated by S/S shall result in less than a 10% weight loss.

iv. Using ASTM D4842, the freeze-thaw durability test on the material treated by S/S shall result in less than a 10% weight loss.

D. Requirements for Air Emissions:

1. Air emissions from the S/S system and from any SVE using the S/S system shall be controlled using carbon adsorption or

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[4] This value was calculated for a non-carcinogenic risk index equal to unity due to vanadium alone using the reference dose and procedures outlined in Appendix II.

[5] This value is equal to the 24-hour average fresh water ambient water quality criteria for zinc for protection of aquatic life times 3.6. The ambient water quality criteria value is from Quality Criteria for Water 1986, EPA 440/5-86-001. The factor 3.6 is the estimated dilution of ground water by the surface water at Midco II.

another treatment process that is equally effective.

2. Air emissions from the (i) ground water treatment, (ii) the soil S/S, (iii) SVE using the S/S system, or (iv) SVE separate from the S/S system shall be controlled to the extent necessary to assure that each operation does not have the potential to result in exposures to a hypothetical resident located at the Facility boundary that would cause an estimated cumulative, incremental, lifetime carcinogenic risk exceeding 1.0×10^{-7}, or from causing a non-carcinogenic risk index greater than 1.0. The risk levels will be calculated in accordance with the procedures outlined in Attachment V. Ambient air monitoring and air emission monitoring shall be conducted to determine whether this criteria is being met. The air emission monitoring data shall be input into an air model to estimate the potential exposure rates in order to determine whether controls such as carbon adsorption or other controls will be required for the emission sources. For the soil S/S system and SVE using the S/S system such controls (if any) shall be in addition to the controls required by paragraph D.1.

   Since there are multiple operations that cause air emissions as well as fugitive sources that can not be controlled, each operation that can be controlled must be controlled to the 1×10^{-7} risk level to assure that the total risk will be less than 1×10^{-6}. In addition, since some nearby residents and workers may have already been exposed to the chemicals at Midco I during its operation, it is imperative that this emission criteria be met.

3. In addition to the requirements of paragraphs 1 and 2 above, if cumulative emissions of VOCs as defined under the Clean Air Act from all operations at the Facility other than excavation exceed 3 pounds per hour, carbon adsorption or another technology that is equally effective shall be used to control air emissions from the ground water treatment system and all SVE.

4. Air emissions must be monitored and controlled to the extent necessary to comply with applicable OSHA regulations, and applicable State of Indiana air regulations, including Title 326 Indiana Administrative Code 6-4 for fugitive dust.

5. The effective stack height for air emissions from the ground water treatment, S/S, and SVE must be at least 30 feet above ground level.

6. For any carbon adsorption unit that is being or has been used for control of air emissions for the ground water treatment system, the S/S system or the SVE conducted with

the S/S system, access to the unit shall be restricted within 3 feet of the unit. For any carbon unit that is being or has been used for control of air emissions for SVE conducted as a separate operation from the S/S, access to the unit shall be restricted within 10 feet of the unit.

E. Handling and Treatment of Surface Sediments and Soils Beneath the Sediments:

The surface sediments in areas outlined in Figure 2 will be excavated to a depth that will leave the soils below the excavation less than the following soil CALs:

cumulative lifetime carcinogenic risk = 1.0×10^{-5}
cumulative chronic non-carcinogenic index= 1.0

These sediments and soils will be consolidated on-site and treated by S/S along with the subsurface soils.

F. Site Cover, Access Restrictions, Long Term Monitoring, and Further Remedial Actions:

For Alternative 10, a cover shall be installed over the Minimum Cover Boundary outlined in Figure 2 following the soil treatment outlined in Section II.C. above. This cover will be extended over Area C shown in Figure 2 if the results of sampling in that area indicate that the area-wide risk using the arithmetic average of the soil sampling results (see Appendix III) exceeds the soil CALs in Section V.E using the risk calculation procedures in Appendix IV. This cover shall meet or exceed the requirements for RCRA Subtitle C closure. This cover shall be designed to provide long term minimization of infiltration, minimize maintenance, promote drainage, and minimize erosion. These requirements will be deemed satisfied by a cover which consists of multiple layers including:

- a top layer consisting of a vegetated component, and a 24 inch soil layer comprised of topsoil and/or fill soil with a surface slope of at least 3 percent and not more than 5 percent;
- a geofilter in between the upper layer of soil and the middle layer of drainage material;
- a drainage layer of either 12 inches of soil with a minimum hydraulic conductivity of 1.0×10^{-2} cm/sec or a geosynthetic material with equivalent performance characteristics, and with a final bottom slope of at least 3 percent;

- a low permeability layer with 24 inches of compacted soil with a maximum in place saturated hydraulic conductivity of 1.0×10^{-7} cm/sec.; and

- Details of the site cover design shall also be consistent with the EPA Guidance entitled TECHNICAL GUIDANCE DOCUMENT EPA/530-SW-89-047 (July 1989) FINAL COVERS ON HAZARDOUS WASTE LANDFILLS AND SURFACE IMPOUNDMENTS.

Access restrictions will be imposed including installation of a six foot chain link fence, warning signs and possible deed restrictions. Deed restrictions limiting development and the placement of new wells will be sought voluntarily from owners or compelled to the extent authorized under any applicable local and State laws.

As in Alternative 8, the final site cover and access restrictions must be consistent with hazardous waste landfill closure requirements of the RCRA (40 CFR 264.111, 264.116, 264.117, and 264.310).

Following attainment of ground water CALs, ground water monitoring will continue for at least 15 years. The ground water monitoring must be consistent with the substantive requirements for ground water monitoring in 40 CFR 264.98, and where necessary 264.98(g) and 264.99.

If a ground water CAL is exceeded during this period due to a release from the Midco II site, the site cover shall be upgraded or repaired as needed; operation of the ground water pump treatment and underground injection system will be reinitiated; and steps will be taken to meet the ground water CALs. These actions must be consistent with the substantive requirements of 40 CFR 264.100 (except that the relevant ground water protection standards shall be the ground water CALs as defined in this ROD rather than concentration limits specified pursuant to 40 CFR 264.92).

G. Other ARARs and Applicable Regulations included in Alternative 8:

1. The requirements of Executive Order 11990, Protection of Wetlands, 40 CFR 6, Appendix A; and Clean Water Act Section 404, 40 CFR 230 and 231 shall be met. Contaminated wetlands will be replaced off-site at an appropriate ratio. This may be undertaken as part of an agreement between PRPs and the natural resources trustees.

2. The area of remediation must comply with the Migratory Bird Treaty Act.

3. Any residuals (such as spent activated carbon) from the ground water or soil treatment processes shall be considered a RCRA hazardous waste.[6] Therefore, these residuals must be stored on site, and disposed of or treated on-site or off-site in accordance with RCRA regulations, including the LDRs in 40 CFR 268, and 40 CFR 264 Subpart X for residues that are sent off site to be regenerated. It is possible that metals sludge from the ground water treatment process could be treated by S/S on-site, if Land Disposal Restriction requirements are met.

Any debris (such as tree trunks or crushed drums that can not be properly incorporated into the solidified mass) encountered during the S/S process or during excavations must be properly handled and stored on-site, and properly disposed of off-site or contained under the final cover if degradation of the material will not cause site cover maintenance problems. Any containerized or drummed liquid wastes encountered during the remedial actions shall be properly stored and properly disposed of off-site.

Any off-site transportation, treatment, or disposal must be in compliance with DOT and RCRA requirements, and EPA's Off-Site Policy.

VI. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This Section updates the evaluation in Section IX of the 1989 ROD. The 1989 ROD justified the elimination of alternatives other than Alternatives 7 and 8. It is now known that Alternative 7 should not be further considered. Therefore, this evaluation will only compare Alternative 8 to the new Alternative 10.

The following table compares some of the critical elements of Alternative 10 with Alternative 8.

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[6] The contaminated ground water and soil contains the following RCRA listed hazardous wastes: F001; F002, F003, F005, F007, F008, F009.

AREA OF COMPARISON	ALTERNATIVE 8	ALTERNATIVE 10
MEANS TO ADDRESS GROUND WATER CONTAMINATION	GROUND WATER EXTRACTION SYSTEM	NO CHANGE
GROUND WATER CALS	CR[7] = 1×10^{-5} NCRI[8] = 1.0 PMCLS[9] AWQC[10] X 3.6	NO CHANGE
MEANS OF GROUND WATER DISPOSAL	DEEP WELL INJECTION, OR INJECTION INTO THE CALUMET AQUIFER IN A MANNER THAT WILL NOT SPREAD THE SALT PLUME	NO CHANGE
GROUND WATER TREATMENT REQUIREMENTS FOR COMPLIANCE WITH RCRA PRIOR TO DEEP WELL INJECTION	RCRA LAND DISPOSAL RESTRICTIONS (BEST DEMONSTRATED AVAILABLE TECHNOLOGY) (LDRs)	RCRA DELISTING (6.3 TIMES HEALTH BASED LEVELS[11], MACs)

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[7] Cumulative Lifetime Carcinogenic Risk calculated for each ground water sampling location using the assumptions and procedures in Appendix II.

[8] Cumulative non-carcinogenic risk index calculated for each ground water sampling location using the assumptions and procedures in Appendix II,

[9] Primary Maximum Contaminant Levels (40 CFR 141).

[10] Chronic Ambient Water Quality Criteria for aquatic life. The AWQC values used in this ROD Amendment are listed in Appendix II.

[11] Health-Based Levels (HBLs) are concentrations of hazardous constituents that are used in the RCRA program for making decisions regarding whether a waste that is regulated as a hazardous waste under RCRA because it is listed under 40 CFR Part 261, Subpart D can be delisted so that it is no longer regulated as hazardous waste under RCRA because it is listed. In a delisting petition, it must be demonstrated that the HBLs will be met in a hypothetical receptor well. The HBLs are set at concentrations of constituents that provide protection for drinking water usage (Maximum Contaminant Levels from 40 CFR Part 141 are the HBLs when available, otherwise the HBL is set at the 10^{-6} risk level or the level that will not cause a non-carcinogenic risk assuming that 2 liters per day is ingested over a 60 year lifetime). See Section V.A.

MEANS TO ADDRESS PRINCIPAL THREATS FROM SOILS	TREAT BY S/S (AND SVE IF NECESSARY TO PROTECT GROUND WATER). S/S AND SVE WILL PROVIDE PERMANENT TREATMENT OF HIGHEST CONTAMINATED AREAS LOCATED ABOVE AND BELOW THE WATER TABLE. S/S MATERIAL WILL BE PROTECTED WITH A SITE COVER, AND MONITORED AND MAINTAINED OVER LONG TERM.	NO CHANGE EXCEPT SVE WILL BE REQUIRED WHERE S/S IS CONDUCTED.
MEANS TO ADDRESS RISKS FROM SOILS THAT ARE ABOVE THE WATER TABLE AND THAT PRESENT A LOW LONG TERM THREAT VIA GROUND WATER AND DIRECT CONTACT	TREAT BY S/S (AND POSSIBLY SVE). LONG TERM MAINTENANCE & MONITORING OF THE S/S WOULD BE REQUIRED. THIS WOULD PROVIDE SOME PERMANENT TREATMENT, REDUCE LEACHING TO GROUND WATER, AND REDUCE DIRECT CONTACT THREAT BY S/S AND COVER OVER THE S/S.	CONSTRUCT A RCRA COVER. LONG TERM MAINTENANCE AND MONITORING OF THE COVER WOULD BE REQUIRED. AS LONG AS COVER IS MAINTAINED WILL SUBSTANTIALLY REDUCE LEACHING AND THE DIRECT CONTACT THREAT BY COVERING WITH A FIVE FOOT THICK COVER.
SOIL TREATMENT ACTION LEVELS	CR = 1×10^{-6} NCRI = 1.0	AT A MINIMUM TREAT MINIMUM AREA FOR TREATMENT IN FIGURE 2. OUTSIDE THIS AREA: CR = 5×10^{-4} NCRI = 5.0
ESTIMATE OF QUANTITY OF SOIL TO BE TREATED	35,000 CUBIC YD.[12]	18,300 CUBIC YD.[13]

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[12] This estimate is probably biased high because it is partially based on unreliable arsenic data (see Section III).

[13] This is a very rough estimate that assumes 50% more than the minimum amount will be treated as a result of further sampling.

PERFORMANCE STANDARDS FOR S/S	FOR IN-SITU S/S ASSURE ATTAINMENT OF GROUND WATER CALS.	SPECIFIC PERFORMANCE STANDARDS FOR BOTH INORGANICS AND ORGANICS BASED ON TESTS ON S/S
CRITERIA FOR SVE	CONDUCTED PRIOR TO S/S TO THE EXTENT NECESSARY TO MEET GROUND WATER CALS BASED ON MODELLING	WILL DEFINITELY BE CONDUCTED IN ALL AREAS BEING S/S'ed TO REDUCE VOCs IN SOILS BY 97% IF CONDUCTED AS A SEPARATE OPERATION, AND BY 90% OF CERTAIN VOCs IF CONDUCTED WITH IN SITU S/S EQUIPMENT.
MEANS TO ADDRESS RISKS FROM SOILS BELOW THE WATER TABLE THAT WILL NOT BE TREATED BY S/S	SOILS WILL GRADUALLY BE REMEDIATED BY THE GROUND WATER EXTRACTION OPERATION.	NO CHANGE
MEANS TO ADDRESS CONTAMINATION OF SURFACE SEDIMENTS	EXCAVATION AND ON-SITE S/S	NO CHANGE
SOIL/SEDIMENT CALS	CR = 1×10^{-5} NCRI = 1.0	NO CHANGE
AIR EMISSIONS CRITERIA	CR = 10^{-7} TO NEAREST RESIDENTS AND WORKERS FOR EACH EMISSION SOURCE, TO ASSURE ATTAINMENT OF CR = 10^{-6} OVERALL.	SAME AS ALT. 8 CRITERIA, PLUS NO GREATER THAN 3 LBS PER HOUR, AND EMISSION CONTROLS REQUIRED ON S/S SYSTEM.
SITE COVER SPECIFICATIONS	FOR IN-SITU S/S DEPENDED ON RESULTS OF S/S	CONSISTENT WITH RCRA SUBTITLE C
ACCESS RESTRICTIONS, DEED RESTRICTIONS, LONG TERM MONITORING	REQUIRED	NO CHANGE

AN ESTIMATE OF THE PRESENT WORTH	$19 MILLION[14]	$13 MILLION[15]

In Alternative 10 the extracted ground water must meet the MACs prior to deep well injection rather than meet the LDRs, which were expected to be used in Alternative 8. Treatment to the MACs is as protective or more protective than treatment to the LDRs because generally the MACs are more stringent for the more toxic compounds. However, treatment to the LDRs would be more difficult. Modelling will be conducted to confirm that injection of extracted ground water meeting the MACs (into the lower Mount Simon Formation) will be protective of drinking water aquifers. In Alternative 10, treatment beyond the MACs will be conducted if necessary to be protective of drinking water aquifers. See Section V.A.

In Alternative 10, SVE will definitely be conducted as described in Section V.C.2 prior to the treatment by S/S. In Alterative 8, SVE would be been required only if necessary to assure that leaching from the S/S material would not cause an exceedance of the ground water CALs.

In Alternative 10, areas of the site having soils located above the water table with calculated risks below CR = 5 X 10^{-4} and NCRI = 5.0, will be covered consistent with RCRA Subtitle C requirements without being treated by S/S or SVE. However, the site cover will not be installed until the ground water extraction system has operated for a few years. Such operation may further reduce VOCs prior to installation of the site cover. EPA considers that following treatment of the highly contaminated areas, the site cover will provide overall protection to CR = 1 X 10^{-6} and NCRI =1.0 levels. The cover will be multi-layered and five feet thick. The cover will substantially reduce the infiltration into the soil and, therefore, reduce the contamination of the ground water. It will provide an effective barrier to direct contact while it is maintained. During its operation any contaminants leached from the soils would be recovered by the ground water extraction system. In the unlikely event that long term leaching causes the ground water to exceed the ground water CALs, the ground water extraction system would continue to operate or be reactivated so that protection from any

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[14] This is a very rough cost estimate from the Feasibility Study and is likely biased high because it was partially based on unreliable arsenic data for the extent of soil treatment (see Section III).

[15] This is a very rough estimate based on the assumption that 50% more than the minimum amount of soil is treated, that SVE increases the cost of S/S by 50%, and certain ground water treatment assumptions.

ground water threat is assured.

In Alternative 8, compared to Alternative 10, VOCs in the lower contaminated areas may have been further reduced by operation of the SVE system, and the mobility of metals and other organics reduced by the S/S. However, as mentioned before for Alternative 10, any additional leachate from the soils would be recovered in the ground water extraction system so that protection from any ground water threat is assured. Alternative 8 may provide some additional protection compared to Alternative 10 from the direct contact threat in case the site cover is severely disturbed in the future because the low contaminated soils would be treated by S/S. However, it appears to be very unlikely that a five foot site cover would be so completely removed, and even if it was Alternative 10 provides for treatment of the most highly contaminated soils so that only the lesser contaminated soils would remain.

Since the time of the 1989 ROD, specialists in S/S treatment have developed specific tests for testing the permanence of S/S treatment for inorganics and organics. Therefore, these tests have been incorporated into Alternative 10 of this ROD Amendment.

Because of the difficulty in reasonably modelling the impact of VOCs on the ground water, it was decided to simply require SVE to provide substantial removal of the VOCs prior to treatment by S/S. The criteria is less stringent for conducting SVE with the in-situ S/S equipment compared to using a separate operation because it is much more difficult to monitor the removal of VOCs from the soils using the in-situ S/S equipment because the soil is treated by S/S immediately after the SVE operation.

The three pounds per hour limit on air emissions for Alternative 10 was added to be consistent with EPA's policies on control of photochemical oxidants. Because the emissions from the in-situ S/S operation could be substantial and unpredictable, it was decided that air emissions from the in-situ S/s system must be controlled.

A. Threshold Criteria: protection of human health and the environment; and attainment of applicable, and relevant and appropriate requirements (ARARs):

Both Alternatives 8 and 10 would be protective of human health and the environment, by extraction and treatment of the ground water, by treating the highly contaminated soils and sediments, and by cover installation. Both alternatives are expected to protect aquatic life in surrounding surface waters from hazardous substances from the Midco I site including attainment of Ambient

Water Quality Criteria for aquatic life[16] and restore the Calumet aquifer to drinking water quality[17] including attaining the Primary Maximum Contaminant Levels.

Both include deep well injection of the treated ground water (or reinjection into the Calumet aquifer in a manner that will not spread the salt plume). Both would comply with the RCRA LDRs prior to injection of the ground water: Alternative 8 by treating to LDR treatment standards; and Alternative 10 by delisting. Both include soil treatment by S/S and SVE. Both include excavation and S/S of contaminated sediments. Finally both include installation of a cover and site access restrictions.

While Alternative 8 includes treatment of a greater volume of soils than Alternative 10, the level of protection provided by Alternative 10 is not considered to be significantly different from the level of protection provided by Alternative 8 because low level contaminated soils will be contained by an effective cover that is consistent with RCRA Subtitle C closure requirements, and access to the site will be restricted. Furthermore, the additional soil treatment in Alternative 8 would not allow unrestricted future usage of the site because the S/S material and site cover would require long term monitoring and maintenance.

Under Alternative 10, if it is determined that it is technically impracticable from an engineering perspective to attain the ground water CALs by a ground water extraction system, contingency measures may be implemented (see Section V.B). These contingency measures will maintain protection of human health and the environment by institutional controls, by attaining the lowest achievable levels in the ground water, and by containment measures, as appropriate. If it is demonstrated that some primary MCLs, which are used in the ground water CALs, can not be attained in some portions of the aquifer due to technical impracticability, these ARARs will be waived provided that appropriate contingency measures are implemented.

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[16] Except possibly for the Ambient Water Quality Criteria for solids (dissolved) and salinity, for which a ground water CAL is not being applied since adjacent sources of this contaminant exist and are not being remediated.

[17] Except for total dissolved solids, chlorides, sodium and potassium, for which a ground water CAL is not being applied since adjacent sources of these contaminants exist and are not being remediated.

B. Balancing Criteria: long term effectiveness and permanence; reduction in toxicity mobility and volume; short-term effectiveness; implementability; and cost:

The short term effectiveness of Alternative 10 is expected to be essentially the same as Alternative 8. The pump, treatment and injection system will be installed first in Alternative 10. Access to the site will be controlled; so the delay in the soil treatment will not cause any health impact. For both Alternatives, VOC air emissions during the remedial actions may be the short term impact of most concern. These emissions should be controllable using carbon absorption or another treatment process that is equally effective.

Both Alternative 8 and 10 employ treatment technologies--ground water extraction and treatment, S/S, and SVE--that are expected to perform to substantially reduce the toxicity, mobility, or volume of hazardous substances at the Midco II site. Both Alternatives 8 and 10 provide for long-term effectiveness and permanence through soil treatment by S/S and SVE, by ground water extraction and treatment, deep well injection of treated ground water, site cover, long term maintenance, and ground water monitoring.

While Alternative 10 will result in treatment of a lower volume of soils than Alternative 8, Alternative 10 provides for a reduction of the toxicity and mobility of the more highly contaminated soil at Midco II. Furthermore, the additional soil treatment in Alternative 8 will not result in a reduction in the long term monitoring or maintenance requirements nor allow unrestricted future usage of the site. In the context of conditions at this particular site, the use of engineering controls such as site cover coupled with long-term (permanent) maintenance and monitoring of the site cover and ground water to address any remaining risks posed by soils with low level contamination is consistent with EPA's expectations for remedy selection regarding treatment of principal threats and use of controls for lower level threats as set forth in 40 CFR

300.430(a)(1)(iii) of the National Contingency Plan promulgated on March 6, 1990.

Alternatives 8 and 10 are identical in implementability in most respects, and no major problems in implementation are expected.

Very rough estimates of the costs of Alternative 8 and Alternative 10 in millions of dollars are compared in the following Table.

	CAPITAL	ANNUAL O&M	PRESENT WORTH
Alternative 8	12	0.73	19
Alternative 10	9	0.66	13

Typically cost estimates in the Feasibility Study are expected to have an accuracy of plus 50% to minus 30%. There is more than the usual amount of uncertainty in the costs for both Alternatives 10 and 8. However, Alternative 10 may be considerably less expensive than Alternative 8 primarily because most likely less soil will be treated, ground water treatment requirements may be reduced, and the sequence of implementation of remedial actions (see Sections V.C.1, V.C.2 and V.F) will be changed. Because the risk reduction and reduction in toxicity or mobility of the additional treatment required in Alternative 8 is small, it is not considered to be cost effective compared to Alternative 10.

Time for completion of the project depends on how fast the ground water CALs are attained. All other portions of the project are expected to be completed in no more than six years.

C. Modifying Criteria: support agency acceptance; community acceptance:

The Indiana Deparment of Environmental Management, involved in the process that lead to this ROD Amendment, formally concurred with U.S. EPA's remedy selection in this ROD Amendment in a letter dated January 6, 1992.

U.S. EPA prepared a Draft Proposed ROD Amendment and a fact sheet explaining the ROD Amendment, and held a public comment period on the proposed Amendments from February 7 through March 14, 1992. The Proposed Plan was mailed to approximately 300 persons in the communities near Midco II. The Draft Proposed ROD Amendment was available for review in the Hammond Department of Environmental Management and at the Gary Public Library. The Administrative Record for this action was available for review at the Region V, U.S. EPA, Chicago office. A public meeting was held on the proposed ROD Amendment on February 20, 1992.

One comment on the proposed ROD Amendment was received during the public meeting, and written comments were received from the Grand Calumet River Task Force and from U.S. Reduction Co. U.S. EPA's full response to these comments are included in the Responsiveness Summary, which is Appendix VI of this ROD Amendment, and is an integral part of this ROD Amendment.

The comment from the Grand Calumet River task force expressed concern about the public and environmental protectiveness of the deep well injection operation and recommended use of a desalination plant for final disposal of the salt contaminated ground water, instead of deep well injection. In response to these comments, U.S. EPA describes the importance of the cost effectiveness of the remedy, and the precautions that will be taken to assure that the deep well injection process is conducted safely and in a manner that will be protective of human health and the environment.

The comment at the public meeting had to do with the completeness of the remedy apparently related to soil treatment by solidification/stabilization and disposal of ground water by deep well injection. In response to this comment U.S. EPA explained the basis for its belief that treatment by solidification/ stabilization would be effective, and that the deep well injection process would be conducted in a manner that will be protective of human health and the environment.

The comments from U.S. Reduction had to do with the completeness of the Administrative Record for the risk assessment, selection of deep well injection, and selection of solidification/ stabilization. U.S. Reduction also recommended that additional investigations be conducted. In response to these comments, U.S. EPA described in detail how the Administrative Record supports the risk assessment, and the selection of the deep well injection procedure, and solidification/stabilization.

No changes were made to this ROD Amendment following review of the public comments other than incorporating this section of the Summary for Record of Decision Amendment and the Responsiveness Summary, indicating that the State of Indiana has concurred in the remedy selection, and removing a reference in the Declaration that the administrative record would be updated at a later date to address public comments.

VI. STATUTORY DETERMINATIONS

Based on the description and evaluation of alternatives in the ROD Amendment, EPA selects Alternative 10 for implementation at Midco II. This Alternative is described in Section IV of this ROD Amendment.

Alternative 10, including the provision of contingency measures in case it is technically impracticable to attain ground water CALs, will be protective of human health and the environment, and will be cost effective. ARARs shall be attained except that some primary MCLs will be waived in portions of the Calumet aquifer, provided that it is demonstrated that it is technically impracticable from an engineering perspective to attain these standards, and that appropriate contingency measures are implemented. The remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The State of Indiana concurs in the selected remedial actions.

Because the remedy will result in hazardous substances remaining on-site above health-based levels that would allow for unrestricted use, a review will be conducted within five years after commencement of remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment.

APPENDICES TO MIDCO II RECORD OF DECISION AMENDMENT

I. HEALTH BASED LEVELS FOR RCRA DELISTING FOR MIDCO II

II. PROCEDURES FOR CONDUCTING RISK BASED CALCULATIONS AND DETERMINATION OF GROUND WATER CLEANUP ACTION LEVELS AT MIDCO II

III. PROCEDURES FOR DETERMINING THE EXTENT OF TREATMENT FOR SOILS AND DEBRIS AT MIDCO II

IV. PROCEDURES FOR CONDUCTING RISK BASED CALCULATIONS FOR THE EXTENT OF SOIL TREATMENT AT MIDCO II

V. PROCEDURE FOR CONDUCTING RISK CALCULATIONS FOR AIR EMISSIONS

VI. RESPONSIVENESS SUMMARY

GLOSSARY

CALs : cleanup action levels.

delisting : If a waste fits the definition for a listed hazardous waste under RCRA, it can only be removed from regulation under RCRA by meeting the delisting requirements pursuant to 40 CFR 260.22.

EPA : United States Environmental Protection Agency.

F&W : United States Fish and Wildlife Service.

HBLs : health based levels used by EPA to make delisting decisions.

IDEM : Indiana Department of Environmental Management.

LDR : Land Disposal Restrictions under RCRA.

MACs : Maximum allowable concentrations. This term is defined in "A Guide to Delisting of RCRA Wastes for Superfund Remedial Responses" (9347.3-09FS) to be the maximum concentration in a waste or in a leachate from a waste that will still allow the waste to be delisted.

MCLs : Maximum Concentration Limits as defined under the Clean Water Act (40 CFR 141 and 143.

mg/kg : concentration of a constituent in soil expressed in milligrams of the constituent per kilogram of soil.

no migration petition: A petition submitted to EPA pursuant to 40 CFR 268.6 and 148 Subpart C that must demonstrate that deep well injection of a waste will not cause migration out of the injection zone within 10,000 years. EPA approval of such a petition is required prior to deep well injection of a hazardous waste restricted from land disposal under the LDRs without treatment to the LDR treatment standards.

PCBs : polychlorinated biphenols

PRC : Planning Research Corporation, Chicago, Illinois.

PRPs	:	potentially responsible parties. These generally include the site owners, site operators and entities that disposed of or arranged for disposal of wastes containing hazardous substances at the site.
RCRA	:	Resource Conservation and Recovery Act.
RI/FS	:	Remedial Investigation/Feasibility Study.
ROD	:	Record of Decision.
SVE	:	soil vapor extraction treatment.
S/S	:	solidification/stabilization treatment.
USDW	:	underground source of drinking water as defined in 40 CFR 144.3.
VOCs	:	volatile organic compounds.
VHS	:	Vertical Horizontal Spread model for modelling spread of contamination in the ground water.

APPENDIX I

HEALTH-BASED LEVELS AND SOLUBILITIES FOR CONSTITUENTS OF CONCERN IN DELISTING PETITIONS
July 1991

CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
83 32 9	Acenaphthene	2	26	3.42	6
67 64 1	Acetone	4	4	$1.0x10^{6}$	6
75 05 8	Acetonitrile	$2x10^{-1}$	4	$1.0x10^{6}$	6
98 86 2	Acetophenone	4	4	$5.5x10^{3}$	15
107 02 8	Acrolein	$5x10^{-1}$	37	$5x10^{5}$	2
79 06 1	Acrylamide	Treatment Technique	42	$>1x10^{6}$	15
107 13 1	Acrylonitrile	$6x10^{-5}$	5	$7.9x10^{4}$	6
309 00 2	Aldrin	$2x10^{-6}$	5	$1.8x10^{-1}$	6
62 53 3	Aniline (Benzeneamine)	$6x10^{-3}$	5	$3.5x10^{4}$	2
7440 36 0	Antimony	$1x10^{-2}$	27		
140 57 8	Aramite	$1x10^{-3}$	26		
7440 38 2	Arsenic	$5x10^{-2}$	13		
7440 39 3	Barium	1	13		
56 55 3	Benz(a)anthracene	$1x10^{-5}$	16	$5.7x10^{-3}$	6
71 43 2	Benzene	$5x10^{-3}$	14	$1.75x10^{3}$	6
92 87 5	Benzidine	$2x10^{-7}$	5	$4.0x10^{2}$	6
50 32 8	Benzo(a)pyrene	$2x10^{-4}$	27	$1.2x10^{-3}$	6
205 99 2	Benzo(b)fluoranthene	$2x10^{-5}$	8	$1.4x10^{-2}$	6
100 51 6	Benzyl alcohol	$1x10^{1}$	26	$4x10^{4}$ (17°C)	15
100 44 7	Benzyl chloride	$2x10^{-4}$	5	$3.3x10^{3}$	6
7440 41 7	Beryllium	$1x10^{-3}$	27		
111 44 4	Bis(2-chloroethyl)ether	$3x10^{-5}$	5	$1.02x10^{4}$	6
108 60 1	Bis(2-chloroisopropyl ether)	1	4	$1.7x10^{3}$	6
117 81 7	Bis(2-ethylhexyl)phthalate	$3x10^{-3}$	5	$4x10^{-1}$	11
75 27 4	Bromodichloromethane	$3x10^{-4}$	5	$4.7x10^{3}$ (22°C)	22
74 83 9	Bromomethane	$5x10^{-2}$	4	$1.0x10^{3}$	18
85 68 7	Butyl benzyl phthalate	7	4	2.9	10
88 85 7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	$7x10^{-3}$	27	$5x10^{1}$	6
7440 43 9	Cadmium	$5x10^{-3}$	42		
75 15 0	Carbon disulfide	4	4	$2.94x10^{3}$	6
56 23 5	Carbon tetrachloride	$5x10^{-3}$	14	$7.57x10^{2}$	6
57 74 9	Chlordane	$2x10^{-3}$	42	$5.6x10^{-1}$	6
106 47 8	p-Chloroaniline	$1x10^{-1}$	4	$3.9x10^{3}$	24
108 90 7	Chlorobenzene	$1x10^{-1}$	42	$4.66x10^{2}$	6
510 15 6	Chlorobenzilate	$7x10^{-1}$	4	$1x10^{4}$	1
126 99 8	2-Chloro-1,3-butadiene (Chloroprene)	$7x10^{-1}$	26	$3x10^{2}$	1
124 48 1	Chlorodibromomethane	$4x10^{-4}$	5	$4.4x10^{3}$(22°C)	22
67 66 3	Chloroform	$6x10^{-3}$	5	$8.2x10^{3}$	6
95 57 8	2-Chlorophenol	$2x10^{-1}$	4	$2.85x10^{4}$(20°C)	15
107 05 1	3-Chloropropene (Allyl chloride)	$2x10^{-3}$	36	$1x10^{2}$	15

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CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
7440 47 3	Chromium	$1x10^{-1}$	42		
218 01 9	Chrysene	$2x10^{-4}$	8	$1.8x10^{-3}$	6
319 77 3	Cresols	2	4	$3.1x10^{4}$	6
57 12 5	Cyanide	$2x10^{-1}$	27		
94 75 7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	$7x10^{-2}$	42	$8.9x10^{2}$	6
72 54 8	DDD	$1x10^{-4}$	5	$1x10^{-1}$	6
72 55 9	DDE	$1x10^{-4}$	5	$4x10^{-2}$	6
50 29 3	DDT	$1x10^{-4}$	5	$5x10^{-3}$	6
2303 16 4	Diallate	$6x10^{-4}$	26	$1.4x10^{1}$	6
53 70 3	Dibenz(a,h)anthracene	$7x10^{-7}$	8,17	$5.0x10^{-4}$	6
96 12 8	1,2-Dibromo-3-chloropropane	$2x10^{-4}$	42	$1.0x10^{3}$	6
74 95 3	Dibromomethane	$4x10^{-1}$	4	$1.3x10^{4}$	25
84 74 2	Di-n-butyl phthalate	4	4	$1.3x10^{1}$	6
95 50 1	1,2-Dichlorobenzene	$6x10^{-1}$	42	$1.0x10^{2}$	6
106 46 7	1,4-Dichlorobenzene	$7.5x10^{-2}$	14	$7.9x10^{1}$	6
91 94 1	3,3'-Dichlorobenzidine	$8x10^{-5}$	5	4	6
75 71 8	Dichlorodifluoromethane	7	4	$2.8x10^{2}$	6
75 34 3	1,1-Dichloroethane	$4x10^{-4}$	26	$5.5x10^{3}$	6
107 06 2	1,2-Dichloroethane	$5x10^{-3}$	14	$8.52x10^{3}$	6
75 35 4	1,1-Dichloroethylene	$7x10^{-3}$	14	$2.25x10^{3}$	6
156 59 2	cis-1,2-Dichloroethylene	$7x10^{-2}$	42	$3.5x10^{3}$	6
156 60 5	trans-1,2-Dichloroethylene	$1x10^{-1}$	42	$6.3x10^{3}$	6
75 09 2	Dichloromethane	$5x10^{-3}$	27	$2.0x10^{4}$	6
120 83 2	2,4-Dichlorophenol	$1x10^{-1}$	4	$4.6x10^{3}$	6
78 87 5	1,2-Dichloropropane	$5x10^{-3}$	42	$2.7x10^{3}$	6
542 75 6	1,3-Dichloropropene	$2x10^{-4}$	5	$2.8x10^{3}$	6
60 57 1	Dieldrin	$2x10^{-6}$	5	$1.95x10^{-1}$	6
84 66 2	Diethyl phthalate	$3x10^{1}$	4	$8.96x10^{2}$	6
56 53 1	Diethylstilbesterol	$7x10^{-8}$	26	$1.3x10^{4}$	15
60 51 5	Dimethoate	$7x10^{-3}$	4	$2.5x10^{4}$	6
119 90 4	3,3'-Dimethoxybenzidine	$3x10^{-3}$	26	$2x10^{3}$	1,23
119 93 7	3,3'-Dimethylbenzidine	$4x10^{-6}$	26	$7x10^{1}$	1,23
57 97 6	7,12-Dimethylbenz(a)-anthracene	$1x10^{-6}$	20	$4.4x10^{-3}$	6
105 67 9	2,4-Dimethylphenol	$7x10^{-1}$	4	$5.9x10^{2}$	9
131 11 3	Dimethyl phthalate	$4x10^{1}$	26	$4.3x10^{3}$	2
99 65 0	1,3-Dinitrobenzene	$4x10^{-3}$	4	$4.7x10^{2}$	6
51 28 5	2,4-Dinitrophenol	$7x10^{-2}$	4	$5.6x10^{3}$	6
121 14 2	Dinitrotoluene	$5x10^{-5}$	5,21	$1.32x10^{3}$	6
117 84 0	Di-n-octyl phthalate	$7x10^{-1}$	26	3	22
123 91 1	1,4-Dioxane	$3x10^{-3}$	5	$4.31x10^{5}$	6

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CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
122 39 4	Diphenylamine	$9x10^{-1}$	4	$5.76x10^{1}$	6
122 66 7	1,2-Diphenylhydrazine	$4x10^{-5}$	5	$1.84x10^{3}$	6
298 04 4	Disulfoton	$1x10^{-3}$	4	$2.5x10^{1}$	24
115 29 7	Endosulfan	$2x10^{-3}$	4	$5.3x10^{-1}$	22
72 20 8	Endrin	$2x10^{-4}$	13	$2.5x10^{-1}$	22
106 89 8	Epichlorohydrin (1-Chloro-2,3-epoxypropane)	Treatment Technique	42	$6.0x10^{4}$	6
110 80 5	2-Ethoxy ethanol	$1x10^{1}$	26	$1x10^{5}$	1
100 41 4	Ethyl benzene	$7x10^{-1}$	42	$1.52x10^{2}$	6
60 29 7	Ethyl ether	$2x10^{1}$	4	$6.05x10^{4}$	12,2
106 93 4	Ethylene dibromide	$5x10^{-5}$	42	$4.3x10^{3}$	6
97 63 2	Ethyl methacrylate	3	26	$7x10^{2}$	1,6
62 50 0	Ethyl methanesulfonate	$1x10^{-6}$	28	$3.69x10^{5}$	6
52 85 7	Famphur	$1x10^{-3}$	41	$1.43x10^{2}$	15
206 44 0	Fluoranthene	1	4	$2.06x10^{-1}$	6
86 73 7	Fluorene	1	4	1.69	6
16984 48 8	Fluoride	4	39		
64 18 6	Formic acid	$7x10^{1}$	4	$1x10^{6}$	6
76 44 8	Heptachlor	$4x10^{-4}$	42	$1.8x10^{-1}$	6
1024 57 3	Heptachlor epoxide (alpha, beta, gamma isomers)	$2x10^{-4}$	42	$3.5x10^{-1}$	6
118 74 1	Hexachlorobenzene	$1x10^{-3}$	27	$6.0x10^{-3}$	6
87 68 3	Hexachlorobutadiene	$4x10^{-4}$	5	$1.5x10^{-1}$	6
77 47 4	Hexachlorocyclopentadiene	$5x10^{-2}$	27	2.1	6
67 72 1	Hexachloroethane	$3x10^{-3}$	5	$5.0x10^{1}$	6
70 30 4	Hexachlorophene	$1x10^{-2}$	4	$4x10^{-3}$	6
319 84 6	alpha-HCH	$6x10^{-6}$	26	1.63	6
319 85 7	beta-HCH	$2x10^{-5}$	26	$2.4x10^{-1}$	6
193 39 5	Indeno(1,2,3,cd)pyrene	$2x10^{-4}$	8	$5.3x10^{-4}$	6
78 83 1	Isobutanol	$1x10^{1}$	4	$7.6x10^{4}$	3
78 59 1	Isophorone	$9x10^{-3}$	5	$1.2x10^{4}$	15
143 50 0	Kepone	$2x10^{-6}$	29	7.6 (24°C)	15
7439 92 1	Lead	$1.5x10^{-2}$	44		
58 89 9	Lindane (gamma-HCH)	$2x10^{-4}$	42	7.8	6
7439 97 6	Mercury	$2x10^{-3}$	42		
126 98 7	Methacrylonitrile	$4x10^{-3}$	4	$2.5x10^{4}$	15
67 56 1	Methanol	$2x10^{1}$	4	$>1x10^{6}$	1
72 43 5	Methoxychlor	$4x10^{-2}$	42	$4x10^{-2}$(24°C)	24
74 87 3	Methyl chloride	$3x10^{-3}$	26	$6.5x10^{3}$	6
56 49 3	3-Methylcholanthrene	$4x10^{-6}$	30		
78 93 3	Methyl ethyl ketone	2	4	$2.68x10^{5}$	6
108 10 1	Methyl isobutyl ketone	2	4	$1.91x10^{4}$	2

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CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
80 62 6	Methyl methacrylate	3	43,26	$2.0x10^1$	6
298 00 0	Methyl parathion	$9x10^{-3}$	4	$6x10^1$	6
91 20 3	Naphthalene	$1x10^{-1}$	26	$3.4x10^1$	15
91 59 8	2-Naphthylamine	$4x10^{-5}$	31	$5.86x10^2$	6
7440 02 0	Nickel	$1x10^{-1}$	27		
98 95 3	Nitrobenzene	$2x10^{-2}$	4	$1.9x10^3$	6
79 46 9	2-Nitropropane	$4x10^{-6}$	26	$1.7x10^5$	38
924 16 3	N-Nitroso-di-n-butylamine	$6x10^{-6}$	5	$6.7x10^3$	1,23
55 18 5	N-Nitrosodiethylamine	$2x10^{-7}$	5	$4.1x10^5$	1,23
62 75 9	N-Nitrosodimethylamine	$7x10^{-7}$	5	$2x10^2$	1
156 10 5	N-Nitrosodiphenylamine	$7x10^{-3}$	5	$4.0x10^1$	10
621 64 7	N-Nitrosodi-n-propylamine	$5x10^{-6}$	5	$9.9x10^3$	1
10595 95 6	N-Nitrosomethylethylamine	$2x10^{-6}$	26	$2x10^4$	1
100 75 4	N-Nitrosopiperidine	$8x10^{-6}$	32	$>1x10^6$	6
930 55 2	Nitrosopyrrolidine	$2x10^{-5}$	5	$>1x10^6$	6
152 16 9	Octamethyl pyrophosphoramide	$7x10^{-2}$	26	$>1x10^6$	1
56 38 2	Parathion	$2x10^{-1}$	26	$2.4x10^1$ (20°C)	15
608 93 5	Pentachlorobenzene	$3x10^{-2}$	4	$1.35x10^{-1}$	6
82 68 8	Pentachloronitrobenzene	$1x10^{-1}$	4	$7.11x10^{-2}$	6
87 86 5	Pentachlorophenol	$1x10^{-3}$	19	$1.4x10^1$	6
108 95 2	Phenol	$2x10^1$	4	$9.3x10^4$	6
298 02 2	Phorate	$7x10^{-3}$	40	$5x10^1$	18
1336 36 3	Polychlorinated biphenyls	$5x10^{-4}$	42	$3.1x10^{-2}$	6
23950 58 5	Pronamide	3	4	$1x10^2$	1
129 00 0	Pyrene	1	4	$1.32x10^{-1}$	6
110 86 1	Pyridine	$4x10^{-2}$	4	$4x10^4$	1
94 59 7	Safrole	$1x10^{-4}$	33	$1.5x10^3$	6
7782 49 2	Selenium	$5x10^{-2}$	42		
7440 22 4	Silver	$5x10^{-2}$	13		
57 24 9	Strychnine and salts	$1x10^{-2}$	4	$1.56x10^2$	6
100 42 5	Styrene	$1x10^{-1}$	42	$3x10^2$	15
95 94 3	1,2,4,5-Tetrachlorobenzene	$1x10^{-2}$	4	6	6
630 20 6	1,1,1,2-Tetrachloroethane	$1x10^{-3}$	26	$2.9x10^3$	6
79 34 5	1,1,2,2-Tetrachloroethane	$2x10^{-4}$	5	$2.9x10^3$	6
127 18 4	Tetrachloroethylene	$5x10^{-3}$	42	$1.5x10^2$	6
58 90 2	2,3,4,6-Tetrachlorophenol	1	4	$1x10^3$	6
3689 24 5	Tetraethyl dithiopyrophosphate	$2x10^{-2}$	4	$3x10^1$	25
7440 28 0	Thallium	$2x10^{-3}$	27		
108 88 3	Toluene	1	42	$5.35x10^2$	6
95 80 7	Toluene-2,4-diamine	$9x10^{-5}$	34	$4.77x10^4$	6

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CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
823 40 5	Toluene-2,6-diamine	7	7	$1.3x10^5$	1
95 53 4	o-Toluidine	$1x10^{-4}$	26	$7x10^2$	1,23
106 49 0	p-Toluidine	$2x10^{-4}$	26	$7.4x10^3$ (21°C)	15
8001 35 2	Toxaphene	$3x10^{-3}$	42	$5x10^{-1}$	6
93 72 1	2,4,5-TP (Silvex)	$5x10^{-2}$	42	$1.4x10^2$	2
75 25 2	Tribromomethane (Bromoform)	$4x10^{-3}$	5	$3.01x10^3$	6
120 82 1	1,2,4-Trichlorobenzene	$9x10^{-3}$	27	$3.0x10^1$	6
71 55 6	1,1,1-Trichloroethane	$2x10^{-1}$	14	$1.5x10^3$	6
79 00 5	1,1,2-Trichloroethane	$5x10^{-3}$	27	$4.5x10^3$	6
79 01 6	Trichloroethylene	$5x10^{-3}$	14	$1.1x10^3$	6
75 69 4	Trichlorofluoromethane	$1x10^1$	4	$1.1x10^3$	6
95 95 4	2,4,5-Trichlorophenol	4	4	$1.19x10^3$	6
88 06 2	2,4,6-Trichlorophenol	$3x10^{-3}$	5	$8.0x10^2$	6
93 76 5	2,4,5-Trichlorophenoxy-acetic acid (2,4,5-T)	$4x10^{-1}$	4	$2.4x10^2$(30°C)	2
96 18 4	1,2,3-Trichloropropane	$2x10^{-1}$	4	$4x10^3$	1
76 13 1	1,1,2-Trichloro-1,2,2-trifluoroethane	$1x10^3$	4	$1x10^1$	6
99 35 4	sym-Trinitrobenzene	$2x10^{-3}$	4	$3.5x10^2$	2
126 72 7	Tris(2,3-dibromopropyl) phosphate	$3x10^{-5}$	35	$1.2x10^2$	6
7440 62 2	Vanadium	$2x10^{-1}$	26		
75 01 4	Vinyl chloride	$2x10^{-3}$	14	$2.67x10^3$	6
1330 20 7	Xylene (mixed)	$1x10^1$	42	$1.98x10^2$	6
7440 66 6	Zinc	7	26		

APPENDIX II

PROCEDURES FOR CONDUCTING RISK BASED CALCULATIONS FOR DETERMINATION OF GROUND WATER CLEAN UP ACTION LEVELS AT MIDCO II

Risk based calculations shall be conducted for each sample. The calculation shall be the sum of the estimated risks produced by each constituent in the sample.

The carcinogenic risk based calculation for each sample is simply the summation of a lifetime averaged exposure rate via ingestion of the ground water for each constituent times that constituent's oral carcinogenic potency factor (slope factor), plus the summation of a lifetime averaged exposure rate via inhalation for each volatile organic compound times that volatile organic compound's inhalation carcinogenic potency factor (slope factor).

This is summarized in the following equation:

$CR_s = \Sigma\ (OI)_i(OSF)_i + \Sigma\ (II)_i(ISF)_i$

$OI_i = (3.09 \times 10^{-2}\ l/kg/d)\ C_i$

$II_i = (9.74 \times 10^{-2}\ l/kg/d)\ C_i$

CR_s = Cumulative lifetime carcinogenic risk for a sample

Σ = Summation of the carcinogenic risk from each constituent detected in the sample.

OI_i = Lifetime averaged exposure rate via ingestion for constituent i

OSF_i = Oral carcinogenic potency factor (or slope factor) of constituent i. These are listed in Table 2 of Appendix IV.

II_i = Lifetime averaged exposure rate via inhalation for constituent i.

ISF = Inhalation carcinogenic potency factor (or slope factor) of constituent i. These are listed in Table 2 of Appendix IV.

3.09×10^{-2} l/kg/d = lifetime averaged ground water ingestion rate based on the following assumptions:

- The ground water intake averaged over 70 years (25550 days) corresponding to children age 2-6, with a body weight of 17 kg, and an ingestion rate of 1 liter of ground water per day for 5 years, equal to 4.2×10^{-3} l/kg/d.

- The ground water intake averaged over 70 years corresponding to children age 7-12 with a body weight of 29 kg, and an ingestion rate of 1 liter of ground water per day for 6 years, equal to 3.0×10^{-3} l/kg/d.

- The ground water intake averaged over 70 years corresponding to adults, with a body weight of 70 kg, and an ingestion rate of 2 liters of ground water per day for 58 years, equal to 23.7 $\times 10^{-3}$ l/kg/d.

$(4.2 + 3.0 + 23.7) \times 10^{-3}$ l/kg/d = 3.09×10^{-2}

9.74×10^{-2} l/kg/d = lifetime averaged ground water exposure rate via inhalation based on the following assumptions:

- Calculate the lifetime ground water inhalation intake while bathing. In order to do this, it is assumed that all subpopulations (adults, children age 7-12 and children age 2-6) bathe for 20 minutes each day and stay an additional 10 minutes inside the closed-door bathroom, where the concentration in the air of the compound volatilized from the ground water used for bathing increases from zero to the actual ground water concentration at the end of the bathing period, and then decreases to zero during the additional 10 minutes in the bathroom. To account for this increase/decrease in concentration, a factor of 0.38 is used in the equation to calculate the intake. The actual ground water concentration can then be used to calculate the risk. Additional assumptions include: (1) each bath will consume 200 liters of water; (2) the volume of the shower stall is 3 m^3; and (3) the volume of the bathroom is 10 m^3. Also, the volume of air inhaled per hour is: 0.55 m^3 for adults, 0.6 m^3 for children age 7-12, and 0.49 m^3 for children age 2-6.

The inhalation intake can be calculated as:

$$0.38\ [(200\ 1/3\ m^3) \times (20\ min/60\ min/day) + (200\ 1/10\ m^3) \times (10\ min/60\ min/day)] \times [(0.55\ m^3 \times 58\ yrs)/(70\ kg \times 70\ yrs) + (0.60\ m^3 \times 6\ yrs)/(29\ kg \times 70\ yrs) + (0.49\ m^3 \times 4\ yrs)/(16\ kg \times 70\ yrs)] = 9.74 \times 10^{-2}\ l/kg/d.$$

C_i = Concentration of constituent i in the sample.

The cumulative chronic non-carcinogenic risk index is calculated as follows:

$$NI_s = \Sigma\ ((C_i)(3.09 \times 10^{-2}\ l/kg/d)/ORfD_i) + \Sigma\ ((C_i)(9.74 \times 10^{-2}\ l/kg/d)/IRfD_i)$$

NI_s = Cumulative chronic non-carcinogenic risk index.

Σ = Summation of chronic non-carcinogenic risk for all constituents detected in the sample that affect the same target organ.

$ORfD_i$ = Oral reference dose of constituent i. The reference doses for this Consent Decree are listed in Table 2 of Appendix IV.

$IRfD_i$ = Inhalation reference dose of constituent i. The reference doses for this Consent Decree are listed in Table 2 of Appendix IV.

Compounds detected below the background concentrations listed in the Table 1 of this Attachment will not be included in either the carcinogenic or non-carcinogenic risk based calculations.

The Primary Maximum Contaminant Levels (MCLs) are from 40 CFR 141. New primary MCLs will automatically be added to the ground water CALs when they are promulgated.

The Ambient Water Quality Criteria (AWQC) for protection of aquatic life to be used in this Decree are listed in Table 2 of this Attachment. The ground water CALs for the AWQC are calculated by multiplying the AWQC from Table 2 by 3.6.

The CAL can not be less than the background concentrations listed in Table 1, nor be less than the analytical detection limits. The analyses shall at least attain the quantification limits necessary to evaluate attainment of the ground water CALs. However, quantification limits below the lowest practical quantification limits listed for each compound in Appendix IX of 40 CFR 264 shall not be required. If only one constituent is detected in a ground water sample that is calculated to potentially cause a lifetime, incremental carcinogenic risk of 1×10^{-5} or greater, and an MCL has been promulgated for this constituent pursuant to 40 CFR 141, then that constituent will not be used in either the carcinogenic nor the non-carcinogenic risk calculations, and the CAL for that constituent will be either the MCL or the AWQC times 3.6, whichever is less.

TABLE 1 OF APPENDIX II

GROUND WATER BACKGROUND CONCENTRATIONS *

Compound	95 % UCL Midco I	95 % UCL Midco II	Compound	95 % UCL Midco I	95 % UCL Midco II
ARSENIC	6.00E+00	1.51E+01	4-METHYL-2-PENTANONE		
BARIUM	1.18E+02	1.07E+02	TETRACHLOROETHENE		
BERYLLIUM			TOLUENE		
CADMIUM		1.50E-01	ETHYLBENZENE		
CHROMIUM (III)	8.00E+00	7.50E+00	XYLENES		
CHROMIUM (VI)	8.00E+00	7.50E+00	PHENOL		
COPPER.		2.52E+01	BIS(2-CHLOROETHYL)ETHER		
IRON	3.88E+03	1.53E+04	BIS(2-CHLOROISOPROPYL)ETHER		
LEAD		5.60E+00	BENZYL ALCOHOL		
MANGANESE	1.40E+03	4.64E+02	CRESOL		
MERCURY		2.50E-01	NITROBENZENE		
NICKEL	5.80E+01	1.23E+01	ISOPHORONE		
SELENIUM			2,4-DIMETHYLPHENOL		
SILVER		4.60E+00	BENZOIC ACID		
THALLIUM			2,4-DICHLOROPHENOL		
VANADIUM	4.33E+00		NAPHTHALENE		
ZINC		1.47E+03	2-METHYLNAPHTHALENE		
CYANIDE	1.04E+01	1.58E+02	ACENAPHTHENE		
VINYL CHLORIDE	1.32E+00	2.20E+00	4-NITROPHENOL		
CHLOROETHANE			2,4-DINITROTOLUENE		
METHYLENE CHLORIDE	1.30E+00	1.90E+00	DIETHYLPHTHALATE		
ACETONE		6.90E+00	FLUORENE		
CARBON DISULFIDE			4-NITROANILINE		
1,1-DICHLOROETHENE			PHENANTHRENE		
1,1-DICHLOROETHANE			DI-N-BUTYLPHTHALATE		3.00E-01
TRANS-1,2-DICHLOROETHENE	1.60E-01	6.10E+00	N-NITROSODIPHENYLAMINE	2.60E-01	
CHLOROFORM			PENTACHLOROPHENOL		
1,2-DICHLOROETHANE			BIS(2-ETHYLHEXYL)PHTHALATE	1.50E+00	
2-BUTANONE			DI-N-OCTYLPHTHALATE		
1,1,1-TRICHLOROETHANE			HEPTACHLOR EPOXIDE		
1,2-DICHLOROPROPANE			LINDANE		
TRICHLOROETHENE			DIELDRIN		
BENZENE		4.00E-02	ENDRIN		
2-HEXANONE			PCBs		

95 % UCL = 95 percent upper confidence limit of the average background ground water concentration at each site. From the Feasibility Study for each site.

*All values are given in ug/l.

TABLE 2 OF APPENDIX II

MIDCO I AND II - WATER QUALITY CRITERIA TO BE MET IN THE GROUND WATER

Compound	MIDCO I Surface Water Water Quality Criteria (ug/l)		MIDCO I WQC to be met (ug/l)	MIDCO II Surface Water Water Quality Criteria (ug/l)		MIDCO II WQC to be met (ug/l)
ARSENIC	4.80E+01		1.87E+02	4.80E+01		1.73E+02
BERYLLIUM	5.30E+00		2.07E+01	5.30E+00		1.91E+01
CADMIUM	1.20E+00-6.00E+00	H	4.68E+00	2.90E+00-4.49E+00	H	1.04E+01
CHROMIUM (III)	2.20E+02-1.19E+03	H	8.58E+02	5.58E+02-8.68E+02	H	2.01E+03
CHROMIUM (VI)	1.10E+01		4.29E+01	1.10E+01		3.96E+01
COPPER	1.30E+01-7.30E+01	H	5.07E+01	3.33E+01-5.28E+01	H	1.20E+02
IRON	1.00E+03		3.90E+03	1.00E+03		3.60E+03
LEAD	3.50E+00-4.80E+01	H	1.37E+01	1.49E+01-2.96E+01	H	5.36E+01
MERCURY	1.20E-02		4.68E-02	1.20E-02		4.32E-02
NICKEL	1.68E+02-9.57E+02	H	6.55E+02	4.40E+02-6.94E+02	H	1.58E+03
SELENIUM	3.50E+01		1.37E+02	3.50E+01		1.26E+02
SILVER	1.20E-01		4.68E-01	1.20E-01		4.32E-01
THALLIUM	4.00E+01		1.56E+02	4.00E+01		1.44E+02
ZINC	3.42E+02-1.89E+03	H	1.33E+03	8.78E+02-1.37E+03	H	3.16E+03
CYANIDE	5.20E+00		2.03E+01	5.20E+00		1.87E+01
PENTACHLOROPHENOL	1.30E+01	pH	5.07E+01			
HEPTACHLOR EPOXIDE	3.80E-03		1.48E-02	3.80E-03		1.37E-02
DIELDRIN	1.90E-03		7.41E-03			
ENDRIN	2.30E-03		8.97E-03			
PCBs	1.40E-02		5.46E-02			

WQC = freshwater chronic water quality criteria for the protection of aquatic life; H = hardness dependent, values shown are for the range of hardness present in surface water samples; pH = value is pH dependent (pH = 7.8 used).

Reference: Quality Criteria for Water
1986. U.S. EPA. EPA 440/5-86-001.
May 1, 1986.

APPENDIX III

PROCEDURES FOR DETERMINING THE EXTENT OF TREATMENT FOR SOILS AND DEBRIS AT MIDCO II

To define the extent of the treatment by S/S and/or by SVE outside of the minimum area for treatment outlined in Figure 2, samples shall be collected on a square grid with 60 foot centers. The location of the initial grid point shall be determined by the random number technique, and the rest of the grid points measured from the initial point. The grid shall cover the whole soil sample collection area shown in Figure 2 excluding the minimum area for treatment. Split spoon samples shall be collected at each grid point from 1-3 and 4-6 foot depths.

In addition to this grid sampling, one composite sample shall be collected from the pile of contaminated soil in the north corner of Midco II. This composite sample shall be collected using a three dimensional simple random sampling strategy (Test Methods for Evaluating Solid Waste. U.S. EPA, SW-846, Volume 2, 1986.)

The following parameters shall be considered in determining whether the Soil Treatment Action Levels (defined in Section V.C.2) are exceeded at each sampling point:

METALS: total chromium, chromium (VI), lead, antimony, nickel, barium, cadmium, selenium, copper, iron, zinc, vanadium, manganese;

OTHER INORGANICS: arsenic, cyanide;

VOLATILE ORGANIC COMPOUNDS (VOCs): methylene chloride, trichloroethylene, tetrachloroethylene, 2-butanone, acetone, toluene, 1,1,1 trichoroethane, benzene, xylene, ethyl benzene, methyl isobutyl ketone, 1,1-dichloroethylene, 1,2 dichloroethylene, vinyl chloride;

ACID/BASE/NEUTRAL FRACTION: benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3)pyrene, dibenz(a,h)anthracene, bis(2-ethylhexyl)phthalate, diethyl phthalate, di-n-butyl phthalate, isophorone, phenol;

PESTICIDE/PCB FRACTION: chlordane, aldrin, dieldrin, polychlorinated biphenyls.

For any of the grid sampling points that exceed the Soil Treatment Action Levels, either:

(a) The entire area within the 60 foot square centered at the grid point will be treated in accordance with Section V.C.2; or

(b) Further sampling and treatment will be conducted as follows:

(1) The 60-foot square centered at the grid point shall be subdivided into nine squares measuring 20 by 20 feet. The center 20-foot square, where the grid point is located shall be treated in accordance with Section V.C.2.

(2) Samples at 1-3 and 4-6 foot depth shall be collected at the center of each of the eight surrounding 20 foot squares. If any of these samples exceed the Soil Treatment Action Levels, the entire area within these 20 foot squares shall be treated in accordance with Section V.C.2.

(3) Samples at 1-3 and 4-6 foot depth shall be collected at the center of each 20 foot square that is along side a 20-foot square determined to exceed the Soil Treatment Action Levels based on the previous sampling. If any of these samples exceed the Soil Treatment Action Levels, the entire area within these squares shall be treated in accordance with Section V.C.2.

(4) The process in (b)(3) above shall be repeated until each 20 foot square along side a square containing a sample that exceeds the Soil Treatment Action Levels, has been sampled, even if this requires sampling of 20-foot squares that are part of 60-foot squares whose center grid point sample results are less than the Soil Treatment Action Levels.

APPENDIX IV

PROCEDURES FOR CONDUCTING RISK BASED CALCULATIONS FOR SOILS AND SEDIMENTS AT MIDCO II

Risk Calculations

Risk based calculations shall be conducted for each sample for both carcinogenic and non-carcinogenic risks. The calculation shall be the sum of the estimated risks produced by each constituent detected in the sample for the ingestion, dermal contact, and inhalation routes of exposure using a residential development scenario.

The carcinogenic risk based calculation for each exposure route shall be the summation of the lifetime average exposure rate for each constituent times that constituent's carcinogenic potency factor (slope factor). This is summarized by the following equation:

$$CR_s = \Sigma\ (OI)_i(OSF)_i + \Sigma\ (DI)_i(DSF)_i + \Sigma\ (II)_i(ISF)_i$$

CR_s = Cumulative lifetime carcinogenic risk for each sample

Σ = Summation of the carcinogenic risk for each constituent detected in the sample

OI_i = Lifetime exposure rate to constituent i via ingestion

DI_i = Lifetime exposure rate to constituent i via dermal contact

II_i = Lifetime exposure rate to constituent i via inhalation

OSF_i = Oral slope factor or carcinogenic potency factor (CPF) of constituent i

DSF_i = Dermal slope factor or carcinogenic potency factor of constituent i

ISF_i = Inhalation slope factor or carcinogenic potency factor of constituent i

The non-carcinogenic risk based calculation for each exposure route shall be the summation of the non-carcinogenic risk indexes for each constituent. The non-carcinogenic risk index is the ratio of the averaged exposure rate divided by the reference dose. This is summarized by the following equation:

$$NI_s = \Sigma\ (OCDI_i)/(ORfD)_i + \Sigma\ (DCDI)_i/(DRfD)_i + \Sigma\ (ICDI)_i(IRfD)_i$$

NI_s = Cumulative chronic non-carcinogenic risk index for each sample

$OCDI_i$ = Chronic daily intake of constituent i for the ingestion route of exposure

$DCDI_i$ = Chronic daily intake of constituent i for the dermal contact route of exposure

$ICDI_i$ = Chronic daily intake of constituent i for the inhalation route of exposure

$ORfD_i$ = Chronic oral reference dose

$DRfD_i$ = Chronic dermal reference dose

$IRfD_i$ = Chronic inhalation reference dose

Constituents that are not detected shall not be included in the risk calculations. The chemical analyses shall at least attain the quantitation limits necessary to evaluate attainment of soil CALs. However, quantitation limits lower than the detection limits listed in Table 1-7 of the Feasiblity Studies for Midco I and Midco II will not be required. Compounds detected below background concentrations shown in Table 1 shall not be used in the risk calculations. No OSF, ISF, ORfD or IRfD is presently available for lead. Therefore, the soil treatment action level for lead is set at 1000 mg/kg in the soil, and the sediment/soil CAL is set at 500 mg/kg.

If NI_s exceeds 5.0 for the STALs or 1.0 for the soil/sediment CALs, the organ specific NI_s shall be calculated in a manner consistent with EPA guidance. Then the highest organ specific NI_s shall be used to evaluate whether the criteria for soil treatment is or is not exceeded.

The procedures for the calculations for each exposure route are summarized below:

FOR THE INGESTION ROUTE OF EXPOSURE:

CARCINOGENIC RISK CALCULATION

$CR_{si} = \Sigma\ (OI)_{ii}(OSF)_i$

$OI_i = (2.34\ mg/kg/d)(C_i)$

CR_{si} = Cumulative lifetime carcinogenic risk for each sample for the ingestion route of exposure

OI_i = Lifetime exposure rate to constituent i for the ingestion route of exposure

OSF_i = Oral slope factor or carcinogenic potency factor (CPF) of compound i. These are listed in Table 2. The CPFs in Table 2 are from the U.S. EPA "Health Effects Assessment Summary Tables", April 1989, OERR 9200.6-303-(89-2), except for the carcinogenic polyaromatic hydrocarbons, which are from the U.S. EPA Health Effects Assessment Group.

2.34 mg/kg/d = lifetime averaged soil intake based on the following assumptions:

- The soil intake averaged over 70 years (25550 days) corresponding to children age 2-6, with a body weight of 17 kg, and an ingestion rate of 0.2 grams of soil per day for 5 years, equal to 8.4×10^{-4} g/kg/d.

- The soil intake averaged over 25550 days corresponding to children age 7-12, with a body weight of 29 kg, and an ingestion rate of 0.1 grams of soil per day for 6 years, equal to 3.0×10^{-4} g/kg/d.

- The soil intake averaged over 25550 days corresponding to adults, with a body weight of 70 kg, and an ingestion rate of 0.1 grams of soil per day for 58 years, equal to 12×10^{-4} g/kg/d.

$(8.4 + 3.0 + 12) \times 10^{-4}$ g/kg/d $\times 10^{3}$ mg/g = 2.34 mg/kg/d

C_i = Concentration of constituent i in the sample in milligrams contaminant per milligram soil.

NON-CARCINOGENIC RISK INDEX CALCULATION

NI_{si} = Σ $(C)_i$(11.8 mg/kg/d)/$ORfD_i$)

NI_{si} = Cumulative chronic non-carcinogenic risk index for the ingestion route of exposure

C_i = Concentration of constituent i in the sample in milligrams contaminant per milligram soil

11.8 mg/kg/d = Soil intake for children ages 2-6, based on a bodyweight of 17 kg and an ingestion rate of 0.2 grams of soil per day for five years

$ORfD_i$ = Chronic oral reference dose. The oral reference doses for this Decree are listed in Table 2. The RfDs listed in Table 2 are from the U.S. EPA "Health Effects Assessment Summary Tables", April 1989, OERR 9200.6-303-(89-2)

FOR THE DIRECT CONTACT ROUTE OF EXPOSURE:

CARCINOGENIC RISK CALCULATION

$CR_{sd} = \Sigma\ (DI)_i(DSF)_i$

$DI_i = (C)_i(DF)_i(14.53\ mg/kg/d)$

CR_{sd} = Cumulative lifetime carcinogenic risk for each sample for the dermal contact route of exposure

DI_i = Lifetime exposure rate to compound i for the dermal contact route of exposure

C_i = Concentration of constituent i in the sample in milligrams contaminant per milligram soil

DSF_i = Dermal slope factor or carcinogenic potency factor (CPF) of constituent i. These are listed in Table 2. The dermal CPFs in Table 2 were adjusted from the oral CPFs by dividing the oral CPF by the chemical-specific oral absorption factor that represents the percentage of ingested chemical that is actually absorbed. The absorption factors are also listed in Table 2.

DF_i = Desorption factor. This is a chemical-specific value that takes into account the desorption of a constituent from the soil matrix. The following desorption factors shall be used: volatile organic compounds = 0.25; semivolatile organic compounds = 0.10; inorganics = 0.01.

14.53 mg/kg/d = Lifetime soil to skin adherence based on the following assumptions:

- The soil adherence averaged over 70 years (25550 days) corresponding to children age 2-6, with a body weight of 17 kg, an exposed body surface area of 3160 cm^2, a soil-to skin adherence factor of 0.9 mg/cm^2 (Exposure Factors Handbook, Technical Report, U.S. EPA, 1989, Contract No. 68-02-4254) of soil per day, for 138 days per year, for 5 years, equal to 4.52 mg/kg/d. The exposed body surface area includes arms, legs and hands (50th percentile, children aged 3-4, from Exposure Factors Handbook, 1989).

- The soil adherence averaged over 70 years

(25550 days) corresponding to children age 7-12, with a body weight of 29 kg, an exposed body surface area of 4970 cm^2, a soil-to skin adherence factor of 0.9 mg/cm^2 of soil per day, for 138 days per year, for 6 years, equal to 5.00 mg/kg/d. The exposed body surface area includes arms, legs and hands (50th percentile, children aged 9-10 from Exposure Factors Handbook, 1989).

- The soil adherence averaged over 70 years (25550 days) corresponding to adults, with a body weight of 70 kg, an exposed body surface area of 3120 cm^2, a soil-to skin adherence factor of 0.9 mg/cm^2 of soil per day, for 55 days per year, for 58 years equal to 5.01 mg/kg/d. The exposed body surface area includes arms and hands (50th percentile adults from Exposure Factors Handbook, 1989).

NON-CARCINOGENIC RISK INDEX CALCULATION

NI_{sd} = $\Sigma\ (C)_i(DF)_i(63.25\ mg/kg/d)/(DRfD_i)$

NI_{sd} = Cumulative chronic non-carcinogenic index for the direct contact route of exposure

C_i = Concentration of constituent i in the sample in milligrams contaminant per milligram soil

DF_i = Desorption factor. Use definition previously provided for the carcinogenic risk calculation.

63.25 mg/kg/d = The soil adherence corresponding to children age 2-6, with a body weight of 17 kg, an exposed body surface area of 3160 cm^2, a soil-to skin adherence factor of 0.9 mg/cm^2 of soil per day, for 138 days per year, for 5 years.

$DRfD_i$ = Chronic dermal reference dose. The chronic dermal reference doses for this Decree are listed in Table 2. The chronic dermal reference doses listed in Table 2 were adjusted from the oral reference doses by multiplying the oral reference doses by the chemical-specific oral absorption factor that represents the percentage of ingested chemical that is actually absorbed. The oral absorption factors are also listed in Table 2.

FOR THE INHALATION ROUTE OF EXPOSURE:

CARCINOGENIC RISK CALCULATION

CR_{si} = Σ $(II)_i(ISF)_i$

II_i = $(C)_i(D)_i(VP)_i(MW)_i(0.033)$

CR_{si} = Cumulative carcinogenic risk for each sample for the inhalation route of exposure

II_i = Lifetime exposure rate to constituent i for the inhalation route of exposure

ISF_i = Inhalation slope factor or carcinogenic potency factor (CPF) for constituent i. The inhalation CPFs are listed in Table 2 and are from: U.S. EPA, 1989, Health Effects Summary Tables, OERR 9200.6-303-(89-2).

C_i = Concentration of constituent i in the sample in milligrams contaminant per milligram soil

D_i = Diffusion coefficient of constituent i in the air, in cm^2/sec

VP_i = Vapor pressure of constituent i, in mm Hg

MW_i = Molecular weight of constituent i, in g/mole

$$0.033 = \frac{(INR)(ET)(EF)(ED)(A)(P^{4/3})(1000\ mg/g)}{(BW)(AT)(h)(u)(w)(L)(R)(T)}$$

INR = Inhalation rate in m^3/hour: 0.76 from 1-6 years; 0.89 from 7-12 years; 0.83 for adults

ET = Exposure time in hours/day: 21.1 from 1-6 years; 18.3 from 7-12 years; 21.1 for adults

EF = Exposure frequency in days/year: 350 for all age groups

ED = Exposure duration in years: 6 years from 1-6 years; 6 years from 7-12 years; and 58 years for adults

A = 1 E+6 cm^2 (a box 1 meter wide and 100 meters long)

P = Total soil porosity: 0.35

BW = Body weight in kg.: 17 kg from 1-6 year; 29 kg. from 6-12 years; and 70 kg adult

AT = Averaging time: 25550 days (365 days/year X 70 years)

h = Mixing height: 1.83 meters

w = Mixing width: 1 meter

u = Wind speed: 2.4 meters/sec.

L = Effective depth of soil cover: 30 cm.

R = Gas constant: 62,361 mm Hg/gmole/°K

T = Temperature: 290 °K

NON-CARCINOGENIC RISK INDEX CALCULATION

NI_{si} = Σ $(C)_i(D)_i(VP)_i(MW)_i(0.0938)/(IRfD_i)$

NI_{si} = Cumulative chronic non-carcinogenic index for the inhalation route of exposure

C_i = Concentration of constituent i in the sample in milligrams contaminant per milligram soil

D_i, VP_i, and MW_i are as defined above

$$0.0938 = \frac{(INR)(ET)(EF)(ED)(A)(P^{4/3})(1000\ mg/g)}{(BW)(AT)(h)(u)(w)(L)(R)(T)}$$

INR = Inhalation rate in m^3/hour: 0.76 for 1-6 year olds

ET = Exposure time in hours/day: 21.1 for 1-6 year olds

ED = Exposure duration in years: 6 years

BW = Body weight in kg.: 17 kg for 1-6 year olds

AT = Averaging time: 2190 days (365 days/year X 6 years)

A, P, EF, P, h, w, u, L, R, and T are as defined above

$IRfD_i$ = Inhalation reference dose for constituent i. The inhalation CPFs are listed in Table 2 and are from: U.S. EPA, 1989, Health Effects Summary Tables, OERR 9200.6-303-(89-2).

TABLE 1 OF APPENDIX IV

MIDCO I AND II - BACKGROUND SOIL CONCENTRATIONS *

COMPOUND	95% UCL (ug/kg)	COMPOUND	95% UCL (ug/kg)	COMPOUND	95% UCL (ug/kg)
ALUMINUM	8,175,837	1,2-DICHLOROETHANE	0	DIETHYLPHTHALATE	27.1
ANTIMONY	1,290	2-BUTANONE	6.7	FLUORENE	0
ARSENIC	14,014	1,1,1-TRICHLOROETHANE	0	N-NITROSODIPHENYLAMINE	0
BARIUM	80,492	1,1,2,2-TETRACHLOROETHANE	0	PENTACHLOROPHENOL	0
BERYLLIUM	0	TRICHLOROETHENE	0	PHENANTHRENE	131
CADMIUM	2,769	BENZENE	0	ANTHRACENE	0
CALCIUM	10,662,779	2-HEXANONE	0	DI-N-BUTYLPHTHALATE	0
CHROMIUM (III)	19,260	4-METHYL-2-PENTANONE	0	FLUORANTHENE	255
CHROMIUM (VI)	19,260	TETRACHLOROETHENE	0	PYRENE	248
COBALT	4,197	TOLUENE	2.0	BUTYLBENZYLPHTHALATE	112
COPPER	48,876	CHLOROBENZENE	0	BENZO(A)ANTHRACENE	158
IRON	13,673,722	ETHYLBENZENE	0	BIS(2-ETHYLHEXYL)PHTHALATE	985
LEAD	145,843	STYRENE	0	CHRYSENE	238
MAGNESIUM	3,386,934	TOTAL XYLENES	0	DI-N-OCTYLPHTHALATE	36.4
MANGANESE	117,133	PHENOL	0	BENZO(B)FLUORANTHENE	241
MERCURY	288	1,4-DICHLOROBENZENE	0	BENZO(K)FLUORANTHENE	154
NICKEL	17,348	2-METHYLPHENOL	0	BENZO(A)PYRENE	137
POTASSIUM	1,002,938	4-METHYLPHENOL	0	INDENO(1,2,3-CD)PYRENE	103
SELENIUM	0	CRESOL	0	DIBENZ(A,H)ANTHRACENE	0
SILVER	447	NITROBENZENE	0	BENZO(G,H,I)PERYLENE	108
SODIUM	81,517	N-NITROSODIPROPYLAMINE	0	ALDRIN	0
THALLIUM	1,477	ISOPHORONE	0	DIELDRIN	0
TIN	1,581	2,4-DIMETHYLPHENOL	0	ENDRIN	0
VANADIUM	20,553	BENZOIC ACID	0	4,4'-DDD	29.5
ZINC	312,974	2,4-DICHLOROPHENOL	0	4,4'-DDT	127
CYANIDE	0	NAPHTHALENE	0	CHLORDANE	4,098
METHYLENE CHLORIDE	9.4	4-CHLORO-3-METHYLPHENOL	0	AROCLOR-1242	0
ACETONE	13.9	2-METHYLNAPHTHALENE	0	AROCLOR-1248	0
1,1-DICHLOROETHANE	0	ACENAPHTHYLENE	0	AROCLOR-1254	0
TRANS-1,2-DICHLOROETHENE	0	ACENAPHTHENE	0	AROCLOR-1260	0
CHLOROFORM	0	DIBENZOFURAN	0	4,4-DDE	44.8

* 95% UCL = 95 percent upper confidence limit of the average background soil concentrations. From the Feasibility Study (both sites have the same soil background concentrations).

TABLE 2 OF APPENDIX IV

CHEMICAL SPECIFIC RISK FACTORS

CHEMICAL	CPF-oral $(mg/kg/d)^{-1}$	Chronic Oral RfD (mg/kg/d)	Inhalation CPF $(mg/kg/d)^{-1}$	Chronic Inhalation RfD (mg/kg/d)	Oral Absorption Factor	Dermal CPF[a] $(mg/kg/d)^{-1}$	Chronic Dermal RfD (mg/kg/d)
antimony	NA	4.00E-04	NA	NA	0.05	NA	2.00E-05
arsenic	1.75E+00	1.00E-03	5.00E+01	NA	0.98	1.79E+00	9.80E-04
barium	NA	5.00E-02	NA	1.00E-04	0.10	NA	5.00E-03
beryllium	NA	5.00E-03	8.40E+00	NA	0.001	NA	5.00E-06
cadmium	NA	1.00E-03	6.10E+00	NA	0.06	NA	6.00E-05
chromium(III)	NA	1.00E+00	NA	NA	0.01	NA	1.00E-02
chromium(VI)	NA	5.00E-03	4.10E+00	NA	0.05	NA	2.50E-04
manganese	NA	2.00E-01	NA	3.00E-04	0.05	NA	1.00E-02
mercury	NA	3.00E-04	NA	NA	0.15	NA	4.50E-05
nickel	NA	2.00E-02	8.40E-01	NA	0.05	NA	1.00E-03
selenium	NA	3.00E-03	NA	1.00E-03	0.60	NA	1.80E-03
thallium	NA	7.00E-05	NA	NA	0.05	NA	3.50E-06
tin	NA	6.00E-01	NA	NA	0.05	NA	3.00E-02
vanadium	NA	7.00E-03	NA	NA	0.05	NA	3.50E-04
zinc	NA	2.00E-01	NA	NA	0.50	NA	1.00E-01
cyanide	NA	2.00E-02	NA	NA	0.45	NA	9.00E-03
methylene chloride	7.50E-03	6.00E-02	1.40E-02	3.00E+00	1.00	7.50E-03	6.00E-02
acetone	NA	1.00E-01	NA	NA	0.90	NA	9.00E-02
1,1-dichloroethane	NA	1.00E-01	NA	1.00E-01	0.70	NA	7.00E-02
1,1-dichloroethene	6.00E-01	9.00E-03	1.20E+00	NA	0.93	6.45E-01	9.30E-03
chloroform	6.10E-03	1.00E-02	8.10E-02	NA	1.00	6.10E-03	1.00E-02
1,2-dichloroethane	9.10E-02	NA	9.10E-02	NA	1.00	9.10E-02	NA
2-butanone	NA	5.00E-02	NA	9.00E-02	0.90	NA	4.50E-02
1,1,1-trichloroethane	NA	9.00E-02	NA	3.00E-01	0.90	NA	8.10E-02
carbon tetrachloride	1.30E-01	7.00E-04	1.30E-01	NA	0.80	1.63E-01	5.60E-04
1,1,2,2-tetrachloroethane	2.00E-01	NA	2.00E-01	NA	0.90	2.22E-01	NA
1,2-dichloropropane	6.80E-02	NA	NA	NA	0.90	6.67E-02	NA
trichloroethene	1.10E-02	NA	1.30E-02	NA	0.95	1.16E-02	NA
1,1,2-trichloroethane	5.70E-02	4.00E-03	5.70E-02	NA	0.90	6.33E-02	3.60E-03
benzene	2.90E-02	NA	2.90E-02	NA	1.00	2.90E-02	NA
4-methyl-2-pentanone	NA	5.00E-02	NA	NA	0.90	NA	4.50E-02

CHEMICAL SPECIFIC RISK FACTORS

CHEMICAL	CPF-oral $(mg/kg/d)^{-1}$	Chronic Oral RfD (mg/kg/d)	Inhalation CPF $(mg/kg/d)^{-1}$	Chronic Inhalation RfD (mg/kg/d)	Oral Absorption Factor	Dermal CPF[a] $(mg/kg/d)^{-1}$	Chronic Dermal RfD (mg/kg/d)
tetrachloroethene	5.10E-02	1.00E-02	3.30E-03	NA	0.90	5.67E-02	9.00E-03
toluene	NA	3.00E-01	NA	1.00E+00	1.00	NA	3.00E-01
chlorobenzene	NA	3.00E-02	NA	5.00E-03	0.31	NA	9.30E-03
ethylbenzene	NA	1.00E-01	NA	NA	0.82	NA	8.20E-02
xylenes	NA	2.00E+00	NA	4.00E-01	1.00	NA	2.00E+00
phenol	NA	6.00E-01	NA	NA	0.90	NA	5.40E-01
1,4-dichlorobenzene	2.40E-02	NA	NA	7.00E-01	1.00	2.40E-02	NA
1,2-dichlorobenzene	NA	4.00E-01	NA	4.00E-02	0.90	NA	3.60E-01
cresol	NA	5.00E-02	NA	NA	0.90	NA	4.50E-02
nitrobenzene	NA	5.00E-04	NA	6.00E-04	0.90	NA	4.50E-04
isophorone	4.10E-03	1.50E-01	NA	NA	0.90	4.56E-03	1.35E-01
benzoic acid	NA	4.00E+00	NA	NA	0.40	NA	1.60E+00
2,4-dichlorophenol	NA	3.00E-03	NA	NA	0.90	NA	2.70E-03
1,2,4-trichlorobenzene	NA	2.00E-02	NA	3.00E-03	0.90	NA	1.80E-02
napthalene	NA	4.00E-01	NA	NA	1.00	NA	4.00E-01
4-chloroaniline	3.50E-02	4.00E-03	NA	NA	0.90	3.89E-02	3.60E-03
diethylphthalate	NA	8.00E-01	NA	NA	0.15	NA	1.20E-01
N-nitrosodiphenylamine	4.90E-03	NA	NA	NA	0.90	5.44E-03	NA
pentachlorophenol	NA	3.00E-02	NA	NA	0.90	NA	2.70E-02
di-N-butylphthalate	NA	1.00E-01	NA	NA	0.85	NA	8.50E-02
benzidine	2.30E+02	3.00E-03	2.30E+02	NA	0.90	2.56E+02	2.70E-03
butylbenzylphthalate	NA	2.00E-01	NA	NA	0.15	NA	3.00E-02
benzo(a)anthracene	1.15E-01	NA	NA	NA	0.50	2.30E-01	NA
bis(2-ethylhexl)phthalate	1.40E-02	2.00E-02	NA	NA	0.15	9.33E-02	3.00E-03
chrysene	1.15E-01	NA	NA	NA	0.50	2.30E-01	NA
benzo(b)fluoranthene	3.45E+00	NA	NA	NA	0.15	6.90E+00	NA
benzo(a)pyrene	1.15E+01	NA	NA	NA	0.50	2.30E+01	NA
indeno(1,2,3-cd)pyrene	1.15E-01	NA	NA	NA	0.50	2.30E-01	NA
dibenz(a,h)anthracene	1.15E+01	NA	NA	NA	0.50	2.30E+01	NA
aldrin	1.70E+01	3.00E-05	1.70E+01	NA	0.50	3.40E+01	1.50E-05
dieldrin	1.60E+01	5.00E-05	1.60E+01	NA	0.50	3.20E+01	2.50E-05
endrin	NA	3.00E-04	NA	NA	0.50	NA	1.50E-04

CHEMICAL SPECIFIC RISK FACTORS

CHEMICAL	CPF-oral $(mg/kg/d)^{-1}$	Chronic Oral RfD (mg/kg/d)	Inhalation CPF $(mg/kg/d)^{-1}$	Chronic Inhalation RfD (mg/kg/d)	Oral Absorption Factor	Dermal CPF[a] $(mg/kg/d)^{-1}$	Chronic Dermal RfD (mg/kg/d)
4,4'-DDT	3.40E-01	5.00E-04	3.40E-01	NA	0.50	6.80E-01	2.50E-04
chlordane	1.30E+00	5.00E-05	1.30E+00	NA	0.50	2.60E+00	2.50E-05
aroclor-1242	7.70E+00	NA	NA	NA	0.50	1.54E+01	NA
araclor-1248	7.70E+00	NA	NA	NA	0.50	1.54E+01	NA
aroclor-1254	7.70E+00	NA	NA	NA	0.50	1.54E+01	NA
araclor-1260	7.70E+00	NA	NA	NA	0.50	1.54E+01	NA
PCBs	7.70E+00	NA	NA	NA	0.95	8.11E+00	NA

NA Not Available
CPF Carcinogenic Potency Factor
RfD Reference Dose
[a] Dermal risk factors are calculated as follows:

$$\frac{\text{Oral CPF}}{\text{oral absorption factor}} = \text{Dermal CPF}$$

$$\text{Oral RfD} * \text{Oral Absorption Factor} = \text{Dermal RfD}$$

APPENDIX V

PROCEDURE FOR CONDUCTING RISK CALCULATIONS FOR AIR EMISSIONS

The carcinogenic risk calculations shall be the summation of a lifetime averaged exposure rate for each constituent times that constituent's inhalation carcinogenic potency factor. This is summarized in the following equation:

CR = $\Sigma\ (II)_i\ (ISF)_i$

CR = Cumulative lifetime carcinogenic risk.

Σ = Summation of the carcinogenic risk of each constituent in the air emission.

II_i = Lifetime averaged exposure rate to compound i. More information from the design will be needed to determine II_i for each process or combination of processes. However, the values for INR, ET, EF, ED, BW, and AT from Appenidix IV shall be used for exposures to residents. In addition IR for workers shall be 1.3 cubic meters per hour.

ISF_i = Inhalation carcinogenic potency factor (or slope factor) for compound i. The ISFs are listed in Table 2 of Appenidix IV.

The chronic non-carcinogenic risk index is calculated as follows:

NI = $\Sigma\ (II)_i/RfD_i$

NI = Cumulative chronic non-carcinogenic index

Σ = Summation of chronic non-carcinogenic risk for all constituents affecting the same target organ

II_i = Chronic exposure rate of constituent i. More process specific information is needed to calculate this number.

RfD_i = Inhalation reference dose of constituent i. The RfD_i are listed in Table 2 of Appenidix IV.

APPENDIX VI

RESPONSIVENESS SUMMARY

FOR THE MIDCO I AND MIDCO II RECORD OF DECISION AMENDMENTS

SUBMITTED FOR PUBLIC COMMENTS STARTING ON 2/7/92

I. RESPONSIVENESS SUMMARY OVERVIEW

In accordance with Section 117 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP), a public comment period was held to allow interested members of the public to comment on the United States Environmental Protection Agency's (U.S. EPA) proposed Record of Decision Amendments for the Midco I and Midco II hazardous waste sites. The public comment period started on February 7, 1992, and was intended to last for 30 days. However, as a result of a request from U.S. Reduction Company, the public comment period was extended to March 14, 1992, making the public comment period 37 days long. Because all comments received apply equally to Midco I and Midco II, the Responsiveness Summary for the two sites are combined in this document.

The purpose of the Responsiveness Summary is to summarize comments received during the public comment period and to provide U.S. EPA's responses to these comments. All comments received during the public comment period were considered by U.S. EPA in the final decision for the remedial action at the Midco I and Midco II sites as defined in the Midco I and Midco II Record of Decision Amendments.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

The Midco I and Midco II sites are located in Gary, Indiana. Community concerns about Midco I and Midco II were raised well prior to the initiation of removal actions by U.S. EPA in 1981, when U.S. EPA constructed fences at the sites.

The nearest residential area to Midco I is in Hammond, Indiana within one-fourth mile of Midco I. On December 21, 1976, a fire at Midco I destroyed thousands of drums of chemical wastes. Community concern about Midco I intensified in 1981, when a 14-year old Hammond boy suffered leg burns while playing near Midco I. In June 1981, a heavy rainfall resulted in flooding in Hammond, and a flow of surface water from the areas east of Hammond, where the Midco I and Ninth Avenue Dump Superfund sites are located, into Hammond. Several residents complained of chemical odors in flooded basements and chemical burns from contact with flood waters. In response to this occurrence, Hammond constructed a dirt dike across Ninth Avenue at the Cline Avenue overpass. This dike is still in place. U.S. EPA has stated that this dike is no longer necessary from an environmental standpoint.

The Midco II site is approximately one mile from the nearest residential homes. In 1977, a fire at Midco II destroyed thousands of drums of chemical wastes at that site. A citizen's group called the Grand Calumet River task force has been concerned about the impact of Midco II on the Grand Calumet River.

In 1981, U.S. EPA constructed fences around Midco I and Midco II. In 1982, U.S. EPA conducted a removal action at Midco I that included removal of containerized wastes and some contaminated surface soils, and installation of a temporary clay cover over most of the site. On July 8, 1982, a public meeting was held to discuss the Midco I removal action. During the Midco I removal action, employees at the adjacent Indiana Department of Highways garage complained of health problems possibly caused by chemical emissions. To respond to these concerns, U.S. EPA monitored air emissions during the removal action and obtained the services of the Centers for Disease Control to review the health complaints.

From 1984 through 1989, U.S. EPA conducted a removal action at Midco II that included the removal of containerized wastes, and excavation and removal of some contaminated soils. During this removal action, the U.S. EPA On-Scene Coordinators established and maintained communications with local officials and private citizens.

U.S. EPA held public meetings to discuss the initiation of the Remedial Investigations/Feasibility Studies (RI/FSs) on February 21, 1985 for Midco I and on July 18, 1985 for Midco II. Residential well sampling conducted during the RIs identified several contaminated wells, but the contamination was not attributable to the Midco sites. These were handled through letters and direct contact with the affected residents. U.S. EPA provided updates to the public on the status of the RI/FSs using fact sheets in November 1987 and December 1988.

The first public comment period on the FSs and the Proposed Plans for the remedial actions was held from April 20 to May 19, 1989. Proposed Plan Fact Sheets were mailed to over 100 concerned parties. Oral comments were received during a public meeting held on April 27. In addition, written comments were received during the public comment period. U.S. EPA considered these comments and made its decision on the selection of the remedial actions for Midco I and Midco II in Records of Decision (RODs) signed on June 30, 1989. U.S. EPA's response to the public comments received during the public comment period are presented in a document called "MIDCO I AND MIDCO II RESPONSIVENESS SUMMARY", which is attached to the Midco I and Midco II RODs.

On November 15, 1989, U.S. EPA issued a public notice of the availability of the RODs and Administrative Records for those RODs, and distributed a fact sheet that explained the remedies selected in the 1989 RODs, the actions U.S. EPA was taking, and the availability of the RODs and Administrative Records for the sites.

In July 1990, an alleged report of a cyanide burn in a Hammond residential neighborhood was attributed to Midco I or Ninth Avenue Dump and received media attention, including a broadcast on WBBM TV. U.S. EPA conducted sampling in the area but cyanide was not detected and no link to either site was found. Letters were sent by U.S. EPA to the public and WBBM-TV explaining the results of the tests.

In March 1991, U.S. EPA updated the public on its activities for the Midco sites by distribution of a fact sheet.

On April 17, 1991, U.S. EPA excavated soil at Midco I for a treatability study of low temperature thermal desorption. This study was conducted by the Waste Treatment Branch of the Office of Solid Waste in Washington, D.C. An Indiana Department of Tranportation facility is located adjacent to the Midco I site. The Indiana Department of Transportation reported to U.S. EPA that some of its employees had health problems on April 17. Indiana Department of Transportation employees were sent home that day. This was reported in the local papers, which generated concerns from some residents in Hammond. The City of Hammond sent a letter to U.S. EPA, Region V regarding this matter, expressing concern about why the City was not notified of this situation. The Agency for Toxic Substances and Disease Registry reviewed the available data and concluded that the concentrations of chemicals resulting from the excavation were below levels of human health concern at the Indiana Department of Transportation garage and in Hammond. This was communicated to the City of Hammond in a letter from the Regional Administrator, Region V, U.S. EPA. In this letter, U.S. EPA committed to inform the City of Hammond of future on-site activities of this magnitude.

Since the 1989 RODs, U.S. EPA gained new information about the sites, and new and updated guidance relevant to the remedial actions has been issued. As a result, U.S. EPA decided to amend the 1989 RODs using Record of Decision Amendments. During the same period of time, U.S. EPA reached an agreement with a group a potentially responsible parties for them to conduct the remedial actions at the Midco sites. This agreement is included in a proposed Consent Decree that has been lodged in the Federal District Court in Hammond, Indiana. The United States Department of Justice conducted a public comment period on this proposed Consent Decree from February 6 through March 14. Public comments received on the Consent Decree by the Department of Justice are handled separately by the Department of Justice and are not addressed in this Responsiveness Summary, except to the extent that the same comments were made to U.S. EPA on the ROD Amendments.

U.S. EPA provided a notice of the start of the public comment period on the Record of Decision Amendments in two local papers on February 7, 1992. This notice included a summary comparison of the 1989 RODs and the proposed ROD Amendments, and a notice of the availability of the ROD Amendments for review. A notice announcing extension of the public comment period to March 14 was advertised in the same local papers on February 12, 1992. Administrative Records for the sites were available for review in U.S. EPA's Chicago office. In addition, a Fact Sheet presenting the proposed ROD Amendments was prepared and distributed to approximately 300 parties. One oral comment on the ROD Amendments was received at the public meeting held on February 20, 1992. In addition, written comments were received from the Grand Calumet River Task Force, and from U.S. Reduction Company (USR Comments).

III. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND USEPA RESPONSES

1. U.S. Reduction Company commented on its view of the criteria under CERCLA for the remedy selection as follows:

> U.S. Reduction II is entitled to demand that the EPA select the most cost-effective and technologically-feasible methods to accomplish a "Superfund quality" clean-up which are both necessary and consistent with the National Contingency Plan. (p. 2 of USR Comments).
>
> In general, the remedial action or removal action selected must: - Be necessary; - To the extent practicable, be consistent with the NCP (40 CFR Part 300); - Provide a cost effective response; - Attain a degree of cleanup which, at a minimum, assures protection of public health and the environment; - At least meets the most stringent legally applicable or relevant and appropriate standard, requirement, criteria or limitation under federal or state environmental laws ("ARAR's"), including maximum contaminant levels ("MCL's") established for drinking water under the Safe Drinking Water Act [42 U.S.C. 300 et seq.] (p. 13 of USR Comments).

U.S. EPA'S RESPONSE:

The criteria that U.S. EPA is required to follow in selection of remedial actions under the remedial program are clearly defined in Section 121 of CERCLA and in 40 CFR 300.430 of the National

Contingency Plan (NCP). The NCP provides for evaluation of nine criteria for selection of remedial action under the remedial program: two threshold criteria, five primary balancing criteria, and two modifying criteria (40 CFR 300.430(f)). The two threshold criteria that each alternative must meet in order to be eligible for selection are:

- overall protection of human health and the environment; and

- compliance with applicable or relevant and appropriate requirements (ARARs) (unless specifically waived).

The five primary balancing criteria are:

- long-term effectiveness and permanence;

- reduction of toxicity, mobility, or volume through treatment;

- short-term effectiveness;

- implementability; and

- cost.

The two modifying criteria are:

- state acceptance; and

- community acceptance.

The nine criteria evaluation procedure is consistent with the requirements of Section 121 of CERCLA. Cost and implementability are two important primary balancing criteria. Other important balancing criteria are long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, and short-term effectiveness.

U.S. EPA selects the remedial action that provides the best balance of the five criteria, and that meets the threshold criteria. The remedial action may be modified in response to public comments or state concerns. Cost effectiveness and implementability are important and are seriously considered by U.S. EPA, as are the other criteria. Pursuant to Section 121 of CERCLA, U.S. EPA is required to have a preference for selection of remedies that permanently and significantly reduce the toxicity, mobility or volume of the hazardous substances, and is required to select permanent solutions and alternative treatment technologies or resource recovery technologies to the extent practicable.

2. The Grand Calumet River Task Force requested that desalinization treatment be used in place of deep well injection to dispose of the salt-contaminated ground water. They suggested that the desalinization plant be combined with a desalinization plant built at a local sanitary district that could treat salty ground water from the sites and deal with storm-water runoff problems arising from use of salt for snow melt.

U.S. EPA'S RESPONSE:

As an alternative to deep well injection, the alternative of desalination by evaporation was evaluated in the Feasibility Studies (see Alternatives 4E). In the Feasibility Studies it was determined that desalination treatment by reverse osmosis would not be beneficial because it is not capable of sufficiently reducing the volume of the salt-contaminated ground water at these sites.

The evaporation alternative would be more expensive than deep well injection. Although the cost estimates of the evaporation alternative included in the Feasibility Studies were comparable to the costs for deep well injection, these cost estimates did not include costs for the extensive treatment of the salt cake recovered from the evaporation operation that would be required to meet the RCRA Land Disposal Restrictions, did not include costs for adequate air emission controls, nor costs for adequate treatment of the condensate water prior to discharge. Inasmuch as U.S. EPA has determined that deep well injection of the ground water once it meets maximum contaminant levels (MACs) could be conducted in a manner that would be protective of human health and the environment and in compliance with applicable requirements, there would be little if any benefit of evaporation over the deep well injection alternative.

3. U.S. Reduction contends that it did not have an adequate opportunity to comment on the 1989 RODs (see p. 2 of USR Comments).

U.S. EPA'S RESPONSE:

As stated in U.S. Reduction's comments, it was notified that it was a potentially responsible party for the Midco sites in a letter from U.S. EPA dated June 30, 1987. This was two years before the 1989 RODs were signed.

Following completion of the RI/FSs, U.S. EPA announced the public comment period on the Proposed Plans for remedial actions at Midco I and Midco II in the Hammond Times and in the Gary Post Tribune on April 20, 1989, and the public comment period was held from April 20 through May 19. U.S. Reduction had an opportunity to provide comments on the Proposed Plans for remedial action along with other members of the public during that period of time.

Contrary to U.S. Reduction's statement on p. 5, another notice letter from U.S. EPA identifying U.S. Reduction as a potentially responsible party, and providing it with a copy of the Proposed Plan for remedial actions at Midco I and Midco II, was received by a representative of U.S. Reduction on May 11, 1989. Yet U.S. EPA received no comments from U.S. Reduction on the 1989 RODs until its comments on the ROD Amendments were received in March of 1992.

In spite of this, U.S. EPA will respond to U.S. Reduction's comments on the 1989 RODs in this Responsiveness Summary.

4. U.S Reduction objects to use of a residential development scenario in the risk assessments at Midco I and Midco II and claims that use of a residential development scenario is not backed up by the Administrative Record (pp. 18-25 of USR Comments).

U.S. EPA'S RESPONSE:

U.S. Reduction argues that U.S. EPA did not follow its own regulations and guidance for the risk assessments for Midco I and Midco II. U.S. Reduction provides an incomplete and misleading presentation of U.S. EPA guidance and regulations. On page 24 of the USR comments, U.S. Reduction indicates that U.S. EPA assumed that residential development would occur on the sites. However, the guidance referenced by U.S. Reduction makes it clear that the residential analysis is appropriate if residential use is "possible" ("Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual" (HHEM), pp. 6-7). Use of a residential development scenario does not mean that it is assumed that it will occur. To the contrary, the HHEM indicates that the residential analysis should not be undertaken only if the likelihood of residential use is "exceedingly small" (HHEM p. 6-7). The HHEM also encourages the use of professional judgment in considering pathways of exposure, including all pathways that would have "catastrophic consequences" even if "its probability of occurrence is very low" (HHEM p. 6-17).

U.S. Reduction also claims that the HHEM strongly suggests usage of aerial photographs to determine current and <u>potential future use</u> of sites. U.S. Reduction states that this is the "worst example". Based on this, U.S. Reduction conjectures "whether ... a review of these aerial photographs was simply not done because to do so would contradict ... assumption previously made by U.S. EPA" (p. 21 of USR Comments). Yet, a reading of Section 6.2.2 of the HHEM clearly shows that while review of aerial photographs is listed as a source of information for determining <u>current</u> land use (p. 6-6), it is not mentioned as a source of information for <u>future</u> land use (p. 6-7). Please note that U.S. EPA did use aerial photographs to help assess current conditions at the sites (see Sections 1 of the Remedial Investigations).

U.S. EPA agrees that information from Bureau of Census projections, zoning ordinances, and city master plans are valuable to consider in evaluating future land use (to the extent available), and this is consistent with the HHEM (p. 6-7). However, the HHEM emphasizes:

> Note that while these sources provide potentially useful information, they should not be interpreted as providing proof that a certain land use will or will not occur.

Furthermore, the HHEM is guidance and there is no need to obtain all information on a site if the information available is adequate for making a decision (p. ii of the HHEM).

Bureau of Census projections were considered by U.S. EPA for the Midco I and Midco II sites. In Sections 4.3 of the Midco I and Midco II Remedial Investigations, Bureau of Census statistics from 1970 and 1984 on the populations of Hammond and Gary were reported. The population trends described in the Remedial Investigations are the same as described by U.S. Reduction using data from 1980 and 1990. However, the Remedial Investigations noted that "This large drop in population in Lake County is most likely due to the depressed economy of the area which relies heavily on steel industries, but may in part be due to families moving to outlying communities". In other words, population trends can be cyclical. With improvements in the economy, the populations of Hammond and Gary could increase.

In addition, the zoning and city plans were taken into consideration. Page 4-6 of the Midco I Remedial Investigation states that the area is zoned M-3, heavy industrial district. Page 4-8 of the Remedial Investigation mentions the expansion plans for the Gary City Airport.

The information in the Administrative Records for both the 1989 RODs and the ROD Amendments demonstrates that future residential development is possible at the Midco I and Midco II sites. A logical argument for this was previously provided on page 18 of the Responsiveness Summary attached to the 1989 RODs. Although presently zoned heavy industrial both Midco I and Midco II were described as primarily light industrial and commercial (p. 4-5 of the Midco I Remedial Investigation, and p. 4-6 of the Midco II Remedial Investigation). One residence is located 500 feet south of Midco I on Blaine Street. In addition, there are a number of residences approximately one mile southeast of Midco II. These residences are within the same commercial and light industrial areas as Midco I and Midco II (Responsiveness Summary p. 18, attached to the 1989 RODs). Previously a plat map had been prepared for residential development of the area that includes Midco I (see Figure 1-2 of the Midco I Remedial Investigation). A sand stripping operation had been conducted on property east of Midco I (see Figure 108 of the Midco I Remedial Investigation). A sand stripping operation could transport contaminated soils to a residential location. A sewer line had been constructed to serve the proposed new development (see p. 4-33 of the Midco I Remedial Investigation, and p. 8 of the Ninth Avenue Dump Public Review Draft Remedial Investigation Report).

This information demonstrates that the Midco I and Midco II properties could possibly be used in the future for residences. Indeed the Midco I area was seriously considered for residential development. Therefore, residential development is possible. Long-term protection could extend for hundreds or more years. Over a period of even less than 100 years, zoning ordinances and land use can change dramatically as evidenced by the changes in development over a period of only 30 years near Midco I and Midco II from undeveloped wetlands to being within a light industrial and commercial area, and nearby highly populated residential areas (see Sections 1.5 of the Midco I and Midco II Remedial Investigations).

Finally U.S. EPA would like to emphasize that risks at the Midco I and Midco II sites would still be high enough to justify the remedial actions being taken at the site even under an industrial development scenario. Industrial development scenarios were also evaluated in the Midco I and Midco II Remedial Investigations, as well as being evaluated in the Responsiveness Summary, which is attached to the RODs. The results of the Remedial Investigation evaluations are summarized in the following statement on page ES-6 of each RI report (also see p. 5-56 and Table 6-18 of the Midco I RI, and p. 6-53 of the Midco II RI):

> The exposures to adults would not vary significantly [from the residential development scenario] because the routes of exposure and concentrations of contaminants would be the same. The only difference would be in the chronic intake, because the industrial scenario would assume water is drunk from an on-site well for 250 working days, instead of the 365 days assumed for the residential development.

It follows that the estimated risk from ground-water ingestion in case of future development of the sites for industrial uses, would not vary significantly from the risk estimated for the residential development scenario.

The risks due to soils in the industrial development scenario was addressed by EPA in the Responsiveness Summaries, which are attached to the RODs. On page 17 of these Responsiveness Summaries, EPA states that the risks for the industrial development scenario is approximately 60% of the risks for the residential development scenario. Therefore, the risk estimates for soil exposures would be a significant fraction of the substantial risks for the residential development scenario (at Midco I carcinogenic risk (excluding arsenic) = 4.1×10^{-5} and non-carcinogenic risk index of 3.6; at Midco II carcinogenic risk (excluding arsenic) =

5.7 X 10^{-5} and non-carcinogenic risk index (excluding arsenic) = 1.7 (p. 8 of the ROD Amendment Summaries)).

5. U.S. Reduction makes the following general statements and inquiries regarding U.S. EPA's selection of the deep well injection technology for disposal of contaminated ground water after treatment:

> [T]he U.S. EPA should have gone further to educate itself of the potential catastrophic consequences, both in financial terms and in environmental terms, which may result from making a decision to locate, drill and operate a deep underground injection well with no concrete site specific data to support that decision (pp. 26-27 of the USR Comments);
>
> To focus attention on this incredible lack of a proper data base, one need only reference page 2-14 of the Dames & Moore Public Comment Feasibility Study for the Midco II site. (p. 28 of the USR Comments)
>
> Upon what 'limited information available' did Dames & Moore conclude that the 'Mt. Simon formation in the area could be used for saline water injection'? (p. 28 of the USR Comments);
>
> It is, therefore, extremely extraordinary, if not shocking, to find that here, in the Superfund context, the U.S. EPA is so prepared to embark on such a major capital investment, with such a potential for irreversible environmental catastrophe, based upon data that even it admits is "limited". (p. 28 of the USR Comments);
>
> It appears as though there is an extremely limited data base of reliable geological data from which to make any reasoned predictions as to the capabilities of the lower Mt. Simon formation to receive and contain contaminants in a manner so as to not result in a violation of any ARAR's, including any MCL's or any background concentration for total dissolved solids ("TDS"). (p. 30 of the USR Comments).

U.S. EPA'S RESPONSE:

U.S. Reduction implies that the personnel involved in preparing and reviewing the documents for the remedy selection know very little and did not inform themselves about any potential problems with application of deep well injection technology in the area of the Midco I and Midco II sites. The Feasibility Studies were prepared by Dames and Moore with oversight by personnel from Environmental Resources Management, U.S. EPA, Roy F. Weston, Inc., and by Dr. Keros Cartwright.

The qualifications of the personnel involved are impressive, and a number of them have in-depth experience in deep well injection technology as well as a thorough understanding of the geology of Northwest Indiana. Dames and Moore is an engineering firm with extensive experience in investigation and remediation of hazardous waste sites (see brochures in the Administrative Records). Environmental Resources Management has extensive experience in investigation of hazardous waste sites (see brochures and resumes in the Administrative Records). U.S. EPA Region V has been responsible for oversight of 11 deep injection wells into the Mt. Simon formation in northwestern Indiana since 1984. This included oversight of construction of three deep injection wells. U.S. EPA reviewed the Feasibility Studies and prepared the 1989 RODs and the ROD Amendments. The resume of Dr. Leah Haworth of Region V, who participated in the preparation of the Midco I and Midco II ROD Amendments is included in Attachment 1 of this Responsiveness Summary and included in the Administrative Records. Roy F. Weston, Inc., is an engineering firm that has extensive experience in investigation and remediation of hazardous wastes sites. This firm was employed by U.S. EPA for oversight of the Feasibility Study, and they paid special attention to review of the cost estimates. Dr. Keros Cartwright is a nationally recognized expert in hydrogeology who has participated in review of a number of deep well injection projects. Dr. Cartwright was under a subcontract with U.S. EPA and participated in review of the Feasibility Studies and the draft RODs and ROD Amendments. Dr. Cartwright's resume is included in Attachment 1 of this Responsiveness Summary and is included in the Administrative Records. With this wealth of experience, U.S. EPA has been well prepared to evaluate the potential success, protectiveness and costs of deep well injection.

It is generally accepted that reliance upon any document is premised not only on the data provided in the document, but also on the knowledge, perception, and abilities of those who prepared the document. U.S. EPA relied upon the broad base of experience of the parties involved in the preparation of documents for the remedy selections. The participation of the parties listed above in the preparation and review of documents for the remedy selection is clearly documented in the Administrative Records.

In addition, information on pages 2-7 of the Responsiveness Summary for the 1989 RODs indicates that U.S. EPA is aware of any potential problems associated with deep well injection, and is taking stringent measures to prevent them. In the Responsiveness Summary, U.S. EPA responded to comments regarding the safety of deep well injection. U.S. EPA's response included a discussion of a GAO Report on underground injection wells ("Hazardous Waste Controls Over Injection Well Disposal Operations", GAO/RCED-87-170, August 1987).

A multitude of data is available from the deep injection wells in the vicinity of the Midco I and Midco II sites. Eight wells are located within a ten mile radius of Midco I and Midco II. This data includes geophysical well logs, cores, pressure transient tests, injectivity tests, drill stem tests, and water samples from all major aquifers between the surface and the granitic basement complex beneath the Mt. Simon formation. Additional water quality data for the Mt. Simon formation is available from a U.S. Geological Survey test well in northeastern Illinois, and additional data for overlying formations is available from water wells in northeastern Illinois and a ground water monitoring well at Midwest Steel.

Furthermore, preliminary modeling was conducted by Environmental Resources Management with oversight by U.S. EPA that indicated (based on conservative assumptions) that the injected contaminants would remain 120 feet below the Lower Eau Claire formation (which is expected to be the lowermost underground source of drinking water (USDW)) and within 1.0 mile radius of the well for the 10,000 year period after injection (see Executive Summary from "Deep Injection Well Model Results", August 20, 1991, which is in the Administrative Records). All of this data and evaluation has lead U.S. EPA to the conclusion that the lower Mt. Simon formation at the Midco sites is very likely to be suitable for the injection of non-hazardous waste in volumes projected for Midco I and Midco II.

Although there is plenty of evidence to indicate that deep well injection of treated ground water can be conducted safely and effectively at the Midco sites, that does not mean that U.S. EPA, simply by selecting this remedy in ROD Amendments, is indicating that site specific testing is not necessary prior to conducting the deep well injection. CERCLA requires compliance with all the substantive provisions of applicable or relevant and appropriate requirements (ARARs). This includes the requirements of the Underground Injection Program. As a result, the deep well injection at the Midco sites must at least comply with the same substantive requirements as a private deep injection well. The ARARs for the deep well injection are identified on pp. 15 and 16 of the Midco I ROD Amendment and p. 16 of the Midco II ROD Amendment. Pages 13 through 25 of Attachment 1 to the proposed Consent Decree, Statement of Work, lists tests that must be conducted and conditions that must be met for operation of the deep well injection system, including compliance with ARARs. This includes geological and chemical sampling and testing to confirm the technical premises on which the preliminary model was based, and requirements for injection well construction, operation and monitoring. In addition, the design and operation of the deep well injection system must be reviewed and approved by U.S. EPA in a process that is substantially equivalent in substance to the permit process for private deep well injection.

6. U.S. Reduction indicates that it believes that the potential for success of deep well injection at the Midco sites is comparable to the potential for success in the oil and gas industry (p. 27 of USR Comments).

U.S. EPA'S RESPONSE:

In contrast to some oil and gas exploration, U.S. EPA is looking for a thick geological formation whose presence and characteristics have been evaluated based on the abundant data sources listed above. U.S. EPA would not recommend the deep well injection option if ample information were not available which indicate that the site is likely to be suitable. Of course, as mentioned before, the suitability of the site will have to be confirmed by tests conducted at the actual injection well site.

7. U.S. Reduction quotes the Midco II Feasibility Study as follows: "despite an acknowledgement that there is 'limited information available', it is concluded that the 'Mt. Simon formation in the area could be used for saline water injection' (p.28). U.S. EPA admits its data is "limited" (p. 28 of USR Comments).

U.S. EPA'S RESPONSE:

From reading this quote in context, it is apparent that the reference to limited information included in the Feasibility Study prepared by Dames & Moore applies mainly to the ability to comply with the requirements of the Underground Injection Control (UIC) program, especially those for injection of hazardous wastes. Deep well injection of hazardous wastes is not allowed in the ROD Amendments since the ground water must meet the maximum allowable concentrations (MACs) prior to deep well injection. This eliminates most of the uncertainty about the acceptability of deep well injection as proposed in the ROD Amendments.

8. "Upon what data did ERM make the assumption that the liquid currently existing in the lower Mt. Simon formation contains a sodium chloride ("NaCl") concentration of 12.4%?" The U.S. EPA is predicting the lower Mt. Simon to be 2,000 ft. below the surface. Natural NaCl concentration in formations at this level are not typically this high [12.4%]." (p. 28 of USR Comments). "Upon what data did ERM make the assumption that the liquid to be injected would be 'pure water'?" (p. 29 of USR Comments).

U.S. EPA'S RESPONSE:

The document being referred to in U.S. Reduction's comments is:

"Deep Injection Well Model Results", August 20, 1991, by Environmental Resources Management. The objective of this modeling effort was to determine whether injection of ground water from the Midco sites is expected to affect the lowermost USDW (this is expected to be the Lower Eau Claire formation). The modeling was designed to predict the maximum extent of vertical and lateral migration of contamination that would result from deep well injection at the Midco sites. The maximum extent of migration was evaluated by using rock and fluid characteristics that are as unfavorable for containment of the injection fluid as can reasonably be expected. This is what U.S. EPA calls "conservative" modeling.

The modeling was conducted using specific gravities of the fluid in the injection zone of 1.04 and 1.09 in order to evaluate the potential affect of the density of the fluid in the injection zone on contaminant migration. These densities happen to correspond to salt contents of 6.0% and 12.4%, respectively (although it is the densities, not the salt contents, which affect the modeling results). These specific gravities bracket actual conditions measured in nearby deep wells (see references in Attachment 2) and so provide conservative estimates of the extent of migration. The effect of the higher specific gravity in the injection zone is to increase the force of buoyancy driving less-dense injectate vertically and laterally away from the point of injection. The effect of the lower specific gravity is to increase migration due to pressure buildup in the injection zone (advective flow).

In addition, the modeling assumed that the injectate would have the same specific gravity as "pure water" (i.e. 1.0). Again the effect of this assumption is to increase predicted vertical migration and provide a conservative estimate of the extent of migration.

In all cases, even using these and other conservative assumptions, modeling indicated that the injectate would not affect the water quality of the lowermost USDW even over a period of 10,000 years.

9. The Grand Calumet River Task Force stated that a "'salty' subsurface aquifer may be needed to provide usable surface water" at some point in the future.

USEPA RESPONSE:

The Underground Injection Control (UIC) program's mandate is to protect underground sources of drinking water (USDWs). In general, under the UIC regulations, a USDW is any aquifer which contains less than 10,000 mg/l of total dissolved solids (TDS). To put this in perspective, almost all drinking water being used today has less than a few hundred mg/l TDS. Above this level water becomes unpalatable. As you can see, many "salty" aquifers are being protected as future potential sources of drinking water. Only the most "salty" are considered acceptable for deep well injection operations such as is proposed for Midco I and Midco II.

10. "Data U.S. Reduction II has obtained shows that in Minnesota the Mt. Simon produces fresh water at slightly higher elevations." (p. 29 of USR Comments). References are made to data from Minnesota, southwestern Indiana and southeastern Illinois, and northwestern and southwestern Ohio (pp. 30-31 of USR Comments).

U.S. EPA'S RESPONSE:

The data referred to above are from sites in Minnesota, southern Illinois, southern Indiana, and Ohio that are all several hundred miles from the proposed Midco injection well. Therefore, this data is of limited use in the characterization needed for the Midco injection well. The abundant data from deep wells within northwest Indiana provide more useful data for evaluation of conditions for deep well injection at the Midco sites.

11. U.S. Reduction expressed concern that a number of potential mechanisms for contamination of other aquifers was not addressed at Midco I and Midco II including:

> Should these dissolved solids precipitate before leaving the well casing or the annulus of the well, the well could become plugged. Such precipitation can also effect the permeability of the lower Mt. Simon immediately around the well. This can cause fracturing of the formation and abandonment of the well. Also, chlorides under the heat and pressure caused by injection can become corrosive, causing the casing to corrode and leak. (p. 29 of USR Comments).
>
> Are the data points obtained from other wells completed within the Mt. Simon formation sufficient in number and sufficiently close to the proposed well to allow geological experts to accurately predict the degree of uniformity of depth of the formation? ... Thus, the degree of accuracy of the predictions regarding the uniformity of the depth of the Mt. Simon formation in this area is extremely critical. (p. 29 of USR Comments). ... Without more site specific data concerning the depth of the lower most portion of the Mt. Simon, there is a substantial risk that the parties involved herein, should they commence drilling, will be drilling "blindly" and will run a substantial risk of drilling completely through the Mt. Simon formation before they decide to complete the well. If this is true, then good operating practice and regulatory

requirements would dictate abandoning and plugging the well. There is no indication that any cost or probability factor has been calculated for this definite possibility. (p. 32 of USR Comments).

What data, if any, has been generated relative to natural conduits which may exist within the Mr. Simon formation, as well as above the formation or below it? For instance, what geological data has been developed to confirm at this point whether or not there exists within the area any fault lines, karst conditions or other geological phenomenon which have been known to act as conduits for the upward and downward migration of contaminants in deep underground injection wells? (p. 29-30 of USR Comments).

U.S. Reduction inquired about data regarding hydraulic pressures found in the lower Mt. Simon formation, and the potential for contamination of aquifers above the Mt. Simon due to the "geyser effect" (p. 32 of USR Comments).

U.S. Reduction expressed concerns about fractured formations, and leaking well casings, and about deep well injection operations causing earthquakes (p. 34 of USR Comments).

In addition, the Grand Calumet River Task Force expressed concern about "contamination from drilling, accidental subsurface contamination from in-ground or above-ground contaminates, accidental injection of contaminated liquids and/or inadequate monitoring of injection water".

U.S. EPA'S RESPONSE:

The Responsiveness Summary for the 1989 RODs provided U.S. EPA's response to similar concerns expressed in the public comments for the 1989 RODs. As stated in response to a previous comment, U.S. EPA will require the deep well injection at the Midco sites to comply with all of the substantive requirements of the UIC program that would apply to a well operated by a private party. The UIC regulations and program require many measures to assure that the deep well injection operation does not cause contamination of other aquifers. A number of these measures, including tests and requirements, are included in the Statement of Work in the Consent Decree.

The potential for harmful affects from the deep well injection is reduced compared to the 1989 RODs because the alternative of injection of the ground water without treatment has been eliminated. The ground water will have to meet what is called maximum allowable concentrations (MACs) prior to deep well injection. Generally the MAC for a parameter is 6.3 times the concentration that would be protective for drinking water usage. Once the ground water meets the MACs it is no longer regulated as a hazardous waste under the Resource Conservation and Recovery Act.

Following are statements included in pages 2-7 of the Responsiveness Summary for the 1989 RODs that summarize many important UIC program requirements:

> Regulations regarding permit requirements have undergone extensive review and public comment. Permit conditions prohibit any injection activity that allows the movement into a USDW of fluid containing any contaminant, if the presence of that contaminant may cause a violation of any primary drinking water regulation (40 CFR 144.12) or may otherwise adversely affect the health of persons.
>
> Underground injection permits include strict construction, corrective action, operation, abandonment, monitoring, reporting and financial requirements to assure that the injection well is constructed and operated in a manner that will meet U.S. EPA requirements and be protective of human health and the environment.
>
> Further data collection is required during construction of the deep well to determine or verify the geology and the quality of the construction. Measurements include resistivity, spontaneous potential, caliper, cement bond, density, temperature, porosity, gamma ray and fracture finder logs, a pressure test, a radioactive tracer survey, core samples, and a casing inspection survey. The injection well must be cased and sealed to prevent any migration of injection fluid up the borehole.
>
> The owner or operator must assure that the injection pressure at the wellhead does not exceed a maximum pressure in the injection zone [this pressure will be determined during U.S. EPA's review and approval process] during injection, and does not initiate new fractures or propagate existing fractures in the injection zone. The injection tubing must be surrounded by an annular space, which is filled with fluid. The injection pressure, flow rate, and volume of injected fluids, and the pressure on the annulus, must be continuously monitored.
>
> U.S. EPA uses three interrelated program requirements to assure compliance with well operating regulations. Mechanical integrity tests measure the operating soundness of the wells, including checking for leaks. Operator reports include information on the waste being injected; the well pressure, flow rate and volume; and report the degree of permittee compliance with these permit conditions. Periodic inspections determine the accuracy of operator self-monitoring and the adequacy injected-waste sampling. ...

> The GAO report concluded that the new deep well injection requirements should provide additional safeguards to prevent the contamination of USDWs.

Regarding concerns about precipitation, through the review, approval and oversight process for the deep well injection, U.S. EPA will assure that measures are taken to prevent precipitation of solids from plugging the formation. The well operator shall sample and test the fluid in the injection formation and the formation itself for compatibility with the injectate. If any adverse effects are noted, the operator must take appropriate control measures, such as the addition of a buffer fluid prior to injection of the waste, increased filtering of the injectate, or added pretreatment of the injectate. Limits on the injection pressure will be enforced so that the injection will not have the potential to fracture the formation and allow injection fluid to migrate out of the injection zone.

Regarding concerns about corrosion, U.S EPA requires that casing material be chosen which is expected to remain without leaks from corrosion for the life of the well. The well operator must show that casing and tubing material meets this requirement before the well is constructed.

Regarding concern about drilling completely through the Mt. Simon formation, it should be noted both that this is unlikely to occur accidently and that the consequences of this occurrence is not undesirable as indicated by U.S Reduction. Accidently drilling through the Mt. Simon formation is unlikely because the depth of the Mt. Simon formation is well defined and because the drilling depth can be controlled with sufficient accuracy. Based on the abundant data from deep wells in northwest Indiana, it is known that the structure of the Mt. Simon formation is not complex; it is laterally continuous and subject only to broad-scale folding in this area. As a result, the depth of formation boundaries can be accurately predicted to within 100 feet or less (see permit applications and completion reports for Criterion Catalyst and Midwest Steel). During the drilling, the drill cuttings (including rock fragments from the rock being drilled through) are continuously brought to the surface and examined by microscope. Using this record and a detailed record of drilling speed, the well driller can accurately predict formation boundaries.

Drilling through the Mt. Simon formation and into the top of the preCambrian basement granites is not an environmental concern because the basement rock is virtually impermeable. It may even be desirable to drill all the way through the Mt. Simon formation, because in some locations a very permeable layer is present at the formation boundary between the Mt. Simon and the granites. This layer can accept a large volume of wastewater with minimal pressure buildup.

Regarding the potential presence of natural conduits that would cause upward migration of fluids, review of information from nearby wells at USX, Inland Steel, Midwest Steel, and Bethlehem Steel do not indicate the existence of any natural conduits that may allow fluid migration. U.S. EPA will require that tests be conducted to assure that this condition does not exist at the injection well site. During drilling of the well, tests will be performed to determine the extent of the reservoir, which will indicate whether any natural conduits exist at that time. These tests will be repeated annually to assure that conduits have not developed.

Regarding hydraulic pressures in the Mt. Simon formation, hydraulic pressures have been recorded from all deep injection wells in the vicinity of the Midco sites. This data shows no indication that any abnormally high pressure formations exist in this area. During the review and approval process, U.S. EPA will assure that the available data on formation pressures is taken into account when the drilling program is planned. If necessary, Barite and other drilling additives will be added to the drilling mud to ensure that the formation fluid does not move uphole during drilling and into any USDW.

Regarding the potential for the deep well injection to cause an earthquake, U.S. EPA regulations require that injection wells not be located in areas where transmissive faults might allow migration of waste out of the confining zone, and that injection pressures be maintained below a level that might cause movement along a fault. To ensure that this does not occur, a review of all available geologic literature will be conducted for the Midco sites. Such a review has already been conducted for the petitions and permit applications for deep wells in the area (see references listed in Attachment 2), and no cause for concern about geologic faults was found.

In addition, the Consent Decree requires that an in-situ stress test be conducted during construction of the well to determine the fracture closure pressure of the injection interval (p. 21-22 of the Statement of Work, Attachment 1 to the Consent Decree). By requiring that the maximum injection pressure is set below the fracture closure pressure, U.S. EPA will assure that fractures are not caused by the deep well injection.

The problems at the Department of Defense deep well injection at Rocky Mountain arsenal are very unlikely to occur at the Midco sites because there are no indications of faulting in the northwest Indiana area.

12. U.S. Reduction seems to indicate that U.S. EPA is relying on an after-the-fact contingency plan instead of prevention of contamination of other aquifers. U.S. Reduction states that the cost effectiveness of these contingency measures was not evaluated. (p. 33 of USR Comments).

U.S. EPA'S RESPONSE:

The previous answers clearly demonstrate that U.S. EPA's focus is on taking all measures necessary to prevent contamination in the injectate from moving outside of the confining zone. U.S. EPA will require that contingency measures be taken in case a USDW is contaminated. The possibility that contingency measures will have to be implemented at the Midco sites is very remote because of what is known about the geologic conditions, because of the controls being placed on the deep well injection, and because the ground water must meet the MACs prior to deep well injection, that is, be within a factor of 6.3 times concentrations that are safe for drinking water usage.

13. U.S. Reduction states that U.S. EPA should select reinjection of ground water into the Calumet aquifer instead of deep well injection (p. 35 of USR Comments).

U.S. EPA'S RESPONSE:

This option is already allowed at both the Midco I and Midco II sites under the ROD Amendments. It states on page 2 of each Declaration for Record of Decision Amendment: "Alternatively, the ground water could be treated to remove hazardous substances followed by reinjection of the ground water into the Calumet aquifer in a manner that will prevent spreading of the salt plume." This is the alternative that was selected for the Ninth Avenue Dump site, where a slurry wall was constructed around most of the contaminated ground water. The ground water within the slurry wall will be pumped, treated for hazardous substances, and then reinjected within the slurry wall. The slurry wall will prevent the reinjection of the ground water from spreading the salt plume. The requirement against spreading the salt plume is to prevent the CERCLA action from causing contamination of the aquifer and the nearby wetlands where it does not presently exist.

U.S. EPA is concerned about the water quality of the Calumet aquifer. Available data indicates that while the Calumet aquifer has localized pockets of contamination from contaminant sources, overall it is of drinking water quality. In addition, it is used for drinking by a number of residents in the area. The Calumet aquifer has been determined to be a drinking water aquifer under U.S. EPA's ground-water classification system.

Deep well injection is safe and environmentally protective if it is conducted using the proper procedures and in the right geological conditions. The presently available information indicates that the geological conditions at the Midco sites will be acceptable for injection of the contaminated ground water once it meets the MACs. Deep well injection has an advantage over the reinjection option, in that the salt-contaminated ground water is removed from a drinking-water aquifer and following treatment is injected into an aquifer that already naturally contains salt.

14. U.S. Reduction contends that U.S. EPA should have conducted a "preliminary scientific literature search and screening process" for the soil treatment process before selection of the solidification/stabilization treatment alternative for soils (p. 37 of the USR Comments).

U.S. EPA'S RESPONSE:

U.S. EPA has already completed preliminary scientific literature searches and screening processes for soil treatment, and included the results in guidance documents that are included in the Administrative Records. For example, Dames & Moore indicated that they used the "Handbook Remedial Action at Waste Disposal Sites", October 1985, OSWER Dir 9380.0-0, which is included in the Administrative Records (see References at the end of Chapter 4 of the Feasibility Studies). This guidance document includes a summary of available information on solidification/stabilization at the time (immobilization) in pages 9-50 and 9-51, and includes a number of references that include more detailed information.

It is pointed out on page 22 of the Midco I ROD Summary and on page 21 of the Midco II ROD Summary that solidification/stabilization was selected as the best demonstrated technology for treatment of a number of hazardous wastes as defined under the Resource Conservation and Recovery Act for treatment of cadmium, chromium, lead, nickel, silver, arsenic, and selenium. U.S. EPA had to go through testing and screening processes to make this determination. This process is summarized for some hazardous wastes in the preamble to 40 CFR 268 August 17, 1988 (53 FR, No. 159, pp. 31152-31174), and further information is provided in 54 FR, No. 7, pp. 1055-1120 and 1098-1099, and in the Best Demonstrated Available Technology Background Documents Volumes 1-18. These documents are included in the Administrative Records. Data on immobilization of chromium, copper, nickel, copper, lead, zinc, cadmium, and arsenic used to develop a U.S. EPA report are included in Attachment E to the 1989 ROD Summaries.

Another guidance document summarizing information from the scientific literature and that is referenced in the 1989 RODs is the "U.S. EPA Technology Screening Guide for Treatment of CERCLA Soils and Sludges", Sept. 1988, EPA/540/2-88/004 (Midco I ROD Summary, p. 22, and Midco II ROD Summary p. 21). Table D-2 of this guidance document indicates that solidification/stabilization has demonstrated effectiveness for metals in soils and potential effectiveness for organic compounds in soils.

It should be pointed out that solidification/stabilization was not an unusual treatment technology. In 1989, it was selected in 18 out of 100 RODs that included source control measures (Exhibit 1, ROD Annual Report 1989 (EPA/540/8-90/006).

Although the bodies of the ROD Amendments do not further address the effectiveness of solidification/stabilization, since selection of this treatment alternative did not change from the 1989 RODs, a number of additional documents were added to the Administrative Records that provide information on more recent test results on the solidification/stabilization technology. These include documents on in-situ solidification/stabilization, and on stabilization of inorganic and organic compounds.

As is the case with the deep well injection alternative, U.S. EPA is also depending on input into the remedial action decision documents by experts in the field of solidification/stabilization, including Ed Barth, Ed Bates and Walter Grube of the U.S. EPA Risk Reduction Engineering Laboratory, and Dr. Soundarajin of RMC Laboratory. The credentials of Ed Barth and Dr. Soundarajin are included in Attachment 1 and in the Administrative Records.

Furthermore, U.S. EPA has stated in both the 1989 RODs and in the ROD Amendments that because of any uncertainties in the performance of solidification/stabilization, site-specific treatability studies are needed prior to full scale implementation of this alternative. If the results of the treatability study are not acceptable, the full scale operation will not be implemented, and U.S. EPA may have to select an alternative treatment technology through another ROD Amendment.

15. U.S. Reduction states that "If the arsenic results were indeed flawed, then serious questions would arise regarding the validity of the U.S. EPA's decision to require cleanup of the Midco Sites." (p. 8 of USR Comments). U.S. Reduction demands that U.S. EPA "commission a new RI/FS" (p. 38 of USR Comments).

U.S. EPA'S RESPONSE:

Based on review of the public comments, it does not appear that additional information is needed to select remedial actions at the site. Generally U.S. Reduction does not take into account the additional testing that will be required prior to operation of the deep well injection system, and the treatability study that will be conducted prior to conducting the solidification/stabilization. Of course, if the additional testing indicates that implementation of these technologies would be unacceptable, U.S. EPA will have to *reevaluate the selection of the remedial actions.*

In any event, the Remedial Investigations generated plenty of data without the arsenic in soil data. The Remedial Investigations included analyses for 131 organic compounds and 29 inorganic compounds. Over 100 samples were collected and analyzed at each site including ground water, soils, sediments and surface waters. 75 constituents other than arsenic were detected in the on-site soils at Midco I and 68 different constituents in the ground water. Similarly at Midco II, 81 constituents other than arsenic were detected in the on-site soils and 74 different constituents in the ground water. All of this data was subjected to rigorous QA/QC procedures including:

- Development and approval of a Quality Assurance Project Plan for all measurement methods prior to initiation of the work. This plan was approved by U.S. EPA. This plan included procedures for sampling, chain-of-custody, and analytical procedures.

- Unannounced inspections of the field procedures were conducted.

- Almost all of the sampling was overseen by a contractor employed by U.S. EPA.

- The analyses were conducted by a laboratory that participates in U.S. EPA's Contract Laboratory Program. Under this program, the laboratory must demonstrate that it can meet certain QA/QC requirements and provide thorough documentation of the procedures used for the analyses.

- The data from the laboratory was validated under oversight by U.S. EPA.

It should be noted that elimination of the soil arsenic data from the risk calculations does not have an enormous effect on the calculated carcinogenic risk levels from exposures to soils at the sites, although the affect is significant. Of course, the ground-water risks are unaffected since only the soil arsenic data was determined to be unreliable by EPA. The affect of the arsenic data on the estimated risks from soil ingestion at the sites based on the calculations in the Addenda to the Public Comment Draft Feasibility Studies is summarized as follows:

SITE	CARCINOGENIC RISK WITH ARSENIC (INGESTION ONLY)	CARCINOGENIC RISK WITHOUT ARSENIC (INGESTION ONLY)
Midco I	6.8×10^{-5}	4.2×10^{-5}

Midco II	3.3×10^{-4}	5.7×10^{-5}

SITE	NON-CARCINOGENIC RISK INDEX WITH ARSENIC (INGESTION ONLY)	NON-CARCINOGENIC RISK INDEX WITHOUT ARSENIC (INGESTION ONLY)
Midco I	3.6	3.6
Midco II	3.0	1.7

Chemicals other than arsenic contributing to the estimated soil ingestion risk at Midco I and Midco II include polychlorinated biphenyls, bis (2-ethylhexyl) phthalate, tetrachloroethylene, methylene chloride, dieldrin, benzo(a)pyrene, trichloroethylene, hexavalent chromium, antimony, nickel, phenol, and vanadium (Midco RODs p. 9, Addendum to Public Comment Draft FSs Table 4-21). Benzo(a)pyrene is a chemical of concern but was not included in the risk calculations summarized above.

A risk assessment conducted by PRC and included in the Unilateral Administrative Orders shows that there is also a potential acute hazard from exposures to the contaminated soils at Midco I and Midco II. The chemicals other than arsenic identified to be of most concern for acute exposures include methylene chloride, trichloroethylene, polychlorinated biphenyls, cyanide, chromium, lead and nickel.

The risk estimates conducted by PRC, included in the Administrative Records for the ROD Amendments but not in the Administrative Records for the 1989 RODs, reevaluated the direct contact and inhalation routes of exposure to the risks in case of future residential development of the sites. These estimates resulted in very high carcinogenic and non-carcinogenic risks at both sites due to inhalation exposures to some volatile organic compounds including methylene chloride, trichloroethylene, benzene, 2-butanone, and toluene. Of course, the analytical results for these volatile organic compounds are not affected by the results for arsenic.

Considering only the direct contact and ingestion modes of exposure, the following risks excluding arsenic resulted (according to PRC's calculations):

SITE	CARCINOGENIC RISKS WITHOUT ARSENIC (INGESTION AND DERMAL CONTACT)
Midco I	8×10^{-4}
Midco II	1.7×10^{-4}

SITE	NON-CARCINOGENIC RISK INDEX WITHOUT ARSENIC (INGESTION AND DERMAL CONTACT)
Midco I	4.2
Midco II	2.1

All of these analyses demonstrate that, even without considering arsenic, significant risks due to exposures to the contaminated soils exist at the Midco I and Midco II sites.

16. U. S. Reduction denies that it has any responsibility or liability for costs incurred for the Midco sites (pp. 2 and 7 of USR Comments). U.S. Reduction has included information on its involvement in the Ninth Avenue Dump Site (pp. 6 and 7 of USR Comments).

U.S. EPA'S RESPONSE:

This Responsiveness Summary is part of the Record of Decision Amendments for Midco I and Midco II. It does not address the Ninth Avenue Dump site. In addition, this document only addresses remedy selection issues and not liability issues. The liability issues can only be addressed through judicial actions.
It should be noted that page 1 of the "Ninth Avenue Site/U.S. Scrap Site Volumetric Rankings" (Exhibit C from U.S. Reductions comments), specifically states that the zero volume amount "should in no way be interpreted as an indication of no liability or reduced liability for disposal of hazardous substances at the sites." Based on this statement, U.S. EPA believes it is illogical for U.S. Reduction to conclude that it would not be brought into Midco I and II, or Ninth Avenue Dump litigation, in contrast to U.S. Reduction's statements on page 7 of its comments.

17. The only comment received at the public meeting also had to do with remedy selection. This comment was: "I disagree with the whole thing since it's not going to work one hundred percent." (last page Public Meeting Transcript).

U.S. EPA'S RESPONSE:

Based on previous questions from this commenter, it appears that he was concerned about the effectiveness of deep well injection and solidification/stabilization. The concern about the effectiveness of deep well injection was answered in the responses to previous comments.

The treatment method for contaminated soils at Midco I and Midco II was solidification/stabilization and soil vapor extraction. The soil vapor extraction will substantially reduce the amount of volatile organic compounds in the contaminated soils. Solidification/stabilization involves two component processes -- contaminated soils are (1) "solidified" through mixing with reagents into a solid block of material with high structural integrity, and (2) chemically "stabilized by adding reagents that chemically immobilize and reduce the toxicity of the hazardous constituents in the contaminated soils. A treatability study will be conducted to evaluate the effectiveness of the solidification/stabilization process. In order to be accepted, a binder for solidification/stabilization must pass both stringent physical tests and chemical tests. The physical tests include unconfined compressive strength, hydraulic conductivity, wet-dry durability, and freeze-thaw durability. The chemical tests consist of severe leaching tests. Based on such tests, solidification/stabilization has been selected as the Best Demonstrated Available Technology under the RCRA Land Disposal Restriction program for treatment of wastes containing cadmium, chromium, lead, nickel, and selenium. Another type of severe leaching test has shown that even organic compounds can be chemically immobilized by some solidification/stabilization binders.

Besides the soil treatment by soil vapor extraction and solidification/stabilization, an effective cover will be placed over the sites. This cover will be designed to substantially reduce infiltration through the contaminated soil and solidified material, and will be five feet thick to substantially reduce the threat of direct contact with the contaminated soils.

ATTACHMENT 1 TO THE RESPONSIVENESS SUMMARY

FOR THE MIDCO I AND MIDCO II ROD AMENDMENTS

RESUMES FOR DR. LEAH HAWORTH, DR. KEROS CARTWRIGHT

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EDUCATION

Ph.D.	State University of New York at Buffalo	1988
M.S.	University of Vermont	1980
B.A.	Carleton College	1977

EXPERIENCE

Technical Expert on geology of underground injection wells, U.S. Environmental Protection Agency, Chicago, 1/92 to present. Technical coordinator for hazardous waste injection "Land Ban" program and Class I injection well program.

Geologist/Permit Writer for underground injection program, U.S. Environmental Protection Agency, Chicago, 6/88 to 1/92. "Land Ban" petition reviewer, permit writer for Class I and II wells.

Consulting Geologist for Technological Systems Research, Inc., of Amherst, New York, intermittently 1982 to 1985, on bedrock and unconsolidated stratigraphy and hydrogeology.

Research Assistant to Dr. P.E. Calkin, Department of Geological Sciences, State University of New York at Buffalo, 1/82 to 5/85, on Holocene geology of northern Alaska project.

Special Research Assistant to Dr. A.M. Ziegler, Department of Geophysical Sciences, University of Chicago, 10/79 to 6/80, on global paleogeographic mapping project.

Consulting Geologist for Wagner, Heindel and Noyes, Inc., of Burlington, Vermont, intermittently 1977 to 1979, on hydrogeologic investigations related to water supply and waste disposal.

Graduate Teaching Fellow, Department of Geology, University of Vermont, 9/77 to 6/79. Supervised and trained staff for sediment laboratory, lecturing and laboratory instruction to students.

PUBLICATIONS

Haworth, L.A., Chiu, J.J., and Gerrish, H.W., 1991, Bridging the gap between hazardous waste containment models and ground truth: American Geophysical Union Spring Meeting, Special Session on Deep Underground Injection of Hazardous Waste, Baltimore, Maryland.

Haworth, L.A., Hudak, G., and Gerrish, H.W., 1992, Determination Maximum Injection Pressure for Class I Wells, U.S. EPA Region 5 Underground Injection Control Section, Regional Guidance No. 7.

Burns, P.E., Haworth, L.A., Calkin, P.E., and Ellis, J.M., 1983, Glaciology of Grizzly Glacier, Brooks Range, Alaska: Abstracts of the 12th Annual Arctic Workshop, University of Massachusetts, Amherst, Department of Geology Contribution No. 44, p. 19.

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Calkin, P.E., Haworth, L.A., and Ellis, J.M., 1983, Holocene glacier fluctuations in the Brooks Range, Alaska: R.M. Thorson and T.D. Hamilton, eds., Glaciation in Alaska: Extended Abstracts from a Workshop, Alaska Quaternary Association Occaisional Paper No. 2, p. 11-16.

Calkin, P.E., Haworth, L.A., Ellis, J.E., and Burns, P.E., 1985, Cirque glacier regime and Neoglaciation, Brooks Range, Alaska: Zeitschrift fur Gletscherkunde und Glazialgeologie, v. 21, n. 1, 8 p.

Ellis, J.M., Calkin, P.E., Bruen, M.P., and Haworth, L.A., 1983, Guide to Grizzly Glacier and Jaeger and Pika Rock Glaciers, Atigun Pass Area: accompanying J. Brown and R. Kreig, eds., Guidebook 4, Fourth International Conference on Permafrost, Alaska Div. Geol. & Geophys. Surv.

Haworth, L.A., and Calkin, P.E., 1986, Periodic formation of moraines during late Holocene time, Brooks Range, Alaska: Nineth Biennial Meeting of the American Quaternary Association, Program and Abstracts.

Haworth, L.A., Calkin, P.E., and Ellis, J.M., 1983, Glacier recession through the twentieth century, northeastern Alaska: 96th Annual Meeting of the G.S.A., Abstracts with Programs, v. 15, n. 6, p. 593.

____, 1984a, Direct measurement of lichen growth, Brooks Range, Alaska: Abstracts of the 13th Annual Arctic Workshop, Institute of Arctic and Alpine Research, University of Colorado, p. 23-25.

____, 1984b, Recent glaciation of the Schwatka Mountaines, northern Alaska: 97th Annual Meeting of the Geological Society of America, Abstracts with Programs, v. 16, n. 6, p. 533.

____, 1986, Direct measurement of lichen growth in the central Brooks Range, Alaska, U.S.A., and its application to lichenometric dating: Arctic and Alpine Research, v. 18, n. 3, p. 289-296.

Haworth, L.A., Calkin, P.E., and Ellis, J.M., in press, Distribution and activity of rock glaciers, central Brooks Range, Alaska, in J.R. Giardino and J.F. Shroder, eds., Rock Glaciers, American Association of Geography Resource Publication.

Haworth, L.A., et al., 1983a, Holocene glacier variation across the central Brooks Range, Alaska: Abstracts of the 12th Annual Arctic Workshop, University of Massachusetts, Amherst, Department of Geology Contribution No. 44, p. 36-37.

____, 1983b, A Neoglacial sequence for the west-central Brooks Range, Alaska: 18th Annual Meeting of the Geological Association of America, Abstracts with Programs, v. 15, n. 3, p. 126.

Lamo, B., Haworth, L.A., and Ellis, J.M., 1983a, Holocene landscape alteration in an alpine terrain, Brooks Range, Alaska: 18th Annual Meeting of the Geological Society of America, Northeastern Section, Abstracts with Programs, v. 15, n. 3, p. 144.

____, 1983b, Geomorphology of a glaciated arctic valley system, Brooks Range, Alaska: Abstracts of the 12 Annual Arctic Workshop, University of Massachusetts, Amherst, Department of Geology Contribution No. 44., p. 45-46.

March 1, 1991

VITA

KEROS CARTWRIGHT

PERSONAL

Present Position: Principal Geologist and Head,
Hydrogeology Research Laboratory
Illinois State Geological Survey

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615 East Peabody Drive
Champaign, IL 61820

EDUCATION

1959 University of California at Berkeley, A.B. in Geology
1961 University of Nevada at Reno, M.S. in Geology
1973 University of Illinois at Urbana-Champaign, Ph.D. in Geology

PROFESSIONAL EXPERIENCE

1959-1961 Geologist on Humboldt River Research Project - worked on this project for the State of Nevada, U.S. Geological Survey, and U.S. Agriculture Research Service

1961-present Illinois State Geological Survey, Champaign, IL 61820
- 1961-63 - Research Assistant
- 1963-70 - Assistant Geologist
- 1970-75 - Associate Geologist
- 1975-84 - Geologist. Placed In-Charge of the Hydrogeology and Geophysics Section 1974; named Head of Section in 1975.
- 1984-88 - Principal Geologist and Head, General & Environmental Geology Group.
- 1988-present - Principal Research Scientist, Hydrogeology Research Laboratory and

1976 Visiting Associate Professor of Geology, The University of Waterloo, Waterloo, Ontario Canada

1979-present Adjunct Professor of Geology, Northern Illinois University DeKalb, Illinois
1985-present Adjunct Professor of Geology, University of Illinois, Urbana-Champaign

PROFESSIONAL ORGANIZATIONS

Geological Society of America (Fellow)
American Geophysical Union
American Water Resources Association
American Institute of Hydrology
American Institute of Professional Geologists
International Association of Hydrogeologists
Illinois Ground Water Association
Indiana Water Resources Association

PROFESSIONAL CERTIFICATION

State of Indiana: Certified Professional Geologist, Certificate No. 55.
American Institute of Professional Geologist: Certified Professional Geologist, Certificate No. 2643.
American Institute of Hydrologists: Professional Hydrogeologist, Certificate No. 149.

HONORS/DISTINGUISHED LECTURES

1978 Elected a Fellow of the Explorers Club
1987 Distinguished Lecturer; Association of Ground Water Scientist and Engineers of the National Water Well Association
1987-88 Birdsall Distinguished Lecturer; Hydrogeology Division of the Geological Society of America
1988 Certificate of Appreciation from the Director of the U.S. Environmental Protection Agency

PROFESSIONAL ACTIVITIES

Geological Society of America
- Associate Editor of the Bulletin 1981-83
- Hydrogeology Division
  - Secretary/Treasurer 1973-75
  - Second Vice Chairman 1976-77
  - First Vice Chairman 1977-78
  - Chairman 1978-79
- Co-Chairman, Committee on Hydrostratigraphic Units, 1983-1990

American Geophysical Union
- Associate Editor, Water Resources Research 1975-81
- Groundwater Committee 1982-84

Editorial Board - Journal of Hydrology (Elsevier Scientific Publishing Company) 1981-1985
International Association of Hydrologists, Member of the U.S. Committee 1987-91.
American Society for Testing Materials
Chairman of Working Group on Solid Waste Siting
Vice Chairman, Geotechniques of Waste Disposal Technical Advisory
Committee on "208" Planning Illinois, 1977-80.
Lawrence Berkeley Laboratory, University of California, Director's Earth Science Division Review Committee 1982-83
Consultant to the Science Advisory Board of the U.S. Environmental Protection Agency 1983 to present; member of the standing committee on Environmental Engineering 1987-88.
Consultant in hydrogeology on water resources and problems associated with waste disposal to both government agencies and private corporations.
Editorial Board, Handbook of Hydrology, McGraw Hill Publishing Co., N.Y. (book to be published in 1991 or 92).

Vita Annex: Experience in Deep Well Disposal

I have wide experience in deep well disposal, starting in 1965, by identifying target disposal horizons for the first deep disposal well in Illinois. From 1967 to 1978, I was a member of the technical review group reviewing applications for deep well disposal permits, assisting in technical design specification and monitoring. I have administered, overseen, or developed about ten research projects on deep well disposal at the Illinois State Geological Survey. These projects include those using internal funds, U.S. EPA, Illinois Pollution Control Board, Institute for Environmental Studies and Illinois Hazardous Waste Research and Information Center grants.

VitaAnex.KC

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Cartwright, Keros, 1966, Thermal prospecting for shallow glacialand alluvial aquifers in Illinois: (abstract) Program 1966 Annual Meeting of Geol. Soc. America, p. 36.

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Cartwright, Keros and Paul Kraatz, 1967, Hydrogeology at Shelbyville, Illinois - A basis for water resources planning: Illinois State Geological Survey, Environmental Geol. Notes, no. 15, 15 p.

Cartwright, Keros, 1968, Thermal prospecting for ground water: Water Resources Research, v. 4, no. 2, p. 496-501.

Cartwright, Keros and Murray R. McComas, 1968, Geophysical surveys in the vicinity of sanitary landfills in northeastern Illinois: Ground Water, v. 6, no. 5, p. 23-30.

Bergstrom, R. E., Keros Cartwright, Kemal Piskin and M. R. McComas, 1968, Groundwater resources of the Quaternary deposits of Illinois: College of Agric., Special Publ. No. 14, p. 157 164.

Cartwright, Keros, 1968, Temperature prospecting for shallow glacial and alluvial aquifers in Illinois: Ill. State Geological Survey Circular 433, 41 p., 27 figs.

Cartwright, Keros and Frank B. Sherman, 1969, Evaluating sanitary landfill sites in Illinois: Ill. State Geological Survey, Environmental Geology Notes, no. 27, 15 p.

Cartwright, Keros and Frank B. Sherman, 1969, Ground-water and engineering geology in siting of sanitary landfills: Soc. of Mining Engineers of AIME preprint no. 701-57.

Cartwright, Keros, 1970, Geothermal exploration for ground water: Discussion: Bull. Geol. Soc. Am., v. 81, no. 4, p. 1281-1282.

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Cartwright, Keros, 1970, Science, politics, and the N.W.W.A.: Ground Water, v. 8, no. 4, p. 2-3.

Cartwright, Keros, 1970, Tracing shallow ground-water flow systems by soil temperatures: (abstract) Geol. Soc. Am. Abstracts with Programs, v. 2, no. 7, Oct. 1970, p. 515-516.

Bond, D. C. and Keros Cartwright, 1970, Pressure observations and water densities in aquifers and their relation to problems in gas storage: Journ. of Petroleum Technology, December 1970. (Society of Petroleum Engineers of AIME preprint No. SPE 2772).

Cartwright, Keros and F. B. Sherman, 1971: Ground-water and engineering geology in siting of sanitary landfills: Transactions, Soc. of Mining Eng. of AIME, v. 250, no. 1. (Abstract: 1969, Mining Engineering, v. 21, no. 12, p. 58.)

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Cartwright, Keros, R. A. Griffin and R. H. Gilkeson, 1977, Migration of landfill leachate through clayey glacial till: Ground Water, v. 15, no. 4.

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Cartwright, Keros, Robert H. Gilkeson and Thomas M. Johnson, 1980, Summary: Geologic Considerations in Hazardous-Waste Disposal: Am. Soc. of Civil Engineers Preprint 80-624, 5 p.

Nelson, Dan L., Keros Cartwright and Robert A. Griffin, 1980, A landfill Design for a Sensitive Environment: In Proceedings of the Third Annual Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, p. 286-301.

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Reed, Philip C., Keros Cartwright and Donald Osby, 1981, Electrical Earth Resistivity Survey Near Brine Holding Ponds in Illinois: Ill. Geol. Survey EGN 95, 30 p.

Lindorff, David E., Keros Cartwright and Beverly L. Herzog, 1981, Hydrogeology of Spoil at Three Abandoned Surface Mines in Illinois: Preliminary Results: Ill. Geol. Survey EGN 98, 18 p.

Heidari, M., and Keros Cartwright, 1981, Analysis of Rock Stress Around a Liquid Waste Injection System in Illinois: Water Resources Bulletin, Vol. 17, No. 4, p. 614-622.

Herzog, Beverly H., Keros Cartwright, Thomas M. Johnson and Henry J. H. Harris, 1981, A Study of Trench Covers to Minimize Infiltration at Waste Disposal Sites - Task I Report: Review of Present Practices and Annotated Bibliography: U.S. Nuclear Regulatory Commission NUREG/CR-2478, vol. 1, 236 p. (1303 Contract Report 1981 E).

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Kempton, J. P., R. W. Ringler, P. C. Heigold, K. Cartwright, and V. L. Poole, 1981, Ground-Water Resources of Northern Vermilion County, Illinois: Ill. Geol. Survey EGN 101, 36 p.

Johnson, T. M., W. J. Morse, and K. Cartwright, 1981, Codisposal of Industrial Sludges in Sanitary Landfills: Annual Report for FY 1981; Illinois Institute of Natural Resources, 66 p. (unpublished).

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Johnson, T. M., T. H. Larson, B. L. Herzog, K. Cartwright, and C. J. Stohr, 1982, Trench Cap Study; Proceedings of the 4th Annual Participants Information Meeting, DOE Low-Level Waste Management Program, Denver, CO, August 31-September 2, 1982, Oak Ridge National Laboratory, ORNL/NFW-82/18, p. 597-606.

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CURRICULUM VITAE

Rengarajan Soundararajan

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EDUCATION:

Indian Institute of Science, India
Ph.D (Hydrazine Chemistry), 1979

University of Madras, India
M.S. (Analytical Chemistry), 1975

AFFILIATION:

American Chemical Society

Croation Chemical Society

PROFESSIONAL HISTORY:

RMC Environmental Laboratory
West Plains, MO 1986 to date

Health Department, City of Springfield
Springfield, MO 1984-85

Southeast Missouri State University
Cape Girardeau, MO 1983-84

Clemson University
Clemson, S.C. 1981-83

Colorado State University
Fort Collins, CO 1979-81

University of Madras
Madras, India 1970-79

PROFESSIONAL EXPERIENCE:

Several years of experience in the areas of stabilization/solidification, electrochemical detoxification of hazardous materials, soil washing, in-situ vitrification, desensitization of ordnance materials (explosives and propellants).

Headed the research group at RMC and conducted pioneering research in stabilization/solidification process. Our efforts changed this empirical technology into a full-fledged science.

Developed binders for U.S. EPA Region IV for the White House Site which had high levels of PNAs and other long chain hydrocarbons.

Responsible for developing methodologies for the evaluation of S/S binders using physicochemical techniques such as Fourier Transform Infrared (FTIR), Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC) etc. All of these protocols have been adopted by U.S. EPA for treatability studies.

Responsible for developing the leach test, "Total Waste Analysis" (TWA) which is widely used for the evaluation of stabilization binders.

Synthesized several binders for U.S. EPA, Region IV, for the Sapp Battery Site which had 78,000 ppm Lead contamination. All of our binders passed drinking water standards. The cost estimate was brought down from 18 million dollars to 7 million dollars since our binders could be made from commercially available additives.

Have been a Reviewer for the SITE Program for the Risk Reduction Engineering Laboratory (RREL) of the Office of Research and Development (ORD), Cincinnati.

Co-authored the handbook entitled "Physical and Chemical Tests for Evaluating the S/S of Hazardous Wastes," which was developed for EPA's OSCs and RPMs.

Have been a consultant for U.S. Department of Justice and several environmental lawsuits and have given expert testimony (#702) in federal lawsuits on behalf of the U.S. EPA and Department of Justice.

Responsible for several waste site cleanups in Europe. (Please see attached list).

For the first time developed GC/MS procedures for the characterization of explosive and propellant wastes. The procedure was based on the method developed by the FBI.

Have been an advisor to U.S. EPA pertaining to the management and disposal of high energy materials. Provided expert advice to U.S. EPA headquarters, and Region VIII on the Morton Thiokkol waste problems after a site visit and review.

PUBLICATIONS:

Over 70 in various areas. About 21 in the area of stabilization/ solidification.

VITA

Edwin F. Barth, P.E.
Office of Research and Development
United States Environmental Protection Agency
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(513) 569-7669

EXPERIENCE

ENGINEER: United States Environmental Protection Agency Office of Research and Development, Center for Environmental Research Information, Cincinnati, OH. (1990 TO PRESENT)

Compile existing technical information on hazardous waste remediation technologies (focusing on immobilization technologies) developed by industry academia, and national research laboratories on hazardous waste on municipal solid waste into technology transfer documents. Provide verbal and written technical information to Federal agencies, industry, academia and international environmental agencies. Serve as expert witness to Federal agencies. Represent Office of Research and Development in agency work groups and represent agency in interagency work groups involving the transfer of technical information on hazardous waste remediation technologies.

ENGINEER: United States Environmental Protection Agency, Office of Research and Development, Risk Reduction Engineering Laboratory, Cincinnati, OH. (1987-1990)

Project Manager for solidification/stabilization technology evaluation projects. Key laboratory contact for soil solidification/-stabilization and vitrification technical assistance requests, by U.S. EPA Regions, Department of Energy, Army Corps of Engineers and other Federal agencies and states. SITE program Project Manager for demonstration involving CHEMFIX solidification/stabilization process. Key author for Agency solidification/stabilization protocols. Manager of solidification/-stabilization treatability study program at Agency's Center Hill Research Laboratory. Expert witness for solidification/stabilization negotiations.

ENGINEER: United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, Superfund Program, Washington, DC. (1984 - 1987)

Provided technical assistance to U.S. EPA Regions regarding technology implementation for uncontrolled hazardous waste sites. Development of technical policy for Superfund hazardous waste site program. Policy included evaluation and utilization of alternative technologies to land disposal.

ENGINEER: Kamber Engineering, Inc., Gaithersburg, MD. (1981 - 1982)

Project Engineer for CWA Section 201 facility plans, wastewater treatment plan design, and water line extensions.

ENGINEER: Self employed, Notre Dame, IN. (1980 - 1981)

Performed biological treatability studies on hazardous organic leachate waste utilizing sequencing batch reactors.

EDUCATION

MASTER OF SCIENCE: (Environmental Engineering), University of Notre Dame, Notre Dame, IN (1981)

Thesis: Utilization of Sequencing Batch Reactor Process for Enhanced Biological Removal of Phosphorus.

BACHELOR OF ARTS: (Microbiology, Chemistry minor), Miami University, Oxford, OH (1979)

PROFESSIONAL CERTIFICATION

Professional Engineer (P.E.), licensed in District of Columbia and Ohio.

EXPERT WITNESS

For United States Environmental Protection Agency and other Federal Agencies including negotiated settlements.

HONORS/AWARDS

Nominated for local Federal Employee of the Year Award (1988)

Outstanding Performance Rating (1988, 1989, 1990)

Special Act Award (Laboratory) (1989)

Special Act Award (Headquarters) (1989)

PROFESSIONAL ASSOCIATIONS

American Society for Testing Methods (ASTM)

Water Pollution Control Federation (WPCF) - Technical Reviewer

VOLUNTEER

Clermont County Health Department

ATTACHMENT 2 TO THE RESPONSIVENESS SUMMARY

FOR THE MIDCO I AND MIDCO II ROD AMENDMENTS

REFERENCES CONTAINING DATA ON DEEP INJECTION WELLS

IN THE VICINITY OF MIDCO I AND MIDCO II

See the following references that are listed in the Administrative Record index and has been available for review in the U.S. EPA Region V, Chicago offices:

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Golden Strata Services, Inc. "Midwest Steel Division, National Steel Corporation, Petition for an Exemption to the Hazardous Waste Injection Restriction Program, 40 CFR Part 148, Subpart B and Subpart C", Vol. 1-4. 1988.

Ken E. Davis Associates. "UIC Petition, USS, A Division of USX Corporation, Gary Works", Vol. 1-2. 1989.

"Bethlehem Steel, Burns Harbor Plant, Chesterton, Indiana, Petition for Continued Injection of Hazardous Waste". 1988.

"Criterion Catalyst Co., Michigan City, Indiana. Completion Reports for 2 Class I Non-hazardous Injection Wells Drilled to the Mt. Simon Sandstone". 1991.