IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF INDIANA
INDIANAPOLIS DIVISION

UNITED STATES OF AMERICA, et al., Plaintiffs, v. CBS CORPORATION, f/k/a, VIACOM INC., f/k/a CBS CORPORATION, f/k/a WESTINGHOUSE ELECTRIC CORPORATION, et al., Defendant. THE CITY OF BLOOMINGTON, INDIANA, et al., Plaintiffs, v. CBS CORPORATION, f/k/a, VIACOM INC., f/k/a CBS CORPORATION, f/k/a WESTINGHOUSE ELECTRIC CORPORATION, et al., Defendant.	Cause No. 1:81-cv-0448-RLY-KPF JUDGE RICHARD L. YOUNG MAGISTRATE JUDGE KENNARD P. FOSTER

AGREED AMENDMENT TO THE CONSENT DECREE PROVIDING FOR REMEDIAL ACTIONS AT NEAL'S LANDFILL LEMON LANE LANDFILL, AND BENNETT'S DUMP AND ADDRESSING GENERAL MATTERS

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WHEREAS, this Court entered a consent decree in this civil action on August 22, 1985 (the "Original Consent Decree") resolving certain matters at issue in this litigation between the plaintiffs, the United States of America (the "United States"), the State of Indiana and the Indiana Department of Environmental Management (both entities referred to herein collectively as the "State"), Monroe County, Indiana (the "County"), the City of Bloomington, Indiana and the Utilities Service Board of Bloomington, Indiana (previous two entities referred to herein collectively as the "City"), and the remaining defendant, CBS Corporation, formerly known as Westinghouse Electric Corporation and Viacom Inc. (hereinafter referred to as "CBS"), all of whom shall be referred to herein collectively as the "Parties;"

WHEREAS, the Original Consent Decree required, among other things, that CBS design, build and operate an incinerator to incinerate Polychlorinated Biphenyls ("PCBs") and other materials that CBS excavated and removed from six sites in and around Bloomington, Indiana – namely, Winston Thomas Sewage Treatment Plant ("Winston-Thomas Facility"), Anderson Road Landfill, Neal's Dump, Neal's Landfill, Bennett's Dump and Lemon Lane Landfill;

WHEREAS, on February 8, 1994, the Parties submitted a status report informing the Court that they had decided to explore whether alternative clean-up measures should be used to replace the incineration remedy set forth in the Original Consent Decree. Along with the status report, the Parties submitted a statement of agreed-upon operating principles that would guide the Parties' consideration of alternatives;

WHEREAS, on August 18, 1997, the Court entered the First Amendment to the Consent Decree, providing for implementation of alternative clean-up measures for the

sludge drying beds and sludge digesters at Winston-Thomas Facility – one of the sites addressed in the Original Consent Decree;

WHEREAS, on November 25, 1997, the Court ordered the Parties to proceed with an alternative method of disposing of wastes from the interim storage facility (required under Section XII of the Original Consent Decree), which held materials that had been excavated in accordance with the terms of the Original Consent Decree from the Anderson Road Landfill, a second site addressed in the Original Consent Decree, and certain streambeds, also addressed in the Original Consent Decree;

WHEREAS, on June 8, 1998, the Court approved a Stipulation Concerning Removal Measures for Selected Portions of the Winston-Thomas Facility, which provided for implementation of agreed upon alternative clean-up measures for the tertiary lagoon, trickling filter, and abandoned lagoons at the Winston-Thomas Facility;

WHEREAS, on February 8, 1999, the Court approved an Amendment to the Consent Decree for Neal's Dump Remedial Action, which provided for implementation of agreed upon alternative clean-up measures at Neal's Dump – a third site addressed in the Original Consent Decree;

WHEREAS, on January 20, 1999, Magistrate Judge Kennard Foster, as Special Master appointed by the Court, issued his Report and Recommendation (hereinafter "Report"). In this Report, the Special Master, *inter alia*, reported that the Parties had reached consensus with respect to alternative excavation components of the remedies at the three other sites addressed in the Original Consent Decree –Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump (the "Remaining Sites") – but that they continued to have disputes over other issues, including the United States' demands for water treatment,

sediment removal, cost recovery, and natural resource damages, and CBS's defenses to those claims. The Special Master further reported that the Parties agreed to continue to negotiate the disputed issues;

WHEREAS, on February 1, 1999, the Court issued an Order approving the Special Master's Report and Recommendation and directed the Parties to proceed with selection and implementation of alternative excavation components of remedies at the Remaining Sites addressed in the original Consent Decree. The Court further ordered the Parties to engage in settlement negotiations regarding water treatment, sediment removal, cost recovery, and natural resource damages;

WHEREAS, CBS has now completed the alternative excavation components of the remedies at Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump in accordance with Record of Decision ("ROD") Amendments issued by the U.S. Environmental Protection Agency ("U.S. EPA") on October 16, 1998, March 29, 1999, and May 12, 2000 after U.S. EPA received and responded to public comments regarding the alternative excavation components of the remedies;

WHEREAS, the Parties have completed their settlement discussions regarding water treatment, sediment removal, cost recovery, and natural resource damages and now have agreed to the terms set forth in this Amendment to the Consent Decree;

WHEREAS, with respect to the remedial actions set forth in this Amendment to the Consent Decree, U.S. EPA has (1) published for public comment proposed plans explaining the alternative remedial actions to be performed at Neal's Landfill, Lemon Lane Landfill and Bennett's Dump, (2) responded to public comments received during each of the applicable public comment periods, and (3) published ROD Amendments

setting forth the remedial actions to be performed at the Remaining Sites, and

WHEREAS, the Parties intend for all provisions of the Original Consent Decree, as previously amended, to remain in full force and effect, except as is specifically modified or amended by this Consent Decree Amendment;

NOW THEREFORE, with the consent of the Parties, it is hereby Ordered, Adjudged, and Decreed that the original Consent Decree be amended as follows:

I. DEFINITIONS

Unless otherwise expressly provided herein, terms used in this Amendment to the Consent Decree which are defined in the Comprehensive Environmental Response, Compensation and Liability and Act ("CERCLA"), 42 U.S.C. § 101 *et seq.*, in regulations promulgated under CERCLA, or in the Original Consent Decree, shall have the meaning assigned to them in CERCLA, in such regulations or in the Original Consent Decree. Whenever terms listed below are used in this Amendment to the Consent Decree or in the Appendices attached hereto and incorporated hereunder, the following definitions shall apply:

A. "Amendment to the Consent Decree" or "Amendment" shall mean this Amendment, all Appendices attached hereto, all plans reviewed and approved by U.S. EPA under this Amendment and its Appendices, and all plans incorporated by reference into the Amendment or its Appendices. In the event of conflict between this Amendment and any Appendix, this Amendment shall control.

B. "Bloomington Special Account" shall mean the special account established for the sites covered by this Amendment to the Consent Decree pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. §9622(b)(3) and this Consent Decree.

C. "Consent Decree" shall mean the Original Consent Decree entered by the Court on August 22, 1985 as modified by this Amendment and by the orders of the Court issued on April 18, 1996 (modifying decree with respect to Bennett's Dump), August 18, 1997 (modifying decree with respect to the Winston-Thomas Facility), November 25, 1997 (modifying decree with regard to the interim storage facility), June 8, 1998 (modifying the decree with respect to the Winston-Thomas Facility) and February 9, 1999 (modifying the decree with respect to Neal's Dump).

D. "Effective Date" shall mean the date upon which this Amendment to the Consent Decree is entered as an order of this Court, as set forth in Paragraph XIV of this Amendment to the Consent Decree.

E. "Governmental Parties" shall mean the United States of America (the "United States"), the State of Indiana and the Indiana Department of Environmental Management (both entities referred to herein collectively as the "State"), Monroe County, Indiana (the "County"), and the City of Bloomington, Indiana and the Utilities Service Board of Bloomington, Indiana (previous two entities referred to herein collectively as the "City").

F. "ICS Treatment Plant" shall mean the spring water treatment facility constructed by U.S. EPA at Illinois Central Spring as a removal action in connection with Lemon Lane Landfill.

G. "National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

H. "Operation and Maintenance" or "O & M" shall mean all activities required

to maintain the effectiveness of the Remedial Action as required under the Operation and Maintenance Plans approved or developed by U.S. EPA pursuant to the attached Statements of Work ("SOWs").

I. "Original Consent Decree" shall mean the text of the Consent Decree as entered by this Court on August 22, 1985, prior to any amendment thereto. To the extent that any provision of the Original Consent Decree refers to Westinghouse or Westinghouse Electric Corporation, it is understood that the Party referred to is now known as CBS Corporation.

J. "Paragraph" shall mean, depending on the context, the individual paragraphs of this Amendment to the Consent Decree referred to by the appropriate designation in this Amendment to the Consent Decree (e.g. "Paragraph IV.A of this Amendment to the Consent Decree"), or to an individual paragraph of the Original Consent Decree identified by an Arabic numeral (e.g., "Paragraph 82 of the Original Consent Decree").

K. "Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action, set forth in the attached ROD Amendments and SOWs.

L. "Record of Decision Amendments" or "ROD Amendments" shall mean the U.S. EPA Record of Decision Amendments setting forth the Remedial Actions to address Source Control and contamination of groundwater, surface water and sediment at Neal's Landfill (issued on September 25, 2007), Lemon Lane Landfill (issued on September 29, 2006), and Bennett's Dump (issued on September 26, 2006) , which are attached as Appendices hereto.

M. "Remaining Sites" shall mean Bennett's Dump, Lemon Lane Landfill, and

Neal's Landfill.

N. "Remedial Actions" shall mean those activities, except for Operation and Maintenance, to be undertaken and previously undertaken by the CBS at each of the Remaining Sites – Bennett's Dump, Lemon Lane Landfill, and Neal's Landfill – pursuant to the Consent Decree.

O. "Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States has incurred or will incur in the future at or in connection with Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump, plus interest on all such costs which has accrued or may accrue in the future.

P. "Section" shall mean, depending on the context, the Sections of this Amendment to the Consent Decree or the Sections of the Original Consent Decree, designated by the appropriate Roman numeral.

Q. "Statement of Work" or "SOW" shall mean any Statement of Work for implementation of the Remedial Designs, Remedial Actions, and Operation and Maintenance at Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump, and any modifications to such Statements of Work.

R. "Work" shall mean all activities CBS is required to perform under this Amendment to the Consent Decree.

II. REMEDIAL PROVISIONS OF ORIGINAL CONSENT DECREE SUPERSEDED BY THIS AMENDMENT

Notwithstanding any provisions contained in the Original Consent Decree, CBS shall perform the alternative response actions set forth below in Section IV of this Amendment to the Consent Decree with respect to Neal's Landfill, Lemon Lane Landfill,

and Bennett's Dump. As a result of this change in response actions, CBS will no longer be required or allowed to perform the response actions identified below in Paragraphs II.A through II.M, except as specifically stated in this Amendment to the Consent Decree:

A. **Design, Construction and Operation of Incinerator:** CBS shall not be required to perform those duties generally described in Section IV (Purpose and Summary of Activities) of the Original Consent Decree regarding the design, construction, and operation of an incinerator or ash landfill, and shall not be required to perform those specific duties relating to incineration and the disposal of incinerator ash set forth in the following Sections of the Original Consent Decree:

- Section V (Incinerator Obligations);
- Section VI (Solid Waste Supplied by the City and County);
- Section VII (Ash Disposal);
- Section XXII (Permits and Construction Schedule).

B. **Excavation and Transportation:** CBS shall not be required to perform any further duties described in Section VIII (Removal Measures) of the Original Consent Decree relating to the excavation and transportation for incineration of materials within the horizontal and vertical dimensions of Bennett's Dump, Lemon Lane Landfill, and Neal's Landfill, and from buffer zones around them.

C. **Sediment Removal:** CBS has satisfied the requirements for sediment removal specified in Paragraph 51(a)-(f) of Section VIII (Removal Measures) of the Original Consent Decree. CBS shall not be required to perform those post-closure sediment removal activities set forth in Paragraph 51(g) of the Original Consent Decree.

D. **Closure:** CBS shall not be required to perform those closure duties set forth in Section IX (Closure) of the Original Consent Decree with respect to Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump. CBS has previously closed the Winston-Thomas Facility and Neal's Dump sites in accordance with the requirements of the Consent Decree. CBS has no closure obligations with respect to Anderson Road Landfill under the Consent Decree.

E. **Post-Closure:** CBS shall not be required to perform those post-closure duties set forth in Section X (Post-Closure) of the Original Consent Decree with respect to Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump. CBS's post-closure duties with respect to the Winston-Thomas Facility and Neal's Dump are set forth in the prior amendments to the Consent Decree approved by the Court on August 18, 1997 and February 8, 1999, respectively. CBS has no post-closure obligations with respect to Anderson Road Landfill under the Consent Decree.

F. **Interim Measures:** CBS has fully complied with the requirements of Section XI (Interim Measures) of the Original Consent Decree. As of the Effective Date, Paragraph 59(a) of the Original Consent Decree shall no longer apply with respect to the continued operation of the interim water treatment facility at Neal's Landfill, but CBS shall operate that facility in accordance with the terms of the Neal's Landfill SOW for Operable Units 2 and 3 attached at Appendix I and applicable provisions of this Amendment to the Consent Decree. Consistent with Section 121(e)(1) of CERCLA, 42 U.S.C. § 9621(e)(1), no National Pollutant Discharge Elimination System ("NPDES") permit or other permit from any governmental authority shall be required for the operation of that facility as of the Effective Date of this Amendment to the Consent Decree. Accordingly, as of the Effective

Date, the existing NPDES permit for the facility shall be deemed terminated.

G. **Interim Storage:** CBS is not presently storing materials containing PCBs pursuant to Section XII (Interim Storage of Materials Containing PCBs) of the Original Consent Decree and shall have no further obligation to do so. CBS shall close the existing Interim Storage Facility ("ISF") in accordance with 40 C.F.R. § 761.61 and all other applicable federal, state, and local requirements related to closure of the ISF and ISF premises and pay the expenses thereof. CBS shall complete the closure of the ISF within one year of the Effective Date, including the demolition of the ISF, the removal of the demolished ISF from the Winston-Thomas Facility, and the restoration of the site on which the ISF was constructed by bringing to an even grade, seeding with grass seed and covering with straw. CBS shall perform verification sampling after the ISF is removed to ensure the soils beneath and no more than 25 feet from the building perimeter of the removed ISF do not exceed 2 ppm PCBs on average with no single sample being greater than 5 ppm PCBs.

H. **Groundwater Monitoring Protocol:** As of the Effective Date, CBS shall not be required to perform those duties set forth in Paragraphs 71-78 of Section XIII (Groundwater Monitoring Protocol) of the Original Consent Decree with respect to Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump, but CBS shall perform the alternative Groundwater Monitoring Protocols set forth in each of the SOWs for the Remaining Sites with respect to groundwater, surface water, and sediment contamination. Paragraph 82 of the Original Consent Decree shall remain in full force and effect.

I. **Reporting:** CBS shall not be required to comply with the requirements in Section XIV (Reporting) of the Original Consent Decree. Specific reporting requirements relating to the Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump sites are set

forth in the SOWs for each site attached to this Amendment to the Consent Decree.

J. Parties to Be Notified: Section XV of the Original Consent Decree is hereby rescinded and superseded. Each Party designates the following persons as its representatives for purposes of receipt of notice submitted pursuant to this Consent Decree and its amendments:

As to the United States Department of Justice

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
DOJ #: 90-7-1-212A

As to the U.S. Environmental Protection Agency
(with respect to notice of payment under Section VI.B.2)

Chief, Superfund Accounting
U.S. Environmental Protection Agency
Region 5
77 West Jackson Blvd.
Chicago, IL 60604

Regional Counsel
ATTN: Bloomington Sites
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604

Director, Superfund Division
Remedial Project Manager
ATTN: Bloomington Sites
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604

As to the U.S. Environmental Protection Agency
(with respect to all other notices under the Consent Decree)

Regional Counsel
ATTN: Bloomington Sites
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604

Director, Superfund Division
Remedial Project Manager
ATTN: Bloomington Sites
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604

As to the U.S. Department of the Interior
(with respect to notice of payment under Section under Section VII.B.2)

Department of the Interior
Natural Resource Damage Assessment and
Restoration Program
Attn: Restoration Fund Manager
1849 C Street, NW
Mailstop 4449
Washington, DC 20240

Office of the Solicitor
Division of Parks and Wildlife
U.S. Department of the Interior
1849 C Street, N.W.
Washington, DC 20240

As to the State of Indiana:

Valerie Tachtiris
Deputy Attorney General
Office of the Indiana Attorney General
IGCS, 5th floor
302 West Washington Street
Indianapolis, Indiana 46204

Jessica Huxhold Fliss
Federal Programs Section
Office of Land Quality
100 N. Senate Ave
MC 66-31 IGCN 1101
Indianapolis, IN 46204-2251
Ph (317)233-2823

As to the City of Bloomington:

Director of Utilities
P.O. 1216
600 East Miller Drive
Bloomington, Indiana 47402
(812) 349-3683 (fax)

Corporation Counsel
City of Bloomington
P.O. Box 100
401 North Morton Street
Bloomington, Indiana 47402
(812) 349-3441 (fax)

As to Monroe County:

President, Monroe County Board of Commissioners
Monroe County Courthouse, Room 322
100 West Kirkwood Avenue
Bloomington, IN 47404

Dr. Thomas W. Sharp
Health Officer
Monroe County Board of Health,
119 West Seventh St,
Bloomington IN 47404

As to CBS Corporation:

Dorothy M. Alke
Director, Bloomington Project
CBS Corporation
11 Stanwix Street
Pittsburgh, PA 15222
(412) 642-2562
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With respect to legal matters, a copy to:

David R. Berz
David B. Hird
Weil, Gotshal & Manges LLP
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Washington, D.C. 20005
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Each Party may change the identities of its representatives upon written notice to the other Parties. Also, each Party, upon notice to the other Parties, may designate a different individual to receive notice with respect to a specific topic (e.g., the on-scene coordinator of a particular site may be designated to receive technical documents relating to that site).

K. Insurance: Paragraph 99 of Section XX (Insurance) of the Original Consent Decree is hereby rescinded.

L. CBS's Right To Seek Modification of the Remedy: Paragraph 114(i) of the Original Consent Decree is hereby rescinded.

M. Document Retention: Paragraph 86 of the Original Consent Decree is hereby rescinded and superseded.

(1) With respect to each of the Remaining Sites, CBS shall preserve and retain, and instruct its contractors and agents to preserve, until 10 years after CBS's receipt

of the notification by U.S. EPA under the "Completion of the Work" provision of the attached SOWs that CBS has performed the Work in accordance with the Consent Decree, all non-identical copies of the last draft or final version of any documents or records (including documents or records in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work, provided, however, that CBS (and its contractors and agents) must also retain copies of all data generated during the performance of the Work and not contained in the aforementioned documents required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

(2) With respect to each of the other sites covered by the Original Consent Decree (i.e. Neal's Dump, Anderson Road Landfill and the Winston-Thomas Facility), CBS shall preserve and retain, and instruct its contractors and agents to preserve all non-identical copies of the last draft or final version of any documents or records (including documents or records in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of work (including operation and maintenance activities) required under the Original Consent Decree as amended with respect to such site, provided, however, that CBS (and its contractors and agents) must also retain copies of all data generated during the performance of the work and not contained in the aforementioned documents required to be retained. Each of the above record retention requirements shall apply, regardless of any corporate retention policy to the contrary, until ten (10) years after completion of the work (including operation and maintenance activities) required under the Original Consent Decree as amended with respect to such site, or until five (5) years after entry of this Amendment to

the Consent Decree, whichever is later.

(3) At the conclusion of the document retention periods set forth above in Paragraphs II.M(1) and II.M(2), CBS shall notify the United States at least 90 days prior to the destruction of any such records or documents, and, upon request by the United States, CBS shall deliver any such records or documents to U.S. EPA. CBS may assert that certain documents, records, and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If CBS asserts such a privilege, it shall provide the United States with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by CBS. However, no documents, reports, or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged. Nor shall CBS claim privilege with respect to any data (excluding interpretations of results) relating to conditions at the Remaining Sites or in areas affected by releases from the Remaining Sites. Nothing in this Paragraph II.M.2 shall diminish CBS's right to claim privilege in response to a document demand or subpoena by a third-party.

N. **Original Consent Decree As Previously Amended Remains in Full Force and Effect:** Except as expressly provided in this Amendment to the Consent Decree, all terms of the Original Consent Decree as previously amended shall remain in full force and effect.

III. GEOGRAPHIC BOUNDARIES OF CONSENT DECREE SITES

A. The geographic boundaries of Bennett's Dump are revised by replacing Exhibit 2 (Bennett's Dump – South Area – Metes and Bounds of Horizontal Limit of Site) of the Original Consent Decree with the attached Appendix A.

B. The geographic boundaries of Lemon Lane Landfill are revised by replacing Exhibit 7 (Lemon Lane Landfill – Metes and Bounds of Horizontal Limit of Site) of the Original Consent Decree with the attached Appendix B.

C. The geographic boundaries of Neal's Landfill are revised by replacing Exhibit 9 (Neal's Landfill – Metes and Bounds of Horizontal Limit of Site) of the Original Consent Decree with the attached Appendix C.

D. To the extent that CBS investigates or remediates areas outside of the geographical boundaries of the Remaining Sites (as defined by Appendices A, B and C), CBS may petition the U.S. EPA for expansion of the boundaries of the Remaining Site(s) to include the additional areas investigated or remediated in the course of performing the Work. In the event that U.S. EPA, in consultation with the other Governmental Parties, agrees that CBS adequately investigated or remediated the additional areas pursuant to the Work required by this Amendment to the Consent Decree, the Parties shall file with the Court a revised version of the appropriate Appendix (or Appendices) to reflect the expanded boundaries of the Site(s). In the event that U.S. EPA denies CBS's petition, CBS may challenge U.S. EPA's decision under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious, otherwise not in accordance with law, or inconsistent with terms of this Consent Decree.

E. The geographic boundaries of Winston-Thomas Facility, Neal's Dump, and Anderson Road Landfill remain as specified in the Original Consent Decree, as amended prior to this Amendment to the Consent Decree.

IV. ALTERNATIVE REMEDIES FOR NEAL'S LANDFILL, LEMON LANE LANDFILL, AND BENNETT'S DUMP

A. Bennett's Dump:

1. Source Control Operable Unit

CBS has completed all Work required for implementation of the remedy for the Source Control Operable Unit for Bennett's Dump ("Operable Unit 1") in accordance with U.S. EPA's ROD Amendment of October 16, 1998, except O&M. CBS shall continue and complete performance of O&M and other requirements set forth in the March 2002 – Long-term Groundwater Monitoring Plan, which is herein incorporated by reference into this Amendment. When this plan is updated pursuant to the terms of this Amendment or the attached Statement of Work for Bennett's Dump at Appendix E, the updated plan shall replace and supersede the March 2002 plan.

2. Groundwater, Surface Water and Sediment Operable Unit

CBS shall perform all Work at Bennett's Dump in accordance with (i) the Bennett's Dump Record of Decision Amendment for the Groundwater, Surface Water and Sediment Operable Units ("Bennett's Dump ROD Amendment for OU2/3"), which is attached at Appendix D, (ii) the Bennett's Dump Statement of Work for the Surface Water, Groundwater and Sediment Remedial Action, ("Bennett's Dump SOW for OU2/3"), which is attached hereto as Appendix E, and (iii) all work plans and other plans, standards, specifications, and schedules approved by U.S. EPA under the Bennett's

Dump SOW for OU2/3 after reasonable opportunity for review and comment by the other Governmental Parties.

3. Completion

CBS shall continue to implement the Remedial Action and O&M at Bennett's Dump until (1) CBS submits a demonstration pursuant to the "Completion of Work" clause in the Bennett's Dump SOW for OU2/3 that all Work at Bennett's Dump required under Paragraphs IV.A.1 and IV.A.2 above have been fully performed and (2) either U.S. EPA approves this demonstration or the Court overrules EPA's disapproval of CBS's demonstration pursuant to the "Completion of Work" clause in the Bennett's Dump SOW for OU2/3 on the grounds that CBS has fully performed all Work at Bennett's Dump required under Paragraphs IV.A.1 and IV.A.2.

B. <u>Lemon Lane Landfill</u>:

1. Source Control Operable Unit

CBS has completed all Work required for implementation of remedy for the Source Control Operable Unit for Lemon Lane Landfill ("Operable Unit 1") in accordance with U.S. EPA's ROD Amendment of May 12, 2000, except O&M. CBS shall continue and complete performance of O&M and other requirements set forth in the approved plans under the Statement of Work for the Source Control Remedial Action at Lemon Lane Landfill. These approved plans, which are herein incorporated by reference into this Amendment, are as follows:

- June 2001 - Final RCRA Cap Inspection and Maintenance Plan for the Lemon Lane Landfill Site
- April 2003 - Long-term Groundwater Monitoring Plan for the Lemon Lane Landfill Site

In the event that either of the above plans is updated pursuant to the terms of this Amendment or the attached Statement of Work for Lemon Lane Landfill at Appendix G, the updated plan shall replace and supersede the relevant plan listed above.

2. Groundwater, Surface Water and Sediment Operable Units

a. CBS shall take over and continue operation of the ICS Treatment Plant no later than 20 days after the Effective Date of this Amendment to the Consent Decree. The City agrees to allow CBS unlimited access to the property on which the ICS Treatment Plant is located and to Lemon Lane Landfill for as long as is necessary to complete the Work required under this Amendment. To the extent that the United States, the State or the City are beneficiaries of access agreements with third parties in connection with the operation of the ICS Treatment Plant, the United States, the State, and the City shall use their best efforts to use those rights to provide access for CBS.

b. Simultaneously with CBS taking control of the ICS Treatment Plant under the proceeding Paragraph IV.B.2.a, all rights of ownership, if any, held by the City of Bloomington or the United States in the ICS Treatment Plant (excluding the underlying land, which the City of Bloomington shall continue to own) shall be transferred to, and held by, CBS. Such transfer of title shall occur automatically and without need of additional documentation or further action by the City of Bloomington, the United States, or CBS.

c. The Parties acknowledge that the ICS Treatment Plant was designed and constructed by U.S. EPA, operated and maintained by U.S. EPA until at least August 2, 2001, and operated and maintained by the State from August 2, 2001 to July 31, 2004, prior to CBS taking control of the plant under this Amendment. The Parties further

acknowledge that by taking ownership of the plant under this Amendment, CBS is not assuming any liability or any other responsibility for (1) the design and construction of the ICS Treatment Plant by the United States or its contractors, or (2) operation and maintenance of the ICS Treatment Plant prior to CBS's assumption of operation pursuant to this Paragraph IV.B.2.

d. The United States warrants that, as of the date of lodging of this Amendment, the ICS Treatment Plant is free from defects in design, construction, and workmanship, as well as free from defects resulting from the operation or maintenance of the facility prior to August 2, 2001. The State warrants that, as of the date of lodging of this Amendment, the ICS Treatment Plant is free from defects resulting from the operation or maintenance of the facility during the period of August 2, 2001 to July 31, 2004. CBS covenants not to assert any claims against the United States or the State for breach of this warranty, unless CBS becomes obligated (including by settlement agreement) to a person other than a party to this Amendment to pay damages or perform injunctive relief based on a claim relating to the ICS Treatment Plant (excluding any claim that amounts to a challenge to U.S. EPA's selection of a removal or remedial action), in which case, and solely to recover such damages or the costs of such injunctive relief, CBS reserves the right to assert claims against the United States and/or the State for breach of this warranty. The United States and the State reserve all defenses to such a claim, except that the United States and the State agree that they will not assert that CBS's claim for breach of warranty accrued prior to the time that CBS becomes obligated to a third party to pay damages or perform injunctive relief based on a claim relating to the ICS Treatment Plant. Any such claim for breach of warranty shall be brought in this Court pursuant to the Court's retention

of jurisdiction under Section XXXII of the Original Consent Decree. In determining whether or not the United States and/or the State breached the warranty provided under this paragraph, the Court shall apply federal law.

e. In the event that CBS receives notice of claim by a third party relating to the ICS Treatment Plant, which CBS believes may result in a claim under Paragraph IV.B.2.d above, CBS shall provide notice to the United States and the State of Indiana of such a claim within 60 days of the date that CBS first received notice of the claim. If CBS decides to pursue a breach of warranty claim against the United States and/or the State, CBS shall provide notice of its intent to assert such a claim, in which case the parties shall enter into a period of informal negotiations of at least 60 days from the date that the United States and the State of Indiana receive notice in an effort to resolve this claim before CBS asserts such a claim against the United States and/or the State pursuant to Paragraph IV.B.2.d above, and Sections XXIV and XXXII of the Original Consent Decree.

f. In the event that a third party asserts or attempts to assert a claim for damages or injunctive relief relating to the operation and maintenance of the ICS Treatment Plant from July 17, 2004 to the date that CBS takes control of the plant under this Amendment, CBS, the United States, the State and the City of Bloomington each reserves all rights and defenses each may have with respect to such claim.

g. CBS shall perform all Work at Lemon Lane Landfill in accordance with (i) the Lemon Lane Landfill ROD Amendment for the Groundwater, Surface Water and Sediment Operable Units ("Lemon Lane Landfill ROD Amendment for OU2/3"), which is attached as Appendix F, (ii) the Lemon Lane Landfill Statement of Work for the Surface Water, Groundwater and Sediment Remedial Action, ("Lemon Lane

Landfill SOW for OU2/3"), which is attached hereto as Appendix G, and (iii) all work plans and other plans, standards, specifications, and schedules approved by U.S. EPA under the Lemon Lane Landfill SOW for OU2/3 after reasonable opportunity for review and comment by the other Governmental Parties. The City shall implement the institutional controls required for the implementation of remedies for Lemon Lane Landfill for Operable Unit 1 (source control) and Operable Units 2 and 3 (control of PCB-contaminated groundwater, surface water and sediment) with respect to properties owned, leased, or otherwise controlled by the City.

3. Completion

CBS shall continue to implement the Remedial Action and O&M at Lemon Lane Landfill until (1) CBS submits a demonstration pursuant to the "Completion of Work" clause in the Lemon Lane Landfill SOW for OU2/3 that all Work at Lemon Lane Landfill required under Paragraphs IV.B.1 and IV.B.2 above have been fully performed and (2) either U.S. EPA approves this demonstration or the Court overrules EPA's disapproval of CBS's demonstration pursuant to the "Completion of Work" clause in the Lemon Lane Landfill SOW for OU2/3 on the grounds that CBS has fully performed all Work at Lemon Lane Landfill required under Paragraphs IV.B.1 and IV.B.2.

C. <u>Neal's Landfill</u>

1. Source Control Operable Unit

CBS has completed all work requirements for implementation of the remedy for the Source Control Operable Unit for Neal's Landfill ("Operable Unit 1") in accordance with U.S. EPA's ROD Amendment of March 29, 1999, except O&M. CBS shall continue and complete performance of O&M and other requirements set forth in the approved plans under

the Statement of Work for the Source Control Remedial Action at Neal's Landfill. These approved plans, which are herein incorporated by reference, are as follows:

- March 2001 - RCRA Cap Inspection and Maintenance Plan for the Neal's Landfill Site
- April 2002 - Long-term Groundwater Monitoring Plan for the Neal's Landfill Site

In the event that either of the above plans is updated pursuant to the terms of this Amendment or the attached Neal's Landfill Statement of Work for Operable Units 2 and 3 ("Neal's Landfill SOW for OU2/3") at Appendix I, the updated plan shall replace and supersede the relevant plan listed above.

2. Groundwater, Surface Water and Sediment Operable Unit

a. As set forth in Paragraph II.F above, upon entry of this Amendment to the Consent Decree, CBS shall operate the water treatment plant at Neal's Landfill in accordance with the terms of the Neal's Landfill SOW for OU2/3 and applicable provisions of this Amendment to the Consent Decree.

b. CBS shall perform all Work at Neal's Landfill in accordance with (i) the Neal's Landfill Record of Decision Amendment for the Groundwater, Surface Water and Sediment Operable Units ("Neal's Landfill ROD Amendment for OU2/3"), which is attached as Appendix H, (ii) the Neal's Landfill SOW for OU2/3, which is attached hereto as Appendix I, (iii) all work plans and other plans, standards, specifications, and schedules approved by U.S. EPA under the Neal's Landfill SOW for OU2/3 after reasonable opportunity for review and comment by the other Governmental Parties, and (iv) the Remedy Confirmation Clause for Neal's Landfill at Section IX of this Amendment to the Consent Decree.

3. Completion

CBS shall continue to implement the Remedial Action and O&M at Neal's Landfill until (1) CBS submits a demonstration pursuant to the "Completion of Work" clause in the Neal's Landfill SOW for OU2/3 that all Work at Neal's Landfill required under Paragraphs IV.C.1 and IV.C.3 above have been fully performed and all Performance Standards have been either achieved by CBS or waived by U.S. EPA as technically impracticable and (2) either U.S. EPA approves this demonstration or the Court overrules EPA's disapproval of CBS's demonstration pursuant to the "Completion of Work" clause in the Neal's Landfill SOW for OU2/3 on the grounds that CBS has fully performed all Work at Neal's Landfill required under Paragraphs IV.C.1 and IV.C.2 and that all Performance Standards have been either achieved by CBS or waived by U.S. EPA as technically impracticable.

V. PURPOSE OF THE CONSENT DECREE AND OBLIGATIONS OF THE GOVERNMENTAL PARTIES

A. **Purpose**: Section IV (Purpose and Summary of Activities) of the Original Consent Decree is hereby rescinded. Following the effective date of this Amendment to the Consent Decree, any provision of the Original Consent Decree that would otherwise be construed to require CBS to construct an incinerator or incinerate excavated materials from any site shall have no force or effect.

B. **Governmental Parties' Obligations**: The United States, the State, the County and the City are hereby excused from all obligations under Paragraphs 7, 101, and 102 of the Original Consent Decree to review CBS's permit applications and plans for an incinerator or ash landfill. The United States, the State, the County, the City and CBS all

remain subject to the requirements of Paragraph 88 and 135 of the Original Consent Decree to use best efforts to accomplish the terms of the Consent Decree, including all amendments thereto, provided that nothing herein or in the Original Consent Decree shall require the United States to violate the Anti-Deficiency Act, 31. U.S.C. 1341 *et seq.*

C. **City and County Obligations**: The City and County shall not be required to perform their obligations (and give up their rights) with respect to the following provisions of the Original Consent Decree: Section V (Incineration Obligations), Section VI (Solid Waste Supplied by the City and County), and Section VII (Ash Disposal). The City shall continue to be bound by Paragraph 116 of the Original Consent Decree.

VI. PAYMENT FOR RESPONSE COSTS

A. **Additional Payment by CBS:** Within 30 days of the Effective Date of this Amendment to the Consent Decree, CBS shall pay to the United States (in addition to the payment of $1,000,000 made by CBS to the United States under Paragraph 115 of the Original Consent Decree) the amount of $6,669,000 for Response Costs.

B. **Payment Mechanics**:

1. Payment shall be made by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice account in accordance with current EFT procedures, referencing USAO File Number 1980v03100, EPA Site/Spill ID Numbers LL - IND980794341, BD - IND006418651 and NL - IND980614556, and DOJ Case Number 90-7-1-212A. Payment shall be made in accordance with instructions provided to CBS by the Financial Litigation Unit of the United States Attorney's Office for the Southern District of Indiana following lodging of the Amendment to the Consent Decree. Any

payments received by the Department of Justice after 4:00 p.m. (Eastern Time) will be credited on the next business day.

2. At the time of payment, CBS shall send notice that payment has been made to the United States, to U.S. EPA, and to the Regional Financial Management Officer, in accordance with Section II.J of this Amendment to the Consent Decree.

3. The total amount to be paid by CBS pursuant to this Section VI shall be deposited in the Bloomington Special Account within the U.S. EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the sites covered by the Consent Decree or transferred by U.S. EPA to the U.S. EPA Hazardous Substance Superfund.

4. In the event that the payment required under this Section is not received when due, interest shall accrue on the unpaid balance through the date of payment at the rate specified for interest on investments of the U.S. EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a).

VII. PAYMENT FOR NATURAL RESOURCE DAMAGES

A. **Natural Resource Damages Payment**: Within 30 days of the Effective Date of this Amendment to the Consent Decree, CBS shall pay to the United States the sum of $1,881,000 for natural resource damages. CBS shall make this payment by electronic transfer to the United States in accordance with the current electronic funds transfer procedures and instructions to be provided to CBS by the Financial Litigation Unit, United States Attorney's Office for the Southern District of Indiana, following lodging of the Amendment to the Consent Decree. Any payments received by the Department of Justice

("DOJ") after 4:00 p.m. (Eastern Time) will be credited on the next business day. CBS shall provide notice of this payment to DOJ and the United States Department of the Interior ("DOI") in accordance with Section II.J of this Amendment to the Consent Decree. In the event that the payment required under this Section is not received when due, interest shall accrue on the unpaid balance through the date of payment at the rate specified for interest on investments of the U.S. EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a).

B. Allocation of Payment:

1. Payment for Restoration Costs:

One million five hundred thousand dollars ($1,500,000) of the amount to be paid by CBS pursuant to this Section shall be for deposit into the Bloomington Restoration Account, an account to be established within the DOI Natural Resource Damages Assessment and Restoration Fund (the "Restoration Account"). DOI will assign these funds a special project number to allow the funds to be maintained as a segregated account within the Restoration Account. All such funds shall be used by DOI to conduct or finance projects to permanently protect and restore riparian and forested wetland habitat in the White-River/Patoka River watershed to benefit impacted fish and wildlife species that the United States alleges to be injured by hazardous substances at the Remaining Sites. In particular, these projects will benefit birds, fish and bats through conversion of marginal agricultural land to palustrine open water emergent scrub shrub and forested habitats, and will be coordinated with the North American Waterfowl Management Plan and the Emergency Wetlands Resources Act. Any use by DOI of such funds for the purposes not

specified in this Amendment to the Consent Decree will not affect in any manner the rights and obligations of CBS under the Consent Decree.

2. Reimbursement of Assessment Costs

Three hundred eighty-one thousand dollars ($381,000) of the amount to be paid by CBS pursuant to this Section shall be to reimburse damage assessment costs incurred by DOI.

VIII. COVENANTS NOT TO SUE

A. Anderson Road Landfill, Winston-Thomas Facility, Neal's Dump, and Other Areas: With respect to Neal's Landfill, Lemon Lane Landfill and Bennett's Dump, Section XXIII (Covenant Not to Sue) of the Original Consent Decree is hereby amended and superseded by Section VIII.B and C below. In all other respects, the Covenant Not to Sue in the Original Consent Decree remains in full force and effect.

B. Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump:

1. Effective upon entry of this Amendment to the Consent Decree, and conditioned only upon compliance by CBS with the provisions of this Consent Decree including this Amendment, and subject to the reservation of rights set forth in Paragraph VIII.B.4 below, the United States, State, City and County hereby covenant not to assert against CBS in any civil or administrative action or proceeding (i) any claim alleged in the complaints and amended complaints in these actions or (ii) any claim arising under federal, state or local law, including common law, intended to protect the environment, in either case resulting from or relating to:

a. The past disposal or discharge of PCBs or materials contaminated with PCBs at Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump.

For purposes of the preceding sentence, the "past disposal or discharge" includes the subsequent migration of PCBs or materials that first entered the environment before entry of the Original Consent Decree.

b. The release or threatened release of PCBs or materials contaminated with PCBs from Neal's Landfill, Lemon Lane Landfill or Bennett's Dump. For the purposes of the preceding sentence, the "release or threatened release of PCBs" does not include releases or threatened releases from PCBs that first enter into the environment after the entry of the Original Consent Decree through the conduct of CBS, its contractors, representatives, or agents.

c. The release or threatened release of hazardous substances other than PCBs from Neal's Landfill, Lemon Lane Landfill, or Bennett's Dump. For the purposes of the preceding sentence, the "release or threatened release of hazardous substances other than PCBs" does not include releases or threatened releases from hazardous substances that first enter into the environment after the entry of the Original Consent Decree through the conduct of CBS, its contractors, representatives or agents.

d. Activities which CBS performs in compliance with the Consent Decree including, but not limited to, releases occurring as a result of CBS implementing the Work required under the Consent Decree, but excluding the performance of activities in a manner which violates standards of care required by applicable federal, state or local law, including common law.

2. Nothing herein shall be construed to relieve CBS from any liability at law or equity for (1) failure to perform in accordance with this Consent Decree or (2) any acts, omissions or events not expressly referred to in this Covenant. Subject to the

provisions of Section XXVII (Delay or Prevention of Performance) of the Original Consent Decree, in the event that this Court determines that CBS has failed to perform its obligations under this Amendment to the Consent Decree, the Covenant in favor of CBS shall become null and void and of no further force or effect except with respect to those sites and areas as to which CBS has performed its obligations under this Decree; and the United States, State, City and County, or each of them, may seek relief at law or in equity for any matters except to the extent that the Covenant remains effective.

3. To the extent that the law of the State of Indiana may be determined to control and govern the interpretation of this Consent Decree, the Parties hereto do not intend that this Covenant Not to Sue shall be a release as that term is defined by Indiana law. The Parties hereto intend that this provision shall be construed to be a covenant not to sue civilly, execute judgment, or take any civil or administrative action against CBS and only CBS but including its directors, officers, agents and employees. Nothing herein shall be construed to release any claims, causes of action, or demands in law or equity against any person or entity not party to this Consent Decree.

4. The Parties have determined on the basis of currently available information that the remedies for Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump provided under this Amendment to the Consent Decree are adequate to abate the release or threat of release of hazardous wastes or substances from sites and areas that are the subject of the Consent Decree and do not believe that further remedies will be necessary. However, presently unknown or unforeseen conditions may present an imminent and substantial endangerment to health, welfare or the environment in the future. Subject to the provisions of Paragraph 82 of the Original Consent Decree, and in addition

to the powers granted the On Scene Coordinator pursuant to Section XVII (On Scene Coordinator) of the Original Consent Decree, nothing in this Section VIII.B or in this Consent Decree as amended is intended to affect the statutory rights of the United States as follows:

a. United States' Pre-certification Reservations: The United States reserves, and this Consent Decree is without prejudice to, the right to seek appropriate relief to abate a release or threat of release of hazardous wastes or substances, or to seek cost recovery for removal or remedial actions undertaken by the United States or State to abate such a release or threat of release, where such release or threat of release may present an imminent and substantial endangerment to health, welfare or the environment and results from previously unknown or unforeseen conditions that arise or are discovered after entry of this Amendment to the Consent Decree but prior to the Certification of Completion of the Remedial Action with respect to the Remaining Site where the release or threatened release occurs.

b. United States' Post-Certification Reservations: The United States reserves, and this Consent Decree is without prejudice to, the right to seek appropriate relief to abate a release or threat of release of hazardous wastes or substances, or to seek cost recovery for removal or remedial actions undertaken by the United States or State to abate such a release or threat of release, where such release or threat of release may present an imminent and substantial endangerment to health, welfare or the environment and results from previously unknown or unforeseen conditions that arise or are discovered after Certification of Completion of the Remedial Action with respect to the Remaining Site where the release or threatened release occurs.

C. Covenant Not to Sue for Natural Resource Damages

Notwithstanding any other provision of the Original Consent Decree or any of its amendments (including this Amendment), upon payment of the amount specified in Section VII above, the Covenant Not to Sue in Paragraph 111 of the original Consent Decree and the Covenant Not to Sue in this Section VIII shall bar all claims that the United States, the State, the County and the City may have either now or in the future for natural resource damages arising from or relating to the past disposal or discharge, or the threatened release of PCBs, materials contaminated with PCBs, or other hazardous substances at or from (1) Neal's Landfill, Lemon Lane Landfill, and Bennett's Dump as defined in this Consent Decree Amendment; (2) Winston-Thomas Facility, Neal's Dump, and Anderson Road Landfill as defined in the Original Consent Decree, as previously amended, and (3) all other sites and areas identified in Sections VIII and IV, or pursuant to Paragraphs 47 and 51 of the Original Consent Decree as amended. Such Covenants Not to Sue shall not be subject to any reservation of rights by the United States or any other Party to reassert such claims against CBS based on any new information or previously unknown or unforeseen conditions.

D. Covenant Not to Sue by CBS

1. Upon the Effective Date of this Amendment to the Consent Decree, CBS Covenants Not to Sue and agrees not to assert any claims against the United States, the State, the City, or Monroe County with respect to its claim for breach of contract or any violation of the Original Consent Decree arising prior to the Effective Date of this Amendment to the Consent Decree. Such Covenants Not to Sue shall not be subject to any reservation of rights by CBS, except as set forth below in Paragraph VIII.D.2 below.

2. CBS maintains that the State is liable for breach of the Original Consent Decree as a result of State legislature's enactment of Burns Ind. Code § 13-7-16.5-9 (recodified as Burns Ind. Code §§ 13-17-10-1 through 13-17-10-4) or of Burns Ind. Code § 13-7-8.5-11.3 (recodified as Burns Ind. Code § 13-22-3-9) (hereinafter "Breach of Contract Claim"). CBS's Covenant Not to Sue the State on the Breach of Contract Claim shall remain in effect only for as long as the United States does not take any civil or administrative action to seek additional relief pursuant to Paragraph 111(e) of the Original Consent Decree, or Sections IV.C.2.b or VIII.B.4 of this Amendment to the Consent Decree. In the event that the United States seeks such additional relief under any of the above listed provisions, CBS will have the right to pursue its Breach of Contract Claim against the State pursuant to Sections XXIV (Dispute Resolution) and XXXII (Retention of Jurisdiction) of the Original Consent Decree by filing a notice of its intent to pursue this Breach of Contract Claim within 90 days after the United States' action. The State agrees that it will not raise the defenses of statute of limitations or laches for the time period beginning on August 22, 2002 (the date of the Tolling Agreement among the United States, the State, and CBS), provided that a notice of CBS's intent to pursue such Breach of Contract Claim is timely filed with the Court under the terms of the preceding sentence.

E. Waiver of Claims Against Hazardous Substances Response Trust Fund and the United States

1. Paragraph 114(a) of the Original Consent Decree is hereby rescinded and superseded.

2. CBS agrees not to assert any claims or demands for compensation or payment under CERCLA Sections 106(b)(2), 107, 111, 112, 113 or any other provision of

law or under this Consent Decree against the Hazardous Substances Response Trust Fund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507), for or arising from any activity performed or expenses accrued pursuant to this litigation or under this Consent Decree, provided, however, that U.S. EPA hereby approves the Work which CBS is required to take pursuant to this Consent Decree as consistent with the National Contingency Plan for the purpose of allowing CBS to assert against any other person (other than Parties to this Consent Decree) any claim with respect to hazardous waste generated by that person.

3. Except as set forth in Paragraph IV.B.2.d and IV.B.2.f, CBS agrees not to assert any claims or demands for compensation or payment under CERCLA Sections 107 or 113 or any other provision of law against the United States for or arising from any activity performed or expenses accrued pursuant to this litigation or under this Consent Decree.

4. Nothing in this Paragraph VIII.E shall impair the obligation of the United States to fully pay in the event that the Court determines that the United States is liable to CBS for breach of the warranty provided by the United States in Paragraph IV.B.2.d.

IX. REMEDY CONFIRMATION CLAUSE FOR NEAL'S LANDFILL

A. General

1. The remedy selected by U.S. EPA in the Neal's Landfill ROD Amendment for OU2/3 is intended to reduce PCB concentrations in fish in Conard's Branch to "target" concentrations, which U.S. EPA has determined to be protective of

human health and the environment. These target concentrations are set forth in Table 1 below.

Table 1

Target PCB Concentration to Protect Ecological Receptors	
Sampling Location (1)	**Target Mean PCB Concentration in Whole Fish (mg/kg Wet Basis)**
Location B – lower reach of Conard's Branch above Vernal Pike Bridge	2.3
Location D – Richland Creek at the Vernal Pike Bridge	0.9
Target PCB Concentration to Protect Human Receptors	
Sampling Location (1)	**Target Mean PCB Concentration in Fillets (mg/kg Wet Basis)**
Location F – Richland Creek at State Route 43 Bridge in Owen County	0.2

(1) "B","D", and "F" refer to fish sampling locations as previously designated and utilized in 2001 - 2005 sampling

2. The Parties believe that the remedial actions selected by U.S. EPA in the Neal's Landfill ROD Amendment for OU2/3 (hereinafter, for the purposes of this Section, "the remedy") are adequate to achieve the above target concentrations in a period of 10 years (or less) from the date of the completion of construction of the Remedial Action to address PCB contamination in groundwater, surface water and sediment at Neal's Landfill. The purpose of this Section IX Remedy Confirmation Clause ("RCC") is to provide a process (subject to conditions set forth in Paragraphs IX.F and IX.G below) for U.S. EPA to modify the remedy for groundwater, surface water, and sediment contamination if U.S. EPA concludes, based upon criteria set forth in Paragraph IX.D, that the remedy has not achieved and will not achieve the target concentrations in fish.

3. To measure progress toward achieving the target concentrations for PCBs in fish, CBS shall collect fish samples from the sampling locations in Table 1 above (*i.e.* locations B, D and F) in accordance with a Sampling Plan approved by U.S. EPA under Paragraph IX.H below. The Parties shall use these fish samples to determine the mean concentration of PCBs in fish at each sampling location, and then the Parties shall use this mean concentration to measure progress toward achieving the target concentrations for PCBs in fish. For the purpose of this RCC, the term "mean concentration of PCBs in fish" shall refer to a simple arithmetic mean of fish tissue PCB concentrations at each sample location based upon the sample mixes set forth in the chart below. CBS shall continue to perform fish monitoring in accordance with the approved Sampling Plan until (1) CBS demonstrates statistically, in accordance with the methodology set forth in Paragraphs IX.B and IX.C below, that the mean concentration of PCBs in fish at each sample location is equal to or less than the pertinent target concentration, or (2) U.S. EPA modifies the remedy in accordance with the procedures set forth under this RCC, in which case CBS's further monitoring obligations shall be determined consistent with the modified remedial action.

Population of Fish Sampled to Measure Progress Toward Achieving Target Concentrations in Fish Protective of Ecological Receptors	
Sampling Location	**Sample Mix**
Location B – lower reach of Conard's Branch above Vernal Pike Bridge	50% Creek Chub 50% Green Sunfish, or 100% Creek Chub (if insufficient sunfish available)
Location D – Richland Creek at the Vernal Pike Bridge	33% Top Predator (e.g., Sunfish or Rock Bass) 33% Omnivores (e.g., Creek Chub) 33% Bottom Feeders (e.g. White Suckers)
Population of Fish Sampled to Measure Progress Toward Achieving Target Concentrations in Fish Protective of Human Receptors	
Sampling Location	**Sample Mix**
Location F – Richland Creek at State Route 43 Bridge in Owen County	75% Top Predator (e.g., Sunfish or Rock Bass) 25% Bottom Feeders (e.g. White Suckers)

4. U.S. EPA will evaluate the remedy every five years after the completion of construction to determine whether the mean concentration for PCBs in fish is statistically greater than or less than the target concentrations. Subject to the limitations set forth in Paragraphs IX.F and IX.G below, U.S. EPA may modify the remedy for groundwater and sediment contamination if it can statistically demonstrate that the remedy "has not achieved and will not achieve the target concentrations in fish" in accordance with the methodology set forth in Paragraphs IX.B and IX.D below, or in accordance with an alternative methodology mutually agreed to by U.S. EPA and CBS. In the event that U.S. EPA makes such a demonstration, it shall provide notice to CBS of this fact and of U.S. EPA's intent to modify the remedy pursuant to the RCC. CBS will then have the opportunity under Paragraph IX.F below to challenge U.S. EPA's determination. If CBS cannot meet its burden under Paragraph IX.F, U.S. EPA may modify the remedy subject to the limitations set forth under Paragraph IX.G below. In modifying the remedy, U.S. EPA shall be guided by the ROD amendment process in the National Contingency Plan.

5. Upon selection of the modified remedy by U.S. EPA, CBS shall be

required to perform the modified remedy. CBS, however, may exercise its right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's selection pursuant to Paragraph IX.G.5 below.

B. Statistical Hypothesis Testing

1. There is inherent uncertainty in determining whether mean PCB concentrations in fish are above or below the target concentrations because of variability in sampling data. U.S. EPA and CBS shall use statistical sampling and analysis procedures to control the risk of reaching false conclusions with respect to whether the mean concentrations of PCBs in fish have achieved or will achieve the target concentrations set forth in Paragraph IX.A.1 above. Unless U.S. EPA and CBS, in consultation with the other Governmental Parties, mutually agree upon an alternative statistical methodology (e.g. regression analysis or statistical modeling), they shall use the statistical methodology known as "classical statistical hypothesis testing," which is described in the guidance documents *U.S. EPA QA/G-4 Guidance on Systematic Planning Using the Data Quality Objectives Process (February 2006), and U.S. EPA QA/G-9S Data Quality Assessment: Statistical Methods for Practitioners (February 2006).* U.S. EPA and CBS, in consultation with the other Governmental Parties, may mutually agree to use a regression model to test trends in the mean concentration of PCBs in fish, or to compare mean concentrations to target concentrations or historical data, while accounting for cofactors such as the year when sampling was conducted, the season when sampling was conducted, the sample location, the species of fish sampled, and the lipid content of the sampled fish.

2. The following terms shall be given the same meaning in this RCC that they have in the two guidance documents cited above:

- baseline condition
- alternative condition
- gray region
- false rejection of the baseline condition
- false acceptance of the baseline condition
- false rejection decision error limit
- false acceptance decision error limit

C. Termination of CBS's Obligation to Modify Remedy under the RCC

1. At any time after the completion of construction of the remedy to address PCB contamination in groundwater, surface water, and sediment at Neal's Landfill, CBS may request a determination by U.S. EPA that the remedy has successfully achieved the target concentration for PCBs in fish set forth in Paragraph IX.A.1. CBS shall use statistical hypothesis testing to demonstrate to EPA that the remedy has achieved the target concentrations set forth in Paragraph IX.A.1 at each sampling location. Thus, CBS shall perform a total of three tests, one for each location.

2. In conducting the statistical hypothesis tests, CBS shall assume as its baseline condition that the mean PCB concentration in fish from any given sampling location is equal to or greater than the target concentration for that sampling location. If CBS can statistically prove with 95% confidence the alternative condition (*i.e.*, if CBS can demonstrate that the mean PCB concentration for fish is below the target value by a statistically significant margin) for all sample locations, CBS will have adequately demonstrated that the remedy has been successful. At that point, CBS's obligations under this RCC will terminate and CBS and the United States will so notify the Court. CBS will continue to have operation and maintenance obligations at the Site. These O&M obligations will include fish sampling (at the reduced level specified in the Long-term Monitoring Plan approved by U.S. EPA under the Neal's Landfill SOW for OU2/3) in

support of U.S. EPA's five-year review process. If U.S. EPA does not concur with CBS's statistical demonstration under the previous Paragraph IX.C.1 and this Paragraph IX.C.2, CBS may petition the Court under Section XXIV (Dispute Resolution) of the Original Consent Decree to demonstrate that U.S. EPA's non-concurrence is arbitrary and capricious or otherwise not in accordance with law.

3. In the event that CBS cannot meet the test set forth in the preceding Paragraph IX.C.2 with respect to all sample locations but it can meet the test with respect to a sample location in Richland Creek (*i.e.*, sample location D or F), CBS shall be relieved of its obligation to implement the sampling plan for enhanced fish monitoring approved by U.S. EPA under Paragraph IX.H with respect to that sample location and shall implement instead at that location the fish sampling specified in the Long-term Monitoring Plan approved by U.S. EPA under the Neal's Landfill Statement of Work for Operable Units 2 and 3.

4. For the purpose of estimating sample sizes for conducting each statistical hypothesis test, CBS shall estimate sample requirements as follows:

a. The upper bound of the gray region shall be set at the target concentrations set forth in Paragraph IX.A.1;

b. The lower bound of the gray region shall be set at 20% less than the upper bound. Specifically, the lower bound will be set at 1.8 mg/kg for location B, 0.72 mg/kg for location D, and 0.16 mg/kg for location F;

c. The false rejection decision error limit at the upper bound of the gray region (*i.e.*, the boundary of the gray region at the target concentration) shall be set at 5%, and;

d. The false acceptance decision error limit at the lower bound of the gray region (*i.e.*, the boundary of the gray region opposite the boundary formed by the target concentration) shall be set at 20%.

5. In accordance with Paragraph IX.H.3, the parameters set forth in Paragraph IX.C.4 above may be modified in light of the number of fish that are reasonably available in the streams for sampling. In the event that the parameters set forth in Paragraph IX.C.4 are modified, CBS may petition U.S. EPA to modify the hypothesis test set forth in Paragraph IX.C.2. In response, U.S. EPA may determine that hypothesis test shall remain unchanged, or alternatively, U.S. EPA may modify the hypothesis test pursuant to the mutual agreement of U.S. EPA and CBS. In either event, the hypothesis test shall be performed in accordance with U.S. EPA's determination, except that CBS may exercise its right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination that the hypothesis test shall remain unchanged on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

D. Evaluation of Achievement of Target Concentrations in Fish

1. First Five-Year Review

a. To demonstrate at the first five-year review that the remedy has not achieved and will not achieve the target concentrations in fish, U.S. EPA must show that (1) the mean concentration of PCBs in fish at any sampling location is greater than the target concentration set forth in Paragraph IX.A.1 for that location, and (2) the mean concentration of PCBs in fish at the same location has shown no improvement in comparison to pre-remedy data collected from the same location in 2003 through 2005. To

make this showing, U.S. EPA shall satisfy each part of the following two-part test with respect to any one of the three sampling locations:

i. First Part: U.S. EPA shall use statistical hypothesis testing to demonstrate that the mean concentration of PCBs in fish at a sampling location has failed to achieve the target concentration for that location. In conducting this test, U.S. EPA shall assume as its baseline condition that the mean concentration of PCBs in fish at the sampling location is equal to or less than the target concentration for the sampling location. In the event that U.S. EPA can statistically prove the alternative condition with 95% confidence (*i.e.*, that the mean concentration of PCBs in fish is greater than the target concentration by a statistically significant margin) at any one of the three sampling locations, U.S. EPA may then proceed to the second part of the test.

ii. Second Part: For each sampling location where the mean concentration of PCBs in fish is greater than the target value by a statistically significant margin (*i.e.*, for any sampling location where U.S. EPA has rejected the baseline condition that the mean concentration of PCBs in fish at the location is equal to or less than the target concentration), U.S. EPA shall use statistical hypothesis testing to determine whether there has been an improvement in the mean concentration of PCBs in fish in comparison to pre-remedy data collected from the same location in 2003 through 2005, as shown in the documents identified under Paragraph IX.D.1.a.iii below. In conducting this test, U.S. EPA shall assume as its baseline condition that the mean concentration of PCBs in fish in year 5 is equal to or less than the mean concentration for PCBs in fish at the same sampling location in 2003 through 2005. In the event that U.S. EPA can statistically prove the alternative condition with 95% confidence (*i.e.*, that the mean concentration of PCBs in

fish at year 5 is greater than the mean concentration in 2003 through 2005 by a statistically significant margin) for at least one sample location, U.S. EPA will have adequately demonstrated that the remedy has not and will not achieve the target concentrations for fish set forth in Paragraph IX.A.1.

iii. For the purposes of the previous Paragraph IX.D.1.a.ii, the term "pre-remedy data" shall mean data included within the following documents:

(1) All documents listed below from the Administrative Record for the Neal's Landfill ROD Amendment for OU2/3:

- Document 179 - From U.S. EPA - Split Fish Sample Analytical Results for the Neal's Landfill Site (7/23/04)
- Document 205 - From CBS - Neal's Landfill Fish Samples May 2003 Validation with Attachments (8/6/04)
- Document 206 - From CBS - Neal's Landfill Fish Samples November 2003 Validation with Attachments (8/11/04)
- Document 207 - From Tetra Tech - Tetra Tech's Data Validation Review of Neal's Landfill Fish Samples May 2003 Validation (8/17/04)
- Document 208 - From Tetra Tech - Tetra Tech's Data Validation Review of Neal's Landfill Fish Samples November 2003 Validation (9/1/04)
- Document 210 - From Tetra Tech - Fish Tissue Sample Analytical Results at the Neal's Landfill Site with Attachments (9/7/04)
- Document 212 - From CBS - Viacom's Comments to Tetra Tech's Data Validation Review of Neal's Landfill Fish Samples May 2003 Validation (9/22/04)
- Document 213 - From U.S. EPA - Revised Fish Sample Analytical Results at the Neal's Landfill Site with Attachments (9/21/04)
- Document 215 - From Tetra Tech Responses to Viacom's Comments on Data Validation Review of Neal's Landfill Fish Samples May 2003 Validation (10/5/04)

- Document 259 - From U.S. EPA - Fish Tissue Split Sample Analytical Results at Neal's Landfill with Attachments (2/20/06)

- Document 260 - From CBS - Fall 2005 Fish Tissue Sampling for Aroclor and Lipid Analysis at Conard's Branch and Richland Creek Near Neal's Landfill (2/27/06)

- Document 262 - From CBS - Neal's Landfill November 2005 Fish Sample Congener PCB Validation (3/23/06)

- Document 265 - From Tetra Tech - Tetra Tech's Data Validation Review of Neal's Landfill Fish Sample November 2005 Cogener PCB Validation (4/27/06)

or (2) all other documents added as an update to the Administrative Record for the Neal's Landfill ROD Amendment for OU2/3, provided that any such document includes pre-remedy fish data collected in 2003, 2004, or 2005 from one or more of the fish sample locations set forth in Paragraph IX.A.1, and that such data qualifies as contract lab program ("CLP") data or has been subject to quality assurance and quality control ("QA/QC") safeguards equivalent to those required for CLP data. Any Party may propose to place additional fish data in the Administrative Record as an update to the Neal's Landfill ROD Amendment for OU2/3 for the purposes of this Paragraph, and U.S. EPA shall accept any such proposed data, provided that it satisfies the conditions set forth in the proceeding sentence (*i.e.*, the data were collected in 2003, 2004, or 2005 from one or more of the fish sample locations set forth in Paragraph IX.A.1, and such data qualifies as CLP data or has been subjected to QA/QC safeguards equivalent to those required for CLP data).

b. For the purpose of estimating sample sizes for conducting each statistical hypothesis test set forth in Paragraph IX.D.1.a.i above, U.S. EPA shall apply the following parameters:

i. The upper bound of the gray region shall be set at a

value equal to the target concentration set forth in Paragraph IX.A.1, plus 20% of the target concentration. Specifically, the upper bounds will be set at 2.8 mg/kg for location B, 1.1 mg/kg for location D, and 0.24 mg/kg for location F;

ii. The lower bound of the gray region shall be set at the target concentration set forth in Paragraph IX.A.1;

iii. The false rejection decision error limit shall be set at 5% at the lower bound of the gray region (*i.e.*, the boundary of the gray region formed by the target concentration); and

iv. The false acceptance decision error limit shall be set at 20% at the upper bound of the gray region (*i.e.*, the boundary of the gray region opposite the boundary formed by the target concentration).

c. For the purpose of setting sample sizes for conducting each statistical hypothesis test set forth in Paragraph IX.D.1.a.ii above, U.S. EPA shall apply the following constraints:

i. The upper bound of the gray region shall be set at a value equal to 20% of the mean of the historical data for each fish species at each sampling location;

ii. The lower bound of the gray region shall be set at zero, (corresponding to the case that there is no difference between the mean concentration of PCBs in post remediation fish and the mean concentration for PCBs in fish at the same sampling location in 2003 through 2005);

iii. The false rejection decision error limit shall be set at 5% at the lower bound of the gray region, and

iv. The false acceptance decision error limit shall be set at 20% at the upper bound of the gray region.

d. In accordance with Paragraph IX.H.3, the parameters set forth in Paragraph IX.D.1.b and IX.D.1.c above may be modified in light of the number of fish that are reasonably available in the streams for sampling. In the event that the parameters set forth in Paragraph IX.D.1.b and IX.D.1.c are modified, CBS may petition U.S. EPA to modify the hypothesis tests set forth in Paragraph IX.D.1.a. In response, U.S. EPA may determine that the hypothesis tests shall remain unchanged, or alternatively, U.S. EPA may modify the hypothesis tests pursuant to the mutual agreement of U.S. EPA and CBS. In either event, the hypothesis tests shall be performed in accordance with U.S. EPA's determination, except that CBS may exercise its right under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

2. Second Five-Year Review

a. To demonstrate at the second five-year review that the remedy has not and will not achieve the target concentrations in fish, U.S. EPA must show that (1) the mean concentration of PCBs in fish at one or more sample locations is greater than the target concentration listed in Paragraph IX.A.1 for that sample location, and (2) there is not a sufficient basis for U.S. EPA to conclude, based on trend data, that the mean concentration of PCBs in fish at that sample location will reach the target concentration in the future. To make this showing, U.S. EPA shall satisfy each part of the following two-part test with respect to any one of the three sample locations:

i. First Part: U.S. EPA shall repeat the same statistical

hypothesis testing that it used for the first part of the two-part test described above in Paragraph IX.D.1.a.i with respect to the first five-year review. Specifically, U.S. EPA shall use statistical hypothesis testing to demonstrate that the mean concentration of PCBs in fish at any sample location has not achieved the target concentration for that sample location. In conducting this test, U.S. EPA shall assume as the baseline condition that the mean PCB concentration in fish at a sample location is equal to or less than the target concentration set forth in Paragraph IX.A.1 with respect to that location. In the event that U.S. EPA can statistically prove the alternative condition (*i.e.*, that the mean concentration of PCBs in fish is greater than the target value with 95% confidence) for any sample location, U.S. EPA may then proceed to the second part of the test.

ii. Second Part: For each sampling location where the mean concentration of PCBs in fish is greater than the target concentration by a statistically significant margin (*i.e.*, for any sampling location where U.S. EPA has rejected the baseline condition that the mean concentration of PCBs in fish at the sample location is equal to or less than the target concentration), U.S. EPA shall use statistical hypothesis tests to determine if there is a deceasing trend at that location with respect to the mean concentration of PCBs in fish. In conducting this test, U.S. EPA shall assume as the baseline condition that there is no trend or the trend is increasing (trend is greater than or equal to zero) at the sample location. In the event that U.S. EPA cannot statistically prove the alternative condition (*i.e.* that PCB concentrations in fish are decreasing over time) with 95% confidence for at least one sample location, U.S. EPA will have adequately demonstrated that there is no significant decreasing trend and that failure to achieve the target concentrations in fish set forth in Paragraph IX.A.1 has occurred, and that the target

concentrations will not be met in the future.

b. For the purpose of estimating sample sizes for conducting statistical hypothesis testing set forth in Paragraph IX.D.2.a.i above, U.S. EPA shall apply the same parameters set forth in Paragraph IX.D.1.b above.

c. For the purpose of determining sample sizes for conducting each statistical hypothesis test set forth in Paragraph IX.D.2.a.ii above, U.S. EPA shall apply the following parameters:

i. The upper bound of the gray region shall be set at zero (corresponding to the case that there is no trend at that location with respect to the mean concentration of PCBs in fish);

ii. The lower bound of the gray region shall be set at a value corresponding to a 1% per year decrease in the mean concentration (*i.e.*, a slope for the trend line of –1%);

iii. The false rejection decision error limit shall be set at 5% at the upperbound of the gray region; and

iv. The false acceptance decision error limit shall be set at 20% at the lower bound of the gray region.

d. In accordance with Paragraph IX.H.3, the parameters set forth in Paragraph IX.D.2.b and IX.D.2c above may be modified in light of the number of fish that are reasonably available in the streams for sampling. In the event that the parameters set forth in Paragraph IX.D.2.b and IX.D.2c are modified, CBS may petition U.S. EPA to modify the hypothesis tests set forth in Paragraph IX.D.2.a. In response, U.S. EPA may determine that hypothesis tests shall remain unchanged, or alternatively, U.S.

EPA may modify the hypothesis tests pursuant to the mutual agreement of U.S. EPA and CBS. In either event, the hypothesis tests shall be performed in accordance with U.S. EPA's determination, except that CBS may exercise its right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination that the hypothesis tests shall remain unchanged on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

3. Third Five-Year Review (and Beyond)

a. Beginning with the third five-year review, U.S. EPA will no longer take into account the long-term trend of PCBs in fish to determine whether or not the remedy has achieved or will achieve the target concentrations set forth in Paragraph IX.A.1. Rather, U.S. EPA must show only that the mean concentration of PCBs in fish at any sampling location is statistically greater than the target concentration set forth in Paragraph IX.A.1 with respect to that location. To make this showing, U.S. EPA shall repeat the same statistical hypothesis testing that it used for the first part of the two-part tests described above in Paragraphs IX.D.1.a.i and IX.D.2.a.i with respect to the first and second five-year reviews with the baseline condition configured as described in those paragraphs.

b. For the purpose of estimating sample sizes for conducting statistical hypothesis testing set forth in Paragraph IX.D.3.a above, U.S. EPA shall apply the same parameters set forth in Paragraph IX.D.1.b.

c. In accordance with Paragraph IX.H.3, the parameters required under Paragraph IX.D.3.b above may be modified in light of the number of fish that are reasonably available in the streams for sampling. In the event that the parameters

required under Paragraph IX.D.3.b are modified, CBS may petition U.S. EPA to modify the hypothesis test set forth in Paragraph IX.D.3.a. In response, U.S. EPA may determine that hypothesis test shall remain unchanged, or alternatively, U.S. EPA may modify the hypothesis test pursuant to the mutual agreement of U.S. EPA and CBS. In either event, the hypothesis test shall be performed in accordance with U.S. EPA's determination, except that CBS may exercise its right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination that the hypothesis test shall remain unchanged on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

E. Standard for Continuing Enhanced Monitoring

If the statistical hypothesis tests described in Paragraphs IX.C and IX.D above are inconclusive (*i.e.*, they fail to prove either that the remedy has achieved the target concentrations or, alternatively, that the remedy has not achieved and will not achieve the target concentrations), CBS shall continue to perform the enhanced monitoring required by the Sampling Plan approved by U.S. EPA in accordance with Paragraph IX.H, below, except to the extent that CBS is relieved of this obligation in accordance with Paragraph IX.C.3 above.

F. CBS's Right to Challenge U.S. EPA's Determination to Modify the Remedy

1. In the event that U.S. EPA determines in accordance with Paragraph IX.D that the target concentration of PCBs in fish has not been achieved and will not be achieved at one or more sample locations, U.S. EPA will provide CBS with a notice of this determination and of U.S. EPA's intent to modify the remedy under the RCC. CBS then

will be given time to conduct an evaluation and submit a petition to U.S. EPA challenging this determination. To prevail on its challenge, CBS bears the burden of demonstrating at least one of the following:

a. U.S. EPA's determination under Paragraph IX.D was incorrect;

b. The failure to achieve the target concentration(s) in fish set forth in Paragraph IX.A.1 was caused by conditions at the Site changing after entry of this Amendment for reasons beyond the control of CBS; or

c. Sampling Location B was the only sampling location where the mean concentration of PCBs in fish exceeded the target concentration set forth in Paragraph IX.A.1, and that improvements in PCB concentrations in fish tissue at other sampling locations show that the remedy is protective of mink based upon the assumptions and conclusions set forth in U.S. EPA's ecological risk assessment. In such a case, CBS may petition U.S. EPA for approval to reduce enhanced monitoring of PCB concentrations in fish.

2. In the event that CBS persuades U.S. EPA of the merits of its challenge, U.S. EPA shall not modify the remedy under this RCC. However, nothing in this RCC in any way limits any rights of the United States under the re-opener clause at Paragraph VIII.B.4 of this Amendment to the Consent Decree.

3. In the event that U.S. EPA does not accept CBS's challenge, CBS may exercise its right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law. Assuming that CBS does not challenge

U.S. EPA's determination (or dispute resolution is resolved in U.S. EPA's favor), U.S. EPA may proceed to modify the remedy subject to the limitations set forth in Paragraph IX.G.

G. Modification of the Remedy under this RCC

1. Within 180 days of issuance of U.S. EPA's notice of its intent to modify the remedy under the RCC (or, in the event that CBS invokes dispute resolution, within 60 days of a final decision by U.S. EPA or the District Court, whichever is later, determining that U.S. EPA may modify the remedy under this RCC), CBS shall submit to U.S. EPA for review and approval a work plan for investigating and evaluating additional remedies that would accord the incremental reduction in risk necessary to achieve the target concentrations set forth in Paragraph IX.A.1. This work plan shall include:

a. A proposed list of additional remedies that CBS shall investigate and evaluate. The supplemental remedies proposed by CBS may include, but are not limited to, the removal of additional sediments within the streams if the sediments are shown to be recontaminated above 1 mg/kg on average and the sediments are believed to be a main contributor to the PCB levels in fish.

b. A proposed schedule for investigating and evaluating the proposed remedies.

2. Upon approval of the work plan, CBS shall proceed with the investigation and evaluation of the supplemental remedies in accordance with the approved schedule. At the completion of the investigation, CBS shall submit to U.S. EPA for review and approval a proposed plan for modifying the remedy to achieve the target concentrations set forth in Paragraph IX.A.1. The proposed plan shall include:

a. A description of the investigatory actions performed by CBS;

b. An evaluation of the additional remedies based upon the nine evaluation criteria set forth in the National Contingency Plan for evaluating remedial actions;

c. A recommendation as to the preferred supplemental remedial action; and

d. All documents, reports or other materials that were prepared or considered by CBS in preparing the proposed plan, together with an index of this record.

3. In addition to submitting the proposed plan required under Paragraph IX.G.2, CBS may propose an alternative plan for modifying the remedy. In support of this alternative plan, CBS shall demonstrate that (i) the target concentrations set forth in Paragraph IX.A.1 are technically impracticable, (ii) target concentrations proposed by CBS as an alternative to those set forth in Paragraph IX.A.1 are protective of human health and the environment, and (iii) remedial alternatives proposed by CBS, including potentially a "no further action" alternative, will achieve the alternative target concentrations proposed by CBS. In the event that U.S. EPA determines that CBS has adequately demonstrated all three conditions, U.S. EPA shall publish the proposed alternative plan for public comment in accordance with the procedures set forth below in Paragraph IX.G.4. Alternatively, in the event that U.S. EPA determines that CBS has not adequately demonstrated one (or more) of the conditions, U.S. EPA may reject the alternative plan, and CBS may challenge U.S. EPA's determination under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

4. Unless the alternative plan is approved by U.S. EPA pursuant to Paragraph IX.G.3, U.S. EPA may approve CBS's proposed plan or it may prepare its own proposed plan for additional remedial measures to achieve the target concentrations set forth in Paragraph IX.A.1. In either event, U.S. EPA shall publish the proposed plan for public comment in accordance with the requirements of the National Contingency Plan. After receiving and reviewing public comments, U.S. EPA may select an additional remedial action to achieve the target concentrations set forth in Paragraph IX.A.1. This RCC does not provide U.S. EPA with the authority to modify in any way the remedial actions that have been implemented by CBS for Operable Unit 1 for Neal's Landfill.

5. In the event that CBS disagrees with any additional remedial measures selected by U.S. EPA under this RCC, CBS retains the right, prior to implementation, to challenge U.S. EPA's decision before the Court pursuant to Section 113(j)(2) of CERCLA on the ground that all or part of the decision is arbitrary and capricious or otherwise not in accordance with law. To the extent that CBS prevails on its challenge, it is not required to implement the additional remedial measures selected by U.S. EPA.

6. Within 60 days of U.S. EPA's selection of the additional remedial action (or, in the event that CBS challenges U.S. EPA's selection, within 60 days of the Court's decision upholding the U.S. EPA's selection), CBS shall submit to U.S. EPA for review and approval a proposed plan and schedule for the design and construction of the additional remedial action. Upon approval of this proposed plan, CBS shall proceed with the design and construction of the additional remedial measures in accordance with the approved schedule.

7. All plans, reports and schedules submitted to U.S. EPA for review and approval under this Paragraph IX.G are subject to the pertinent provisions of the Statement of Work for Operable Units 2 and 3 at Neal's Landfill with respect to the approval of deliverables.

H. Sampling Plan

1. Within two years of execution of the Consent Decree, CBS shall submit to U.S. EPA for approval a sampling plan for enhanced fish monitoring, containing a plan for statistical evaluation of the fish tissue data. The plan shall comply with requirements set forth in the Consent Decree and shall be consistent with U.S. EPA's Data Objective ("DQO") Process as described in U.S. EPA's publication, *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 (February 2006)*. The plan shall require fish sampling at the locations where target concentrations are set in Paragraph IX.A.1.

2. Further, the enhanced fish monitoring plan shall require CBS to collect sufficient fish samples to meet the parameters set forth in Paragraphs IX.C and IX.D for statistical hypothesis testing. This plan will require composite samples of at least 3 fish per composite sample to reduce the overall variance.

3. In the event that U.S. EPA or CBS believes that sample size estimates and composite sampling in the enhanced fish monitoring plan will result in sampling requirements that are not reasonable in light of the limited number of fish available for sampling at the agreed-upon locations in Conard's Branch and Richland Creek, U.S. EPA and CBS shall confer in an effort to reach agreement upon whether or not there should be adjustments to (i) composite sampling requirements and/or (ii) the

sampling parameters set forth in Paragraphs IX.C and IX.D. In the event that U.S. EPA and CBS cannot reach agreement, U.S. EPA may determine that no adjustments to sampling requirements are necessary, or alternatively, U.S. EPA may adjust the sampling requirements. In either event, CBS shall implement the enhanced fish monitoring plan in accordance with U.S. EPA's determination, except that CBS shall have the right to challenge U.S. EPA's determination under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

4. The enhanced fish monitoring plan shall require that the fish chosen from each location be representative of the sizes of fish found at that location, consistent with past sampling events and representative of the size of fish eaten by the human and ecological receptors assumed in the risk assessments prepared by U.S. EPA. Generally this requirement can be met by showing that the mean size of fish collected are within 1 standard deviation of the same species of fish collected by CBS or U.S. EPA at the appropriate location during prior sampling events after the completion of the source control operable unit.

5. The enhanced fish monitoring plan should ensure a balanced data set of composite samples to be included in the mean from both summer and fall time periods at each location. Specifically, "balanced" means that there are an equal number of fall and summer samples to be included in the mean. The mean can be calculated for samples collected over one year or two years.

6. The fish are to be analyzed using total congener and lipid methods equivalent to those analytical methods used in 2005.

X. RIGHTS AND RESPONSIBILITIES UNDER ORIGINAL CONSENT DECREE

Except as expressly provided in this Amendment to the Consent Decree or in prior amendments to the Consent Decree, the Original Consent Decree remains binding upon the Parties.

XI. TERMINATION

Termination of CBS's Obligations under this Amendment to the Consent Decree shall be governed by Paragraph 138 of the Original Consent Decree. The Covenants Not to Sue in Paragraph 111 of the Consent Decree and Section VIII of this Amendment to the Consent Decree shall continue in effect even after the CBS's obligations hereunder have terminated.

XII. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

A. **Lodging**: This Amendment to the Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Amendment to the Consent Decree disclose facts or considerations which indicate that the Amendment is inappropriate, improper, or inadequate. The State, County, City, and CBS consent to the entry of this Amendment to the Consent Decree without further notice.

B. **Agreement Voidable if Not Entered by the Court**: If for any reason the Court should decline to approve this Amendment to the Consent Decree in the form presented, this Amendment is voidable at the sole discretion of any Party and, if voided, the

terms of the agreement may not be used as evidence in any litigation between the Parties.

XIII. EFFECTIVE DATE OF THIS AMENDMENT TO THE CONSENT DECREE

This Amendment to the Consent Decree shall be effective upon execution by the United States District Judge assigned to this matter as set forth below and upon entry on the docket of the U.S. District Court for the Southern District of Indiana. Subject to Section XI of this Amendment, it shall remain in full force and effect thereafter unless modified or voided by a federal court with jurisdiction over the matter.

XIV. FINAL JUDGMENT

Upon approval and entry of this Amendment to the Consent Decree, the Consent Decree shall constitute a final judgment between and among the Governmental Parties -- the United States, the State of Indiana, the City of Bloomington and Monroe County -- and CBS. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS____ DAY OF_____, 2008

_____
RICHARD L. YOUNG
United States District Judge

THE UNDERSIGNED PARTY joins in this Amendment to the Consent Decree providing for Remedial Actions at Neal's Landfill, Lemon Lane Landfill and Bennett's Dump and addressing general matters in United States, et al. v. CBS Corporation, Case No. 1:81-cv-0448-RLY-KPF (S.D. Ind.).

FOR THE UNITED STATES OF AMERICA

Date _____

_____
RONALD J. TENPAS
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

Date _____

_____
JOS. W.C. WARREN
Trial Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611

TIMOTHY M. MORRISON
Acting United States Attorney

CHARLES GOODLOE, JR.
Assistant United States Attorney's
United States Attorney's Office
46 East Ohio Street, 5th Floor
Indianapolis, Indiana 46204

For the U.S. Environmental Protection Agency

Date _____

_____
RICHARD C. KARL
Director of Superfund Division
U.S. Environmental Protection Agency,
Region 5
77 West Jackson Boulevard
Chicago, IL 60604

Date _____

_____
JEFFREY A. CAHN
Associate Regional Counsel
U.S. Environmental Protection Agency,
Region 5
77 West Jackson Boulevard
Chicago, IL 60604

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FOR THE CITY OF BLOOMINGTON

Date: _____

_____
GEOFFREY M. GRODNER
Mallor, Clendening, Grodner & Bohrer, LLP
511 Woodscrest Drive
P.O. Box 5787
Bloomington, IN 47407

THE UNDERSIGNED PARTY joins in this Amendment to the Consent Decree providing for Remedial Actions at Neal's Landfill, Lemon Lane Landfill and Bennett's Dump and addressing general matters in United States, et al. v. CBS Corporation, Case No. 1:81-cv-0448-RLY-KPF (S.D. Ind.).

FOR THE STATE OF INDIANA

Date: _____

_____
VALERIE TACHTIRIS
Deputy Attorney General
Indiana Attorney General's Office
Indiana Government Center North
5th Floor
302 West Washington Street
Indianapolis, IN 46204

THE UNDERSIGNED PARTY joins in this Amendment to the Consent Decree providing for Remedial Actions at Neal's Landfill, Lemon Lane Landfill and Bennett's Dump and addressing general matters in United States, et al. v. CBS Corporation, Case No. 1:81-cv-0448-RLY-KPF (S.D. Ind.).

FOR MONROE COUNTY

Date:_____

_____
WILLIAM STEGER
County Attorney
Monroe County Legal Department
Monroe County Courthouse, Room 220
Bloomington, IN 47404

THE UNDERSIGNED PARTY joins in this Amendment to the Consent Decree providing for Remedial Actions at Neal's Landfill, Lemon Lane Landfill and Bennett's Dump and addressing general matters in United States, et al. v. CBS Corporation, Case No. 1:81-cv-0448-RLY-KPF (S.D. Ind.).

FOR CBS CORPORATION

Date: _____

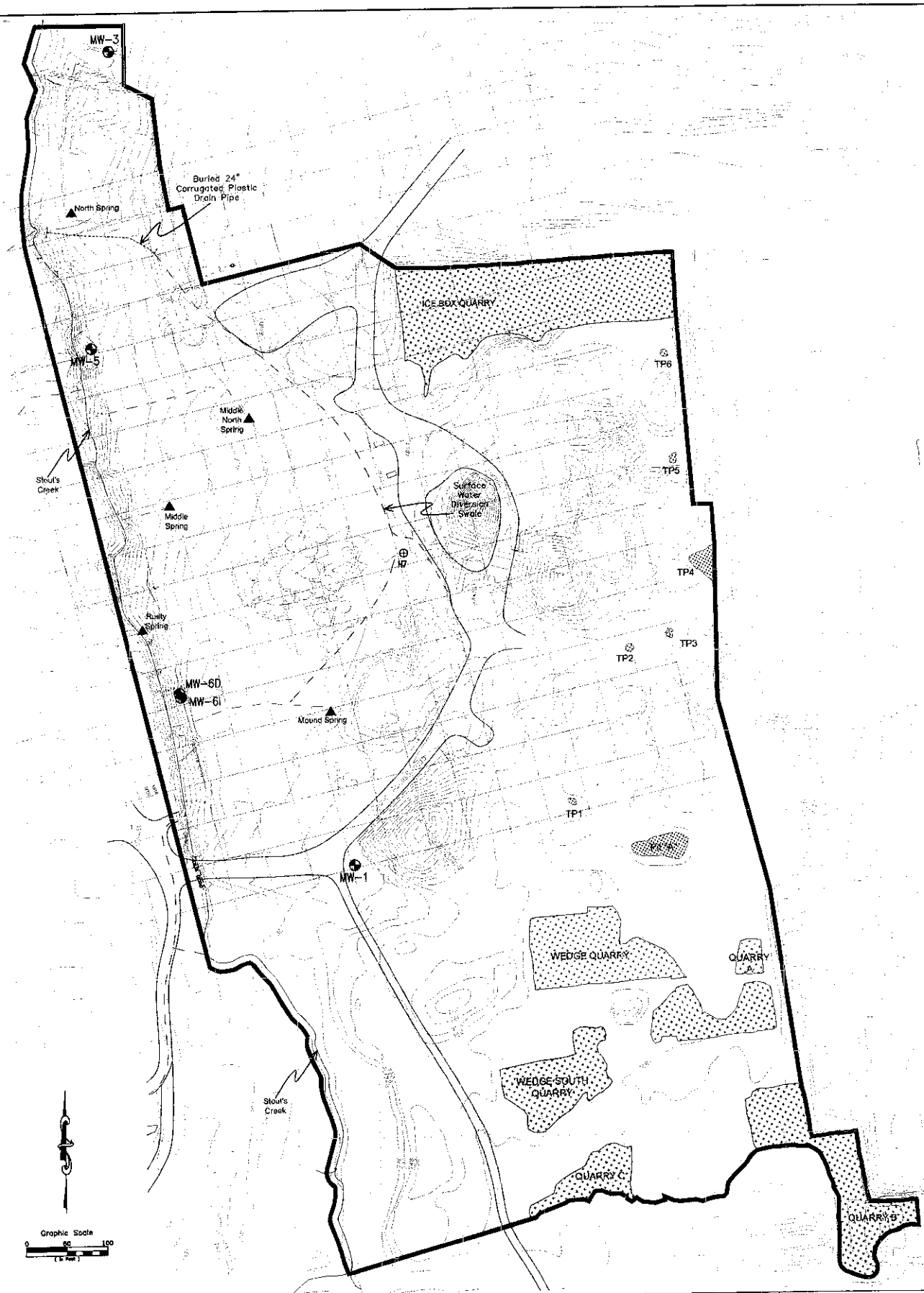
_____
Louis J. Briskman,
Executive Vice President and General Counsel
CBS Corporation
51 West 52nd Street
New York, NY 10019

Date: _____

_____
David R. Berz
Weil, Gotshal & Manges LLP
1300 Eye Street, N.W.
Washington, D.C. 20005
(202) 682-7000
david.berz@weil.com

Counsel to CBS Corporation

Appendix A



Bennette Bump.dwg

PSARA TECHNOLOGIES, INC.

LEGEND

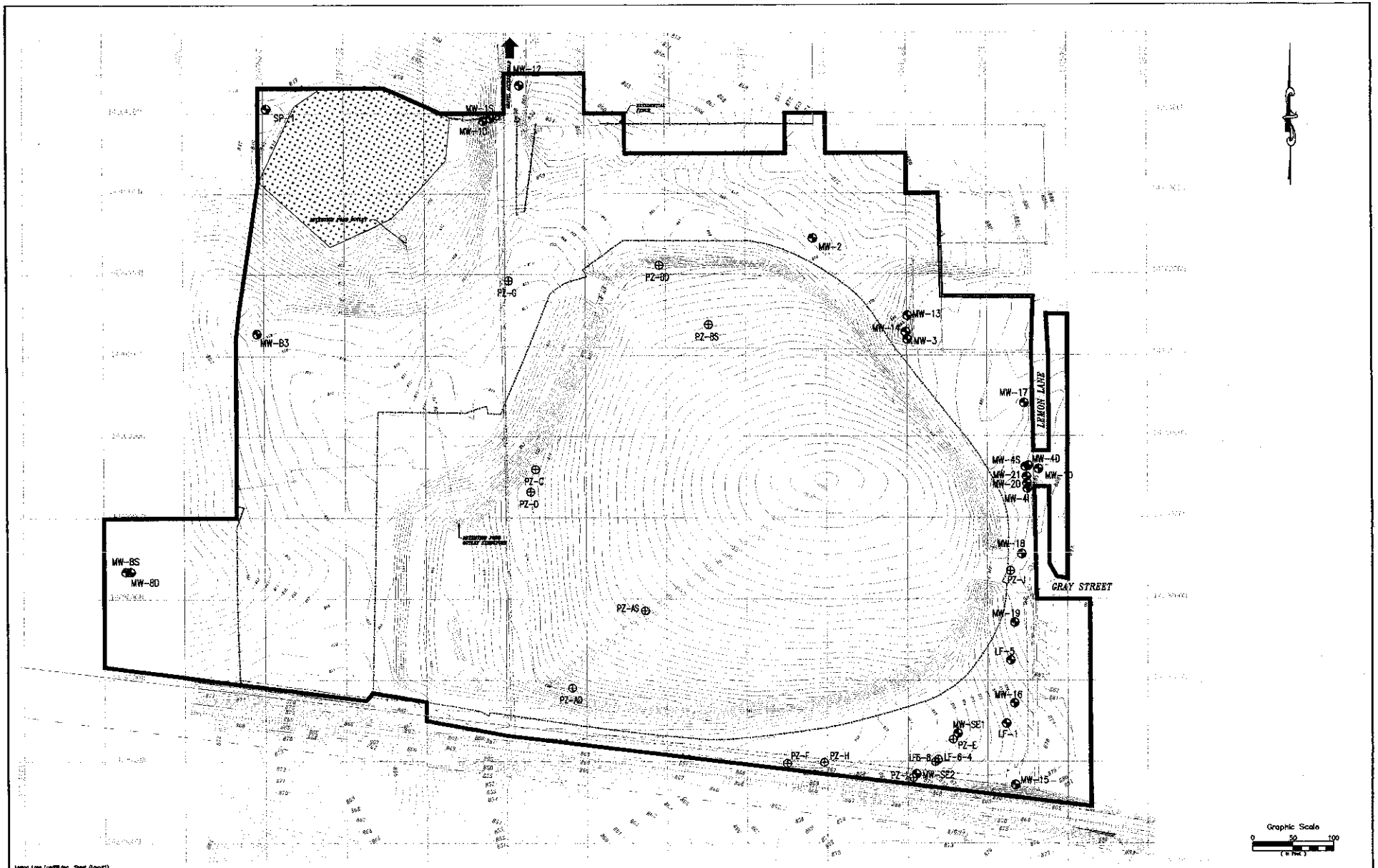
- Geographic Site Boundary
- Open Quarry Pit or Test Pit Location
- ▲ Spring
- Monitoring well
- ⊕ Piezometer Location

CBS Corporation

Geographic Site Boundary of Bennett's Dump
Appendix A, Sheet 1 of 1
Bennette Dump Area

Drawn By:	Date:	Scale:
MLR	10/24/07	1"=60'

Appendix B



Lemon Lane Landfill.dwg Sheet (Layout1)

PSARA TECHNOLOGIES, INC.

LEGEND

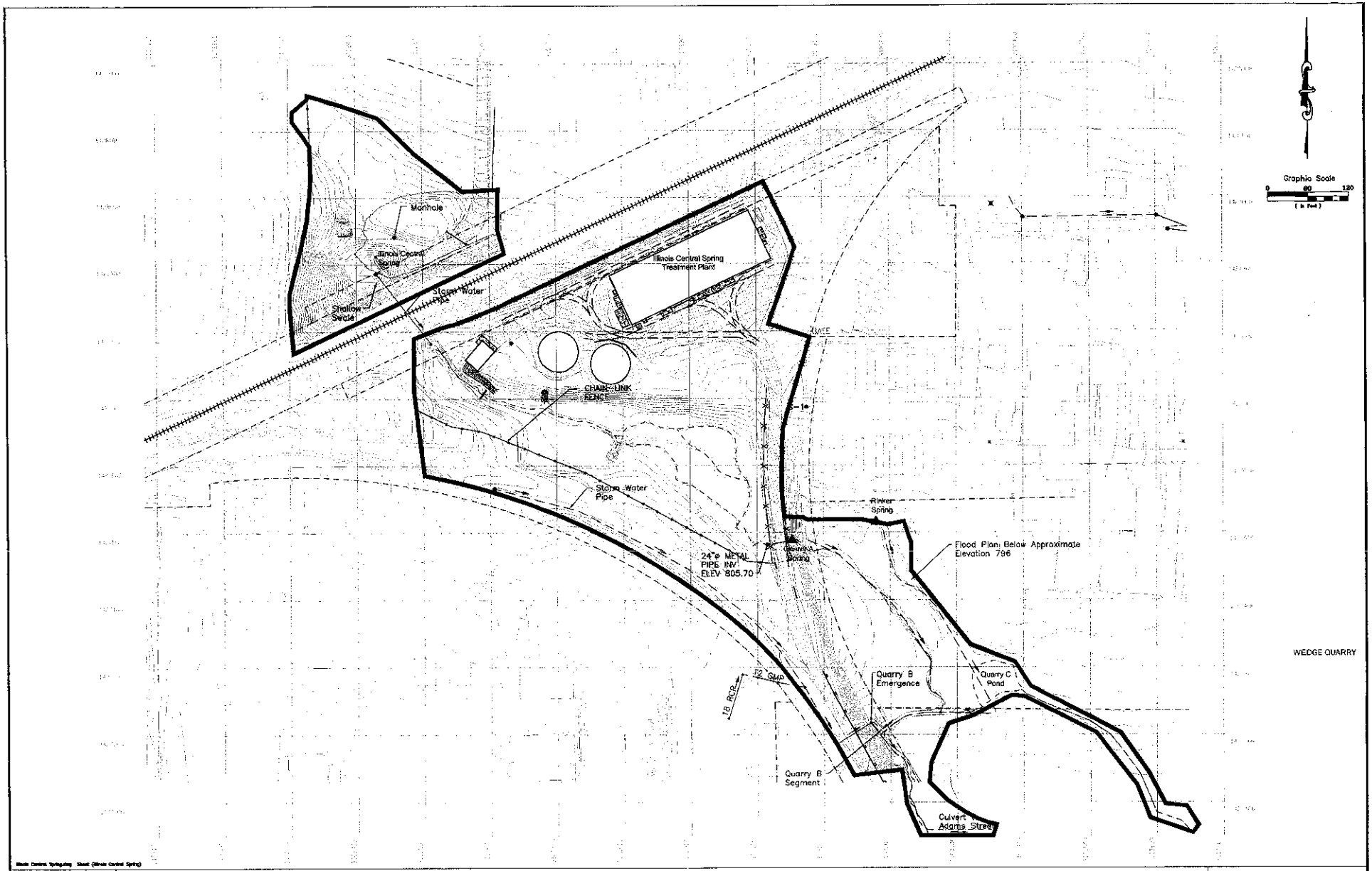
- Buried RCP
- Railroad Tracks
- Limits Of Consolidation
- Overhead Electric
- Gas Line
- Property Boundary
- Landfill Perimeter Fence
- 1'contour Interval
- Geographic Site Boundary
- Monitoring well
- Piezometer Location
- Sinkhole Pond

Note: Property boundaries taken from Figure 1, Lemon Lane Landfill Boundary and Topographic Survey, dated January 21, 2000 by Smith Neubecker & Associates, Inc.

CBS Corporation

Geographic Site Boundary of Lemon Lane Landfill
Appendix B, Sheet 1 of 2
Lemon Lane Landfill Area

Drawn By:	Date:	Scale:
RLR	10/24/07	1"=50'



LEGEND

- Geographic Site Boundary
- Contour Interval 2.0 feet
- Shallow Surface Stream Channel
- ▲ Spring

Note: Boundaries based on the "Illinois Central Spring: FIELDS Analysis" Report dated 20 October 2005.

PSARA TECHNOLOGIES, INC.

CBS Corporation

Geographic Site Boundary of Lemon Lane Landfill
Appendix B, Sheet 2 of 2
Illinois Central Spring Area

Drawn By:	Date:	Scale:
MLR	10/26/07	1"=60'

Appendix C



Graphic Scale

0 100 200

(In Feet)

Neal's Landfill.dwg

PSARA TECHNOLOGIES, INC.

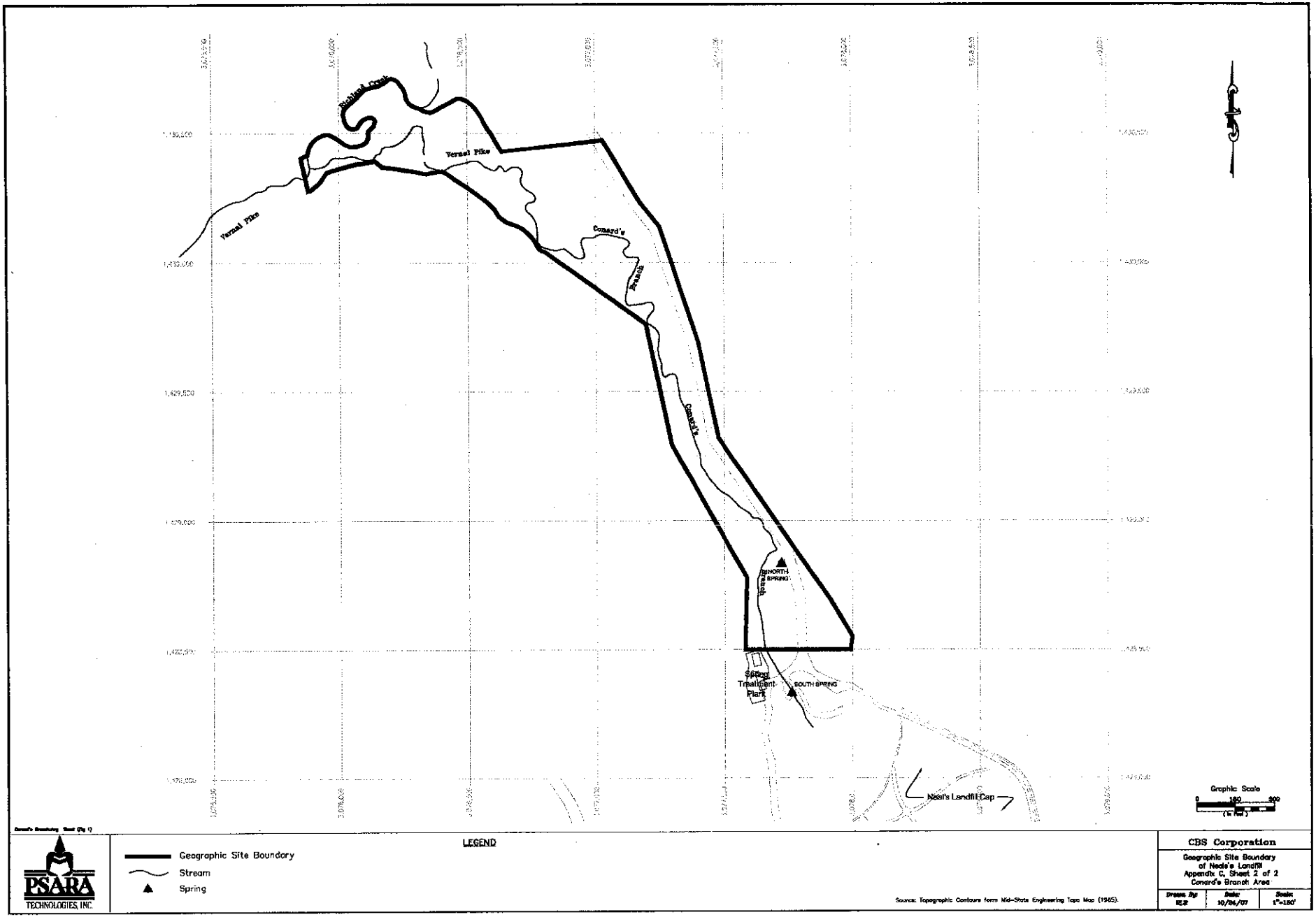
LEGEND

- Access Easement
- Fence around Restricted Area
- Overhead Electric Line
- Ditch
- Geographic Site Boundary
- (S) Sink Hole
- (M) MW-5 Monitoring Well Locations
- PZ#3 Piezometer Locations

CBS Corporation

Geographic Site Boundary of Neal's Landfill
Appendix C, Sheet 1 of 2
Neal's Landfill Area

Drawn By:	Date:	Scale:
RLR	10/24/07	1"=100'



LEGEND

- Geographic Site Boundary
- Stream
- Spring

Source: Topographic Contours form Mid-State Engineering Topo Map (1985).

PSARA TECHNOLOGIES, INC.

CBS Corporation

Geographic Site Boundary of Neals Landfill
Appendix C, Sheet 2 of 2
Conard's Branch Area

Drawn By:	Date:	Scale:
RLP	10/26/07	1"=100'

Appendix D

EPA Region 5 Records Ctr.
259525

DECLARATION FOR THE BENNETT'S DUMP RECORD OF DECISION AMENDMENT

SITE NAME AND LOCATION

The Bennett's Dump site, sometimes referred to as the Bennett's Stone Quarry is located in Bloomington, Indiana. The National Superfund Database identification number is IND006418651. This Record of Decision Amendment addresses contaminated water and sediment and is referred to as operable unit 2 and operable unit 3.

STATEMENT AND BASIS AND PURPOSE

This decision document presents the Selected Remedy for the Bennett's Dump site, located in Bloomington, Indiana. This ROD Amendment presents the remedial action selected in accordance with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This ROD Amendment will become part of the Administrative Record file per Section 300.825(a)(2) of the NCP. The Administrative Record, which contains the information on which selection of the remedial action was based, is available for review at the Monroe County Public Library in Bloomington, Indiana, as well as at the U.S. Environmental Protection Agency, Region 5 Superfund Records Center.

ASSESSMENT OF SITE

The response action selected in the Record of Decision Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for the Bennett's Dump site addresses groundwater and sediment contaminated by PCBs from springs located on the site. The source control operable unit one was completed in 1999 and addressed the principal threat waste through the excavation and off-site disposal and off-site incineration of high concentrations of PCB waste, including PCB oil-filled capacitors. Sampling of sediment has shown that no additional sediment cleanup is required since PCB levels are below 1 part per million and it is unlikely that further risk reduction will occur in light of the low level of sediment contamination in Stout's Creek. The Selected Remedy for the site consists of the installation of a passive quarry drain to reduce groundwater flow and the construction of groundwater interceptor trench with carbon adsorption treatment for the PCB contaminated groundwater. The major components of the water operable unit consist of the following:

- Install a passive quarry drain system to reduce the flow from springs and groundwater. The passive quarry drain will drain the Wedge Quarry Complex to reduce the groundwater elevation and thereby reduce groundwater flow from the springs. Icebox Quarry may also

be drained into the Wedge Quarry Complex. Treatment of water from Icebox Quarry may be required since sampling has shown PCBs at 0.1 ppb PCBs.

- Install a groundwater interceptor trench to capture groundwater and treat the PCB contaminated water prior to discharge to Stout's Creek. The discharge will meet the National Pollution Discharge Elimination System (NPDES) substantive requirements. The conceptual design of the interceptor trench would be to locate the trench along the east side of Stout's Creek and be approximately 800-feet long and 8 feet deep. The trench would collect all discharges from the springs at the site, as well as collect contaminated groundwater that may be emerging from springs in and along Stout's Creek Groundwater is assumed to flow at a maximum of 100 gallons per minute during storm events. A pre-design study on the groundwater will be required after the installation of the passive quarry drain to determine the final design parameters of the interceptor trench and treatment system.

- An Operations and Maintenance Plan will be developed for the collection and treatment system and a monitoring program to monitor the effectiveness of the remedy.

- Deed restrictions will be required to prevent residential development, deep excavation in the former quarry pits and placement of drinking water wells on the site. Fencing around the interceptor trench and treatment system will also be required.

STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e. reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. The first Five-Year Review was completed in August 2002 and next scheduled review is in August 2007.

RECORD OF DECISION AMENDMENT DATA CERTIFICATION CHECKLIST

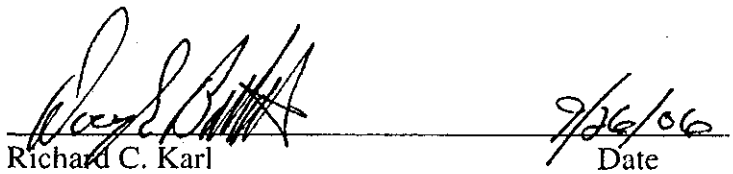
The following information is included in the Decision summary section of the Record of Decision amendment. Additional information can be found in the Administrative Record located at the Monroe County Public Library.

- Chemicals of concern and their respective concentrations are located on Page 6.
- Baseline risks represented by the chemicals of concern are located on Pages 11 - 14.
- Cleanup levels established for chemicals of concern and the basis for these levels are located on Page 28.

- Description of how source materials constituting principal threats are addressed is addressed on Page 27.
- Description of the current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD Amendment are located on Page 8.
- Description of the potential land and groundwater use that will be available at the site as a result of the implementation of the passive quarry drain and groundwater interceptor trench with treatment is located on Page 8 .
- Description of the estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected is located in Tables 1 and 2.
- Description of the key factors that led to selecting the remedy is located on Pages 22 - 25.

AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

The United States Environmental Protection Agency is the lead Agency for developing and preparing this Record of Decision Amendment. The State of Indiana, City of Bloomington, and Monroe County are signatories to the Consent Decree and those parties have all submitted letters of concurrence for the implementation of the passive quarry drain and groundwater interceptor trench with carbon treatment.



9/26/06

Richard C. Karl — Date

for Director, Superfund Division

RECORD OF DECISION AMENDMENT
BENNETT'S DUMP
OPERABLE UNITS 2 AND 3

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

CBS Corporation (formerly known as Westinghouse Electric Corporation and formerly known as Viacom Inc.) owned and operated an electrical capacitor production facility in Bloomington, Indiana. The insulating fluid used in the manufacture of the electrical capacitors contained polychlorinated biphenyls (PCBs). During the 1960s, a portion of the Bennett's Stone Quarry, located 2.5 miles northwest of Bloomington, Indiana (the Site), was used as an uncontrolled dump for electrical parts and capacitors containing PCB dielectric fluid. Figure 1 shows the location of the Site. Only a portion of Bennett's Stone Quarry was used for disposal activities and the disposal areas are referenced as Bennett's Dump.

The Bennett's Dump Site was placed on the National Priorities List in September 21, 1984, and was one of the six sites subject to a Consent Decree entered by the United States District Court for the Southern District of Indiana on August 22, 1985. Parties to the Consent Decree are the United States Environmental Protection Agency (EPA), the State of Indiana, the City of Bloomington, Monroe County, and CBS Corporation. CBS Corporation, with assistance from the governmental parties, has led the investigation at the Site.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Monroe County first discovered the Bennett's Dump site and the EPA did an initial site inspection on May 12, 1983. The initial condition of this site indicated that most of the electrical parts visible at the site had been crushed, burned, or otherwise destroyed as evidenced by insulator wrapping paper, ceramic bushings, and other electrical parts scattered about the dump. Stained soil was also evident on surface soil. Another area of the dump, referred to as the satellite area, is located approximately one hundred feet to the east of the main area. The satellite area is approximately one half acre in size.

Sampling showed large concentrations of PCBs across the site. To address this contamination, EPA initiated an interim remedial measure in June 1983. The interim remedial measures included the following:

- Installation of a locked, 8-foot high chain link and barbed wire security fence surrounding the contaminated areas.
- A total of 252 visible capacitors were removed for off-site incineration and 20 cubic yards of stained soil were excavated and disposed of in an approved off-site landfill.
- A cap consisting of between 16 and 22 inches of clay with a 6 inches of topsoil cover was installed over the main site.

The plan for the final remedial action at Bennett's Dump was memorialized in a civil judicial Consent Decree that was entered by the United States District Court for the Southern District of Indiana in 1985. The 1985 Consent Decree called for the construction of a permitted, TSCA-approved, incinerator to be used to destroy PCB-contaminated soils and materials excavated from six sites, including the Bennett's Site. The other five sites addressed by the Consent Decree are the Anderson Road Landfill, the Winston Thomas Sewage Treatment Plant, Neal's Landfill, Neal's Dump, and Lemon Lane Landfill.

Public opposition to the incinerator arose before and after entry of the Consent Decree. CBS submitted applications for the necessary permits to design and build the incinerator in 1991. The Indiana State Legislature, however, passed several laws which prevented any immediate consideration of CBS's permit applications. In February 1994, the parties agreed to a set of principles to guide the process of exploring remedies to substitute for the incinerator remedy. These principles (known as the Operating Principles) provided for, among other things, the selection of remedial alternatives that would be conducted in accordance with EPA's ROD Amendment process.

In November 1997, Judge S. Hugh Dillin issued an Order requiring that the six Consent Decree sites be remediated by December 1999. Judge Dillin also assigned Special Master Kennard Foster to oversee the progress of the parties toward meeting the December 1999 deadline. On February 1, 1999, Judge Dillin issued another Order approving and adopting the Report and Recommendations of Special Master Kennard Foster which extended the deadline for completion of the source control at the remaining five sites (Anderson Road Landfill was already completed) by December 31, 2000, and ordered the parties to implement the source control operable units at three sites and to engage in future settlement discussions with respect to other issues, including remedial measures to address groundwater and surface water contamination. The source control remedies were completed by the December 31, 2000, deadline and CBS and the governmental parties are in the process of negotiating a global settlement[1] for all the remaining issues for the six Consent Decree sites. If a global settlement is not reached among the parties, then EPA may use its enforcement tools, including litigation, to address the cleanup at the site.

The EPA made the source control operable unit Proposed Plan for the Bennett's Dump Site available to the public in 1998. The other governmental parties (IDEM, City of Bloomington, Monroe County) concurred on the source control operable unit ROD Amendment and that ROD Amendment was signed by the EPA on October 16, 1998.

The source control operable unit involved the following:

---

[1] The global settlement will include both technical and non-technical issues.

- Excavation and off-site disposal at a permitted landfill of all materials containing greater than 25 parts per million (ppm) PCBs on average (estimated total volume of 55,000 cubic yards), followed by placement of 12-inch thick clean soil cover.

- Incineration of PCB-containing capacitors at a permitted incinerator.

- Excavation of sediment in Stout's Creek containing concentrations greater than 1 ppm PCBs with subsequent placement under the clean soil cover.

- Monitoring of groundwater monitoring wells and on-site springs and related deed restrictions.

CBS began excavation activities at the site in August 1999 and disposed of a total of 36,172 tons of PCB-contaminated material in an off-site landfill permitted to accept PCBs. CBS also removed and incinerated a total of 1,756 capacitors (118.72 tons at an off-site incinerator permitted to accept PCBs). CBS then covered the site with a 12-inch soil cover. When cleanup activities were completed in November 1999, the final average PCB concentration of the remaining PCBs in soil was 11.3 ppm. In September of 2000, CBS excavated a total of 10 cubic yards of sediment from Stout's Creek.

During excavation activities in 1999, three deep quarry pits filled with rubble and fill were discovered. Capacitor parts and PCB contaminated soils were found above the rubble and groundwater at these locations had a light, oily sheen. An analysis of this groundwater showed PCBs mixed with diesel fuel. No further material could be removed due to the depth of the excavation and the large amount of groundwater present. As a result, these locations did not meet the soil cleanup criteria.

After completion of the 1999 source control operable unit remediation, a series of periodic flowing springs and seeps developed at the Bennett's Dump Site containing PCBs. These springs discharge directly into Stout's Creek, which flows along the western edge of the Site. Historical analysis of aerial photographs shows springs on the Site, but not at the location of the current springs. Figure 2 shows the location of the various springs and other Site features.

COMMUNITY PARTICIPATION

The community has been involved at the Bennett's Dump Site. The EPA has funded a Technical Assistance Grant (TAG) with a citizens group called Citizens Opposed to PCB Ash (COPA). In addition to hiring experts to review data and technical documents, COPA has also developed a web page (www.copa.org) to distribute information to the public. The EPA and State have participated in, at a minimum, quarterly Citizens Information Committee meetings with the public to update them on the recent site activities. These meetings are televised on the local Bloomington cable access station.

The Proposed Plan for the groundwater operable unit and an additional sediment operable unit for the Bennett's Dump Site was made available for 30 days of public comment on February 3,

2006. A 30-day extension to the public comment period was granted and the public comment period ended on the Proposed Plan on April 4, 2006. The Administrative Record (AR), in electronic form, was placed in the Monroe County Public Library. Interested parties were able to receive copies of the AR for review and for the development of comments on the Proposed Plan. Approximately 5,000 Proposed Plan fact sheets were mailed to residents in the Bloomington area, and a number of individuals provided public comment.

A public meeting was held on February 14, 2006, to present the Proposed Plan to the public. Representatives from EPA and the State of Indiana were present to answer questions. The EPA's responses to comments received during the public comment period are included in the Responsiveness Summary, which is part of this Record of Decision Amendment.

SCOPE AND ROLE OF THE OPERABLE UNITS

This action is the final action for the Bennett's Dump Site and addresses both contaminated groundwater and sediment, known respectively as operable units 2 and 3. The 1998 ROD Amendment did not have a water treatment component. As a result of the new springs that emerged at the Site after the completion of the source control cleanup, EPA conducted an analysis of the continuing releases in a Five-Year Review, dated August 22, 2002, and determined that both a water and sediment operable unit was required. The 1999 cleanup remediated the Site to levels which will allow industrial or commercial development. The 1999 source control cleanup addressed the "principal threat" waste and these final two operable units will address contaminated groundwater and sediment. Since the removal of the contaminated soil and capacitors from the site in November 1999, groundwater PCB-contamination levels at the site have not improved as was expected. Levels greater than 0.1 ppb PCBs have been detected periodically downstream in Stout's Creek. The detections are greater than the national Ambient Water Quality Criteria as described in 40 CFR 129.105. The implementation of the remedial actions in this Operable Unit will:

- Reduce the amount of PCBs released from groundwater to Stout's Creek through mass reduction.
- Reduce the PCB levels in fish for beneficial reuse by reducing PCBs released to Stout's Creek.
- Reduce the amount of PCB mass in sediments that may be available to fish by reducing PCBs released to Stout's Creek.

SITE CHARACTERISTICS

The historical operation at Bennett's Quarry was the quarrying of limestone primarily for building purposes. Specifically, Indiana limestone, a quality dimension building stone, was used for finished building stone, road construction, low magnesium limestone for cement, and high-magnesium limestone for steel production and agricultural application. The Site is no longer

used for quarrying operations. Many of the quarry pits were backfilled with large quarry blocks, stone rubble, and heterogeneous mixtures of soil. Other abandoned quarry pits remain open to the elements and have filled with water over time.

Historical Quarrying Operations

Quarrying operations in the general area of Bennett's Dump were established by 1908, based upon U.S. Geological Survey topographic maps. CBS evaluated a number of aerial photographs of the Bennett's Dump Site from 1939, 1946, 1949, 1954, 1961, 1962, 1967, 1975, 1980, 1983, 1985, 1989, and 1990. This analysis, which is depicted in Figure 3, showed that quarrying activities took place over a large area on, and adjacent to, the Site, and that many (but not all) of the quarry pits were already backfilled at the time of PCB disposal. Therefore, it is likely that most of the PCB disposal occurred in areas overlying backfilled quarry pits, but some disposal may have occurred in small quarry pit areas that had not been backfilled. Former quarry walls were identified during the remediation activities in 1999.

Quarrying activity appears to have caused other significant landscape changes. Soil borings and channel alignments suggest that Stout's Creek formerly flowed through the approximate center of the Site, but was later channelized to its current position along the western site boundary. The former surface channel (a bedrock valley area) through the Site has been filled.

Geology and Hydrogeology

Bennett's Dump is located on the eastern margin of the Mitchell Plain physiographic region, a low plateau developed on limestones of the Mississippian aged Blue River and Sanders Groups. The Mitchell Plain is a well developed karst terrain developed on and within these limestones. Karst terrain is characterized by land forms including sinkholes, subterranean channels, and springs formed by the dissolution of the soluble bedrock. The Salem Limestone (Sanders Group) immediately underlies the Site and was the rock unit that was quarried for dimension stone.

Stout's Creek is the main surface water body associated with Bennett's Dump and flows from south to north along the western edge of the Site. Slaughterhouse Spring, which is connected hydrologically to the Lemon Lane Landfill, and other small springs in the Slaughterhouse area form the headwaters of Stout's Creek. All known springs and surface storm water from the Site eventually flow into Stout's Creek. Open quarry pits in the area collect surface water and groundwater. The water from the quarry pits also seeps into Stout's Creek. Upstream of Bennett's Dump, sampling within Stout's Creek has not shown PCBs (one sample in 2003 did show PCBs just above the detection limit in upstream sampling, but was an estimated sample). Sampling adjacent to and downstream of the Site has shown PCBs at concentrations generally below 1 part per billion (ppb).

The groundwater flow system associated with the Site is composed of recharge areas, flow areas, and discharge areas. Recharge to the groundwater flow system occurs in the topographically higher areas east and south of the Site, in part through open water-filled quarry pits and through

old backfilled quarry pits. Surface water runoff is a contributing source of water to both open and backfilled quarries.

There are four springs within the Bennett's Dump Site, (Middle Spring, Mound Spring, North Spring, and Mid-north Spring). See Figure 2. An additional spring is located on the Site within the channel of Stout's Creek referred to as Rusty Spring. None of these springs flow continuously and there is seasonal variation in the spring flow regime. Generally, the lower elevation springs have the longer duration of flow. Both Mid-north and North Springs flow for only brief periods during extremely wet periods while Mound and Middle Springs flow consistently except during extended dry periods.

Routine PCB monitoring and flow estimates at the four major springs have continued since the completion of the remediation activities in 1999. In April 2002, a Long-Term Groundwater Monitoring Plan was implemented which required quarterly monitoring of all springs, continuous monitoring of Middle and Mound Springs, and estimating flow rates for both North and Mid-north Springs. Rusty Spring has been sampled periodically since October 2003, when it was found.

Mound Spring has periodically ceased flowing approximately 25 percent of the time (8 out of 33 monthly monitoring periods). The PCB content in the water ranges from 0.57 ppb to 7.3 ppb, with a median value of 1 ppb. Spring flow during non-storm events ranges from 1.7 gallons per minute (gpm) to 20 gpm with an average flow of approximately 10 gallons per minute. Storm sampling has shown PCB values peaking around 25 ppb with flow rates peaking at less than 100 gpm. Flow on average during storm events rises 5 to 15 gallons per minute compared to non-storm flow. Following such storm events, it typically takes two to three days for water flow to return to its pre-storm rate.

The flow pattern indicates that the springs are not fed by conduits in the karst bedrock. For example, at karst springs associated with Neal's Landfill and Lemon Lane Landfill, storm events produce much higher flows from the springs and higher PCB concentrations, because a flushing of PCBs from within the karst conduits occur.

Middle Spring has also been evaluated during both non-storm and storm periods. Middle Spring has a longer flow duration (dry during only 3 out of 39 monitoring events). During non-storm events, Middle Spring has a flow range from 0 to 12 gpm with a mean of approximately 3 gpm. PCB concentrations at Middle Spring are generally higher than at Mound Spring, and have ranged from 2.1 ppb to 17 ppb with most concentrations under 10 ppb. During storm events, there is only a small flow response with a rise in flow of 5 to 9 gpm. As with Mound Spring, neither the flow, nor the PCB response during storm events, are indicative of a typical karst conduit-fed spring.

Mid-north Spring and North Spring flow only during very wet periods. For example, North Spring has been dry except for 1 sampling event since November 1999. Mid-north Spring has registered flow 8 out of 25 monitoring events since June 2000. PCB concentrations in Mid-north Spring were less than 1 ppb.

Rusty Spring has been sampled periodically since October 2003. Flow has been estimated to be around 1 gpm with a PCB concentration of approximately 5 ppb.

To determine if additional springs may be present along the banks of Stout's Creek, CBS conducted PCB sampling within Stout's Creek to see if the PCBs present in the creek could be accounted for by the known spring discharges. If different PCB concentrations were discovered within the creek at different locations, then additional springs could be present. PCB mass balance calculations suggest that there may be additional PCB inputs to Stout's Creek not associated with the known springs discussed above.

Piezometers installed by CBS Corporation indicate that a buried bedrock valley is present that is oriented north-south through the middle of the Site. The elevation of bedrock in this valley is generally lower than the present channel of Stout's Creek. This valley contains some sand and gravel material at the top of rock, which, together with the elevation data, indicates that the valley may have been a former channel for Stout's Creek. This channel appears to rejoin the present Stout's Creek channel at the northern fringe of the Site. Railroad tracks adjacent to Stout's Creek were used by the quarry and the railroad berm was constructed over this channel and may be impeding flow within this channel, causing some groundwater mounding in the northern portion of the Site.

Quarry Pits

Under the oversight of EPA and the State, CBS has extensively investigated three open quarry pits at the Site, known as Wedge Quarry, Wedge South Quarry (collectively the Wedge Quarry Complex) and Icebox Quarry. The pits are filled with water, and sampling of this water has shown contamination consistently present at around 0.1 ppb in Icebox Quarry. Water in the Wedge Quarry Complex has been consistently non-detect for PCBs.

A buried quarry designated "Pit A" lies to the east of the Site and is just north of Wedge Quarry (See Figure 3). This pit has a water pool at the surface that has neither been observed to freeze in the winter nor been observed to dry out during dry summer periods. This indicates a source of groundwater recharge to this pit. The investigation of the quarry pits has focused on their influence on the spring flow. Observations during dry periods when both Middle and Mound Springs ceased to flow relate to a water level in the Wedge Quarry Complex of approximately 739 to 740 feet above mean sea level (msl). Further, it was observed that water in Mound Spring and in the Wedge Quarry Complex shared a unique characteristic in that the conductivity of the water was elevated. It is believed that the elevated conductivity of the water in the Wedge Quarry Complex is a result of road salt from runoff from the nearby highway. The fact that the water emerging from Mound Spring had similar conductivity indicates that the Wedge Quarry Complex may be recharging the groundwater to Mound Spring.

To test this theory, CBS conducted a series of pump down tests of the Wedge Quarry Complex to determine if draining the Wedge Quarry Complex had the potential to reduce spring flow by limiting the groundwater recharge. The results from tests confirmed the theory. The initial

short-term pump down of Wedge Quarry Complex to a 737 foot msl showed that the flow at Mound Spring was reduced to zero. A second long-term pump down test at all three quarry pits diminished groundwater recharge to much of the Site and sharply reduced the flow at Mound Spring, if not eliminating the flow altogether. These two tests clearly showed that reducing the water level in the pits would reduce the amount of contaminated groundwater emerging from the springs. The tests also showed that reducing the water levels in the pit would not wholly eliminate the on-going releases from the springs. Middle Spring, for example, was only slightly affected by the pump down of the Wedge Quarry Complex. In November 2005, CBS pump tested two wells in the buried creek channel to determine the effectiveness of capturing groundwater flowing along the bedrock valley. The results of the test showed that the pumping wells were able to control only a portion of the groundwater flow.

Sediment Data

Additional sediment sampling has occurred since the removal of contaminated sediment within Stout's Creek in 2000. The North Park Development Group completed sediment sampling in Stout's Creek subsequent to the cleanup in 2000. The results showed that the continuing release of PCBs into Stout's Creek has not re-contaminated sediment to levels greater than 1 part per million (ppm) PCBs. CBS also completed additional sediment sampling in November 2005, and the results also showed PCBs less than 1 ppm with many samples below the detection limit.

CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

The Bennett's Dump Site is located in a former quarrying operation. The source control operable unit, which consisted of a cleanup of soil and sediment, remediated the main Site area to levels which will permit industrial/commercial development. Currently, the area surrounding the Site is rural with a few commercial businesses and residential homes. A large development by the North Park Development Group is underway and surrounds the Site. This large development will be a mixture of both commercial and residential properties. The Bennett's Dump Site is within the boundaries of the development and institutional controls will be required in the final remedy.

Three houses within a one-mile radius of the Site use groundwater for drinking water. Recent and historical sampling has shown that PCBs have not affected these drinking water wells. The new development will not be using groundwater as a drinking water source, and instead will use City of Bloomington water which comes from Lake Monroe. Incidental ingestion of water and sediment by children playing, wading, or swimming in Stout's Creek was evaluated in the Human Health Risk Assessment.

SUMMARY OF SITE RISKS

EPA completed two focused risk assessments for the purpose of quantifying the threat to public health and the environment from actual or threatened releases of hazardous substances into the environment. One risk assessment focused upon the current and future effects of such releases

on human health. The other assessment focused upon the current and future effects of such releases upon the environment. Each risk assessment is discussed, in turn, below.

Human Health Risks

A Superfund human health risk assessment estimates the baseline risk to human health. This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a Site. To estimate the baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, EPA evaluates the data collected at a particular site to determine which data is appropriate to consider in the risk assessment. For example, the most recent data are used, rather than historical data, because concentrations of PCBs in water and fish tissue can change over time and current data are most reflective of future concentrations. Next, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies helps EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a reasonable maximum exposure (RME) scenario, which represents the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. EPA considers two types of risk: cancer and non-cancer risk. The likelihood of any cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a 1 in 10,000 chance. In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates risk differently. The key concept here is that a threshold level exists below which non-cancer health effects are no longer predicted. This threshold level is conservatively represented by a reference dose (RfD). Non-cancer risks are calculated as the ratio of potential exposure to the RfD; this ratio is referred to as a hazard quotient (HQ). A HQ of greater than 1 indicates a potential for adverse health effects.

EPA calculated the PCB risk by two methods (Aroclor and Toxicity Equivalent). As background, PCBs are mixtures of up to 209 individual chlorinated compounds called congeners.

Many commercial PCB mixtures are known in the United States as Aroclors. Laboratory analysis included measuring PCBs by the Aroclor method and the congener method. With the congener method, thirteen of the 209 congeners are referred to as dioxin-like PCBs as they produce a toxic response similar to the toxic response produced by exposure to dioxin. The concentration of each congener is converted to a dioxin equivalent which is referenced as the toxicity equivalent (TEQ).

In Step 4, EPA determines whether site risks are great enough to cause health problems for people at, or near, the Superfund site. The results of the three previous steps are combined, evaluated and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

In evaluating the human health risks posed by the on-going releases from Bennett's Dump, EPA focused on the health effects of PCBs to children playing in Stout's Creek, as well as children and adults eating PCB-contaminated fish caught in Stout's Creek. In 1996, the Agency for Toxic Substances and Disease Registry (ATSDR) completed its public health assessment of the Bloomington PCB sites and concluded, among other things, that neither children nor adults are likely to engage in activities in Stout's Creek that would lead to significant exposures to site-related contaminants. At the time this report was issued, however, the ATSDR noted that the Bennett's Stone Quarry Site was in a sparsely populated area with fewer than 10 households within a 2 mile of the Site. This is no longer accurate. A portion of the Bennett's Dump Site is now within the boundaries of the North Park Development. This new development consists of both residential and commercial buildings, which will be built within 2 mile of the Site. Notwithstanding the close proximity of the North Park Development to the Site, EPA does not believe that the ongoing releases pose a threat to the drinking water supplies for the development. The North Park Development will obtain potable water from the City of Bloomington. While there are three households within one mile of the Site that use groundwater for drinking water, none of the wells associated with these households have tested positive for PCBs.

EPA believes that human exposure to PCBs from the Site result from three pathways:

- Consumption of PCB-contaminated fish caught in Stout's Creek
- Exposure to sediment in Stout's Creek through skin contact and incidental ingestion
- Exposure to surface water in Stout's Creek through skin contact and ingestion

To determine the risks posed by the first pathway, fish tissue samples were collected at three locations intersecting Stout's Creek. These locations are as follows:

- Hunter Road (1 mile from the Site)
- Acuff Road (3 miles from the Site)

- W. Maple Grove Road (5 miles from the Site)

As part of evaluating risks to humans from the consumption of fish from Stout's Creek, an analysis of the number of fish within the Creek was completed to determine whether enough fish were living in the Creek to be available to consume. The size of the fish are also taken into consideration in developing the amount of fish that can be consumed along with a factor for converting whole fish sample results to an edible fillet sample. The results showed that from a human health standpoint, edible fish at the Hunter Road sampling location are available in sufficient numbers to support consumption of one quarter pound fish meal every three months (1 gram of fish tissue per day). Similarly, edible fish at the Acuff Road and W. Maple Grove Road locations are available in sufficient numbers to support consumption of one quarter pound meal per month (3 grams of fish tissue per day). Using EPA risk assessment guidance and procedures to calculate cancer and non-cancer risk, the following is a summary of the risk at the three sampling locations:

Location	Risk		Hazard	
	PCB	TEQ	PCB	TEQ
Hunter Road				
Green Sunfish (fillet)	3.1E-06	NA	1.8E-01	NA
Green Sunfish (whole)	5.1E-06	3.1E-06	3.0E-01	4.8E-02
Acuff Road				
Green Sunfish (fillet)	1.2E-05	NA	7.3E-01	NA
Green Sunfish (whole)	7.4E-06	4.7E-06	4.3E-01	7.3E-02
White Sucker (whole)	4.8E-05	2.8E-05	2.8E+00	4.4E-02
Combination	2.9E-05	1.6E-05	1.7E+00	2.5E-01
W. Maple Grove Rd				
Green Sunfish	4.4E-06	NA	2.6E-01	NA
Longear Sunfish	3.2E-06	4.8E-06	1.9E-01	7.5E-02
White Sucker	9.6E-06	8.7E-06	5.6E-01	1.4E-01
Combination	6.7E-06	6.8E-06	3.9E-01	1.1E-01

Using the EPA point of departure of 1 in 1,000,000 (1 E-06) excess cancer risk and hazard index greater than 1, evaluating the risk at Acuff Road shows that an unacceptable cancer risk through consumption of PCB-con6taminated fish is present. A single set of risks associated with incidental ingestion and skin (dermal) contact with contaminated sediment and surface water in Stout's Creek were calculated for all three locations and are as follows:

- Incidental ingestion and dermal contact with sediment produces a cancer risk of lower than 1 in 10,000,000 and non-cancer hazard quotient of less than 0.02.

- Incidental ingestion of water from Stout's Creek produces a cancer risk of 1 in 1,000,000 and a non-cancer hazard quotient of less than 0.02.

- Dermal contact with water is associated with a cancer risk of 3 in 100,000 and non-cancer hazard quotient of 1.6.

At W. Maple Grove Road, both the cancer and non-cancer risks from fish consumption are not as great as at Acuff Road, because the PCB concentrations in fish found at W. Maple Grove Road are lower than the PCB concentrations found in fish at Acuff Road. Also, the risk associated with ingestion and dermal contact of water and sediment in Stout's Creek at W. Maple Grove are similar to the risk levels at Acuff Road.

In summary, these results indicate that there are potential risks to both children and adults from ingesting fish and borderline risks associated with dermal contact with water in Stout's Creek. There is not an unacceptable risk, however, with respect to incidental ingestion or dermal contact with sediment.

These risk estimates are based on reasonable maximum exposure (RME) scenarios and were developed by taking into account various conservative assumptions about not only the concentration of PCBs in various media to which humans may be exposed, but also the frequency and duration of an individual's exposure to eating fish or coming into contact with water and sediment from Stout's Creek. In particular, risks associated with potential dermal contact with PCBs in surface water are likely to overestimate actual risks because the risk assessment was based upon PCB concentrations immediately downstream of the Site and did not consider the impact of dilution from the West Branch of Stout's Creek.

Ecological Risks

An ecological risk assessment was completed for the Bennett's Dump Site. The ecological risk assessment focused on whether the PCB-exposure of mammals and birds feeding on PCB-contaminated fish and crayfish from Stout's Creek is high enough to potentially cause reproductive problems in those mammals and birds. Protection of fish-eating birds and mammals is expected to be protective of aquatic organisms as well because the mammals and birds that feed on PCB-contaminated fish are exposed to higher levels of PCBs compared to the fish themselves. Fish-eating mammals are represented by mink, and fish-eating birds are represented by kingfisher.

The exposures of mink and kingfisher to PCBs are based on analyses of fish and crayfish collected from Stout's Creek in 2004. As with the human health risk assessment, the locations are Hunter Road (Station 1), Acuff Road (Station 2), and W. Maple Grove Road (Station 3).

The ratio of fish and crayfish PCB concentrations was used to model PCBs in crayfish at the other two locations, because crayfish were collected only at Acuff Road. Risk is evaluated both for total PCBs and for dioxin toxic equivalents (TEQ). Data on dioxin toxic equivalents are available for only a small subset of the fish collected for the ecological risk assessment, so there is greater uncertainty associated with the risk estimates based on TEQ as compared to the ecological risks assessed based on total PCBs (which have much more sampling data available). Total PCB risks are calculated for both reasonable maximum exposure (RME) based on an upper

estimate of the average PCB exposure, and central tendency exposure (CTE) based on the average measured exposure. Data are insufficient for calculating RME dioxin toxic equivalents, so TEQ risk is calculated only for CTE.

Mink exposure is modeled with a dietary composition of 66% fish, 13% crayfish and 21% prey from land and assuming no PCB contribution from non-aquatic prey. The dietary composition assumptions are based on the results of a Michigan field study. Risk is estimated by hazard quotients (HQ) calculated by dividing the modeled dietary PCB concentrations by the dietary concentration resulting in no adverse effects in mink feeding studies (no effect HQ) and the lowest concentration that caused adverse effects (low effect HQ).

The results for total PCBs show that mink are potentially at risk of adverse reproductive effects at Hunter Road and Acuff Road, with no effect HQs of 9 and 4, respectively, and low effect HQs of 7 and 4, respectively, for the RME scenario. The CTE HQs are similarly elevated at Hunter Road and Acuff Road, with no effect HQs of 7 and 3, respectively, and low effect HQs of 6 and 3, respectively. The TEQ no effect HQs are similar (8 and 4 at Hunter Road and Acuff Road), but the TEQ low effect HQs are lower (2 and 1, respectively) compared to the total PCB HQs. Although the specific values vary among the approaches, all lead to the same conclusion, that mink are potentially at risk at Hunter Road and Acuff Road.

The risk to mink appears to be low at W. Maple Grove Road. The total PCB "no effect" and "low effect" HQs both equal 1 (because of rounding), which indicates that exposure falls within the narrow range between dietary concentrations not associated with adverse effects and those associated with the onset of adverse effects. The TEQ no effect HQ is higher (5), but the low effect HQ is identical (1) to the total PCB HQ.

Kingfisher exposure is modeled with a dietary composition of 80% fish and 20% crayfish. The dietary composition assumptions are based on several field studies in mid-western states. PCB toxicity studies have not been performed with kingfisher. Therefore, to allow use of toxicity data for other species of birds, kingfisher dietary exposure was converted to dose (PCBs per kilogram bodyweight per day). Because the sensitivity of kingfisher to PCBs is unknown, two sets of PCB toxicity values were used to represent higher and lower sensitivities to PCBs. The risk associated with TEQ dose was evaluated with a single high-quality set of toxicity values. TEQ risk was also evaluated through a separate procedure by modeling the accumulation of dioxin-like PCB congeners in kingfisher eggs. The risks associated with TEQ in eggs were assessed with two sets of toxicity values to represent higher and lower sensitivities to dioxin-like effects.

The results for total PCBs show that kingfisher are potentially at risk of adverse reproductive effect at Hunter Road and Acuff Road, with no effect HQ ranging from 3 to 24, and low effect HQ ranging from 1 to 5 for the RME scenario. The CTE HQ are similarly elevated at Hunter Road and Acuff Road, with no effect HQ ranging from 2 to 20, and low effect HQ ranging from 0.9 to 4. The TEQ dose HQ are reasonable consistent with the total PCB risk range, with no effect HQ of 16 and 9 at Hunter Road and Acuff Road, respectively, and low effect HQ of 2 and 0.9, respectively. TEQ egg HQ have a broader range compared to the other approaches, with no effect HQ ranging from 1 to 17, and low effect HQ ranging from 0.3 to 6. Although the values

vary among the approaches, most lead to a similar conclusion that kingfisher are potentially at risk at Hunter Road and Acuff Road. The sole exception is the egg-based risk estimate assuming low sensitivity to dioxin-like effects.

The risk to kingfisher appears to be low at Maple Grove Road based on total PCBs. Although the total PCB "no effect" HQ mostly exceed 1 (0.8 to 4 for CTE and RME), all of the "low effect" HQ are below 1 (0.3 to 0.8 for CTE and RME), which indicates that kingfisher PCB doses at Maple Grove Road are intermediate between doses not associated with adverse effects and those associated with the onset of adverse effects. The TEQ dose HQ are somewhat higher than the total PCB HQ, with a no effect HQ of 10, and a low effect HQ of 1. Again, the egg-based HQ range is very broad, 0.7 to 6 for no effect, and 1 to 10 for low effect. Based on the TEQ approaches, kingfisher risk cannot be ruled out at Maple Grove Road, but based on the total PCB approaches, risk appears to be low.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) provide a general description of what the cleanup will accomplish. The continuing release of PCBs from the spring system connected to the Bennett's Dump has produced unacceptable risks to human health and the environment. The RAO's for operable units two and three are as follows:

- Reduce the amount of PCBs released from groundwater to Stout's Creek through mass reduction.
- Reduce the PCB levels in fish for beneficial reuse by reducing PCBs released to Stout's Creek.
- Reduce the amount of PCB mass in sediments that may be available to fish by reducing PCBs released to Stout's Creek.

DESCRIPTION OF ALTERNATIVES

To address the PCB-contamination at the Bennett's Dump Site, the site investigation was broken up into two operable units, one for water and one for sediment. For operable unit 2, five alternatives, including the No Action Alternative, were evaluated to remediate the PCB-contaminated spring water at the Site. Operable Unit 3 addresses PCB contaminated sediment in Stout's Creek.

Water Operable Unit

All the alternatives, except the No Action Alternative, have common (or overlapping) components. The No Action Alternative is evaluated as a comparison to the other alternatives. All of the alternatives (except the No Action Alternative) anticipate some type of storm water structures with lined retention basins that are intended to minimize groundwater recharge in the area surrounding the Site, because the area surrounding the Site is scheduled to be developed by

the North Park Development Group. The North Park Development Group has not finalized plans, but the group has been cooperative and has agreed to coordinate its activities with the U.S. EPA and the other parties to the Consent Decree.

Alternative 1: No Action Alternative

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Timeframe: None

Regulations governing the Superfund program generally require that the No Action alternative be evaluated generally to establish a baseline for comparison. Under this alternative, U.S. EPA would take no action at the Site to prevent the release of PCBs into Stout's Creek.

Alternative 2: Long-Term Groundwater Monitoring

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $4,700
Estimated Present Worth Cost: $73,322
Estimated Construction Timeframe: None

No additional remedial measures would be implemented with this alternative. Long-term groundwater monitoring for 30 years would take place quarterly at Middle Spring, Mound Spring, Mid-north Spring, Rusty Spring, North Spring and Stout's Creek. Deed restrictions would be placed on the Site to prevent residential development, to prevent deep excavation in the former quarry pits, and to prevent placement of drinking water wells on the Site. Fencing would be required around a portion of the Site to prevent direct contact with the spring water.

Alternative 3: Passive Quarry Drain System

Estimated Capital Cost: $399,500
Estimated Annual O&M Cost: $1,700
Estimated Present Worth Cost: $417,000 at a 7% discount rate and 30 years of operation
Estimated Construction Timeframe: 3 months
Estimated Time to Achieve RAO's: 12 months

The groundwater investigation demonstrates that the flow from the on-site springs can be affected by the water level of the surrounding water filled quarries, particularly the Wedge Quarry Complex (Wedge and Wedge South Quarries). Pump down tests of the Wedge Quarry Complex indicate that maintaining water level of about 736 feet above mean sea level reduces the groundwater recharge in the area and that the pump down greatly reduces (and may eliminate) groundwater flow to some of the on-Site springs. Reducing the water level in Icebox Quarry shows some affect, but not nearly as much as reducing the water level in the Wedge Quarry Complex.

Accordingly, in this alternative, a passive drain would be installed to Stout's Creek from the Wedge Quarry Complex with the intention of lowering the water level in the Wedge Quarry Complex. A passive drainage system through bedrock would be placed from Wedge Quarry to Wedge South Quarry to facilitate the drainage of the Wedge Quarry Complex. Another passive drain into bedrock would be cut from Wedge South Quarry to Stout's Creek upgradient from the Site. This system is to keep the water level in the Wedge Quarry Complex at a 736 foot elevation during low flow and storm events. Direct drainage from the Wedge Quarry Complex to Stout's Creek will not require any treatment, because the water sampled within the quarry has not shown PCB contamination. The Pit A area would also be drained into the Wedge Quarry Complex. In addition, Icebox Quarry may be partially drained either to the Wedge Quarry Complex or directly to Stout's Creek. Icebox Quarry has shown PCB concentrations of 0.1 ppb and water draining from the quarry may require treatment prior to the release to Wedge Quarry Complex. Figure 4 shows a conceptual approach for the Wedge Quarry passive drainage system. Key Applicable or Relevant and Appropriate Requirements (ARARs) for this alternative include the following:

- Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for fugitive dust, i.e. particulate matter that escapes beyond the boundaries of the Site.

- Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust.

- 329 IAC 4.1-4 Requirements for storage and disposal of wastes containing PCBs - Under 329 IAC 4.1-4, any sludge, soil, or other material generated by a water treatment facility or excavation of on-Site material must be managed as PCB remediation waste in accordance with 40 CFR ' 761.61.

- 329 IAC 3.1 Universal Waste Rule - Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether the wastes meet the characteristics of hazardous waste. If they meet these characteristics, they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. " 260-280.

- 329 IAC 10 Solid Waste Land Disposal Facilities - Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste.

- The passive quarry drain from Icebox Quarry to Wedge Quarry may require treatment and will not need to obtain a National Pollutant Discharge Elimination System (NPDES) permit because remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. '96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES

program are relevant and appropriate to discharges from the plant and the discharges must meet the substantive requirements of any permit that would be issued.

Specifically, the following are action-specific ARARS:

- 327 IAC 2-1-6 Table 1, Surface Water Quality Standards
- 327 IAC 5-2-8 Conditions Applicable to All Permits
- 327 IAC 5-2-11 Considerations in the calculation and specification of effluent limitations
- 327 IAC 5-2-11.1 Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system
- 327 IAC 5-9-2 Applicability of Best Management Practices
- 327 IAC 5-2-13 Monitoring
- As noted previously, the State of Indiana has stated in correspondence that it typically sets an effluent limit of .3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits for those contaminants. .

A Long-term Groundwater Monitoring Plan will be developed to monitor the effectiveness of the passive quarry drain system. The monitoring will include any springs which may continue to periodically flow, as well as Stout's Creek and sediment within Stout's Creek. Analysis of fish tissue from Stout's Creek will be conducted.

Institutional controls, such as deed restrictions, would be placed on the Site to prevent residential development, to prevent deep excavation in the former quarry pits, and to prevent placement of drinking water wells on the Site. Fencing may also be required.

Alternative 4: Excavation of Buried Quarry Pits and Passive Quarry Drain (Alternative 3)

Estimated Capital Cost: $1,320,871
Estimated Annual O&M Cost: $1,700
Estimated Present Worth Cost: $1,338,960 at a 7% discount rate and 30 years of operation
Estimated Construction Timeframe: 12 months
Estimated Time to Achieve RAO's: 18 months

Based upon the 1999 excavation, it is known that the filled-in, buried quarry pits on and near the Site contain residual PCBs. The PCBs in the filled-in, buried quarry pits on and near the Site are a source of the PCBs that contaminate the springs and are eventually released to Stout's Creek.

The quarry pits are filled with rubble and fill material and the disposal of PCBs at these areas has contaminated the material deep in the pits which could not be removed during the 1999 cleanup. Groundwater in the quarry pits becomes contaminated by the residual PCBs and are released to Stout's Creek through the on-site springs.

In this alternative, the buried quarry pits near the former area of deeply buried residual PCB contamination would be excavated to a level of 25 ppm. Figure 3 shows the general area of excavation. The PCB-contaminated material excavated from the quarry pits would be disposed of off-site in a landfill permitted to accept PCB waste. The volume of PCB-contaminated material is estimated to be 3,000 cubic yards. Large pieces of rubble within the quarry pits would be placed back into the pit if the rubble is uncontaminated. Clean fill would replace the removed material and the excavated areas returned to the current grade. In addition, all of the remedial action components of Alternative 3 would also be implemented as part of this Alternative.

Key ARARs for this alternative include the following:

- Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for fugitive dust i.e. particulate matter that escapes beyond the boundaries of the Site. These emission limits are relevant and appropriate with respect to dust resulting from the excavation of the Site.

- Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust.

- 329 IAC 4.1-4 Requirements for storage and disposal of wastes containing PCBs - Under 329 IAC 4.1-4, any sludge, soil, or other material generate by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR ' 761.61.

- 329 IAC 3.1 Universal Waste Rule - Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether the wastes meet the characteristics of hazardous waste. If they meet these characteristics, they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. " 260-280.

- 329 IAC 10 Solid Waste Land Disposal Facilities - Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste. This requirement is relevant and appropriate with respect to waste generated by the excavation of Site.

- 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants - Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is

relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. '63.41, the term construct a major source means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that this alternative would meet this threshold limit.

- 326 IAC 2-5.1-3(a)(1)(D) Permits for New HAP Source - Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy would need to comply with the substantive requirements of a permit, although no permit would be issued for the Site.

- 326 IAC 2-5.1-2(a)(1)(A) Registrations - Under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to emit five tons per year of either particulate matter, or particulate matter less than 10 microns, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to meet or exceed this threshold limit, the remedy would need to comply with the substantive requirements of the registration rule, although registration will not be required for the Site. EPA does not anticipate that this alternative would meet this threshold.

A Long-term Groundwater Monitoring Plan will be developed to monitor the effectiveness of the passive quarry drain system and the excavation. The monitoring will include any springs which may continue to periodically flow, Stout's Creek, sediment within Stout's Creek. Analysis of fish tissue from Stout's Creek will be conducted.

Institutional controls, such as deed restrictions, would be placed on the Site to prevent residential development, to prevent deep excavation in the former quarry pits, and to prevent placement of drinking water wells on the Site. Fencing may also be required.

Alternative 5: Passive Quarry Drains with Interceptor Trench and Carbon Treatment

Estimated Capital Cost: $831,900
Estimated Annual O&M Cost: $28,000
Estimated Present Worth Cost: $1,189,972 at a 7% discount rate and 30 years of operation
Estimated Construction Timeframe: 12 months
Estimated Time to Achieve RAO's: 18 months

In this alternative, the passive quarry drain described in Alternative 3 would be implemented, along with the addition of a groundwater interceptor trench with carbon treatment for the captured groundwater. The treated groundwater would be discharged to Stout's Creek. In this alternative, the groundwater would be contained and treated to prevent the release of PCBs and other hazardous constituents from reaching Stout's Creek. The conceptual design of the interceptor trench would be to locate the trench along the west side of the Site. The interceptor

trench would be approximately 800-feet long and 8 feet deep from the top of bedrock. The final depth will be determined in the design phase. It is assumed that groundwater flow will be a maximum of 100 gallons per minute during storm events. Figure 5 shows a conceptual approach for the interceptor trench.

A pre-design study will be required with this alternative. The pre-design study will occur after the installation of the passive quarry drain system, and the study will determine how groundwater flow and PCB contamination is affected by the passive quarry drain system. The interceptor trench may then be designed based upon the pre-design study results. The State of Indiana will provide substantive requirements of the National Pollution Discharge Elimination System (NPDES) water discharge limits, because the captured water will be treated on-site and discharged to Stout's Creek. This discharge, however, will be completed on-site and under the Superfund law the State will only provide substantive requirements, because the discharge is exempt from administrative permitting requirements.

Through correspondence, the State of Indiana has identified 327 IAC 5-2-11.1 as a relevant and appropriate cleanup standard, standards of control, and other substantive requirements, criteria, or limitations in determining PCB discharge criteria for any water treatment plant built at Bennett's Dump. 327 IAC 5-2-11.1 provides an alternate way to determine a cleanup level for PCBs where the WQBEL for PCBs is 0.79 part per trillion and, therefore, is less than the limit of quantitation normally achievable and determined by the Indiana to be appropriate for PCBs. As an alternative and consistent with its regulations, Indiana identified an approved analytical methodology that reliably can disclose PCBs in effluent at concentrations of 0.3 ppb. This higher discharge criteria is based upon an approved laboratory method and is appropriate where the 0.79 ppt is less than the limit of quantitation.

Key ARARs for the water treatment component of this alternative include the following:

The fifth remedial alternative requires the construction and operation of an on-site water treatment plant. This plant will not need to obtain a National Pollutant Discharge Elimination System (NPDES) permit because remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. '96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARS:

- 327 IAC 2-1-6 Table 1, Surface Water Quality Standards
- 327 IAC 5-2-8 Conditions Applicable to All Permits
- 327 IAC 5-2-11 Considerations in the calculation and specification of effluent limitations
- 327 IAC 5-2-11.1 Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system

- 327 IAC 5-9-2 Applicability of Best Management Practices

- 327 IAC 5-2-13 Monitoring

As noted previously, the State of Indiana has stated in correspondence that it typically sets an effluent limit of .3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits for those contaminants. Neither EPA, nor the State of Indiana, has any such information now, but during the source control cleanup in 1999, diesel fuel, containing volatile and semi-volatile compounds was found. If appropriate, the State of Indiana will determine effluent limits for such contaminants. The plant will meet this effluent limits.

Key ARARs for the passive quarry drain and interceptor trench components of this alternative include the following:

- Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for fugitive dust i.e. particulate matter that escapes beyond the boundaries of the Site.

- Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust.

- 329 IAC 4.1-4 Requirements for storage and disposal of wastes containing PCBs - Under 329 IAC 4.1-4, any sludge, soil, or other material generate by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR ' 761.61.

- 329 IAC 3.1 Universal Waste Rule - Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether the wastes meet the characteristics of hazardous waste. If the wastes meet these characteristics, they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. " 260-280.

- 29 IAC 10 Solid Waste Land Disposal Facilities - Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste.

An Operations and Maintenance Plan will be developed for the treatment system. A groundwater monitoring plan will be developed along with a plan to monitor the treated water discharged pursuant to the NPDES substantive requirements. The Long-term Groundwater Monitoring Plan will be developed to monitor the effectiveness of the passive quarry drain

system. The monitoring will include any springs which may continue to periodically flow, as well as Stout's Creek and sediment within Stout's Creek. Analysis of fish tissue analysis from Stout's Creek will be conducted.

To be protective of human health and the environment, each active alternative described within this ROD requires use or access restrictions within the boundaries of the Site. Use restrictions or access restrictions would be implemented through the use of institutional controls. Institutional controls are administrative or legal constraints that minimize the potential for exposure to contamination by limiting land or resource use. Specific actions taken at sites to restrict access or use could include: Governmental Controls - such as zoning restrictions or ordinances; Proprietary Controls - such as easements or covenants; Enforcement Tools - such as consent decrees or administrative orders; and Informational Devices- such as deed notices or state registries. Several types of access or use restrictions employed simultaneously can increase the effectiveness of institutional controls.

It is anticipated that institutional controls will be needed for the Site since the Site will have contaminants remaining at levels that do not allow unrestricted use or unlimited access. The goal of these institutional controls is to prevent residential development, to prevent deep excavation in the former quarry pits, and to prevent placement of drinking water wells on the Site. Fencing may also be required.

Preventing residential development and deep excavation will prevent direct contact exposure with the residual contamination. Therefore, digging or disturbance on the Site (or underlying contaminated material) will be prevented. There will be a program of Operation, Monitoring and & Maintenance, and this will include routine inspection. It is anticipated that institutional controls will be relatively simple to develop, likely through a layered approach, including: proprietary controls (easements and/or covenants); deed restrictions; and enforcement tools (AOCs and/or consent decrees), which will ensure the long-term reliability of the controls. Institutional controls are also needed to control use of groundwater. The goals of these institutional controls are: to prevent use of and exposure to (ingestion, dermal contact) groundwater. Therefore, installation of groundwater production wells will be prevented. Additionally, new construction over areas where contamination exists will be prevented, or the construction will be outfitted so as not to disturb the underlying contamination. There will be a program of Operation, Monitoring and & Maintenance, and this will include routine inspection to ensure that no new production wells or buildings have been constructed.

Sediment Operable Unit

Due to the continuing release of PCBs from the springs into Stout's Creek, additional sampling of sediment in Stout's Creek was completed subsequent to the sediment cleanup in 2000. Using the recent sediment sampling data and evaluating the risk with respect to sediment in Stout's Creek, the risk posed to adults and children from the incidental ingestion and dermal contact produces a cancer risk lower than 1 in 1,000,000 and a non-cancer hazard quotient of less than 1 of 0.02. Evaluating both the carcinogenic and non-carcinogenic risk for the sediment, it has been determined that they are within acceptable risk levels. Further, it is unlikely that EPA could

further reduce the risk in light of the small amount of sediment in Stout's Creek and low level of PCB contamination in the sediment. Therefore, the sediment in Stout's Creek will not require remediation and will not be evaluated further.

COMPARATIVE ANALYSIS OF ALTERNATIVES

EPA uses nine criteria to evaluate the remedial alternatives against each other to determine the most appropriate remedy for the Site. Each alternative is compared to each of the other alternatives to determine which alternative achieves the best balance of the nine criteria.

Overall Protection of Human Health and the Environment

The overall protection of human health and the environment criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Excluding the No Action alternative (Alternative 1) and long-term groundwater monitoring alternative (Alternative 2), the remaining alternatives would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, and institutional controls. Alternative 3 assumes that the groundwater flow would be greatly reduced, even during storm events and, therefore, that the continuing release of PCBs would be greatly minimized. Alternative 4 would reduce the releases to Stout's Creek through excavation of the PCBs within the buried quarry pits, and would further reduce the release of any residual PCBs to Stout's Creek by controlling groundwater by employing the passive drain system. Alternative 5 would control groundwater flow by employing the passive drain system and any remaining PCBs releases would be captured and eliminated through on-site treatment.

The no action alternative and long-term groundwater monitoring alternative would not be protective of human health and the environment. Accordingly, these two alternatives have been eliminated from consideration under the remaining eight criteria.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP Section 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a State in a timely manner and that are more stringent

than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent that Federal requirements may be relevant and appropriate.

The compliance with ARARs criterion addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver.

Excluding alternatives 1 and 2, the remaining alternatives have common ARARS associated with the installation of the passive quarry drain. Discharge of treated water to Stout's Creek will not require a permit but the discharge must meet the substantive requirements. The State of Indiana has stated in correspondence that it typically sets an effluent limit of .3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits. Recent sampling of the springs has shown that other hazardous constituents are not present but a final determination regarding other constituents will be made by the State during the pre-design study.

Alternatives 3, 4, and 5 will attain their respective Federal and State ARARs.

Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Alternatives 3, 4, and 5 each provide some degree of long-term protection. Each alternative reduces the release of PCBs into Stout's Creek. Alternative 3 alone likely would not control all of the PCB releases, especially during large storm events. Alternative 4 includes excavating the PCBs in the buried quarries and controlling spring flow through the installation of the passive quarry drain. However, due to the residual PCBs, during storm events the springs may continue to release PCBs. Alternative 5 includes the passive drain system (which will reduce the release of PCB-contaminate water), and includes the capture of PCB-contaminated water that is released by employing a collection trench. The captured PCB-contaminated water is then treated through carbon adsorption.

Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of each of these alternatives, because hazardous substances would remain on-site in concentrations above acceptable health-based levels.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The reduction of toxicity, mobility, or volume through treatment criterion refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 3 would address the mobility of PCBs and other hazardous constituents by reducing the amount of groundwater released to Stout's Creek, but this alternative does not reduce the toxicity or volume through treatment. Alternative 4 reduces the mobility of contaminants through groundwater control. The excavation of the quarry pits will reduce the potential of PCBs to be released through groundwater. Alternative 4 does not reduce the toxicity of the PCBs, because the excavated material from the quarry pits will be disposed of off-site in a permitted landfill capable of accepting PCBs. Alternative 5 does reduce the toxicity, mobility, or volume through treatment by using groundwater control and groundwater capture in an interceptor trench with the subsequent carbon adsorption treatment of groundwater. The carbon from the water treatment plant residuals will be managed in accordance with the Resource Conservation Recovery Act.

Short-Term Effectiveness

The short-term effectiveness criterion addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternatives 3, 4, and 5 can all be implemented without risk to workers, nearby residents, and the environment. Alternative 4 has the highest potential for short-term risk due to the excavation of PCBs and other hazardous constituents which may volatilize into the air. Air monitoring at the excavation perimeter and worker monitoring would be conducted to ensure the protection of public health and the environment. The short-term risk to construction workers and potential contact with contaminated groundwater will be eliminated through engineering controls and the implementation of health and safety protocols.

Alternative 4 would require the longest actual construction period due to the excavation activities and should be completed in one construction season. Alternative 5 will require the implementation first of the passive drain system to determine the final volume of water which will require collection and treatment. Alternative 5 may require 18 months or longer to complete, because the passive drain system would need to be installed prior to designing the collection/treatment system. The collection and treatment system may require operation and maintenance for at least 30 years.

Implementability

The implementability criterion addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternatives 3, 4, and 5 can be implemented. The excavation portion of Alternative 4 may be problematic, because excavating within a buried quarry may require specialized equipment to reach the necessary depths and to remove large pieces of limestone rubble. The potential for a very large area of excavation is also possible, because the extent of the buried quarry system is not fully defined. In addition, the excavation at depth may mobilize additional contaminants through fractures in the limestone thereby spreading contamination over a wider, deeper area. The installation of the passive drainage system and the interceptor trench into bedrock is not unique construction, but may require the blasting of rock. The treatment of groundwater using activated carbon as described in Alternative 5 is a very common technology and meeting of the State NPDES discharge requirements to Stout's Creek should not pose a problem.

Cost

Evaluating the capital cost of each alternative indicates that Alternative 4 would be the most costly alternative compared to Alternative 5 and Alternative 3. Using present worth calculations at a 7% discount rate shows that Alternative 4 would be more expensive to implement compared to Alternative 5. Below is summary of the costs:

Alternative	Capital Cost	Annual Operation & Maintenance Cost	Present Worth Cost 7% Discount Rate
3	$399,500	$1,700	$417,000
4	$1,320,871	$1,700	$1,338,960
5	$831,900	$28,000	$1,189,972

State/Support Agency Acceptance

The State of Indiana, the City of Bloomington, and Monroe County all support the implementation of Alternative 5.

Community Acceptance

Community acceptance is an important part of the remedy selection process and was assessed during the public comment period and associated public participation activities. Community acceptance of the preferred alternative identified in the Proposed Plan for the ROD Amendment was fully evaluated at the conclusion of the public comment period. The public comments are addressed in the attached Responsiveness Summary. The majority of comments from the public support the implementation of Alternative 5, the preferred alternative identified in the Proposed

Plan. A few individuals submitted a large volume of comments not supporting Alternative 5. These few individuals prefer a complete excavation remedy.

PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever practicable [NCP 300.430(a)(1)(iii)(A)]. Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

During the source control phase of the cleanup, PCB oil mixed with diesel fuel was discovered in a buried quarry. This area may be one source of the PCBs being released to the spring system. Sampling data during non-storm periods, as well as storm sampling, however, does not show high concentrations being released from the spring system. In addition, volatile organic compounds (VOCs) have not been detected in recent spring sampling. Contaminated groundwater generally is not considered to be a source material. Even with the a portion of the buried quarries containing PCB oil mixed with diesel fuel, neither the spring sampling during non-storm periods, nor storm sampling, reflect the concentrations that were discovered during the excavation. Alternative 5 captures and treats the release of PCBs from the springs at the Bennett's Dump Site.

SELECTED REMEDY

EPA has selected Alternative 5 (passive quarry drain system with installation of groundwater interceptor trench with carbon treatment) to address the continuing release of PCBs into Stout's Creek from the springs at the Bennett's Dump Site. This alternative was selected over the other alternatives, because it is expected to achieve substantial and long-term risk reduction through the capture and treatment of contaminated groundwater and minimize the PCBs released to Stout's Creek. The problems with excavating within buried quarry pits and the difficulty of preventing spring flow during storm events through the passive quarry drain favors Alternative 5 over both Alternative 3 and Alternative 4.

The selected remedy will meet the RAO's by preventing and capturing/treating springs and groundwater to reduce PCBs from entering into Stout's Creek.

The first phase of the cleanup requires that the water in Wedge Quarry Complex (none of which is PCB-contaminated) is drained into the upstream portion of Stout's Creek Draining the Wedge Quarry Complex should relieve much of the groundwater recharge through the Site and should reduce the transport of PCBs to the creek. Based upon a pre-design study, Pit A, between Icebox and Wedge Quarries is connected to the Wedge complex by a natural flow connector. Connection to Icebox Quarry will be evaluated. Treatment of the water prior to discharge into

the Wedge Quarry Complex may be required, because PCBs have been periodically detected in Ice Box quarry. A conceptual design is shown in Figure 4. As part of the conceptual design, a trench is excavated into rock between Wedge and Wedge South Quarries. Then a trench is excavated into rock from Wedge South to Stout's Creek upstream of the Site. The trench is excavated so as to maintain the water levels in both quarries below an elevation of 737 feet amsl. This level was shown in a pump-down test to keep Mound Spring dry during non-storm flow conditions. An extension of the passive drain network to Pit A and possibility Icebox Quarry may also be implemented based upon results of a pre-design study.

Once the passive drain system is installed, the springs will be evaluated to determine the parameters for the design of a collection trench and water treatment plant. The conceptual design of the collection trench uses an 800-foot long and 8-foot deep trench into rock along the east side of the Site. Water will be collected in the trench and then sent to an on-site treatment plant for subsequent treatment through carbon adsorption. Flow rates are estimated to be at maximum of 100 gpm but this may change based upon the evaluation of flow after the installation of the passive quarry drain. See Figure 5 for a conceptual approach for the interceptor trench.

The captured water will be treated on-Site and discharged to Stout's Creek. Accordingly, the State of Indiana will provide substantive requirements of the National Pollution Discharge Elimination System (NPDES) water discharge limits. Because this discharge is completed on-site, under the Superfund law the State will only provide substantive requirements and no administrative permitting requirements apply. The State of Indiana has identified 327 IAC 5-2-11.1 as a relevant and appropriate cleanup standard, standards of control, and other substantive requirements, criteria, or limitations in determining PCB discharge criteria for any water treatment plant built at Bennett's. 327 IAC 5-2-11.1 provides an alternate way to determine a cleanup level for PCBs where the WQBEL for PCBs is 0.79 part per trillion and, therefore, is less than the limit of quantitation normally achievable and determined by the Indiana to be appropriate for PCBs. As an alternative and consistent with its regulations, Indiana identified an approved analytical methodology that reliably can disclose PCBs in effluent at concentrations of 0.3 ppb. This higher discharge criteria is based upon an approved laboratory method and is appropriate where the 0.79 ppt is less than the limit of quantitation.

An Operations and Maintenance Plan will be developed for the treatment system. In addition to monitoring the treated water discharge pursuant to the NPDES substantive requirements, a groundwater monitoring plan will be developed. Deed restrictions will be placed on the Site to prevent residential development, to prevent deep excavation in the former quarry pits, and to prevent placement of drinking water wells on the Site.

The cost associated with the implementation of the passive quarry drain and collection trench with treatment by carbon adsorption is presented in Tables 1 and 2.

With the implementation of the passive quarry drain and interceptor trench/carbon adsorption treatment system, PCBs will be captured and treated prior to discharge into Stout's Creek. PCB concentrations in fish will improve over time with the implementation of this remedy. The

expected risk associated with adults and children ingesting fish and through dermal contact with Stout's Creek should be protective of the 1 in 1,000,000 excess cancer risk. The already-completed soil cleanup allows for industrial/commercial development at the Site. Once the influent into the water treatment plant from the collection trench consistently meets 0.3 ppb PCBs during all weather events, EPA will evaluate if the treatment system should remain in place, be modified, or eliminated.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, EPA must select remedies that are protective of human health and the environment, that comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), that are cost-effective, and that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Selected Remedy, Alternative 5, will protect human health and the environment through the treatment of PCB contaminated water by collecting spring water in a trench and treating the PCBs with carbon adsorption. The implementation of the passive quarry drain will help to control spring flow. The release of PCBs into Stout's Creek will be reduced through the implementation of the Selected Remedy and over time, the risk levels will meet the 1 in 1,000,000 excess cancer risk and a Hazard Index of less than 1. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled and no cross-media impacts are expected from the Selected Remedy.

Compliance with Applicable or relevant and Appropriate Requirements

The Selected Remedy - installing a passive quarry drain and collection trench with carbon adsorption treatment for the spring water - will comply with ARARs. A list of ARARs are presented below:

- 327 IAC 2-1-6 Table 1, Surface Water Quality Standards
- 327 IAC 5-2-8 Conditions Applicable to All Permits
- 327 IAC 5-2-11 Considerations in the calculation and specification of effluent limitations
- 327 IAC 5-2-11.1 Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system
- 327 IAC 5-9-2 Applicability of Best Management Practices

- 327 IAC 5-2-13 Monitoring
- 326 IAC 6-4-2 Fugitive Dust Requirements
- 326 IAC 6-4-4 Fugitive Dust Requirements for Vehicle Traffic
- 329 IAC 4.1-4 Requirements for storage and disposal of wastes containing PCBs
- 329 IAC 3.1 Universal Waste Rule
- 329 IAC 10 Solid Waste Land Disposal Facilities

Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money spent. In making this determination, the following definition was used. "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP 300.430.(f)(1)(ii)(D)). This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Remedy is $1,189,972. Even though the Selected Remedy is the most expensive of the Alternatives, it still is considered cost-effective.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and that comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and a bias against off-site treatment and disposal, as well as considering State and community acceptance.

The Selected Remedy treats PCB-contaminated spring water prior to discharge to Stout's Creek. The Selected Remedy reduces the flow of potentially contaminated groundwater to Stout's Creek and satisfies the criteria for long-term effectiveness through the collection and treatment of

spring water. The Selected Remedy does not present short-term risks and the technology to implement the remedy is not unusual.

Preference for Treatment as a Principal Element

By treating the contaminated spring water through the implementation of the passive quarry drains to reduce spring flow and collecting and treating the spring water, the Selected Remedy addresses the remaining threats posed by the Site through the use of treatment technologies. By utilizing treatment, the statutory preference for remedies that employ treatment as a principal element is satisfied.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. The first Five-Year Review was completed in August 2002 and next scheduled review is in August 2007.

DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan for the Bennett's Dump Site was released for public comment on February 3, 2006. The Proposed Plan identified Alternative 5 as the Preferred Alternative for addressing the continuing release of PCBs from springs into Stout's Creek. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

TABLES

Table 1 – Detailed Costs Associated with the Implementation of the Passive Quarry Drain

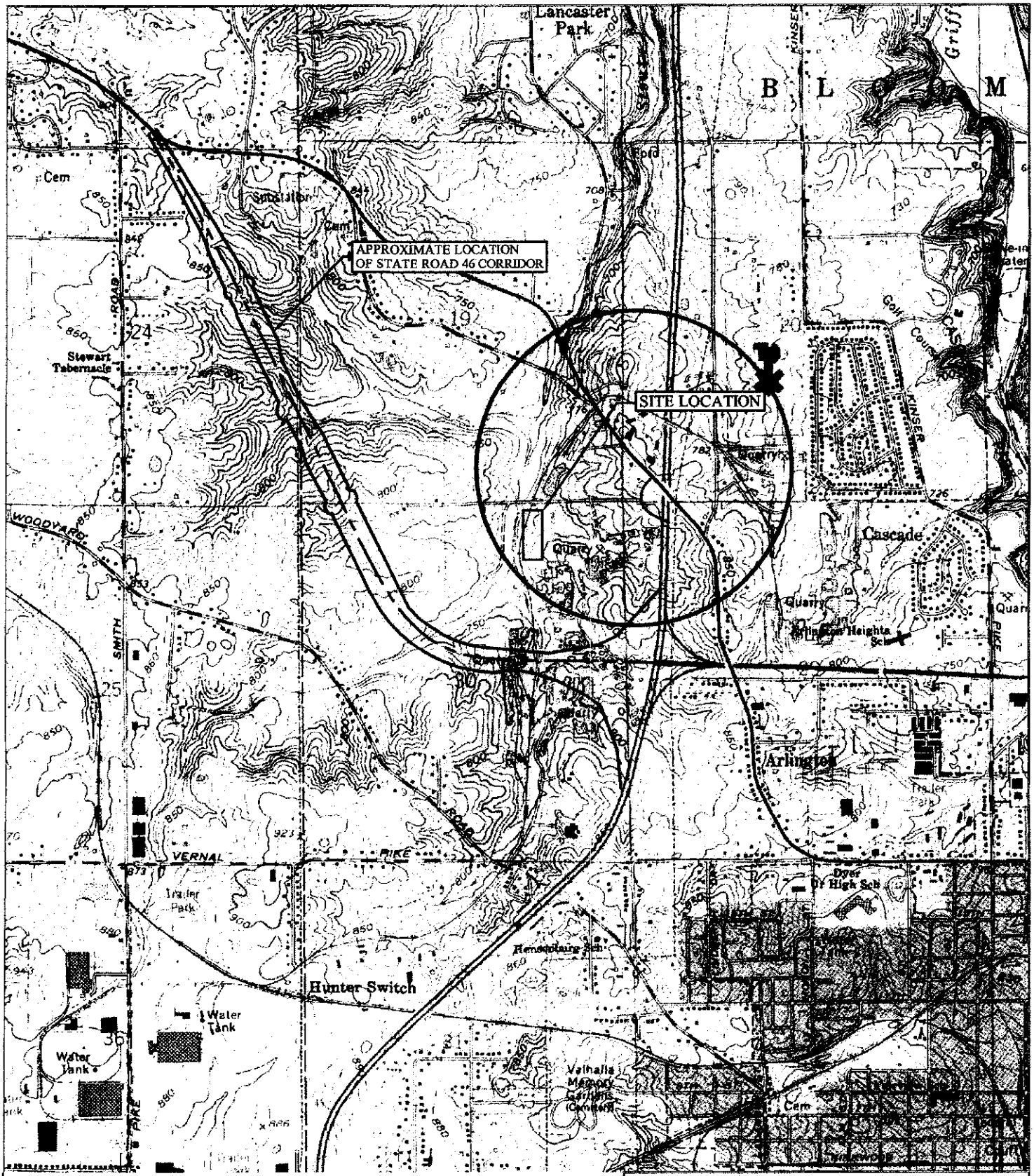
Drain from Wedge Complex to Stout's Creek	
Detailed Design	18,000
Clearing and Grubbing	12,000
Blasting and Excavation	75,000
Quarry Water Control During Installation	5,000
Drain Pipe	10,000
Bedding Material	2,500
Concrete Work	1,000
Pipe Installation and Backfill	15,000
Contingency	20,000
Subtotal for Wedge Drain	158,500
Passive Drain from Icebox to Wedge	
Detailed Design	25,000
Clearing and Grubbing	15,000
Blasting and Excavation	75,000
Quarry Water Control During Installation	5,000
Drain Pipe	35,000
Bedding Material	10,000
Concrete Work	1,000
Pipe Installation and Backfill	30,000
In Pipe Sorbent	5,000
Contingency	40,000
Subtotal for Icebox to Wedge Drain	241,000
Operation and Maintenance	
Monthly Inspections for 30 Years	30,000
Periodic Cleaning Once Per Quarter for 30 Years	6,000
Sorption Media Replacement and Disposal	15,000
Subtotal for Operation and Maintenance	51,000
Total Cost for Passive Quarry Drain in Current Dollars	450,000
Total Cost in Net Present Value (7% Discount Rate)	417,000

Table 2 – Detailed Costs Associated With the Implementation of the Passive Quarry Drain and Interceptor Trench with Carbon Adsorption Treatment

Total Cost for Passive Quarry Drain in Current Dollars	450,000
Total Cost in Net Present Value (7% Discount Rate)	417,000
Interceptor Trench	
Detailed Design	10,000
Site Electrical	5,000
Trench Excavation and Backfilling	35,000
Trench Piping	3,000
Trench Collection Sumps	5,000
Trench Sump Pumps	5,000
Clearing and Grubbing	4,000
Water Control During Trench Installation	5,000
Construction Management	10,000
Excavated Material Disposal	25,000
Discharge Piping From Sumps	8,000
Contingency at 15%	17,250
Subtotal Trench Cost	132,250
Treatment System at 100 gpm Maximum Capacity	
Detailed Design	20,000
Site Electrical	10,000
Building Foundation	15,000
Treatment Building	50,000
Tankage	12,000
Pumps	10,000
Bag Filters	6,000
Carbon Units	30,000
Piping	8,000
Instrumentation	30,000
Construction Oversight	25,000
Mechanical/Electrical Installation	30,000
Site Grading	5,000
System Startup	10,000
Contingency at 15%	39,150
Subtotal Treatment System cost	300,150
Trench and Treatment System Operation and Maintenance for 30 Years	
Yearly Technician Cost	10,000
Yearly Engineer Cost	5,000
Yearly Utilities	5,000
Yearly Replacement Parts	3,000
Carbon Changes Amortized Yearly	2,000
Yearly Sampling	3,000

Subtotal Yearly Operation and Maintenance	28,000
30 Years Operation and Maintenance (Constant Dollars)	840,000
30 Years Operation and Maintenance (Net Present Value at 7% Discount Rate)	339,982
TOTAL COST (CONSENT DOLLARS)	1,722,900
TOTAL COST (NET PRESENT VALUE AT 7% DISCOUNT RATE	1,189,972

FIGURES



0 1000 2000

SCALE IN FEET

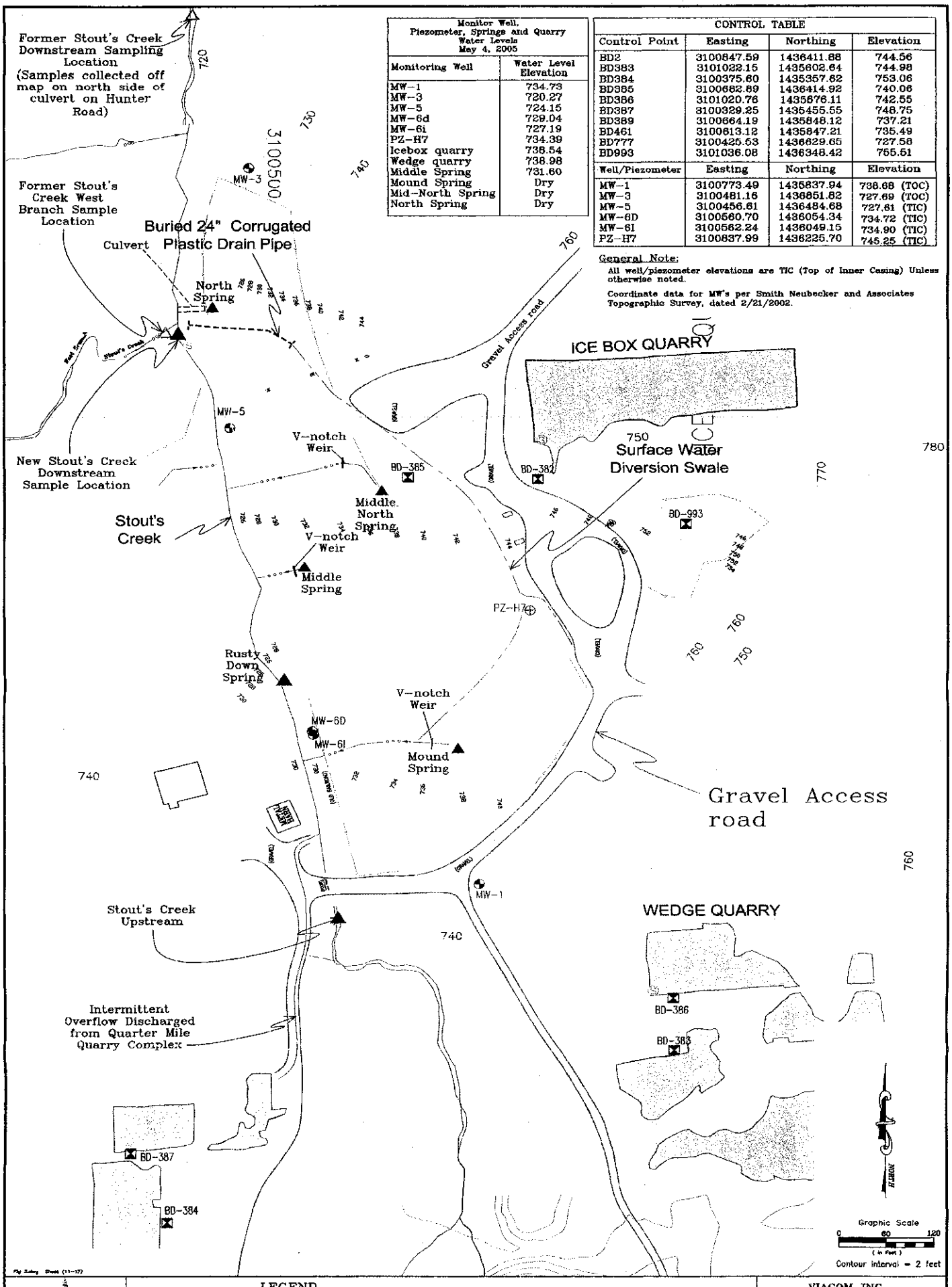
N

SOURCE: MODIFIED FROM U.S. GEOLOGICAL SURVEY 7.5-MINUTE SERIES MAP OF BLOOMINGTON, INDIANA, QUADRANGLE, 1966, PHOTOREVISED, 1990

BENNETT'S DUMP
BLOOMINGTON, INDIANA

FIGURE 1
SITE LOCATION MAP

TETRA TECH FM INC



Monitor Well, Piezometer, Springs and Quarry Water Levels May 4, 2005	
Monitoring Well	Water Level Elevation
MW-1	734.73
MW-3	720.27
MW-5	724.15
MW-6d	729.04
MW-6i	727.19
PZ-H7	734.39
Icebox quarry	736.54
Wedge quarry	738.98
Middle Spring	731.60
Mound Spring	Dry
Mid-North Spring	Dry
North Spring	Dry

CONTROL TABLE			
Control Point	Easting	Northing	Elevation
BD2	3100847.59	1436411.88	744.56
BD383	3101022.15	1435602.64	744.98
BD384	3100375.60	1435357.62	753.06
BD385	3100682.89	1436414.92	740.06
BD386	3101020.76	1435676.11	742.55
BD387	3100329.25	1435455.55	748.75
BD389	3100664.19	1435848.12	737.21
BD461	3100613.12	1435847.21	735.49
BD777	3100425.53	1436629.65	727.58
BD993	3101036.08	1436348.42	755.51
Well/Piezometer	Easting	Northing	Elevation
MW-1	3100773.49	1435837.94	738.68 (TOC)
MW-3	3100481.16	1436851.82	727.69 (TOC)
MW-5	3100456.61	1436484.68	727.61 (TIC)
MW-6D	3100560.70	1436054.34	734.72 (TIC)
MW-6I	3100562.24	1436049.15	734.90 (TIC)
PZ-H7	3100837.99	1436225.70	745.25 (TIC)

General Note:

All well/piezometer elevations are TIC (Top of Inner Casing) Unless otherwise noted.

Coordinate data for MW's per Smith Neubecker and Associates Topographic Survey, dated 2/21/2002.

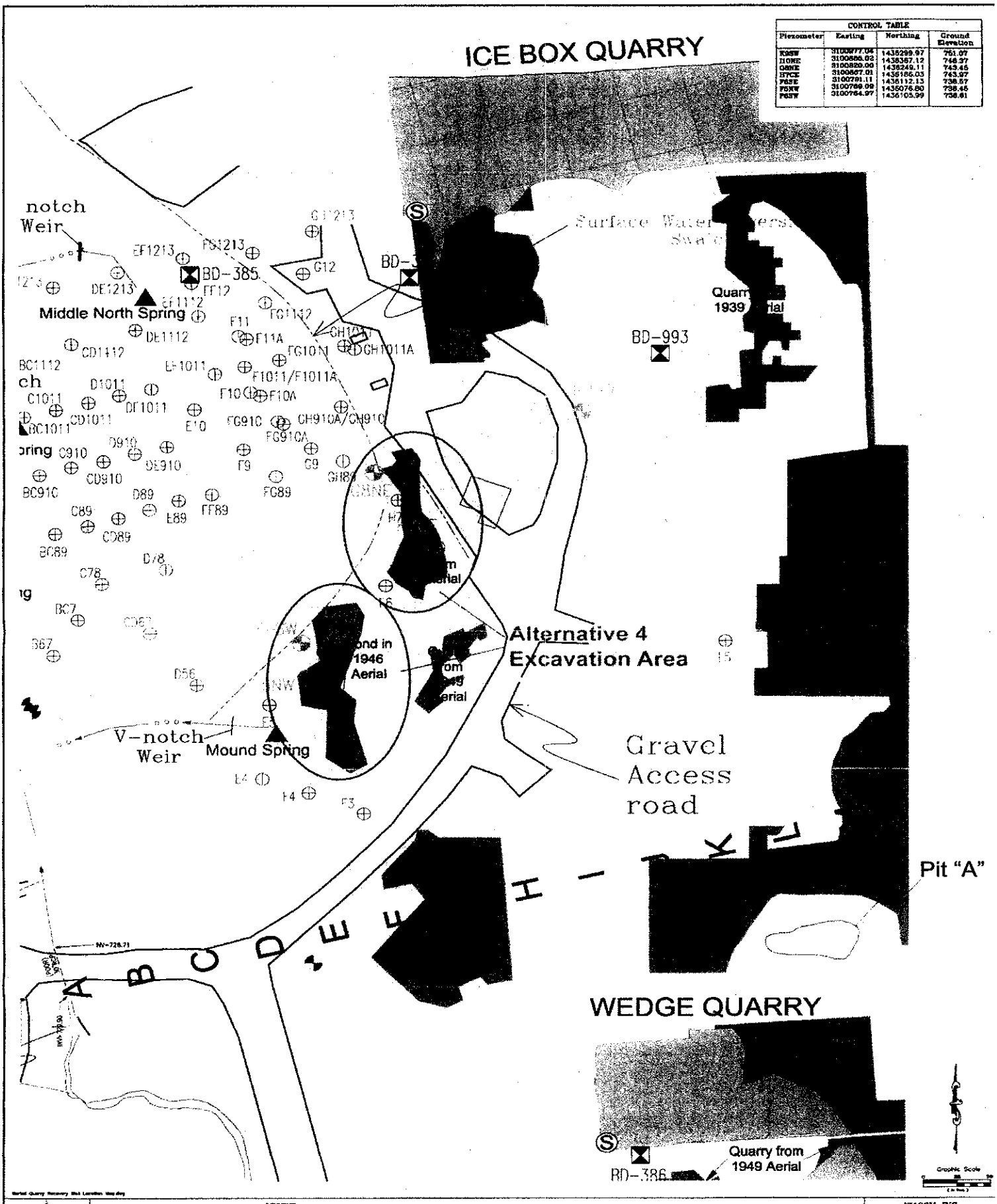
LEGEND

MW-1 Monitoring Well
PZ-H Piezometer
North Spring Springs Location
Stream Gauging and Sampling Point

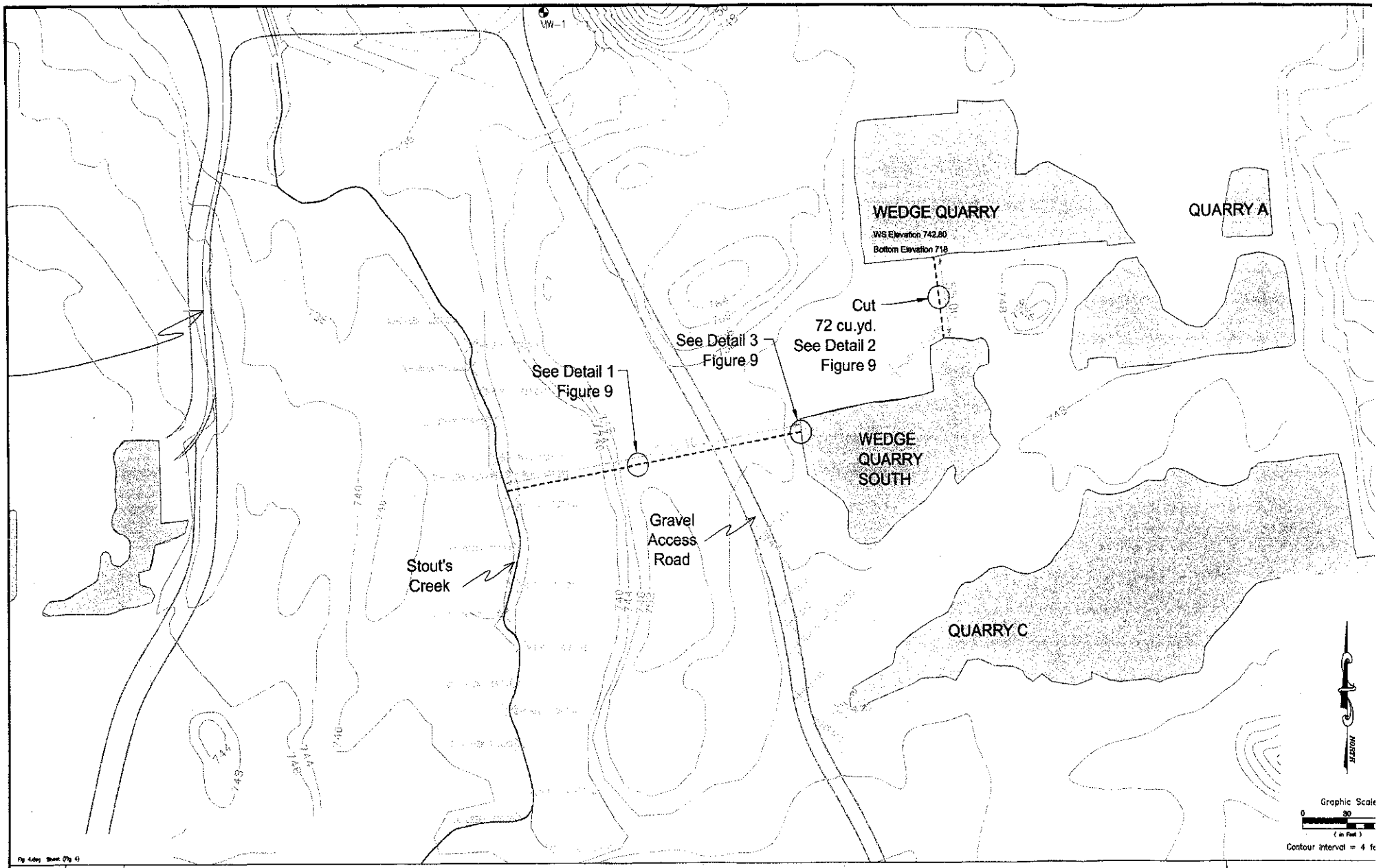
DSADA

VIACOM INC.

Figure 2.
Monitoring and Sampling Locations
Bennetts Dump
Bloomington, Indiana



CONTROL TABLE			
Piezometer	Easting	Northing	Ground Elevation
K9SW	3100977.04	1436299.97	751.07
I10NE	3100886.02	1436367.12	748.37
G8NE	3100820.00	1436249.11	743.46
H7CE	3100867.01	1436186.03	743.97
F6SE	3100791.11	1436112.13	738.57
F5NW	3100769.09	1436076.80	738.45
F6SW	3100764.97	1436105.99	738.61



PSARA TECHNOLOGIES, INC

LEGEND

Topographic Contours

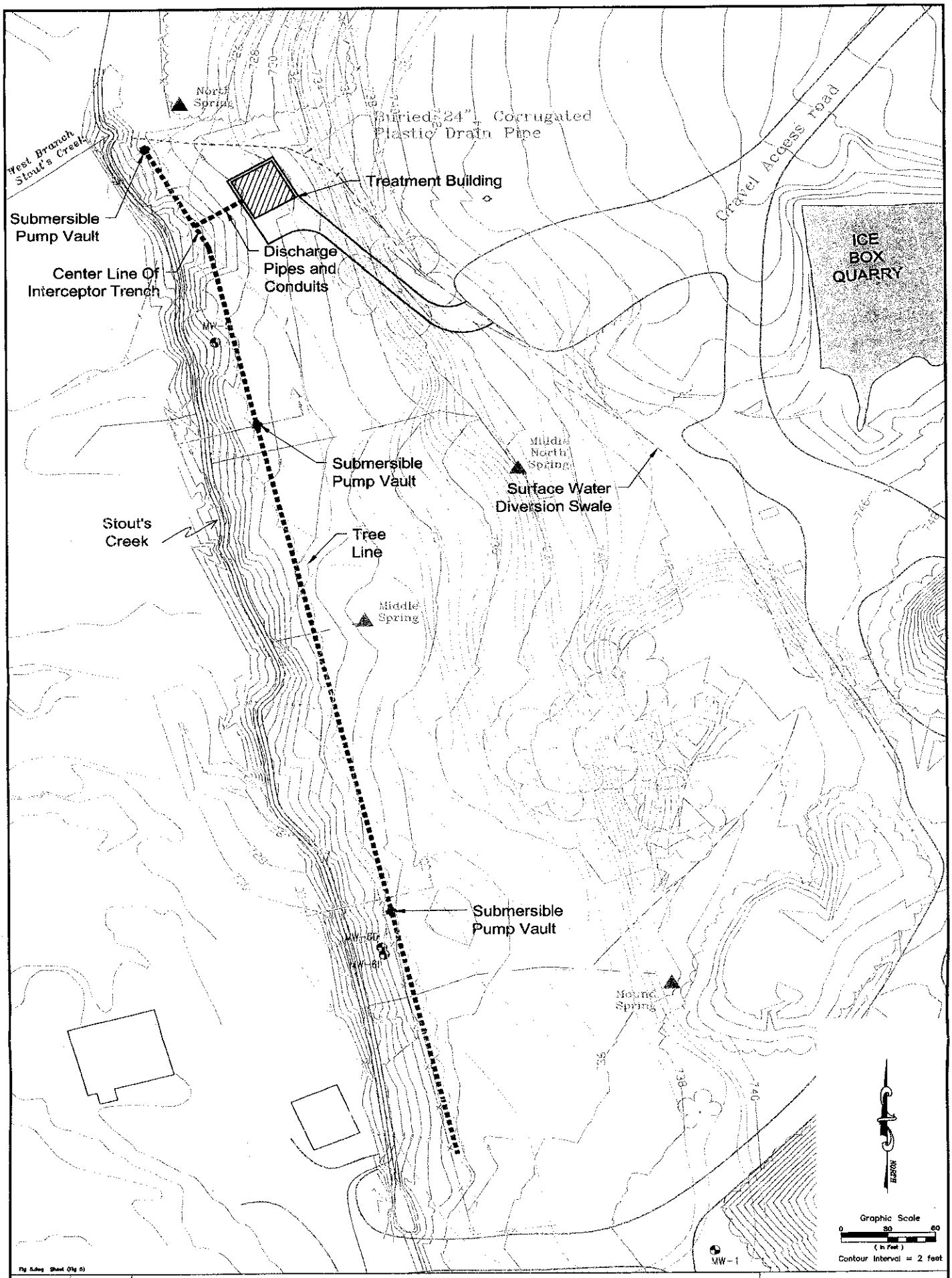
Spot Elevation Centerline Of Creek

Spot Elevation Bed Rock At Creek

VIACOM INC.

Figure 4.
Quarry Drain Plan
Bennetts Dump
Bloomington, Indiana

Drawn By:	Date:	Scal
RLR	6/21/06	As Sh


North Spring
Buried 24" Corrugated Plastic Drain Pipe
West Branch Stout's Creek
Treatment Building
Gravel Access road
Submersible Pump Vault
Discharge Pipes and Conduits
ICE BOX QUARRY
Center Line Of Interceptor Trench
MW-
Submersible Pump Vault
Middle North Spring
Surface Water Diversion Swale
Stout's Creek
Tree Line
Middle Spring
Submersible Pump Vault
MW-6D
MW-6I
Mound Spring
MW-1
Graphic Scale
0 30 60
(In Feet)
Contour Interval = 2 feet
LEGEND
Monitoring Well
Springs Location
VIACOM INC.
Figure 5.
Interception Trench
Bennetts Dump

Responsiveness Summary for the Operable Units Two and Three
Bennett's Dump Superfund Site
Bloomington, Indiana

Comment 1: What types of uncertainties are involved with the collected Bennett's Dump data and human health?

Response: To calculate the risk to human health, a large quantity of site specific data was used to calculate the risk levels. An uncertainty analysis (Section 5.5) is part of the Human Health Risk Assessment and describes in detail the uncertainty in the human health risk assessment.

Comment 2: Is the intake from eating fish where humans get the highest concentration of PCBs from Bennett's Dump?

EPA Response: Yes, fish would be considered the most likely exposure point that would produce the highest risk from the Bennett's Dump site.

Comment 3: What are the preliminary signs in ones body that one has ingested PCBs?

Response: In most cases, you would not know you were exposed to PCBs unless they were at extremely high concentrations. The purpose of this cleanup is to reduce the risks associated with PCB exposure as described in the human health risk assessment.

Comment 4: Where did the calculations from Table 3 on Page 56 originate from?

Response: Please see Appendix B for more information on how the values were calculated.

Comment 5: How does the calculations box relate to the table in page 87?

Response: Page 87 does not exist in the document.

Comment 6: What types of Ecosystem Structure is around Bennett's Dump and how does this play a roll in the spread of PCBs?

Response: Stout's Creek is the most important ecosystem involved in the spread of PCBs from Bennett's Dump (see Sections 2.0, 2.1.1, and 2.2 for details). The terrestrial ecosystem is not a significant route for PCB spread because PCB-contaminated materials and soils near the surface were either excavated and disposed off site, or consolidated and a soil cover placed over the site in remedial actions implemented in 1987 and 1999.

Comment 7: What are the non-cancerous effects involved with the Bennett's Dump site?

Response: Possible non-cancerous affects associated with PCB exposure are described on Page 17, Section 4.1 of the human health risk assessment.

Comment 8: How does 252-PCBs compare to the other PCB site around Bloomington, Indiana. Are 252-PCBs one of the hardest PCB types to clean up?

Response: EPA is unsure on what the commenter is referring to but assumes it may refer to Aroclor mixtures. In any case, the remediation techniques for PCBs are equally effective for different Aroclors

Comment 9: What is the most effective and quickest way to clean up PCBs if money was not an issue?

Response: Many different remediation techniques may be used to address PCB contamination with some more expensive than others. It depends on the media contaminated and the levels of contamination.

Comment 10: Is it possible that the PCBs could become airborne while the clean up is taking place?

Response: Yes, PCBs can volatilize into the air and this happened during excavation activities at the Lemon Lane Landfill. Air monitoring during the Bennett's Dump soil cleanup did not produce unacceptable levels of PCBs. During the implementation of the passive quarry drains and interceptor trench, the EPA expects the volatilization of PCBs based upon the levels remaining at the site to be minimal.

Comment 11: Are the doses of PCBs seen in birds similar to the ones seen in the affected fish?

Response: PCB doses were not calculated for fish because effects in fish were not selected as an assessment endpoint (Section 2.3). PCB doses to kingfisher are modeled from the PCB concentrations measured in fish, and those measured or modeled in crayfish. Since fish comprise 80 % of the kingfisher diet, the PCB dose to kingfisher closely tracks the PCB concentrations in fish.

Comment 12: Are the affects of PCBs similar to the affects of DDT when dealing with fish and birds?

Response: Both chemicals can produce reproductive affects in birds, but they produce them differently.

Comment 13: At the Bennett's dump site which organism is the most sensitive to PCBs?

Response: For Bennett's Dump and the other Bloomington sites, we evaluated both mink and kingfisher since these species represent fish eating birds and fish eating mammals. Since the risk would be the greatest to theses species because the majority of their diet is

fish, EPA is of the opinion that these two species represent a conservative analysis. Therefore, if mink and kingfisher are protected, other species would be protected.

Comment 14: How long did it take to create this study of affected organisms?

Response: The ecological and human health risk assessments took approximately two years to complete.

Comment 15: Because site 1 is so over contaminated by PCBs could groundwater and runoff potentially contaminate the other 2 sites to the levels of site 1?

Response: EPA assumes the commenter is referring to the two satellite areas. Based upon the residual levels at the Bennett's Dump main site, it is very unlikely that the other two sites would become contaminated since runoff from the main site travels to Stout's Creek and runoff from the site is not a problem since the source control was completed in 1999.

Comment 16: Why were reproductive endpoints chosen for this study? Page D-1

Response: Reproductive endpoints were used to evaluate the risk to piscivorous mammals and birds that inhabit or potentially inhabit Stout's Creek.

Comment 17: What is the toxicity reference value and how does it pertain to this table? Page D-14

Response: Toxicity reference values (TRV) represent a threshold effect-level of a chemical. The TRV's listed in the table were used to calculate the Percent Allowable Consumption.

Comment 18: What was the most surprising finding after finishing this study?

Response: EPA did not find the results of the Ecological Risk Assessment surprising considering the continuing release of PCBs into Stout's Creek.

Comment 19: The end of section 3.2.1 says, "inhalation of PCBs in air above or adjacent to Stout's Creek is expected to be a minor contributor to total potential exposure and is not evaluated in this HHRA." Why was it not evaluated?

Response: The volatilization of PCBs into the air is minor compared to the other pathways. Evaluating the PCB levels released from the water shows low parts per billion PCBs and even if most all of the PCBs volatized into the air, the low levels would not produce an unacceptable inhalation risk.

Comment 20: Section 3.2.2 does not list inhalation as an exposure pathway. Why not?

Response: See Response to Comment 19.

Comment 21: Section 3.2.3 discusses the recreational habits and the potential growth of recreationalists around the area. My concern is that if this area is potentially harmful to those people: why are there not signs warning people to stay off the site.

Response: The site is currently on private property and is fenced. Based the land use surrounding the property, fencing and signs will be required.

Comment 22: In the table "Surface Water Total PCB Concentration Measured at Stout's Creek Downstream Location November 1999 through June 2004" the maximum concentration goes down after 2002 even though the location was changed to "eliminate the dilution". Why would the concentration go down if some dilution was eliminated?

Response: EPA moved the monitoring station in Stout's Creek to upgradient of the West Branch of Stout's Creek to eliminate additional water diluting the sample. The most likely reason the concentration went down is that less PCBs are being released into Stout's Creek and possibly greater flow in Stout's Creek during the sampling event diluted the contamination level.

Comment 23: Section 4.1 says the rats were fed a "basal diet for 5 months", what is a basal diet?

Response: A basal diet is sometimes referred to as a control diet and consists of standard animal chow with no contaminant (in this case polychlorinated biphenyl) added.

Comment 24: Section 4.1 also says that female rats had a "91% incidents of liver tumors" and males had only a "4% incidents of tumors". Why such a large difference between males and females?

Response: The information presented in the cited portion of the text was summarized from the U.S. Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS). As presented in IRIS, information regarding the tumor incidence in female and male rats exposed to polychlorinated biphenyls (Aroclor 1260) in the diet was provided. However, the possible basis for the differential response between female and male rats was not discussed.

Comment 25: In section 4.3.1 it says that chronic RfDs refer to periods of over 7 years, but the study uses a 30 year exposure. Why was 30 years used instead of 7?

Response: As discussed in the text, chronic RfDs are used "to evaluate exposures occurring over periods of more than 7 years." The human health risk assessment (HHRA) evaluated two groups of receptors: youth recreationalists (7 to 18 years of age) and adult recreationalists. As discussed in the HHRA (see Table 1), these two receptor groups were assumed to be exposed to polychlorinated biphenyls in various media (surface water, sediment, and fish tissue) for 12 and 30 years, respectively. These receptor-specific periods of time (referred to as the exposure duration) reflect upper-

bound estimates of the time period over which these receptors may be exposed. The 12 year exposure duration for youth recreationalists represents the age range (7 to 18 years) during which (for the purposes of the HHRA) individual receptors are considered to be "youths." The 30 year exposure duration for adult recreationalists represents the upper-bound estimate of the length of time an individual may live in the same residence. The choice of exposure duration is receptor-specific and is entirely independent of the period of time defined as chronic exposure.

Comment 26: I do not understand what is happening in section 5.3. The above sections indicate that all hazard levels are within the EPA's acceptable risk guidelines, but section 5.3 indicate that levels are way above acceptable Indiana limits for AWQC.

Response: The Ecological and Human Health Risk Assessments do not indicate that all hazard levels are within EPA's acceptable risk guidelines. Please see Section 5.2.1.2 and Appendix C for further information or the Bennett's Dump Proposed Plan for a summary. EPA compared the risk calculated to the Ambient Water Quality Criteria as another approach in evaluating risk. In addition, the EPA also compared the risk to fish advisory action levels.

Comment 27: Overall I found this Risk Assessment to be fairly easy to understand for someone who has little experience in this field (myself included). However, I am a little confused with the risks associated with living at or very near to the site.

Response: The residual PCB levels in soil after the 1999 cleanup would not allow for residential development. The current risk would be to people who frequently ingested fish from Stout's Creek at Acuff Road (3 miles from site) and W. Maple Grove Road (5 miles from site) and borderline risks associated with dermal (skin) contact with water near the site. The Proposed Plan contains a useful summary on site risks.

Comment 28: Sections 1 through 2 were very clear to me. It is evident that PCBs have an adverse effect on piscivorous animals. My one question is, do mink and kingfishers live around the Bennett's Dump site? If not, what other species live in the area that would be similarly affected by PCBs?

Response: Kingfisher and mink are in the Bloomington area and the habitat is suitable for both species. EPA uses these two species because they feed on fish and are exposed to higher levels of PCBs. By determining the risk to these two species, we can be assured other mammals and birds would be protected since they do not consume fish.

Comment 29: Many times the risk assessment mentions that contaminated soil issues have been addressed at the site. If plans were to go through to develop the site, would soil concentrations of PCBs become an issue?

Response: Yes, the residual PCB contamination levels in soil are suitable for industrial or commercial development.

Comment 30: Section 3.3 shows that the white sucker had the highest level of PCBs at every site location. What factors lead to this?

Response: Suckers are a type of fish that feeds on the bottom of the creek bed. Even though the PCB concentrations in sediment in Stout's Creek are under 1 ppm, suckers would be exposed to more PCBs than other types of fish in the creek.

Comment 31: Section 3.4.2 again says that crayfish were only sampled at location 1, but not 2 or 3. Why were samples not collected at stations 2 or 3?

Response: Crayfish were only sampled at location 1 since it is the station nearest to the site. Cost and the ability to model the concentrations at other locations factored into the decision making.

Comment 32: In the first paragraph of section 4.3, why is maximum estimated concentrations used for mink and daily doses used for kingfishers? Why not use the same measure for both?

Response: Exposure to mink is evaluated on the basis of dietary concentration because the concentration of PCBs in mink diets along Stout's Creek may be directly compared with the concentrations used in feeding studies performed with mink. In contrast, no PCB feeding studies have been performed with kingfisher. This means that the PCB exposures to kingfisher must be compared to PCB studies performed with different species of birds. Food consumption rates vary with body size. Therefore, direct comparison of dietary PCB concentrations will be misleading if the bird species used in a laboratory toxicity test ingests significantly more or significantly less food per day compared to kingfisher. To avoid this problem, exposure to kingfisher is based on bodyweight-normalized dose (μg PCBs/kg bodyweight/day), which is compared to the bodyweight-normalized dose of the bird species used in PCB toxicity tests. The same procedure could have been followed for mink, but is unnecessary because the toxicity data are available for the same species (mink).

Comment 33: I consider myself to have very little experience in the risk assessment field. Overall I found this Risk Assessment easy to understand. Procedures, results and reasoning were very clearly defined.

Response: No response required.

Comment 34: Based on this study, would you recommend further clean up activities at and around the Bennett's Dump site, be conducted?

Response: EPA has recommended an approach in the Proposed Plan. The ROD Amendment describes the remedy to be implemented at Bennett's Dump.

Comment 35: Human Health Risk Assessment Part, on page 9, there is an explanation of considerations in fish consumption calculation. From the summary of the risk from fish

consumption, it can be assumed that fish fillets, not whole fish, have been tested. Since some people eat whole fish including heads and bones, it would be more appropriate, and perhaps more practical and conservative, to test whole fish especially smaller fish that have softer, thus more edible, bones.

Response: The EPA and CBS did sample both whole fish and fillets. A conversion factor to convert whole fish into fillets for the risk assessment was used. Some people do eat whole fish but are not as prevalent as individuals who eat fillets.

Comment 36: Ecological Risk Assessment Part (pp.9-11), I think this part is described in great detail and thus very informative. However, it is quite difficult to follow all of the numbers in long sentences, so it would be helpful to use a table for readers to grasp the results more easily.

Response: A large number of tables were placed into the document to make it easier to grasp the results. Please see Appendix B.

Comment 37: Overall I really thought the document was put together very well and established the history of the site quite well. It was very accessible and I particularly liked the identification of the types of fish tested in the "Fish Tissue" segment of the document. I believe it spoke well to the public as these are commonly fished for by local anglers.

Response: No response required.

Comment 38: The PCB overview was really well worded and easy to follow given a little chemistry background.

Response: No response required.

Comment 39: In the fish tissue section of the Human report the creek chub was not mentioned as part of the HHRA study. However, in the ecological report on page 27 mentioned the creek chub as part of the sampling. I was unclear after having read the human report, where you refer to the HHRA study on page 4, if this was the same study or not because the citation was vague on page 27 of the ecological report in my opinion. If the two were read one after another, which is what I am assuming will happen, this could pose some confusion.

Response: Creek chub are not evaluated in the human health risk assessment because they usually very small and undesirable to eat. Fish sampling events produce data which are used by both risk assessments.

Comment 40: I felt the mink was a very strong target organism The mink's diet primarily being of fish and given the lipophillic nature of PCB's made it a prime example. I also like the mink because of the amounts of data that was able to be obtained from recent studies from Sweden. Many of the citations were from 2000 or even more recent which helps to strengthen the assessment and its accuracy.

Response: No response required.

Comment 41: Overall, I liked this assessment in many ways. Its strengths were definitely in the fact that many different diagrams and figures were presented throughout the document and not just at the end. I think this format for citing figures may be suitable for the human report as well. I would also like to see the same PCB overview placed in the human risk assessment. I really learned a lot from this assessment and nothing really stood out as needing a change in my opinion.

Response: No response required.

Comment 42: I think your introduction does a nice job of stating the purpose of the report. It is made very clear what the intentions are. This is especially beneficial to someone who has no idea what a risk assessment is in the first place.

Response: No response required.

Comment 43: I feel that the site history section was adequate and definitely gave good background as far as what problems are present at the site and what has and can be done to help alleviate the situation.

Response: No response required.

Comment 44: I was very impressed with the section on exposure. All of the different pathways and media by which someone could get PCBs in their body are mentioned. Also, you distinguish between youth and adults and which shows that you weren't just generalizing about people as a whole. However, it would have been nice to maybe have a category which looked at pregnant women as a different group than adult recreationalists. It seems to me that there is more risk for that target organism.

Response: EPA does acknowledge that pregnant women and the fetus would be at higher risk but we can only evaluate the risk qualitatively and not quantitatively.

Comment 45: I thought it was nice that the general equation for calculating risk was shown, along with what each variable stood for. However, none of the results can be found during the exposure section. Someone has to look all the way at the end of the report to see what numbers were plugged in. I think it would easier to follow if you can see the tables and charts in the same place that they are actually discussed.

Response: Thank you for your comment and this will be considered in future documents.

Comment 46: I think the Toxicity Assessment section was very well done. All the major effects that can be attributed to PCB exposure are mentioned which is a very good thing. The difference between cancer and non-cancer effects was important. Also, I liked the fact that went over how PCBs can be broken up into different groups and the different

exposure pathways which are related to each group. You went in detail about the RfD, as well as how the NOAEL and LOAEL are to be used, which is obviously very vital.

Response: No response required.

Comment 47: In addition, I think it was good that uncertainty factors were covered. These are very important, as they can truly affect the data. If too few are used, the problem can be underestimated, while if too many are used, the problem can be grossly overestimated.

Response: No response required.

Comment 48: In the risk characterization section, the levels at which one should be concerned for both cancer and non-cancer are given. This is extremely important, for even if someone understood all the equations, without the knowing the dangerous levels, it would be useless.

Response: No response required.

Comment 49: I found the summary and conclusions section a bit confusing. At one time it says that total risks are within the EPA's acceptable range. However, a few sentences later it appears to be contradicted. I wish this section was just a little bit more straight forward so that the layman would be able to know whether or not a problem actually exists or not.

Response: The risk assessment process in general is complicated and many different approaches were used to evaluate risk. EPA's risk range and point of departure should have been explained further. EPA usually likes to use a 1 in 1,000,000 excess cancer risk as a point of departure but within Superfund, risk levels of 1 in 10,000 excess cancer risk are acceptable in some circumstances. EPA is of the opinion that if you read the entire document carefully, including the tables, a complete picture of the risk assessment is given.

Comment 50: I like the fact that there is a detailed description of the site history which is placed in the beginning of the risk assessment. A site location map is included with this which I found to be beneficial.

Response: No response required.

Comment 51: I thought it was important that the major components which go into an ecological risk assessment were laid out. This gave me an expectation of what I should be learning from this report. There were differences between this and the human health risk assessment so I was glad to know that from the start.

Response: No response required.

Comment 52: It was important to note early on what this risk assessment would be focusing on. You point out that the focus was to be on PCB-related risks. These were intended to include piscivorous birds and mammals. Also, it was noted that the risk assessment would focus on the aquatic habitat. Again, I'm glad the specifics were provided in a clear way.

Response: No response required.

Comment 53: I especially liked the section which discussed different effects which have occurred from PCB exposure to a number of different animals. A good deal of time was devoted to talking about the reproductive effects which can take place. I think it's important to mention these things because it lets people know that there is a serious problem and that it is being taken very seriously.

Response: No response required.

Comment 54: I think the conceptual site model, in addition to the sections dealing with endpoints, did a good job explaining the process by which PCBs moved around the site. It was nice having the maps to really visualize the process.

Response: No response required.

Comment 55: In the exposure assessment it was clear that the organisms you would be focusing on were the mink and the kingfisher. You provided a good explanation of how you determined the PCB concentration found in each of their diets. You make note that 21% of the mink's diet comes from terrestrial creatures which weren't accounted for in the report. You go on to say that this may cause the mink exposure to be underestimated. I was impressed that this was included. There was no attempt to try and shy away from this so I was glad it was mentioned.

Response: No response required.

Comment 56: I liked the charts that were included in the exposure assessment. It was made clear what the PCB concentration was in both extreme and average terms for the different creatures which the mink and kingfisher were known to consume. Then, the total concentration of PCBs which each consumed was shown.

Response: No response required.

Comment 57: The section dealing with toxicity was done in great detail. Although the information appears to be accurate, it was difficult trying to take it all in. At times it was overwhelming. I thought your summary section did a nice job of wrapping everything up. It was important to make note that remediation efforts had taken place, but that nonetheless the mink and kingfisher were still at risk.

Response: No response required.

Comment 58: Were all the goals from 1998 met for this report and if so how specifically were they met?

Response: The 1998 excavation did not eliminate the groundwater problem at the site as was hoped. The discovery of buried quarries onsite where disposal activities took place did influence the remediation. The cleanup of the source in 1998 will allow for the redevelopment of the site to industrial/commercial standards.

Comment 59: How accurate can you expect the fish data to be if it wasn't collected in person.

Response: The fish data is accurate based on a number of factors. Fish sampling was completed in Stout's Creek using an approved Sampling and Analysis Plan and Quality Assurance Project Plan. EPA in most cases has oversight of CBS's contractor during the fish sampling event. In addition, chain of custody forms are used to ensure that samples are not tampered with during transportation to the laboratory.

Comment 60: Potential receptors is a good section.

Response: No response required.

Comment 61: Splitting up Recreationalist is a good way of to distinguish different affects among potential persons.

Response: No response required.

Comment 62: All the Data and the specific map are very good. This helps the reader truly understand where and how things are working.

Response: No response required.

Comment 63: The uncertainty factors are very thorough.

Response: No response required.

Comment 64: The site map at the beginning with topography is very fitting and good.

Response: No response required.

Comment 65: When soil is removed where is it taken or how is it disposed of? (pg. 12)

Response: It depends on the situation. At Bennett's Dump, the PCB contaminated soil was excavated and transported to a landfill permitted in accept PCB contaminated waste.

Comment 66: I am a very visual person, so I like the pictures of how PCBs look a lot like Dioxin. This was helpful to keep me interested. (pg. 12-14)

Response: No response required.

Comment 67: Pg. 16's diagram is very helpful and informative.

Response: No response required.

Comment 68: Why are seals mentioned? Do the migrating water birds pass PCBs to them or is it just to explain reproductive problems? (19)

Response: Seals are mentioned since PCBs do produce reproductive effects in them.

Comment 69: What is the mink population like in Bennett's Dump? (pg. 23)

Response: The mink population is unknown, but the habitat is suitable for mink. We did find a dead mink near another Bloomington area site. The main reason we use mink as an organism to evaluate is that health data exists on PCB exposure to mink and it is a fish eating mammal. Therefore, if we protect mink, we can assume that other mammals would also be protected.

Comment 70: LENGTH OF REMEDIATION- My first is concern is that although the site was discovered in 1985 final excavation of the site wasn't ordered to be completed until 2000. I admire the initial actions and progress taken in 1984 and 1985 by placing the site on the NPL, but am concerned that the site wasn't totally excavated until relatively recently. I think that prompt action is necessary to prevent damage to human health and ecosystems. Although I understand that the process of negotiating with the liable entity is a lengthy, drawn out process, I still think that human health and environmental safety be the priority.

Response: EPA agrees with the commenter that the length of time between the site being discovered and excavation was a long period of time. The Consent Decree between the parties has limited EPA's ability to address this site in more timely fashion. The interim action did help to address the immediate risk but the effort to implement the original incinerator remedy and the eventual evaluation of other remedies under the 1994 Operating Principles took a long period of time due to the disagreements between the governmental parties and CBS Corporation.

Comment 71: EXPOSURE AREAS- A second concern is choice to limit the exposure assessment to the Stout Creek area, while only "indirectly" considering the risks associated with the five other creeks associated with the Bennett's Dump area. These areas are also used in similar ways to the Stout Creek and thus should be included in the risk assessment.

Response: The purpose of both the Human Health and Ecological Risk Assessment is to evaluate the risk associated with the Bennett's Dump site and to determine if cleanup activities are required. We did evaluate downstream of the Bennett's Dump site and saw minimal risk at the W. Maple Grove location. To evaluate streams or creeks indirectly connected to Bennett's Dump would be a good research project, it goes beyond the scope of our objective. EPA is of the opinion that unacceptable risk is present in Stout's Creek and additional remedial measures are required.

Comment 72: EXPOSURE SCENARIOS- I think that both child and adult recreationalists are appropriate target organisms, but I think that this group should be expanded to include pregnant women. The fetus is a particularly sensitive subpopulation and shouldn't be ignored.

Response: It is very difficult to evaluate pregnant women in a risk assessment, but please be aware that reproductive affects are taken into consideration in the calculating of non-cancer risks.

Comment 73: VISUALS- I think that all the visuals for this risk assessment were particularly effective. Not only were they complementary to the text, they were also nice looking documents.

Response: No response required.

Comment 74: BIOACCUMULATION- I found the ecological risk assessment to be more thorough than the assessment done for human health. My only worry is that associated with PCBs bioaccumulation throughout the food chain. A risk assessment should be done for other top level consumers- deer/rabbits/other animals who consume plants contaminated with PCBs and other species of birds that eat the fish in Stout Creek.

Response: Plants do not uptake PCBs in large quantities compared to fish. Our focus was to be conservative by using mink. It would be a good research project to evaluate other top level consumers but would have provided a less conservative approach. The kingfisher was used since its feeding range is somewhat limited, For example, the Great Blue Heron could have been evaluated but since its feeding range is large, the risk would be much less than a kingfisher.

Comment 75: MOVEMENT OF TARGET ORGANISMS- I am also concerned with the movement of fish and crayfish throughout the creeks located near Bennett's Dump, since I don't think the other creeks were not considered in the risk assessment.

Response: Stout's Creek was evaluated since it is directly connected to the Bennett's Dump site. Fish and crayfish do move but not in distances which would make EPA be concerned that other creeks are being affected. Levels in fish decrease as you move from Bennett's Dump site.

Comment 76: Pg. 10 last paragraph. Since sediment is a complete exposure pathway for aquatic receptors shouldn't it be covered under FERA? If not then why?

Response: EPA focused its efforts on evaluating the risk through the uptake of fish, which are exposed to contaminated sediment. Evaluating the PCB levels in sediment in Stout's Creek shows that PCB contamination has not impacted sediment. No samples were above 1 ppm PCBs in Stout's Creek.

Comment 77: Pg. 15 3rd paragraph. It states that the kingfisher will be compared to other avian species. This will not make for precise measurements because many other avian birds have different diets.

Response: A kingfisher is used as a receptor since a large portion of its diet is made up of fish. To be conservative, we evaluate the risk to kingfisher, therefore, if kingfisher is protected, then other avian species will be protected.

Comment 78: Pg. 17 In comparing the information on the mink located on the Michigan Rivers and mink near Stout Creek the information might not be accurate. A mink that lives near a large river might have a different diet than a mink living near a small stream.

Response: EPA could have tried to complete a field study at the site in which we could have tried to capture mink and evaluate gut contents to determine the type of diet. This kind of study can be difficult to do and is very expensive. Using a mink field study from the Midwest would be much more accurate than using different assumptions of the diet. EPA is of the opinion that the diets would be similar enough not to make the risk calculations inaccurate.

Comment 79: Pg. 21 last paragraph. This paragraph tells us that the fish were tested for PCBs using gas chromatography method. What is this method? How accurate is it?

Response: Gas chromatography is a laboratory instrument that can analyze various organic compounds down to parts per trillion level.

Comment 80: Pg. 29 There is an assumption that the consumption of crayfish at station 2 and 3 would be modeled after station 1 but the amount of PCBs in these crayfish could be more or less.

Response: EPA did only sample crayfish at station 1 but modeling PCB concentrations at stations 2 and 3 is accurate enough, especially considering the percentage of diet of crayfish used in the risk calculations.

Comment 81: Pg. 33 Discusses how the TRV used for the kingfisher is interpolated from dose-response plot from a chicken feeding study. How much would this affect the study?

Response: The comment may be interpreted two ways – how does interpolation affect the results, or how does use of chicken affect the results? The main effect of interpolation from dose-response plots is that the range between no effect levels and lowest effect levels is narrower than the range obtained without interpolation because, without interpolation, only those doses actually tested may be selected as effect levels. In most toxicity tests, there are 10-fold differences between each of the tested doses. The interpolated low-effect TRV is consistent with the PCB LOAEL-TRVs previously used by the Great Lakes Initiative and for the Sheboygan River and Harbor Superfund site, but the interpolated no-effect TRV is higher than the corresponding NOAEL-TRVs (see the Attachment to the Bennett's Dump ERA). Chicken are a sensitive species to PCBs, and therefore TRVs based on chicken toxicity data indicate higher risk compared to TRVs based on a less sensitive species. Since the sensitivity of kingfisher to PCBs is unknown, a second set of TRVs based on effects in doves is also used to bracket the kingfisher risk estimates.

Comment 82: Pg. 35 This is the first time I have seen PAC formula. How accurate is this formula?

Response: The formula itself is accurate, but the results are subject to the same uncertainties as hazard quotients (HQs). The main uncertainties of HQs are the uncertainties associated with exposure estimates (for example, dietary composition, foraging area, PCB concentrations in prey) and toxic effects (for example, the selection of TRVs).

Comment 83: Pg. 51-53.The assumptions of dietary composition and foraging for mink and kingfisher seem to be good.

Response: No response required.

Comment 84: Pg. 54 It states that seasonal data was not available. How much do you think the change in season would affect the calculations?

Response: Seasonal changes in fish concentrations have been observed but the change would only slightly modify the risk calculations.

Comment 85: 2.1.1 Fish Tissue- In paragraph 2 of this section that deals with the amount of locations and samples taken. Why were the tissues samples specifically limited to these locations? Even more what determines how far away the assessment will travel from the contaminated area to collect samples?

Response: Fish sampling locations were determined initially based upon easy access to the creek, usually where roads cross the creek since large amounts of sampling equipment are used to complete the fish sampling. EPA evaluates the initial data and determines if the locations are appropriate. At Bennett's Dump, the W. Maple Grove location is 5.5 miles downstream and fish PCB concentrations are at levels which do not produce risk levels that require further downstream sampling.

Comment 86: 2.1.1 Fish Tissue- The last sentence of this section of the assessment reveals that Creek Chub and Crayfish samples were not considered analytically for this study because these specific species were consumed less than the studied species. Do you feel that since Creek Chub consume significant amounts of sediment while feeding, the use of their samples would have been beneficial to the Human Health Risk Assessment?

Response: Creek chubs are not usually consumed by humans and using them in the calculations would make the risk assessment inaccurate and difficult to defend. Crayfish are consumed but it is very unlikely that individuals would use Stout's Creek as a source for crayfish.

Comment 87: 3.2.3 Exposure Scenarios- The last sentence of the subtitled section named: Youth Recreationalists that covers receptors assumed to be exposed through ingestion of fish. Why does this assessment evaluate exposure through the ingestion of fish only for adult receptors, when considering youth recreationalists?

Response: Children were evaluated in the risk assessment and are approximately double the risk associated with an adult.

Comment 88: 3.3.1 EPC Calculations- The last sentence on page twelve under the subtitle: Fish Tissue EPCs indicates that no sucker filet samples were taken. Why was the sucker fish not considered for the site-specific conversion factors?

Response: Whole suckers were obtained and converted to fillets by using a 50% reduction. Sucker fillets were not obtained due to the limited fish and the cost.

Comment 89: 3.3 Data Collection And Analysis- With in the paragraph and with in Figure 3 it is mentioned that during the year of 2003 fish sampling was conducted at station 2 only. Even though the data was considered not adequate for the risk assessment, why was data not collected from stations 1 and 3 for the year 2003? Do you feel that this lack of data affected the assessment in any way?

Response: No, EPA is of the opinion that sufficient data has been obtained to do an accurate assessment of the risk at the site.

Comment 90: Referring to 1.1 Site History, will reducing the Bennett's Dump concentration of PCB's to 11.3ppm be enough to control off-site contamination from increasing?

Response: The average concentration of 11.3 ppm PCBs is low enough to prevent the migration of PCBs to Stout's Creek through run-off due to the soil cover being present and the higher concentrations of PCBs being located in the buried quarries..

Comment 91: Referring to 2.1.1 Fish Tissue, the assessment states that the primary fish species in the exposed area are minnows which feed other larger fish. Will the fish

feeding on the minnows be contaminated with as high of a concentration that the minnow ingested was?

Response: Most likely they will be contaminated with levels as high as or higher, particularly older fish since PCBs bioaccumulate.

Comment 92: Referring to 2.2 Identification, are PCB's the only source of contamination on the site and should other contaminants be considered in this relocation program?

Response: We have sampled the groundwater for Volatile Organic Compounds (VOCs) and treatment of those compounds will occur if present in unacceptable levels. The State will be developing discharge criteria for the water treatment plant.

Comment 93: Referring to 3.2.1 Potential Contaminant Sources and Mechanisms of Release, if rain water lands on the contaminated site and runs off through drainage, is the water contaminated upon absorbing into the soil?

Response: Some contaminants easily partition into water but PCBs do not easily transfer into water. The low levels of contaminants at the site and the soil cover prevents runoff from contaminating Stout's Creek.

Comment 94: Referring to 4.1 PCB Toxicity, is "Chloracne" the first noticeable toxic effect sign that exposes itself or are there other early warning signs of PCB contamination?

Response: As mentioned in the Section, chloracne developed after a latent period along with pigmentation of skin areas, visual disturbances, gastrointestinal distress, jaundice and lethargy.

Comment 95: Referring to 3.3.1 Surface Water EPC, when water is extracted to be fed into the county water systems are PCB's detectable when passing though the system and can they counteract the contaminant to make the water safe for drinking?

Response: Bloomington's main water source is Lake Monroe which is not contaminated with PCBs. Four families around the Bennett's Dump site do use groundwater for drinking water but those wells are uncontaminated with PCBs at a 100 parts per trillion detection limit.

Comment 96: Referring to 2.1.1 Fate and Transport, if PCB's partition between media sources such as; water to air, soil to water, or sediment to water is there a risk of inhaling PCB mixtures off the contaminated site and if so, how far is it estimated that an airborne PCB can travel?

Response: Some PCBs are volatilizing from the Bennett's Dump site but based upon the residual levels and levels required to produce a risk from inhalation, unacceptable risk is

not produced from PCBs at the Bennett's Dump site. PCBs can travel many, many miles just by the fact that PCBs have been discovered in the Artic Circle.

Comment 97: Referring to 2.1.1 Fate and Transport, is it possible to speed up the photolysis process to help the degradation process and possibly help control the PCB population?

Response: The photolysis is referring to the lower chlorinated congeners which are more volatile. The heavier PCB congeners are not affected by photolysis, therefore, it is not likely that photolysis would break down PCBs to an acceptable level.

Comment 98: Referring to 4.2 Kingfisher Toxicity Reference Values, it is amazing to think of the possibilities of this contaminant traveling through birds and other wildlife that feed in the area and migrate to other climates. The possibility of a contaminant that was ingested in Indiana and then migrating to a warmer climate seems almost uncontrollable; does the EPA inform parts of the world that have a large number of wildlife migrating to their area of the contamination problem occurring in this area?

Response: No, EPA does not inform other countries. EPA's efforts are focused on addressing the risk at the site.

Comment 99: What possible signs should a recreational fisherman look for when catching fish to consume? Are there indicating factors as to whether the fish has been contaminated with PCB mixtures?

Response: It is not possible to tell just by observing the fish if they have been contaminated by PCBs. Most States distribute a guide to fish advisories for fisherman which will help them to make decisions on the fish that they have caught.

Comment 100: Do you feel that there should be further studies in the migration pattern of animals in relation with the areas of contamination of PCB's?

Response: The frequency of exposure to migrating animals at the Bennett's Dump site would be low, so for purposes of the Bennett's Dump risk assessment, EPA would not recommend further studies.

Comment 101: Introduction - I like how the very first paragraph clearly outlined the objectives of the risk assessment.

Response: No response required.

Comment 102: What exactly is a clay cap and what would it do to help the situation? I would think that most people would not know this.

Response: A clay or soil cap helps to prevent direct contact with the contamination and prevents runoff of contamination.

Comment 103: What is a hydrogeologic investigation?

Response: A hydrogeologic investigation refers to the study of the groundwater.

Comment 104: I like the clear explanation of each section contained in the risk assessment.

Response: No response required.

Comment 105: Data Evaluation, I'm still not quite sure what exactly COPCs are and how they relate to PCBs.

Response: COPC stands for chemical of potential concern and these chemicals are used in the calculation of risk. At Bennett's Dump, COPC are PCBs.

Comment 106: Exposure Assessment, I like the clear explanation and steps of the exposure assessment that are stated in the opening paragraph of the section.

Response: No response required.

Comment 107: If they are expecting that children will come into direct contact with the site as a result of the proposed subdivision, then why is direct exposure to soil on the site not being considered in the risk assessment?

Response: The source control remedy addressed the direct contact threat risk and institutional controls such as deed restrictions will be put into place to prevent development other than commercial/industrial.

Comment 108: I think that it was a good observation to note that there is a difference between low-income fishers and recreational fishers.

Response: No response required.

Comment 109: I like the fact that it is stated that the EPC is conservative.

Response: No response required.

Comment 110: What are RME conditions?

Response: RME stands for reasonable maximum exposure which represents the highest level of human exposure that could reasonable be expected to occur.

Comment 111: Toxicity Assessment, again, I like the clear explanation of the section stated in the opening paragraph.

Response: No response required.

Comment 112: I would like to know more about Yusho Disease.

Response: In 1968 in northern Kyushu in Japan about 2000 people were poisoned by PCBs and PCDFs (pyrolysis products of PCBs) which contaminated rice oil. Their condition was named "Yusho" disease. A similar poisoning by PCBs in Taiwan was named "Yu-Cheng" disease. The major symptoms of Yusho disease were dermal and ocular lesions, but some of the symptoms, such as irregular menstrual cycles and altered immune responses, were notable with respect to the endocrine disrupting activities of PCBs and related compounds.

Comment 113: What is a B2 carcinogen. I see that the classifications are explained later in the section. This is very helpful and informative.

Response: No response required.

Comment 114: I believe that the possible uncertainty factors should have been listed.

Response: The uncertainty factors are discussed in Section 5.5 of the Human Health risk assessment and Section 6.0 of the Ecological Risk Assessment.

Comment 115: Risk and Hazard Characterization, hazard index and hazard quotient were hard to understand.

Response: The Proposed Plan for Bennett's Dump contains information that may make it easier to understand.

Comment 116: Too many abbreviations!! If you are not familiar with what they mean, you forget what they stand for a paragraph after you read them.

Response: Abbreviations are used frequently in Superfund and this can be a problem sometimes considering the complex documents that are developed. We do put an abbreviation page at the front of the risk assessments but in the future will try to limit the abbreviations, if possible.

Comment 117: I reviewed Figure 3 of the Ecological Risk Assessment: "May 2004 Downstream Sediment, Water and Fish Sampling Locations." I observed on the map that there are four sampling locations, including Bennett's Dump, with the other three locations advancing downstream from Bennett's Dump respectively. I am assuming that these three testing sites were select since, according to Figure 3, they are close to intersecting roads. Has there been any discussion on whether or not other sampling locations should be established farther down from Location 3? Have PCB concentrations been diluted to acceptable amounts at or past Location 3? Also, is there a need to possibly establish testing locations along Beanblossom Creek?

Response: W. Maple Grove road which is over 5 miles from the site was farthest location sampled from the site. Results of the risk assessments show minimal risk at that locations which leads EPA to believe that sampling farther downstream is unnecessary.

Comment 118: Page 15 of the Ecological Risk Assessment says that no dietary studies on PCBs in the kingfisher were identified, and thus a direct diet comparison could not be made. Why were no dietary studies done on the kingfisher when they were done on the mink for the site? Also, if both the mink and the kingfisher's diet consist of fish and crayfish, would it not have been easier to measure dietary concentration of PCBs for the kingfishers as well?

Response: No site specific dietary studies were done for either kingfisher or mink at the Bennett's Dump site. The Ecological Risk Assessment used dietary studies completed in the Midwest for both kingfisher and mink. Completing field studies are difficult and expensive to perform and the EPA choose to use literature values to complete the risk assessment in a timely manner and values from the literature would expect to be similar to results from a field study.

Comment 119: I also reviewed Table B-2 in the Appendix section: "CTE Total PCB Concentrations in Diet and Station-Specific Risk, May 2004 Data." The table states that the PCB concentration in the diet of the kingfisher is higher than that of the mink at all three of the stations. Since, I am assuming, the mink is a larger animal and can ingest more fish at a time (an in effect more PCBs) than compared to the kingfisher, I would think that the PCB concentration would be higher in minks. Why does the data suggest the opposite?

Response: Mink and kingfisher feed differently. Mink not only feeds on fish but also on uncontaminated prey. Kingfishers feed mainly on fish.

Comment 120: My first concern comes from page two where you are talking about everything that has been cleaned up and removed from the Bennett's Dumpsite but it still says, "The final average PCB concentration of the remaining soil was 11.3 ppm." To me this seems like a high concentration to be left with especially after everything that has been removed and then covered up with a 12 inch-thick clean soil covering. Is this still a relatively high concentration rate for a site that has been cleaned up? I think it would have been better if more soil was removed and the final PCB concentration of the soil was at least taken down into single digits.

Response: The final cleanup value of 11.3 ppm PCBs is suitable for industrial development and with the soil cover, a direct contact threat is greatly minimized. In addition, most of the site is non-detect for PCBs but a few limited areas at depth contain higher PCB numbers which has influenced the average.

Comment 121: A total of 10 cubic yards of sediment was excavated from Stout's Creek in September 2000; sediment containing greater than 2.7 ppm PCBs was excavated and placed under the clean soil cover." This immediately follows the above statement from

the assessment. I found this to be very confusing you refer to everything that has been removed from the site, and how the final PCB concentration is 11.3ppm, but then directly following that you talk about sediment that contained greater than 2.7ppm PCBs were excavated and then placed under the clean soil cover.

Response: The very small sediment removal adjacent to the site in Stout's Creek was completed. This material was removed since it was within Stout's Creek. The site soils were remediated to an industrial PCB redevelopment standard which is different from sediments within Stout's Creek.

Comment 122: Why were the sediments containing greater than 2.7ppm not removed completely?

Response: We removed sediments to a level of 1 ppm which EPA deemed as being protective.

Comment 123: Does the 1ft deep layer of clean soil make that big of difference when you are putting soil contaminated at greater than 2.7ppm underneath it?

Response: Yes, the soil cover helps to prevent direct contact and runoff of the PCB contaminated material.

Comment 124: In the last full paragraph on page two you refer to "Land west of State Route 37, north and south of State Route 46, and south of Arlington Road in Sections 19 and 30 in Bloomington Township in Bloomington, Indiana has been proposed as the site of the Stoneybrook Park Subdivision." This site has been proposed to contain single-family units, multi-family units, and other units for commercial use and office use. With the Bennett's Dump site the way it is do you think it is safe for this sub-division to be made?

Response: The Bennett's Dump will not pose an unacceptable risk to the Stoneybrook Park Subdivision. The site has been remediated to PCB levels acceptable for industrial development and the springs which contain PCBs are being remediated through the on-site treatment plant.

Comment 125: Is there still the possibility that the PCBs can be leaked out into this site even if there are no high levels of PCBs at the time the sub-division is built, could the PCBs leak from Bennett's Dump and effect this area as the years go on?

Response: EPA is of the opinion that if the releases from the springs into Stout's Creek were not addressed through this ROD Amendment, they could have the potential to affect the sub-division. Otherwise, with controlling and treating the release of PCBs from the springs and placing institutional controls on the site such as deed restrictions, the sub-division will not be affected by the site.

Comment 126: In section 3-1 Exposure Setting Characterization you say "In addition, a second satellite fill area measuring about 30 by 60 feet lies 750 feet north of the main fill area. This small satellite area was removed from consideration as part of the site based on sampling conducted by EPA in 1991." If the last test on this area was in 1991, isn't it possible that some of the PCBs from the main fill area have leaked there way to this area? Especially since it is only 750 feet away from the main fill area and it has been over 10 years since the last test was done.

Response: The satellite area you are referring to was located near the entrance gate of the site and contained a few capacitors. This small area was fenced and after removing the capacitors, the area was sampled and it did not show PCBs and it was removed from further consideration. EPA is of the opinion that this area will not be affected by the main site. Another satellite area near Icebox Quarry was remediated during the 1999 soil remediation.

Comment 127: In section 3.2.1 it says "Additional mechanisms of release such as surface water runoff, erosion, and the generation of fugitive dusts are considered to be absent at the site because of remedial actions completed thus far."

Response: Due to the soil remediation in 1999, the issue of water runoff, erosion and fugitive dust were eliminated.

Comment 128: I like the potential receptors that you picked, however I think it would have been interesting to look at children 6 years old or younger more than you did. If the sub-division is made and families with young kids move in I think you will find more kids younger than 6 fishing than you expect. This just comes from the fact that I know in my family I started fishing at a very young age and I loved to go with my dad or whoever even if I wasn't fishing.

Response: The human health risk assessment did evaluate children, including the ingestion of fish and wading activities. Evaluation of other activities would not add value to the risk assessment and may be outside the scope of an RME.

Comment 129: I agree with the exposure pathways, which were chosen to be looked at. I think those are the main pathways in which people will be exposed in this area.

Response: No response required.

Comment 130: Lastly I like the set up of the assessment I just think it would be easier to follow if you put the tables in after the section they go with, I found it hard to keep my place as I was reading and had to scroll all the way to the end of the references before I was able to find the tables. It made it hard to keep track of where you were if you were reading and looking at the tables as you go.

Response: The format with the Tables together in an Appendix is helpful when a specific Table is referenced more than once throughout the document. EPA will take your comment in consideration in the future.

Comment 131: Will the sediment contaminated with PCBs cause harm to wildlife in the future since it is not be clean up with the new plan?

Response: The sediment contamination in Stout's Creek is under 1 ppm PCBs which is a level at which EPA feels is protective. The ROD Amendment proposes to capture and treat the springs contaminated with PCBs which will help to reduce the risk to human health and the environment.

Comment 132: I thought that it was good to include the history of the site and the lawsuits in the proposed plan because the hand out from the Feb 14 meeting lacked this information.

Response: The public meeting is a good forum to give a summary of site and the remedy proposed to remediate the contamination but with a 2.5 hour meeting, not everything can be presented. The Administrative Record contains a large amount of additional information for review.

Comment 133: Since Alternative 5 is the best proposal and most expensive one, which sector of government or organization will be providing the money for this clean up?

Response: The governmental parties are in negotiations with CBS to have the company fund the cleanup. If these negotiations fail, EPA may end up funding the cleanup and trying to recover the costs from CBS through litigation.

Comment 134: Another one of my concerns is how long will it take for the clean up and when would we be able to see the improvement of health in humans/wildlife and the decrease of PCB concentration at the site?

Response: Once the treatment of the springs begins, we should begin to see improvement in the fish. The timing as to when the fish will be at acceptable levels to protect human health and the environment is unknown.

Comment 135: Once the proposal is passed when will construction began on the remediation of the site.

Response: If an agreement is reached with CBS Corporation, EPA would expect construction to begin in the spring of 2007. Completion of construction is estimated to be in 2007 or 2008 depending on the results of the pre-design study.

Comment 136: Is it possible that while the construction is taking place that the PCBs would spread to create a larger remediation area? For example, remediation runoff from construction.

Response: Unlikely, but engineering controls will be put in place to ensure PCBs are not spread to other locations.

Comment 137: Once the PCBs are pumped from the quarries how long does it take for PCBs treated?

Response: PCBs were not scheduled to be pumped from the quarries in the alternatives evaluated for the remediation of Bennett's Dump. During the investigation phase, CBS did try to pump the buried quarries but water was not produced in large enough volume to consider as an option.

Comment 138: Is there a possibility that alternative 5 would not clear the area of PCBs and future outbreaks of PCBs could occur?

Response: Unlikely, but the remedy will require long-term monitoring to ensure that the remedy is functioning as designed. In addition, every five years, the remedy is evaluated to ensure that it is protective of human health and the environment.

Comment 139: Has there been previous discussions about the possibly of building a temporary waste to energy plant near the Bennett's Dump site?

Response: EPA is unaware of any discussions regarding a temporary waste to energy plant.

Comment 140: Is there any further community development planned in the area? If so what effect will this have on the 12 inch clean soil cap?

Response: Yes, further residential and commercial development is scheduled near the Bennett's Dump site. Please see document number 77 and 84 of update number 3 of the Administrative Record for further information.

Comment 141: Page 7 discusses the fact that pumping down the water in the Wedge Quarry complex affected the PCB flow into Mound Spring. Would it be possible to put a system in place to keep the water at the level that brings PCB contaminates in the water down?

Response: The passive quarry drain system will help to reduce groundwater flow from the springs which help to reduce the release of PCBs into Stout's Creek. Initially EPA evaluated an in-situ (in place) treatment system to try to destroy the PCBs in place by oxidation but deemed it unworkable.

Comment 142: Do developers and realtors have a legal obligation to tell potential property buyers of the historical and present conditions and hazards associated with living near the Bennett's Dump site?

Response: No Federal obligations are required to notify potential property buyers of issues associated with nearby Superfund sites. State or local governments may have regulations notifying property buyers of nearby hazardous waste sites. A buyer of a contaminated site would receive notice of use restrictions on the property.

Comment 143: From the Proposed Plan "In 1994, an agreement was reached to explore other remedial alternatives; however, little progress was made." I did not like that this agreement was not explained even in the vaguest detail. This was later followed this text with an explanation of the judicial order that followed. The judicial order was well explained. However, I do think that it leaves a lot to be questioned as to whether or not the 1997 judicial order was as thorough as the agreement that was stated to have had "little progress made". This takes away from the remediation that was actually done. If it were more extensive than the original remediation agreement would have required, it is lessened by the lack of explanation. If it were less extensive, an explanation is owed as to why it was not as extensive as the 1994 agreement would have dictated.

Response: The Administrative Record does contain the 1994 Operating Principles that the commenter references. In 1994, the parties to the original 1985 Consent Decree prepared the Operating Principles to guide their discussions as they explored alternatives to the remedy required in the 1985 Consent Decree. In 1997, the Court issued an order addressing the source control portion of the site remedies and gave a timetable to complete the source control but not the groundwater or sediment components. In 1999, the Court issued another order stating that the parties should continue to negotiate water and sediment issues.

Comment 144: Proposed Plan (pp.11-18) I have three questions in this section. First, why does the alternative 5 not include excavation of the deep-buried quarry pits? To me, it seems that implementing both excavation of residuals and the proposed alternative 5 (trench and carbon treatment) at the same time would clean up the site faster. The other questions pertain to "a pre-design study" described on page 13. Is the time for this study included in the estimated time to achieve RAOs? Additionally, how much time is estimated for completion of the study?

Response: EPA is of the opinion that adding the excavation of the buried quarries to the collection trench would not greatly improve the site remedy. The difficulty in excavating the PCBs in the buried quarries with the contamination intermixed with soil and debris, particularly when groundwater is within the quarries leads EPA to believe that focusing the remediation on water treatment. Considering the PCB levels in groundwater are fairly low but at unacceptable levels, it is unknown if the additional excavation will reduce the time of water treatment. The pre-design study should be completed in less than one year.

Comment 145: If Alternative 5, Passive Quarry Drains with Interceptor Trench and Carbon Treatment, is selected and implemented for the Bennett's Dump site, will the EPA continue to monitor the PCB levels in the water? If so, how often will these waters be tested for PCBs? At what points along the stream will these tests be done (quarries,

Stout's Creek, etc.)? Does the "Cost" evaluation criteria include these tests for the life of the cleanup?

Response: A monitoring program will be implemented but the details have not been determined. Water and sediment sampling will be part of the monitoring program. Yes, the costs do include typical monitoring costs but no final monitoring program is developed.

Comment 146: In addition to monitoring the waters for PCBs, are there any plans to monitor the sediment at the site for contamination? According to the Proposed Plan, the EPA has determined that sediment contamination does not pose unacceptable risks to human health and the environment. However, the Plan also states that there has been still some sediment testing done at Bennett's Dump, as recent as November 2005 conducted by CBS. If EPA decides to not monitor the sediment, will others such as CBS continue to monitor the site for sediment contamination?

Response: See Response to Comment 145.

Comment 147: At the public meeting, there were some citizens who claimed to have lived near PCB-contaminated sites in Bloomington, where their health has been negatively affected from the sites. One citizen in particular asked if they are any plans to provide them compensation for these negative affects. Are there any plans in the future to compensate these residents if it is proven that they have developed adverse health effects from the contaminated sites?

Response: EPA does not have any current plans to compensate individuals who claim that they were affected by the Bennett's Dump site. Congress has not given EPA authority to award such compensation.

Comment 148: After attending the public meeting on February 14th and reading over the Proposed Plan and other presented information related to the Bennett's Dump site, I would agree that Alternative 5: Passive Quarry Drains with Interceptor Trench and Carbon Treatment, is the overall best choice given the five alternatives. Have you or any of your colleagues or representatives from the EPA reconsidered other options, based on comments from the public meeting and/or any new information about the site that may have come to light?

Response: Yes, remedies have been modified based upon public comment. The EPA did consider public opinion when the original incineration remedy was not implemented. For operable unit 2 and 3, EPA did not consider other options.

Comment 149: EPA has determined that sediment contamination does not pose an unacceptable risk to human health or the environment. This portion confused me in a number of different ways. If this is true, does this mean that there is not an unacceptable risk at the present time? If so will it never pose a threat no matter the time frame of remediation? This needs to be clarified as to why this is not a risk in the future. I did not

like this sentence directly following the lines explaining cost as a factor in evaluating remediation. I realize cost is definitely a factor but I also believe it may come off as the most emphasized factor after talking about not having remediation of the sediment in the area. A simple explanation for the reasoning behind the decision will strengthen the document in my opinion.

Response: Sediment is not contaminated at levels which produces unacceptable risk. By implementing the passive quarry drain and groundwater collection trench with treatment, the sediment is not expected to become recontaminated. Additional monitoring of the sediment will occur over time to ensure the sediment does not become recontaminated and produce unacceptable risk. Cost is one of the criteria that is used to evaluate alternatives but it is not the driving factor in decision making.

Comment 150: After the 1999 remediation, a series of periodic flowing springs and seeps developed containing PCBs. These springs discharge directly into Stout's Creek, which flows along the western edge of the site. Historical analysis of aerial photographs shows springs on the site, but not at the location of the current springs. I was confused as to what this means exactly. Does this mean that the 1999 remediation was unsuccessful? Has this problem been remedied? If not what is to say that after remediation the sites will not become once again contaminated from other water flows? This stuck out for me as a weakness in the document. With some explanation it can be quickly explained and strengthened.

Response: EPA is of the opinion that the springs have been located on the site but at different locations. Adding a soil and clay cover to the site after the 1999 source control remediation appears to have changed the location where the spring releases water to Stout's Creek. This was caused by the clay forcing spring water to exit at a different location by blocking the previous pathway. Also, please see Response to Comment 257 for additional detail. The 1999 source control remediation was successful in terms of abating risks resulting from the direct contact threat but did not address PCBs in the buried quarries and in bedrock which come into contact with groundwater. This contamination will be addressed by the selected remedy.

Comment 151: EPA believes that human exposure to PCBs from the site results from three pathways: Fish consumption through fishing within Stout's Creek Exposure to sediment within Stout's Creek through skin contact and incidental ingestion. Exposure to surface water within Stout's Creek through skin contact and ingestion. This really alarmed me to look back at the first critique and further question what parameters were considered in the decision not to remediate sediment. I think that it should also be explained what the criteria was in determining risk. Was sediment deemed safe for a normal functioning adult or was it deemed not an unacceptable risk for a child from 2-4 years old who may consume as much as 5 grams of soil in a day. I would like to know if sensitive populations such as children or pregnant women were being considered in the evaluation.

Response: The human health risk assessment did evaluate the incidental ingestion and dermal (skin) contact with sediment from Stout's Creek or both children and adults. To assume that a child would consume 5 grams of sediment per day for an extended period of time would not be a RME type of exposure and would be highly unlikely. Pregnant women were not considered due to the inability to quantitatively evaluate the risk.

Comment 152: Overall I felt the document was informative but may have lacked a few explanations. I liked the maps and thought they were well placed and informative. I would have liked to see the map on the second page to be bigger for easier reading.

Response: EPA will consider larger maps in future documents. Many more detailed maps are available in the Administrative Record.

Comment 153: On page 10 of the proposed plan you write in the bottom paragraph on the left RME scenario and CTE HQs. What do these stands for and what do they have to do with the effects on ecology in the fish and minks in the area?

Response: RME stands for reasonable maximum exposure and CTE stands for central tendency exposure. These concepts refer to the amount of PCBs the individual or animal is exposed to.

Comment 154: Are there any other sites that are being looked at in the Bloomington area that could possibly be as large as the superfund site at Bennett's Dump?

Response: The Lemon Lane Landfill and Neal's Landfill are larger sites than Bennett's Dump and EPA is in the process of developing the final remedy for both sites. Sites outside the scope of the 1985 Consent Decree that still require remedy implementation include the Fluckmill Road sludge site and the cleanup under the former Westinghouse capacitor plant on Curry Pike Road. Both those sites are small compared to the Bennett's Dump site.

Comment 155: Do you think that the actions taken will need to be changed in order to clean the site or due to your experience in the field do you feel that this action could also be used at the site at Fluckmill Road?

Response: EPA is not of the opinion that the actions taken to date will need to be changed and we expect that the Fluckmill Road site will require further delineation of the extent of contamination and most likely excavation and offsite disposal to residential PCB cleanup standards.

Comment 156: The opening sentence of this document does a good job of laying out its goal. I know right from the start that this was going to deal with the possible solutions that could clean up the PCB contamination at Bennett's Dump. I think it was important that this was brought up early on.

Response: No response required.

Comment 157: Discussing the history of the site was obviously very crucial. The background information given talked about what the problems have been at the site throughout the years and what has been done in the past in terms of cleaning up. I liked that because it allows for someone to really follow along with the whole process and understand how new remedial action relates to the large scope of things at the site.

Response: No response required.

Comment 158: When you discuss the site characteristics, you do so in a specific way. You don't generalize Bennett's Dump as a whole. You break down Bennett's Dump into the number of springs that comprise it. The different PCB concentration levels are noted for the different springs.

Response: No response required.

Comment 159: The section discussing risks was thorough. It provided the essential information as far as how PCBs can affect both humans and ecological components as well. The different pathways and media are discussed as well. This helps to give a better understanding of how people and other things can be exposed to PCBs.

Response: No response required.

Comment 160: You again state what the goals of remediation at Bennett's Dump will be. This is important because you really state what the intentions are going to be. Next, I thought the summaries of the five alternatives for cleaning up Bennett's Dump were provided. This is obviously important because it allows for anyone to see what the possible courses of action are. I thought it was very good that the expected costs were included. Tax payers have the right to know what they are getting into before remediation efforts begin.

Response: No response required.

Comment 161: Each alternative had to go through a criteria checklist to see which would the one to use. One criteria was that the community had acceptance of the proposal. The EPA has chosen alternative as their choice. After reviewing each of the alternatives, I support that decision. I hope it can be implemented soon.

Response: EPA would like to have CBS implement the site remedy as soon as possible.

Comment 162: How will this plan change if funding is increased or decreased for this site?

Response: If EPA must fund the construction of the Bennett's Dump remedy, a funding decrease, though unlikely, could slow the implementation of the remedy.

Comment 163: The site background is thorough. I thought it was very interesting how the site map was done with the charts involved as well giving additional information.

Response: No response required.

Comment 164: Could you better articulate what recharge to the groundwater flow is? (pg 5)

Response: Recharge to groundwater refers to how the groundwater is replenished by rainfall or a pool of water such as the water-filled quarries surrounding the Bennett's Dump site.

Comment 165: Under the site background on page two of the proposed plan it talks about the remedial measures taken in 1983. It states that a clay cap was covered over the site. I was wondering if these clay caps ever break down and if there is a possibility in the future that these covered PCBs might get into our groundwater.

Response: Clay caps can fail without proper maintenance. As part of the source control remedy implemented by CBS in 1999, a maintenance plan for the cap was approved by EPA and continues to be implemented by CBS

Comment 166: On the third page of the paper it discusses how in 1999 a cleanup in which 36,172 tons of PCBs were cleaned up. It says that after the cleanup was complete that there was a 11.3 ppm of PCBs still in the soil and it was just covered in 12 inches of soil. Is it still possible that these PCBs are present and could still enter our groundwater?

Response: PCBs are present at low concentrations at the site. EPA is of the opinion that the residual PCBs at the surface of the site within the soil are not the source of the groundwater contamination.

Comment 167: On page three it also discusses how PCBs were found in the quarries and they were mixed with diesel fuel. Does this cause an adverse effect and could it be more harmful to people? I have heard of many people swimming in these quarries before, especially college students in the summer. Are they in danger of PCB exposure?

Response: The PCBs intermixed with diesel fuel was found in groundwater, not in an open water filled quarry that is sometimes used for swimming. Open water filled quarries are on the Bennett's Dump site and one quarry does have very low concentrations of PCBs. Based upon the concentrations, frequent swimming would probably produce unacceptable risk. It should be pointed out that the water filled quarries on the site are on private property and no evidence is available that shows that these quarries were used for swimming.

Comment 168: Since there has been a population increase in the area due to North Park don't you think that the residents should be warned of the possible PCB problems that

could occur so they keep there children away until the problem have been taken care of? How might you go about informing them?

Response: The final remedy for Bennett's Dump will have institutional controls to prevent direct contact to contaminated material. EPA will continue to do public outreach to the citizens of Bloomington regarding the status of the cleanup, including the North Park Development.

Comment 169: In the ecological risks it talks about fish eating birds. What about the majority of birds that eat worms? These worms are affected by the contaminated soil and intern affects the birds.

Response: The commenter is correct that worms can uptake PCBs and produce risk to certain types of birds and this pathway is evaluated in some risk assessments. Evaluating the risk to fish eating birds is more conservative than evaluating birds which feed on worms since contaminated fish are over a much larger area and only low levels of PCBs remain in the site soils.

Comment 170: The alternative that you chose is very good and makes a great deal of sense. Is it possible however, that you may still need to complete some of the objectives from article four? Until the buried quarry pits are cleansed of PCBs there will still be PCBs present in groundwater due to on-site springs.

Response: The difficultly in excavating the buried quarries and the likelihood of still having to treat groundwater makes Alternative 5 the best alternative.

Comment 171: On page five of the proposal in the fifth paragraph of the Geology and Hydrogeology, a Long-term Groundwater Monitoring Plan is mentioned. However more detail about this plan could be useful. Such as including testing procedures, duration of testing, and locations of tests. This data can clarify that all aspects of the site remediation are being considered.

Response: A number of documents in the Administrative Record are available which describes in more detail the testing which has occurred.

Comment 172: On page seven in the Sediment Data section again more data about the sediment tests would be beneficial. Including testing procedures, duration of testing and the location of proposed tests can elucidate this section.

Response: A number of documents in the Administrative Record are available which describes in more detail the testing which has occurred.

Comment 173: In the Human Health Risks section at the top of page nine there is mention about a new development near Bennett's dump. Drinking water dangers for this community are mentioned as a consideration in this proposal plan. The plan then asserts that groundwater contamination is not an issue because the community will be fed by the

City of Bloomington water supply. I believe that it is a good idea to use the municipal water supply but future uses for the groundwater under the North Park Development. Just because in the near future there is not any planned use for the groundwater, does not mean that this groundwater should be overlooked.

Response: Groundwater is not being overlooked. The contaminated groundwater is being captures and treated. In addition, long-term groundwater monitoring will be part of the cleanup.

Comment 174: No where in the proposal plan is there mention of reducing future exposure. The North Park Development will most likely have children moving into the area. Previously there were only ten houses within a half mile of Stout's Creek. Now there will be many more structures near that area. Are there any plans for educating the new residents of this development about the problems associated with the area? Will there be signs posted around the area or even fences used around the most severely contaminated area? These will be concerns of the new families that will be moving into this area.

Response: The commenter is correct that institutional controls, such as deed restrictions and fencing are part of the final remedy. EPA will continue to do outreach with the community to keep them informed as to the progress of the cleanup.

Comment 175: As an environmental management major at Indiana University, I have concerns about the abundance of PCB contamination and numerous superfund sites. I am learning about the process of risk assessment in one of my classes. I read the Proposed Plan for Bennett's Dump, and my concerns grew. Although I am in the process of learning more about environmental risks, I do understand more than the average citizen. In reading this plan, though, I became confused. I think that documents written for citizens should be more understandable.

Response: The commenter is correct that some of the technical documents and terms used can be confusing, but EPA mailed approximately 6,000 fact sheets to the public which are written in a much more simplified version than the Proposed Plan. By using the fact sheet, the public then can become more involved if they so desire. In addition, the COPA web page and CIC meetings can be used by the public to become more involved and ask questions to the governmental parties.

Comment 176: What is the plan for? In reading the document, some parts sounded as if remediation was complete.

Response: Portions of the site remedy are complete. The Proposed Plan describes the alternatives evaluated for the water and sediment operable unit.

Comment 177: In talking about an incinerator, since it will not be in Bloomington due to recent laws, which incinerator would be used?

Response: During the source control phase of the cleanup in 1999, a permitted off-site incinerator in Texas was used to incinerate PCB containing capacitors disposed of at the site. Incineration is not a planned component of the current two operable units.

Comment 178: Do you feel that it is irresponsible to plan to incinerate the toxin and possibly harm others somewhere else?

Response: The original incineration remedy proposed for the Bennett's Dump site was scheduled to use experimental technology. Based upon many factors, the remedy was not implemented. Incineration can be effective technology if appropriate controls are put in place. Off-site incineration was used pursuant to the Toxic Substances Control Act for capacitors disposed at the Bennett's Dump site. Prior to using any off-site treatment technology, such as incineration, or containment technology, such as landfill disposal, EPA must check the compliance status of the facility to ensure that it meets all the local, State and Federal requirements and the facility does not have any violations.

Comment 179: What is being done about the concentrations of PCB's in animals? I feel that a fish advisory will not be enough. Bioaccumulation will continue to harm the animals, and could spread the contamination.

Response: By implementing Alternative 5, the risk to animals will be reduced or eliminated over time.

Comment 180: How far has the contamination spread due to runoff from rainwater?

Response: After the source control portion of the remedy was completed in 1999, rainwater has not spread the contamination to other areas.

Comment 181: Even after cleanup, will there still be risks?

Response: With the implementation of Alternative 5, the risks will be reduced over time. The PCB levels in fish will not decrease quickly but over time the PCB levels are expected to decrease to acceptable levels.

Comment 182: When the toxin mixed with fuel and the criteria wasn't met, was any action taken?

Response: During the 1999 remediation, groundwater was discovered which contained PCBs mixed with diesel fuel located within a former quarry pit containing rubble and debris. The area was excavated as much as possible, including the pumping of water in the excavation but it was determined that this area would be filled with clean fill due to the depth of the excavation and large amounts of groundwater within the excavation. A detailed description of the activities in located in the Bennett's Dump Final Report, dated February 7, 2000 which is located in the Administrative Record.

Comment 183: Is the situation really not as bad as it sounds in the plan, or is it just sugar coated so as not to alarm the public?

Response: Unacceptable risk to both human health and the environment is present as described in the two risk assessments. Through the implementation of Alternative 5, this risk will be reduced over time.

Comment 184: Many people I know that are not an environmental major have no idea about the problem occurring basically in their back yard. How much effort has been made to really make the public aware? Do you feel that more effort should be made to make more aware?

Response: EPA has done a large amount of outreach to the public. Frequent community meetings are held and EPA has provided the funding for a Technical Assistance Grant to COPA. COPA has hired experts to evaluate technical information along with developing a web page to help in the distribution of information. EPA also mailed over 5,000 fact sheets to nearby residents.

Comment 185: What would it take to completely remediate the site and eliminate all risks?

Response: The implementation of the source control in 1999 along with implementing Alternative 5 will remediate the site. Due to the PCB contamination in fish, the risk will be reduced over time since the release of PCBs will be greatly reduced. EPA is of the opinion that over time, risk will be eliminated.

Comment 186: My only real concern is the use of incineration to dispose of the capacitors from the site. I'm worried that the burn will not burn completely and result in the volatilization of not only the PCBs, but also other pollutants. Also, would taking the waste to a hazardous waste dump be an appropriate alternative? If so why isn't this the plan for remediation? (Especially since the citizens of Bloomington seem to be opposed to the incineration plan)

Response: The source control cleanup in 1999 used off-site disposal in a landfill of PCB contaminated material along with off-site incineration of PCB containing capacitors. The Proposed Plan addresses the risk associated with water and sediment.

Comment 187: I agree with the plan for treating the groundwater at the Bennett's Dump site. I think that the plan to excavate the sites could potentially cause more problems because fissures in the limestone would cause water to travel, thus exacerbating the problem.

Response: EPA agrees that the presence of contaminated groundwater would complicate efforts to conduct further excavation at the Site.

Comment 188: Is the problem being solved by relocating the material that exceeds 25ppm at the Bennett's dump site? Does all contaminated material need to be removed and is this possible?

Response: The source control cleanup in 1999 removed PCB contaminated soil from the site and the final cleanup level was 11.3 ppm PCBs. All the contaminated material does not require removal since the PCB levels remaining are acceptable for industrial or commercial development.

Comment 189: Can we begin to filter the water at the Stout's creek site to reduce the concentration of PCB's so that other areas are not affected downstream?

Response: EPA is not filtering the water in Stout's Creek but capturing spring water and removing the PCBs prior to discharge to Stout's Creek. This will prevent further contamination from reaching downstream in Stout's Creek.

Comment 190: Has the PCB contamination problem become more than we can deal with and does the fact that the courts dragged their feet for almost twenty years have anything to do with the high amounts of concentration we see today?

Response: The continuing release of PCBs over time has made addressing the problem more difficult. The problems with implementing the original incineration remedy and the delays trying to reach agreement with CBS on alternative remedies have been one reason for the delay in the remedy decisions. In addition, a large amount of investigative work was required prior to the remedy decisions. EPA is of the opinion that it can deal with the present PCB problem through the remedial measures described in the proposed plan.

Comment 191: Do you feel that the limited sites listed are the only areas affected by PCB's or are there possibly other sites that do not have quite as high of a concentration, but are still affected? Can these "other" sites re-contaminate if the problem is not solved as a whole?

Response: A PCB site has been discovered recently and is located where Clear Creek meets Fluckmill Road. This small site has not been fully defined but preliminary information indicates that a cleanup will be required. Even though EPA does not expect large PCB contaminated sites to be discovered, smaller sites, particularly sewage sludge sites still may be discovered in the future that contain PCBs at unacceptable levels.

Comment 192: Do you personally feel that the best alternative to controlling the problem should be "Passing Quarry Drains with Interceptor trench and Carbon treatment" even though the capital cost compared to present worth ratio is higher than "long-term groundwater monitoring"?

Response: Evaluating the alternatives to remediate Bennett's Dump, it was determined that long-term groundwater monitoring only would not be protective of human health and

the environment. EPA is of the opinion that Alternative 5 is the best balance of the nine criteria.

Comment 193: I know it says that option 5 is supposed to be very effective in the long run, but looking in the short term it seems that option 4 would be better, and it seems that option 4 would also be just as effective in the long run. The major difference that I can see in the two options is the cost, how much of a role did the cost have in deciding which option would be used?

Response: Due to the similar costs for both Alternative 4 and Alternative 5, cost only played a minor role in the decision making. The difficulty in excavating the buried quarries played a much bigger role than cost.

Comment 194: It seems like they both take the same amount of time to construct and, both are supposed to reach the RAO's in the same amount of time, so will there be that much of a difference in the release of PCBs into Stout's Creek? In option 5 you are just capturing and treating, which to me seems like there could be problems that come with this, and in option 4 you are actually removing most of the waste that contains the PCBs. I was just wondering if you had an idea of what the PCB concentration would be around if option 4 was used and what the PCB concentration is going to be around after option 5 is implemented?

Response: Implementing Alternative 4 in EPA's opinion would not eliminate the need for groundwater treatment. In addition, the difficulty in completing the excavation in buried quarries at depths which would require specialized equipment with groundwater present in the excavation makes Alternative 5 the best alternative. It would be only speculation as to what concentrations would remain if either Alternative 4 or 5 was implemented.

Comment 195: Alternative 5: Passive Quarry Drains with Interceptor Trench and Carbon Treatment. I was just wondering if you could tell me more about how this trench works it seems to me like there could be a lot of problems that could cause this to go wrong.

Response: More detail on the design of the trench will be provided in the future. The conceptual approach will be a trench cut into rock to a depth of about 8 feet. The trench would be lined and water would flow into the trench and be gravity fed or pumped to a treatment plant. This technology has been used at many other sites.

Comment 196: It says that you are assuming that ground water flow is 100 gallons per minute during storm events how did you come up with this number?

Response: The 100 gpm estimate was determined by evaluating spring flow records. The final size of the collection system will depend on how effective the passive quarry drain system is in reducing groundwater flow.

Comment 197: What happens if there is a lot of rain and severe flooding and ground water is moving at faster than 100 gallons per minute will this trench be able to hold it, or will it flood?

Response: The design of the collection system will take into consideration severe rain events and a factor of safety will be put into the design. The final size of the collection system will depend on a pre-design study but if the system is designed to handle 100 gpm and for some reason greater flows are produced, these could bypass the collection system.

Comment 198: Has this method been used anywhere else? If so how effective is it and how often is it used? And have there ever been any problems associated with using a trench like this?

Response: Yes, collection trenches have been used at other sites and are effective in capturing groundwater.

Comment 199: I don't really understand how the carbon treatment works. How is the carbon released into the trench used to treat the water?

Response: Carbon adsorption is very effective in binding some organic compounds, including PCBs. The carbon is in granulated form and when contaminated water containing PCBs comes into contact with the carbon, the PCBs bind onto the carbon and the contaminant is removed from the water. PCBs can bind onto particles or be in a dissolved phase and carbon is able to remove both PCBs bound onto particles or the dissolved phase. In many instances of water treatment, a multi-media filter is placed before the carbon to facilitate the removal of PCBs bound to onto particles. The remedy at Bennett's Dump for water treatment will use carbon but it will be contained in a vessel and not placed into the trench. Water will be collected in the trench and pumped to a carbon vessel for treatment, then discharge to Stout's Creek.

Comment 200: One of the recurring statements/situations presented in the "history" of these Superfund sites by the EPA is that under the Consent Decree a perfectly adequate solution involving complete removal of contaminants and incineration was planned, but rejected by the community. And by implication the resulting delays and difficulties in arriving at alternative solutions is the consequence of the community rejection of incineration. Complete removal was always acceptable, but coupled with incineration of the material along with the community's municipal waste and then, disposal of 600,000+ tons of contaminated incinerator residues in a local hazardous waste landfill was rejected for very good reasons:

a) Incineration a mix of hazardous and municipal waste was an untried technology

b) The mix is inherently a "dirty" burn and could release products of incomplete combustion, volatized PCBs, dioxins, furans, and mercury and yield uncontrollable contamination to the atmosphere and to local drinking water supplies

c) It would have required the community to fuel the incinerator through abandoning its recycling program or buying petroleum fuel to replace it,

d) And was unlikely to work as shown by the state legislation which essentially required that it actually meet the "6-9s" (99.9999%) destruction goal. The federal 6-9s rule is actually destruction/removal effectiveness. By transferring the contamination to other media (air, water, or to another form) that goal is "met". What the state required was not a diversion, or sleight of hand, but actual destruction to non-hazardous forms. And even that was weak, in that it allowed creation of incomplete combustion by-products and release of mercury.

The destruction criterion set by the State was the "kiss-of-death" for the incinerator. It couldn't work when "push-came-to-shove" So, please stop blaming us for the rejection of the poor technology proposed in the Consent Decree. We recurringly smell a collusion of our government agencies and the polluter Westinghouse/Viacom/CBS to absolve them of complete cleanup. The inadequate water treatment at Illinois Central Spring and Neal's Landfill are examples of a poor remedies allowed by the Consent Decree based on inadequate site investigation, ineffective cleanups, and possibly worst of all, too much of it done at taxpayer expense.

Response: EPA disagrees with the commenter. There is no collusion between government agencies and CBS. In the early 1980s, the United States and its other government co-plaintiffs brought civil actions against CBS (then Westinghouse) for the purpose of cleaning up PCBs in and around Bloomington. These law suits were resolved in the 1985 Consent Decree that required CBS, among other things, to excavate all material from the Consent Decree sites and to incinerate this material in an incinerator that CBS design, built and operated. In 1994, in response to growing opposition to the incinerator, the parties put to one side this agreed-upon remedy in the 1985 Consent Decree and embarked down the path of exploring new remedial alternatives based upon new investigations of the sites. Since 1994, EPA has been committed to selecting new alternative remedies that will fully address unacceptable risks to human health and the environment posed by PCBs at the sites. To date, EPA has selected, after public comment, alternatives remedies for three of the six sites covered by the Consent Decree – Neal's Dump, Winston Thomas Sewage Treatment Works, and Anderson Road Landfill. CBS performed those alternative remedies. At present, EPA has not selected a final remedy for the three remaining sites – Bennett's Dump, Lemon Lane Landfill, and Neal's Landfill. While EPA selected, after public comment, a source control remedy for these sites, it has not yet selected the final remedy that will address PCB contamination in groundwater, surface water and sediment. The water treatment plants at Illinois Central Spring (which EPA considers to be part of Lemon Lane Landfill) and at Neal's Landfill are interim water treatments and are not intended to be the final remedy for the sites. EPA is presently engaged in selecting the final remedy for Bennett's Dump, which EPA has identified as Alternative 5 in its published proposed plan. As explained in that plan, EPA believes that the proposed remedial measures will fully address risks to human health and the environment.

Comment 201: Prior cleanup efforts only minimally removed the source of contamination. Field reports cite discoveries of pools of PCB oils with no attempt at removal. In addition to new springs that have developed subsequent to that removal, PCB contamination release to Stout's Cr. continues. The proposed alternatives accept the contamination and provide a "band-aid" fix. The EPA should proceed with full removal of all waste as well as installation of extraction wells directly in the dumps and treatment of water and residual PCB oils.

Response: The commenter is mistaken when discussing field reports which cite pools of PCB oils. During the excavation of Bennett's Dump in 1999, buried quarries filled with rubble and soil were discovered that contained groundwater. PCB oil as a sheen was mixed with the groundwater. Documentation of the excavation, including pictures of the open excavation is in the Tetra Tech oversight summary reports. Please see Response to Comment 210 for a discussion of why extraction wells would not be the best choice to capture PCB contaminated groundwater.

Comment 202: Where is the report on the mass balance exercise for PCBs in Stout's? What were the measured parameters, locations, and exact conclusions, particularly where are the other sources? How does the proposed alternative capture this contamination?

Response: Preliminary mass balance computations were made in the initial phase of the Bennett's Dump groundwater investigation and were reported in the February 2004 Final Groundwater Investigation Report (see page 40 and Figure 96). The follow-up mass balance exercise in Stout's Creek (summarized in Attachment 3 to the Responsiveness Summary) was conducted in October 2003. This involved collection of a series of samples along Stout's Creek and all known flowing springs. The measured parameters were PCBs, TSS, and Conductivity. The mass balance suggested a PCB discharge to the creek occurring downstream of Middle Spring and near monitoring well MW-5A. This subsequently led to investigations of shallow groundwater flow and a buried valley of Stout's Creek in 2004 and 2005. See also the EPA responses to Comments and regarding capture of the PCB contamination.

Comment 203: Is Rusty Spring exiting the filled debris where the old course of Stout's flowed? Is it intermittent? How is it flowing at right angles to the other springs in the buried trace of Stout's, yet does not pick up any contamination?

Response: Rusty Spring is located within the main channel of Stout's Creek between Mound and Middle Spring and does not appear to be exiting from valley fill. It is lower in elevation than either Mound or Middle and has a longer flow frequency. The spring is intermittent and typical flow rate is 1 to 2 gpm. The spring does have PCB contamination. There is evidence that the spring is hydraulically connected to the buried valley of Stout's Creek because pump testing of a well located within the buried valley in November 2005 resulted in a significant decrease in spring flow.

Comment 204: Assessment of PCB releases from Bennett's account for only a portion of the observed contamination in Stout's Cr. The proposed alternatives do not address the

stream contamination identified as coming from elsewhere. Are there other releases around Bennett's, or is this evidence of ongoing release from Lemon Lane which feeds Slaughterhouse Spring above Bennett's? Wasn't it already determined that the release from Lemon Lane went through Illinois Central Spring? Are we seeing a recurring picture here that any movement of waste on the sites changes the flow regime? Neal's and Bennett's developed new springs, and now there is evidence that the pre-"cleanup" assessment of contaminant release is no longer the full picture. Why not capture and treat all contaminated water?

Response: The commenter is referred to the large amount of sampling data which demonstrates no significant PCB contamination flowing into Stout's Creek from locations other than Bennett's Dump. The data do not demonstrate that other PCB releases upstream from Bennett's Dump exist. Slaughterhouse Spring has infrequently shown low levels of PCBs but has not affected Stout's Creek based on sampling data. A total of 40 of 42 routine monitoring water samples collected from Stout's Creek immediately upstream from Bennett's Dump during the 2000 to 2005 were non-detect for PCBs. The two qualified detections of PCBs during this period were just above the analytical reporting limit of 0.1 ug/L. EPA is not of the opinion that we are seeing a recurring picture that movement of waste on the site changes the flow behavior.

Comment 205: The use of fillet v. whole fish in the risk assessment is unclear. By "taking home a catch", the choice of whole fish or filet consumption is based on total mass consumed in the meal rather than a number of whole fish or filets. From my recollection as a creek fisherman, the smaller fish tend to be consumed as whole fish. Their bones are relatively soft and digestible. What might seem more appropriate is to measure the dioxin-like PCBs in the whole fish and filet, and then base the risk calculation on whichever is greater adjusted for a standard portion size, say 8 oz. Please clarify.

Response: EPA recognizes that some percentage of smaller fish may be consumed as whole fish -- as noted by the commenter, "their bones are relatively soft and digestible" and obtaining fillets from smaller fish may be more difficult because of their size. However, EPA believes that the majority of fish (both pelagic [for example sunfish] and benthic [for example, white suckers]) consumed by anglers will be consumed as fillets over the long-term. Therefore, for the purpose of risk assessment calculations, all whole body analytical results were converted to fillet equivalents. This allowed composite fish tissue concentrations (representative of consumption of both pelagic and benthic fish) to be calculated.

It should be noted that EPA did account for potential consumption of smaller fish by identifying fish as small as 80 millimeters (about 3 inches) in length to be "harvestable." EPA also accounted for the potential ingestion of whole smaller fish by increasing the percent of total fish body weight represented by fillets. These two conservative steps contributed to the calculation of higher more health-protective (conservative) location-specific fish biomass estimates and, therefore, sustainable fish tissue ingestion rates based on population studies conducted by CBS on Stout's Creek. The use of location-specific

health-protective fish tissue ingestion rates helps off-set any uncertainty introduced by not evaluating regular consumption of whole fish.

Comment 206: How are the nine criteria used in the selection of "best" alternative weighted? Are there primary and secondary (or even less important ones)? Can that analysis be presented to help in understanding the selection process? How can it be that other agencies did not comment on the proposed plans?

Response: First, regarding other agencies commenting on the Proposed Plan, they can submit public comments if they so desire. The United States Fish and Wildlife Service have been involved in site discussions and based upon those discussions, they support the implementation of Alternative 5. A description of the nine criteria and how they are used is described in the ROD Amendment.

Comment 207: Discussion of alternatives cites a reluctance to remove the remaining contamination as "difficult" and therefore less preferred. Considering that the quarrying operation moved blocks of stone at depths during a time when the machinery was quite a bit less advanced than now,... and kept the quarry dry, it is "difficult" to imagine that it is actually too difficult to remove the waste. How difficult is it actually? Digging a 800 ft long trench in solid rock at greater than 30 ft depth to intercept water would also seem to be "difficult". (Hopefully, I have not misunderstood that the 8 ft depth of the trench is measured from the surface of the quarry area. The springs are coming out at some 30 ft below the upper surface and to capture them requires a trench 8 ft below them, or at about 38 ft deep.)

Response: The 8 foot depth of the trench is a general estimate and would vary according to design phase data, elevation along the alignment and grade to achieve gravity drainage. The proposed interceptor trench would extend into the shallow bedrock along Stout's Creek. A typical trench bottom elevation near Middle Spring would be about 718 feet. EPA is of the opinion that you cannot compare the quarrying of limestone blocks to the excavation of PCBs in buried former quarry pits mixed with rubble, soil and debris. The difficulty in excavating the buried quarries would be dealing with the large amount of excavation at depth with PCBs mixed with groundwater. In addition, the need for groundwater treatment would still be required.

Comment 208: It is difficult to understand how leaving contamination in an unlined deposit, which is clearly leaking, is to be preferred to excavation and removal to a well-engineered containment facility is better for long-term protection. Although there is no actual destruction proposed anywhere in the alternatives, and any contaminants removed will go to a RCRA landfill, or TSCA combustion facility. There is no reduction in mobility or toxicity inherent in the alternatives. How would the contaminated carbon be treated? There is also the problem of removal of fine soil particles and there disposal. (Without removal, the carbon becomes coated and its removal efficiency plummets.) Please explain.

Response: The information obtained during the investigation of Bennett's Dump and the problems discovered during the 1999 excavation, particularly the influence of groundwater at depth, makes the excavation within the buried quarries extremely difficult. EPA and the State are of the opinion that excavating the buried quarries would not eliminate the need for further groundwater treatment. There is reduction in mobility and toxicity by capturing and treating groundwater using carbon adsorption. Carbon can be regenerated through thermal treatment if the values are less than 50 ppm PCBs. The commenter is correct that fine soil particles could foul the carbon but total suspended solids data from the springs does not indicate that this will be a problem. In addition, backwashing of carbon to remove suspended solids is very common with carbon adsorption units. If during the design phase fouling is determined to be an issue, it can be addressed through the use of filters or backwashing.

Comment 209: The removal alternative (4) is coupled with a passive remediation system. This adds to the cost and is difficult to understand. If the source of contamination is removed what need is there for an additional system?

Response: The purpose of adding the passive drain system to the excavation of the buried quarry pits is to minimize the amount of water to be treated by bypassing clean surface water around the PCB contaminated area and not allowing it to recharge groundwater and become contaminated. This is expected to reduce overall groundwater flow to Stout's Creek. In evaluating the excavation of the quarries and the difficultly in removing all the PCB contamination, the Agency was of the opinion that adding the passive quarry drain would ensure that releases would be reduced to Stout's Creek. Based upon the information gathered during the 1999 excavation, the difficulty with groundwater within the excavation and the large amount of rubble and debris from quarrying, would make it very difficult to remove all the PCB contamination. Therefore, the passive quarry drain was added. EPA is of the opinion that even if the buried quarries were excavated, water treatment at the site would still be required.

Comment 210: Little consideration was given in the proposed alternatives to simply emplacing an array of extraction wells in the zones of contamination and treating the more seriously contaminated water. Wells seem to be a cheaper alternative to an 800 foot-long trench emplaced below the Bennett's quarry zones which are 30 feet into bedrock. The excavation costs plus the backfill with clean gravel would seem to be prodigious. Please explain the costing of the alternatives.

Response: Pumping well arrays and extraction trenches each offer advantages and disadvantages. Wells require pumps but a cutoff trench may be gravity drained to one or a few sump recovery points. Tests have shown the well yields may be expected to be limited to a few gallons per minute and thus several wells would be required to depress the water table uniformly over a large area. The recovery trench may also take advantage of a buried former channel of Stout's Creek located east of the current channel for groundwater collection. Pump tests conducted in this area in November 2005 showed buried sand and gravel deposits in the channel to be interconnected but limited well yield could be expected.

With respect to pumping of zones of contamination, four test wells were installed in June 2005 into the contaminated quarry pit areas uncovered during the 1999 remediation. Pumping of the test well demonstrated hydraulic connection of the quarry pits, and PCB levels during a six-hour pump test were in the range of 150 to 280 ug/L. However, only one of these wells would maintain a 5 gpm pump rate.

Outside the quarry pit areas, PCBs have been detected in several shallow wells and piezometers completed at the bedrock surface within and adjacent to the 1999 remediation area. Theses wells and piezometers are located along a buried former channel of Stout's Creek that is located east of the current channel and downgadient of the quarry pits. The wells and piezometers extend along the buried channel for a distance of about 500 feet roughly parallel to Stout's Creek. The PCBs concentrations in the shallow groundwater from these wells ranged from 11 to 5,800 ug/L in October 2005. EPA believes that groundwater in this buried channel is a significant source of PCBs to some of the site springs as well as a source of direct PCB discharge to Stout's Creek. A pump test of one of these wells in November 2005 located near Middle Spring indicated that sand and gravel deposits in the buried channel were interconnected and produced PCB concentrations of 2.9 to 4.9 ug/L over a 48-hour test pumping period. Moreover, the pumping was observed to reduce the flow rates of Middle Spring and Mid-North Spring 98 percent and 93 percent respectively.

EPA believes that groundwater recovery at Bennett's Dump should be conducted in a manner to collect groundwater from the entire 500 foot length of the buried valley, the site springs, and the upgradient buried quarries. The proposed collection trench is located in a manner to fulfill all these recovery objectives and appears to be a better alternative that widely-spaced groundwater recovery wells.

Comment 211: The preferred alternative calls for a capture trench on the west side of the contamination source between it and Stout's Cr. Considering that the springs are intermittent suggests that release is induced primarily during rain events. Where does groundwater go when there are only small rain events and little spring addition to Stout's? Also considering that Icebox Quarry which is upgradient from the Bennett's sites shows contamination and that the groundwater flow is not towards the trench and Stout's Cr, but, instead follows more the regional gradient, which is more southerly than westerly. Also, consider other sources of contamination that appear to access Stout's Cr upstream. The system may be in the wrong location. Please clarify.

Response: Spring flow appears to be directly related to local groundwater levels and groundwater levels fluctuate seasonally as well as with storm events. As noted in the response to Comment 203, EPA believes there is direct "underflow" discharge of PCBs to Stout's Creek in addition to the known spring flow discharges. The proposed capture trench in the shallow bedrock allows capture of the underflow component of PCB release in addition to the direct spring flow component.

EPA's current thoughts are that Ice Box Quarry is contaminated from groundwater flowing into the quarry from the adjacent former Satellite area. In addition, the commenter is referred to the large number of piezometers installed at and around the site, which have been used to develop bedrock and potentiometric surface maps. These maps demonstrate shallow groundwater flow toward Stout's Creek and the proposed collection trench.

The EPA is not sure what the commenter is referring to as upstream sources of contamination. Other PCB sources upstream of the site in Stout's Creek are not producing PCBs at levels which effect Stout's Creek or the location of the collection trench. The commenter is referred to the sampling data from Slaughterhouse spring in the Lemon Lane Administrative Record.

Comment 212: The State requirement for a maximum of 0.79 ng/L release to streams is stated without reference to state regulations. Please identify the source and explain why the State granted such a discrepancy (300 ng/L) between what is required and what is proposed? Considering the cited impacts on mink and kingfisher, how can such an exception be used?

Response: The commenter is referred to the January 30, 2006 correspondence in the Bennett's Dump Administrative Record from IDEM to EPA regarding how the discharge criteria are calculated and implemented by IDEM. The following is taken directly from the IDEM correspondence.

> *"Based on the applicable water quality standards set forth in 327 IAC 2-1-6, the water quality-based effluent limitation (WQBEL) for PCBs in surface water outside of the Great Lakes Basin would be based upon the human health criterion of 0.70 parts per trillion (ppt). The WQBEL for PCBs would be substantially less than the limit of quantitation normally achievable for detection of PCBs in surface water. Consequently, in accordance with 327 IAC 5-2-11.1(f)(1), with respect to PCBs, IDEM inserts into the NPDES Permit, among other conditions, a provision stating that effluent concentrations less than the limit of quantitation are in compliance with the effluent limitations. For permits with WQBELs for PCBs, IDEM has been including Test Method 608 as the appropriate test method to use and the 0.1 ppb as the limit of detection and 0.3 ppb as the limit of quantitation. In accordance with 327 IAC 5-2-16- (c)(2), if at any time a new analytical method for detecting PCBs in surface water that allows for a lower limit of quantitation is approved by IDEM or the United States Environmental Protection Agency (U.S. EPA), IDEM will modify the NPDES discharge limits accordingly."*

Considering the effluent limits, EPA is of the opinion that if the water treatment plant does treat contaminated water to under 0.3 ppb PCBs, then the future risk to kingfisher and mink will be within acceptable levels.

Comment 213: Claiming that there is no analytical method to achieve the required detection level and therefore allowing a 300 ng/L (~380X greater) release level is wrong. First, what method was used to determine the levels in Icebox Quarry as 100 ng/L, or used at ICS Treatment to get to 200 ng/L? Actually, modifications of standard analytical techniques (available under CLP as Special Analytical Service) can achieve detections much closer to the required target to protect the ecosystem. Even the standard method for PCBs (SW-846 Method 8082) can routinely achieve detections of PCB congeners of 5 – 25 ng/L With slight modifications, even lower detections are achievable. Because EPA is dealing with weathered PCBs, Method 8082 recommends congener analysis rather than Aroclors as more accurate. Congener analysis also measures the dioxin-like PCBs that are the really dangerous substances driving the remediation.

Response: IDEM has the authority for the development NPDES requirements. The substantive requirements it develops as part of its NPDES program may be applicable, or relevant and appropriate, substantive requirements for purposes of setting cleanup standards (unless waived) under the Superfund program. As described in the previous comment, IDEM has identified 327 IAC 5-2-11.1 as a relevant and appropriate cleanup standards, standards of control, and other substantive requirements, criteria, or limitations in determining PCB discharge criteria for any water treatment plant built at Bennett's, because it provides a way to determine a cleanup level for PCBs where the WQBEL for PCBs is 0.79 part per trillion and, therefore, is less than the limit of quantitation normally achievable and determined by the Indiana to be appropriate for PCBs. Accordingly, and consistent with its regulations, Indiana identified an approved analytical methodology that reliably can disclose PCBs in effluent at concentrations of 0.3 ug/l effluent standard would apply to the Bennett's Dump site.

Comment 214: The proposal of carbon-adsorption for water cleanup is reasonable, but is also flexible. By increasing surface exposure and water residence time significant improvements in removal efficiency can be achieved. Are there inherent limits on the partitioning of PCBs from water by carbon such that there is no way to achieve the state-recommended limit of 0.79 ng/L?

Response: The commenter wrongly assumes that the State recommended that the proposed treatment plant reduce the concentration of PCBs to 0.79 ppt. This is incorrect. The State recommended a discharge criteria of 0.3 ppb.

The commenter is perhaps confused about the difference between "water quality criteria" and "water quality based effluent limits" (WQBELs). The State has established a surface water quality criteria of 0.79 ppt for PCBs in waters of the State that are not part of the Great Lakes System. This water quality criteria is not the recommended effluent limit for the proposed treatment plant. Rather, it is the basis for the effluent limit determined by the State in accordance with 327 IAC 5-2-11.1. Relying upon this provision, in particular subparagraph (f), the State indicated to EPA that the effluent limit for the proposed treatment plant at Bennett's Dump will be 0.3 ppb. The proposed carbon adsorption technology will meet this discharge criteria.

Turning back to the commenter's question, it is true that there are inherent limits to the partitioning of PCBs from water by carbon. These inherent limits, however are not the basis for the 0.3 ppb discharge criteria identified by the State. The discharge criteria is based upon the inherent limits in the measurement of PCBs. Applying its standard test method for PCBs, the state has determined that the limit of quantitation is 0.3 ppb. EPA expects that the adsorption technology implemented under the remedy will reduce PCBs to a concentration that is substantially below the 0.3 ppb discharge criteria.

Comment 215: The presence of other contaminants such as diesel fuel can interfere with the capacity of carbon-adsorption of PCBs. Has this been taken into consideration in the selection of remediation technology?

Response: The commenter is correct that diesel fuel in high concentrations can interfere with the effectiveness of carbon adsorption technology. The levels of diesel fuel components discovered during the excavation phase along with sampling of the springs which does not indicate the presence of VOCs gives EPA comfort that carbon adsorption technology will be effective.

Comment 216: The similarity of water in Mound Spring and Wedge Quarry is based on specific conductivity and attributed to road salt. Where did the salt come from? Certainly not from deicing gravel roads on the quarry area. Was this confirmed by analysis of sodium and chloride concentrations? Considering that this is used to support plans for dewatering Wedge as a driver of Mound Spring releases, it may need an analytical confirmation. Also, if a source can be identified, what does this tell us about groundwater flow directions? There is a large highway maintenance yard nearby. Could this be the source?

Response: EPA is of the opinion that runoff from deicing SR-37 and SR-46 flowed into the Wedge Quarry complex via direct surface runoff. The southernmost open pits of the Wedge quarry complex are located directly at the foot of the interchange embankment. The relevant analytical data are presented in Table 12 of Viacom (February 2004) *Final Report for the Groundwater Investigation at Bennett's Dump*. Major cations and anions were analyzed by the Indiana University Department of Geological Sciences. The similarity of the water at Mound Spring and Wedge Quarry is based on direct measurements of chloride concentration, and the elevated chloride concentrations are generally reflected by high specific conductance values.

The referenced INDOT maintenance facility is located north or the intersection of Arlington Road and North Prow Road. Surface drainage from this facility is to the north and it is therefore an unlikely source of chloride to the Bennett's Dump area to the southeast.

Comment 217: More recent data suggests a recontamination of Stout's Cr sediment consequent to the 1999 remediation. It is used as part of the risk assessment and constitutes an ongoing source of PCBs after the new remedies are in place. Yet, no plans for further removal of sediment are included. Please explain.

Response: EPA does not agree with the commenter that Stout's creek has been recontaminated based upon the sediment sampling data. The sampling data shows PCB contamination under 1 ppm PCBs. In addition, the sediment alone did not show unacceptable risk with respect to human exposure. The lack of PCB contamination in the sediment and the low amount of risk produced by the sediment justifies not removing sediment from Stout's Creek.

Comment 218: Disposal of contaminated soil and residues captured in the treatment process will be evaluated for consideration as hazardous waste and if so, sent to an appropriate RCRA/TSCA facility. What analytical methods will be used for this evaluation? Somehow there is contamination in the water released to Illinois Central Spring, but none shows up in the treated water or in the removed sediment. Is there an analysis of the carbon to determine disposal needs? What plans are there for analysis of carbon for this new facility?

Response: Based upon information to date, the treatment residuals will be analyzed for disposal by using the Toxicity Characteristic Leaching Potential (TCLP) test and PCB analysis. The commenter is mistaken in the statement that contamination is not found in the sediment at the ICS water treatment plant. The carbon used in the treatment of the water will be tested for PCBs and based upon the concentration, either it will be disposed of in an appropriate landfill or it may be regenerated.

Comment 219: CBS states in its comments that Alternative 1 (No Action) should be chosen as the preferred remedy since the site does not present a significant risk to human health or the environment. CBS also states that EPA may continue to perform groundwater monitoring is they choose but any action at the site is unwarranted.

Response: EPA disagrees with the commenter. The No Action alternative would not address the risk to both human health and the environment.

Comment 220: National Pollution Discharge Elimination System (NPDES) program requirements of the Clean Water Act (CWA) are neither applicable, nor relevant and appropriate, requirements for an on-site water treatment plan if such a plant is constructed as part of the Bennett's Dump remedial action. First, CBS states that it agrees with EPA that NPDES permit requirements are not applicable. Next, CBS states that the substantive NPDES requirements are not relevant and appropriate for the water treatment plant, because the NPDES requirements regulate the "discharge of pollutants" (defined as the addition of pollutants to navigable waters) from a "point source." In this case there is no NPDES-regulated "discharge of pollutants," because the proposed plant would not add pollutants to those already occurring as a result of existing groundwater and surface water flows. In short, "the Bennett's Dump proposal does not involve adding anything to Stout's Creek which would not have flowed there if no action was taken." [Comment Letter at 6.] Instead, the water treatment plant would reduce (and not add) pollutants going to Stout's Creek. Further, there is no "point source" subject to regulation here, because "there is no human effort directing the flow of water. Rather, groundwater

emerges from natural springs and flows directly into surface water. The proposal is to intercept that flow and put the treated water back in the same place where it would naturally flow if not intercepted."

Response: EPA disagrees with the comment. The NPDES program requirements of the CWA are relevant and appropriate requirements for an on-site water treatment plant at Bennett's Dump.

As the lead agency for the site, EPA is charged by 40 C.F.R. § 300.400(g) with identifying applicable or relevant and appropriate requirements to the release or remedial action contemplated for the site. As the commenter correctly notes, EPA determined that the NPDES program requirements of the CWA were not "applicable" to the proposed water treatment plant at Bennett's Dump. This is because Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), specifically exempts remedial actions, such as the proposed water treatment plant, from the permit requirement imposed by the NPDES program. Nevertheless, EPA determined that the substantive requirements of the CWA were "relevant and appropriate" to the proposed plant. Specifically, EPA determined that 327 IAC 5-2-11.1, which sets forth the procedure for establishing a water-quality based effluent limits (WQBEL) for various pollutants including PCBs, was "relevant and appropriate" to establishing the effluent limit for PCBs discharged by proposed water treatment plant at Bennett's Dump.

CBS argues that substantive requirements of the NPDES Program are not "relevant and appropriate" because the proposed water treatment plant will not be subject to the CWA. CBS's argument confuses the difference between requirements that are "applicable" and those that are merely "relevant and appropriate." Even if a requirement is not "applicable," EPA is nevertheless required to determine whether a regulation may be relevant and appropriate to the circumstances of the release. 40 C.F.R. § 300.400(g)(2). A "relevant and appropriate" requirement means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5 (emphasis added). EPA believes that the substantive requirements of the NPDES program are "well-suited" to the cleanup at Bennett's Dump because the NPDES Program, similar to the proposed CERCLA action, is concerned with abating the harmful effects of pollutants discharged into the nation's waterways.

Under 40 C.F.R. § 300.400(g)(2), EPA is required to examine eight factors, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated. Id. An examination of these factors (below) shows that EPA reasonably determined that the substantive requirements of the NPDES Program, including 327 IAC 5-2-11.1, were "relevant and appropriate" to the proposed waste water treatment plant.

Factor 1: The purpose of the requirement and the purpose of the CERCLA action: The objective of 327 IAC 5-2-11.1 is to establish water quality based effluent limits for pollutants discharged into waters other than those within the Great Lakes system. The State of Indiana has established water quality critiera to restore and maintain the chemical, physical and biological integrity of the waters of the state. Pertinent to the present case, the State has determined that the concentrations of PCBs in Indiana waterways shall not exceed .79 parts per trillion ("ppt"). Based upon this water quality criteria, the State has also determined, in accordance with the guidelines set forth at 327 IAC 5-2-11.1, that dischargers of PCBs cannot discharge PCBs at a concentration greater than .3 parts per billion (ppb).

The problem addressed by 327 IAC 5-2-11.1 is similar to the circumstances of the remedial action proposed by EPA for Bennett's Dump. Here, PCBs from the site are being released into Stout's Creek. To protect human health and the environment from these releases, EPA has proposed, among other things, constructing a water treatment plant to capture and treat the PCB-contaminate water before it is discharged into Stout's Creek. A critical question in implementing this remedial action concerns the amount of PCB reduction that is necessary. That is, EPA must determine what concentration of PCBs can be discharged into Stout's Creek without threatening human health and the environment. The procedure set forth at 327 IAC 5-2-11.1 is directly relevant to answering this question, and it is therefore appropriate for EPA to use 327 IAC 5-2-11.1 in selecting the proposed remedy.

Factor 2: The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11.1, is concerned with protecting the waters of the State from the harmful effects of pollutants, such as PCBs. Similarly, the proposed remedial action is concerned with protecting Stout's Creek – one of the State's waterways – from the harmful effects of PCBs. This factor, therefore, supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 3: The substances regulated by the requirement and substances found at the Site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11.1, regulates the discharge of "pollutants," which includes PCBs. PCBs are also the contaminant of concern with respect to the proposed remedial action. Therefore, this factors also supports EPA's determination that the State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 4: The actions or activites regulated by the requirement and the remedial action contemplated at the CECRLA site:

Like all NPDES program, the State of Indiana's NPDES Program regulates the "discharge" of pollutants into the State's waters. Section 503(12) of the CWA, 33 U.S.C.

§ 1362(12), defines the "discharge of a pollutant" in relevant part to mean "any addition of any pollutant to navigable waters from any point source." Here, the Bennett's Dump site is similar to a "point source" if it is not, in fact, a point source. EPA believes, therefore, that these circumstances at the site are similar enough to the activities regulated by the State NPDES program that the substantive requirements of that program are "relevant and appropriate" to the proposed remedial action.

Section 503(14) of the CWA, 33 U.S.C. § 1362(d), defines the term "point source" to mean "any discernible, confined and discrete conveyance . . . from which pollutants are or may be discharged." Cases brought under the CWA establish that the term "point source" is to be broadly construed. Dague v. City of Burlington, 935 F.2d 1343, 1354-55 (2d Cir. 1991); Albahary v. City and Town of Bristol, Connecticut, 963 F.Supp. 150, 152-53 (D. Conn. 1997). The term not only includes pipes or ditches, but also large land areas, such as strip mining pits and mine tailing ponds. In Washington Wilderness Coalition v. Hecla Mining Company, 870 F.Supp. 983 (E.D. Wa. 1994), the Court held that two dirt-filled mine tailing ponds and a third, active, unlined mine tailing pond from which contaminants were leaching could be point sources. Similarly, in Sierra Club v. Abston Construction, 620 F.2d 41, 45 (5th Cir. 1980), the Court held that a strip mine was a point source where "the miner at least initially collected or channeled the water and other materials" that eventually resulted in a discharge into a navigable body of water. See also Beartooth Alliance v. Crown Butte Mines, 904 F.Supp. 1168, 1174 (D. Mont. 1995)("This Court finds that Glengarry Adit, McLaren Pit, and Como Pit are 'discernable, confined and discrete' conveyances constituting point sources.").

All of these cases support the conclusion that the Bennett's Dump site is a point source. The site occupies an abandoned limestone quarry where stonecutters changed the surface of the land to direct the water flow or otherwise impede its progress. Evidence of this fact is plainly visible to this day because there are a number of large rain-filled quarry pits surrounding the site. Further human efforts to change the surface or direct water flow include the filling of the quarry pits with debris, garbage, and industrial waste including capacitors and PCB-containing dielectric fluids. As result of these activities, PCBs are now discharged from the site into Stout's Creek, and hence, the site is a "point source."

The cases relied upon by the commenter are not inapposite. Citing Sierra Club and Friends of Santa Fe County v. LAC Minerals, Inc., 892 F.Supp. 1331 (D.N.M. 1995), the commenter argues that various springs within the Bennett's Dump site are not point sources. This argument, however, misses its mark. Sierra Club and Santa Fe stand for the unremarkable proposition that a point source requires some human effort to direct water flow or impede its progress. Here, as already noted, the progress of water flow at site has been impeded by past human activities at the site. As result of these activities, water now collects in the debris-filled quarry pits and becomes contaminated with PCBs. After the water rises high enough that it overflows the buried pit, the contaminated water flows across the surface of the abandoned dump and enters into Stout's Creek. No more is required to show that the site is a "point source" or, at the very least, that the site is

similar enough to a point source that EPA reasonably determined that the substantive requirements of the CWA were "relevant and appropriate" to the site.

There are also other facts that further bolster this conclusion. For example, CBS has installed weirs along the paths of surface water flows from each of the three springs that now discharge PCB-contaminated water to Stout's Creek. Each of the weirs is a "confined and discrete conveyance" from which pollutants are discharged. Moreover, CBS has created a plastic-lined channel for the surface water flows associated with mound spring. This channel qualifies as a "point source."

A second argument made by the commenter is that future discharges from the proposed water treatment plant are not "discharges" under the CWA. Specifically, the commenter argues that the purpose of proposed plant is to *reduce* the concentration of PCBs entering into Stout's Creek. Since the plant is not *adding* pollutants to Stout's Creek, the commenter maintains that the effluent discharged by the plant does not qualify as a "discharge" for the purposes of the CWA.

This argument overlooks the fact that the site, not the plant, is adding pollutants to Stout's Creek. If the commenter's argument were correct, then a publicly owned treatment works (POTW) would not need to obtain an NPDES permit because a POTW does not add pollutants to the waste stream that flows through the plant. Rather, a POTW merely removes pollutants from the wastestream. Numerous courts, however, held that POTWs are subject to the NPDES program.

A similar argument to the one raised by CBS was considered and rejected in Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990). There, the City of Burlington argued that a culvert that conveyed leachate from a landfill was not a "point source" because the culvert did not add pollutants to the waters of the United States. The Second Circuit rejected this argument, and held that the landfill and the culvert were each point sources, explaining that the CWA was not limited to discharges that flowed directly into the waters of the United States. Id. at 1354-55. In Dague, the City of Burlington owned and operated a landfill that accepted industrial and municipal waste. Waste at the landfill was buried to a depth nine feet below the groundwater table on the northern edge of the landfill. The landfill was bounded on the west and northwest by a marsh area called the Intervale and by a Beaver Pond (which was part of the southeastern part of the marsh.) A railroad embankment bounded the north of the landfill and a culvert under the embankment connected Beaver Pond with the northeastern portion of the Intervale. Rainwater and run-off percolated into the landfill mass. Further, because the part of the landfill was below the groundwater table, groundwater mixed with landfill contaminants. As explained by the Court:

> The leachate generated both by percolation of precipitation into the landfill mass and by flow of groundwater through the refuse. . . . Because the landfill is unlined, the leachate enters the upper gradients or 'flow tube' of groundwater under the landfill. The ground water then flows north beyond the landfill boundaries, and the flow tubes of the leachate-

> contaminated groundwater all surface in the Intervale, north of and within 300 feet of the railroad embankment
>
> Leachate has also emerged from the sides of the landfill via seeps. From there it flows into Beaver Pond and thence through the culvert under the railroad embankment and into the Intervale.

Id. at 1347. The District Court held that City-owned and operated landfill had discharged pollutants from a point source into waters of the United States in violation of the CWA. Id. at 1346-47; 1349. The District Court ruled that the point source here was the railroad culvert. The City of Burlington challenged that finding, arguing that the definition of a point source includes both physical and functional characteristics, and the culvert did not meet the functional requirement, because the culvert did not "add" pollutants to navigable waters and that pollutants would be added only when they are introduced into navigable waters for the first time. Id. at 1349; 1354. The Appellate Court rejected the City's argument that pollutant's must be discharged directly into navigable waters in order for the CWA to apply, and that liability attached where the defendants pollutants were discharged through conveyances owned by another. Id. at 1355. Instead the Appellate Court held that

> [p]ollutants from the landfill directly enter Beaver Pond before flowing through the culvert into the rest of the Intervale. Both Beaver Pond and the rest of the Intervale are parts of the marsh, and both are considered navigable waters for purposes of the CWA. Thus, any pollutants flowing through the culvert have already entered waters of the United States before they flow through the culvert.
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> * * *
>
> Given the broad reach of § 13112(a), we agree with the district court that the Burlington culvert was a point source. We also note that the definition of a "discharge of a pollutant" refers to "any point source" without limitation. 33 U.S.C. § 1362(12). Since the City's landfill caused pollutants to enter Beaver Pond [a navigable water of the U.S.], and since these pollutants were then conveyed into the rest of the Intervale by the railroad culvert, the district court's conclusion that the city discharged pollutants into navigable waters from a point source properly applied the statute to findings that were not clearly erroneous.

Id. at 1354-55 (emphasis added). In short, under one reading of the emphasized language the landfill itself was the point source directly discharging pollutants into Beaver Pond in violation of the CWA and it was not necessary to look to the culvert as constituting the point source.

Factor 5: Any variances, waivers, or exemption of the requirement and their availability for the circumstances at the CERCLA site

Under 327 IAC 2-1-8.8, the State may grant a variance from a water quality standard used to derive a WQBEL for a specific substance. In making this determination, the State must balance the increased risk to human health and the environment if the variance is granted against the hardship or burden upon the applicant if the variance is not granted. This determination is similar to the one that EPA made in selecting the proposed remedial alternative. Specifically, EPA found that the proposed remedial action was the best choice taking into account a number of factors, including cost. For the same reasons set forth in the proposed plan as to why Alternative 5 is the best choice among remedial alternatives, EPA believes that the variance under 327 IAC 2-1-8.8 should not be granted in the present case. Likewise, EPA believes that various exemptions available under its own regulations should not be granted here.

Factor 6: The type of place regulated and the type of place affected by the release or CERLA action:

As already noted, the State NPDES Program regulates dischargers of pollutants into the States' waterways. Similarly, under the proposed remedial action, EPA seeks to clean up a site that is discharging pollutants into a State waterway. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 7: The type and size of structure or facility regulated and the type of size of structure or facility affected by the release or contemplated by the CERCLA action:

As already noted, the State NPDES Program regulates "point source" of pollutants discharged into the State's waterways. Bennett's Dump is consistent with the size and type of point sources regulated under the Clean Water Act. The conclusion that the Bennett's Dump site is itself a point source is directly supported by Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990)(holding city landfill was a point source). Likewise, the proposed water treatment plant is consistent with the size and type of facilities that are routinely subject to the requirements of the NPDES Program. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 8: Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

The requirements of 327 IAC 5-2-11.1 apply to all waterways in the State that are not part of the Great Lakes System, regardless of the use or potential use of the waterway. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Comment 221: EPA and the State of Indiana have failed to identify specific effluent limitations for specific hazardous substances, pollutants, and contaminants and, instead, has identified only broad programmatic requirements. Thus, EPA and the State have failed to properly identify CWA requirements as ARARs.

Response: The commenter is incorrect. EPA refers the commenter to EPA's response to Comment 222 below. In addition, as explained by the State in its letter, as of the date that it identified its ARARs, there are no sample results reflecting the presence of a hazardous substance or pollutant or contaminant other than PCBs in the water emerging from the three Bennett's Dump springs. Diesel fuel contaminated with PCBs, however, was found in groundwater located at abandoned, back-filled quarry pits. Recent limited sampling of water emerging at the Bennett's Dump springs addition, does not show the presence of volatile organic chemicals (VOCs). Accordingly, although PCB-contaminated diesel fuel is present within the area of Bennett's Dump, no effluent limits can be identified for such hazardous substance or pollutant or contaminant, because so far no additional contaminants have been sampled for or have not been detected.

The State has identified its NPDES permit modification regulation (327 IAC 5-2-16(c)(2) and 5-2-16(d)(2)) as an ARAR and as a basis for being able to impose an effluent limit or other requirement for any such hazardous substance or pollutant or contaminant that is later identified (as well as a basis to identify newer methods for quantifying PCB concentrations). EPA agrees that while this may be the way the State handles discovery of additional contaminants (or newer quantification methodologies) at an NPDES-permitted facility, under Superfund EPA handles the discovery of additional contaminants, newer quantification methodologies, the inadequacy of existing treatment technologies, and other matters that may establish that a remedy is not protective, through amendments or other changes to its selected remedy using its remedy amendment process. The discovery of additional contaminants, newer quantification methodologies, or the inadequacy of existing treatment technologies may be raised to U.S. EPA at any time, and U.S. EPA's five year review process is one forum in which such matters may be formally raised and addressed. Thus, if additional hazardous substances or pollutants or contaminants are found to be in the water emerging at the Bennett's Dump Springs (or new PCB-quantitation methodologies are identified), and if these facts are raised to U.S. EPA, then it may be necessary to modify the selected ground water remedy to establish effluent limits or other additional requirements using EPA's processes for amending or otherwise altering a remedy selected in a record of decision.

Comment 222: Regarding PCBs, EPA and the State have not identified a legally enforceable effluent limitation that qualifies as an ARAR. Instead, EPA and the State rely on 327 IAC 5-2-11.1 as the vehicle to set an effluent limit of 0.3 parts per billion (ppb), because that is the limit of quantitiation (a level which can be reliably confirmed using existing measurement technology) using existing technology. The 0.3 ppb effluent limitation for PCBs does not qualify as an ARAR, because it has not been "promulgated" by the State as a regulatory standard.

Response: Indiana properly identified 327 IAC 5-2-11.1 as an ARAR and used that promulgated standard, requirement, criteria, or limitation to set an effluent limit of 0.3 ppb for PCBs. With respect to State ARARs, 42 U.S.C. § 9621(d)(2)(A)(ii) provides that

"any promulgated standard, requirements, criteria, or limitation under a State environmental . . . law that is more stringent than any Federal standard, requirement, criteria, or limitation . . . is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant and appropriate under the circumstances of the release of such hazardous substance or pollutant or contaminant, the remedial action selected . . . shall require, at the completion of the remedial action a level or standard of control for such hazardous substance or pollutant or contaminant which at least attains such legally applicable or relevant and appropriate standard, requirement, criteria, or limitation."

This provision does not require that a State's "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" take the form of a specific, promulgated numeric effluent limit. Rather, it simply requires that the "standard, requirements, criteria, or limitation" identified as an ARAR be promulgated. Here, 327 IAC 5-2-11.1 is the relevant and appropriate standard, requirement, criteria, or limitation promulgated by Indiana. 327 IAC 5-2-11.1(f) in pertinent part provides:

(f) When the WQBEL for any substance is less than the limit of quantitation normally achievable and determined by the commissioner to be appropriate for that substance in the effluent, the permit shall contain the following provisions:
(1) The permittee shall be required to use an approved analytical methodology for the substance in the effluent to produce the LOD and LOQ achievable in the effluent. The analytical method, and the LOD and LOQ associated with this method, shall be specified in the permit in addition to the following requirements:
(A) The permit shall include conditions that state that effluent concentrations less than the limit of quantitation are in compliance with the effluent limitations.
(B) In addition, the permit shall require the permittee to implement one (1) or more of the following requirements:
(i) Develop a more sensitive analytical procedure.
(ii) Use an existing, more sensitive, analytical procedure that has not been approved by EPA.
(iii) Conduct studies to determine the bioaccumulative or bioconcentrative properties of the substance in aquatic species through caged-biota studies or fish tissue analyses of resident species.
(iv) Conduct effluent bioconcentration evaluations.
(v) Conduct whole effluent toxicity testing.
(vi) Other requirements, as appropriate, such as engineering assessments or sediment analyses.
For substances defined as BCCs, at a minimum, either item (iii) or (iv) shall be included in the permit.

(2) If the measured effluent concentrations for a substance are above the WQBELs and above the LOD specified by the permit in any three (3) consecutive analyses or any five (5) out of nine (9) analyses, or if any of the additional analyses required under subdivision (1)(B) indicate that the substance is present in the effluent at concentrations exceeding the WQBELs, the permit shall contain provisions that require the discharger to:

(A) determine the source of this substance through evaluation of sampling techniques, analytical/laboratory procedures, and industrial processes and wastestreams; and

(B) increase the frequency of sampling and testing for the substance.

(3) The permit shall contain provisions allowing the permit to be reopened, in accordance with section 16 of this rule, to include additional requirements or limitations if the information gathered under subdivisions (1) and (2) indicates that such additional requirements or limitations are necessary.

Here, the WQBEL for PCBs is 0.001 part per billion, which is below the limit of quantitation and limit of detection normally achievable and determined by the commissioner to be appropriate for PCBs. As a result, in accordance with the promulgated requirements of the NPDES program, the State set the effluent limit for PCBs at 0.3 ppb, which is the level at which concentrations of PCBs can be reliably quantified.

In identifying 327 IAC 5-2-11.1 as an ARAR, Indiana properly and timely identified a "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" and through application of that standard, requirements, criteria, or limitation derived the 0.3 ppb PCB effluent limitation.

EPA also notes that in its footnote 7 (Comment Letter at 7), CBS identifies a 3 pbb effluent limit taken from EPA Toxic Substances Control Act Spill Policy regulations (40 C.F.R. § 761.79(b)(1)(ii) as a higher (less stringent) limit than the "unpromulgated" limit of 0.3 pbb identified by the State. EPA concludes that the Stale limit of 0.3 pbb derived from application of Indiana's promulgated standard, requirements, criteria, or limitation at 327 IAC 5-2-11.1 is more stringent than the Federal requirement and, therefore, will be used.

Comment 223: PCB effluent limits that could be calculated pursuant to 327 IAC 5-2-11 and 327 IAC 5-2-11.2 also are not ARARs, because those levels are not verifiable using existing technology, and where numerical limits are infeasible, EPA can instead establish conditions to reduce pollutants to an acceptable level by, for example, using best management practices to control or abate the discharge of pollutants.

Response: The commenter appears to be suggesting that PCB effluent limits other than the 0.3 ppb effluent limit could be calculated pursuant to 327 IAC 5-2-11 and 327 IAC 5-2-11.2. Whether or not this is true is immaterial. Based upon consultations with the

State, EPA has determined that the proposed remedy will comply with ARARs under the State's NPDES program if, among other things, the proposed treatment plant meets or exceeds a discharge limit of 0.3 ppb. This discharge limit is verifiable using existing technology.

Comment 224: The 0.3 ppb PCB effluent limit, if it is an ARAR, should be waived under 42 U.S.C. § 9621(d)(4)(C) on the basis that it is technically impracticable to meet this limit from an engineering perspective.

Response: EPA declines to consider a technical impracticability waiver for 327 IAC 5-2-11.1 and the effluent limit of 0.3 ppb PCBs. Given the water flows and volumes at the Site, designing, constructing, and operating a water treatment plant that captures and removes PCBs to an effluent of 0.3 ppb is practicable from an engineering perspective. Indeed, the water treatment plant designed and constructed by EPA at the Illinois Central Spring Site consistently treats PCBs to this level .

Comment 225: The 0.3 ppb PCB effluent limit should also be waived under 42 U.S.C. § 9621(d)(4)(E). This provision "authorizes EPA to waive State ARARs when they are not consistently applied by the State." [Comment letter at 8.]

Response: There is no basis for providing this type of waiver here. The State timely identified 327 IAC 5-2-11.1 and the 0.3 ppb PCB effluent limit (which is based on current testing methodology reliability limitations). Indiana has demonstrated an intention to consistently apply 327 IAC 5-2-11.1, and EPA is unaware of examples of the State of Indiana being inconsistent in its application 327 IAC 5-2-11.1. Accordingly, EPA is unaware of a basis for waiving 327 IAC 5-2-11.1 and a 0.3 ppb PCB effluent under 42 U.S.C. § 9621(d)(4)(E).

Comment 226: CBS has stated that air emission provisions identified by IDEM are not ARARs. In the Fact Sheet, EPA notes that the State has identified as ARARs three requirements relating to major sources of hazardous air pollutants (HAPs). These requirements are plainly inapplicable and not relevant and appropriate. One requirement, 326 IAC 2-4.1, applies to major sources of HAPs. But, based on the description of the remedial alternatives in the Fact Sheet, there is no proposal to construct a major source of a HAP. The second requirement, 326 IAC 2-5.1-3(a)(1)(D), applies to sources of HAPs which have the potential to emit ten (10) tons or more of a HAP in a year, and the third requirement, 326 IAC 2-5.1-2(a)(1)(A), applies to sources of HAPs which also have the potential to emit five tons or more of particulate matter. Again, no such source is contemplated. Accordingly, these requirements should not have been designated as ARARs. These requirements are not only wrongly identified as ARARs, but by identifying them, EPA has created the false impression that air emissions from the proposed remedies are more extensive than contemplated.

Response: EPA agrees that ARARs indentified by the State for Alternative 5 for air emissions would not be applicable or relevant and appropriate. The identified ARARS above would be relevant and appropriate for Alternative 4.

Comment 227: EPA's Human Health Calculations are based on Errors and Unrealistic Assumptions. CBS's states that because available data do not demonstrate any significant risk to human health or ecological receptors at the site, no further action is required. For most exposure pathways, EPA's human health risk calculations do not result in cancer risk levels or non-cancer hazard quotient numbers of concern. In those limited instances in which EPA has calculated risk levels which cause concern, those calculations are inaccurate or based on erroneous exposure assumptions. When risks are recalculated "properly" (emphasis added), the results show no significant risk that justifies any further action, except perhaps precautionary monitoring.

Moreover, the conclusion reached by the Agency for Toxic Substances and Disease Registry (ATSDR) in its 1996 Public Health Assessment – that neither children nor adults are likely to engage in activities in Stout's Creek that are likely to lead to significant exposures to site-related contaminants – is still valid in 2006. The planned construction of North Park Development does not alter that conclusion. The ATSDR conclusion was based not only on the size of the nearby population, but also on the nature of the area of Stout's Creek near the site, which does not provide a desirable location for either fishing or swimming. Stout's Creek is not a favorable fishing area and its shallow depth near the Site makes it unsuitable for swimming. Moreover, the proximity of the proposed North Park Development makes it less likely that citizens would use Stout's Creek for these activities, since people generally prefer to swim and fish in secluded areas, not next to sizeable commercial developments.

The only exposure pathways which appear to give EPA concern are fish ingestion and dermal exposure (to surface water). But EPA's calculations of [the] cancer and non-cancer risks [associated with these exposure pathways] are not accurate, using the very principles of risk assessment which the Agency had established. As discussed in detail in Exhibit 1 (which is incorporated by reference), EPA has made numerous errors in its risk calculations, failing in many instances to follow the principles of risk assessment which the Agency itself had developed. In particular, EPA overestimates the overall fish consumption from Stout's Creek and has biased its fish ingestion calculations on the assumption that there will be a high level of ingestion of suckers. These assumptions are ill-founded. Stout's Creek is a small creek which can only support very limited fishing. Additionally, suckers are not a favored fish for consumption and the affected area of Stout's creek has a very small sucker population. Similarly, EPA's calculation of the risks due to dermal contact with water in Stout's Creek is based on the unsupportable assumption that people will swim two hours a day for sixty-eight days a year in a body of water that is not really suitable for recreational swimming.

EPA's errors are corrected and the risks are recalculated, as shown in the analysis in Exhibit 1. The resulting calculations show that cancer and non-cancer risks posed by the Bennett's Dump Superfund Site are well below the levels which justify action. Cancer risks associated with the ingestion of fish caught at Acuff Road (the point of greatest exposure) are more properly calculated at 3.4 in 1,000,000, rather than 2.9 in 100,000 – an order of magnitude lower. The non-cancer hazard quotient index for fish ingestion at

Acuff Road is more properly calculated as 0.2 for both adults and children, as opposed to the level of 1.7 for adults and 4.3 for children calculated by EPA. The cancer risks associated with dermal exposure to surface water are more properly calculated as ranging between 1.1 in 1,000,000 to 5.8 in 100,000,000, depending on location – substantially lower than the 3 in 100,000 calculated by EPA. With respect to dermal exposure to surface water, the non-cancer hazard index is more properly calculated at 0.064 at Hunter Road and at 0.0064 at the other two locations, instead of the 1.6 calculated by EPA for all three locations.

These recalculated risk levels do not justify remedial action, applying EPA's own standards for risk assessment and risk management. In U.S. EPA OSWER Directive 9355.0-30 "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" at 1 (April 22, 1991), EPA announced its policy that "[w]here the cumulative carcinogenic site risks to an individual based on reasonable maximum exposure for both current and future land use is less than 10(-4) [less than 1 in 10,000] and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." Applying this standard to the Site, no remedial action is required, because, when properly calculated, all the cancer risks are well below 1 in 10,000 – indeed, well below 1 in 1,000,000 – and all the non-cancer hazard quotients are well below 1. Thus, no further action is justified by human health risks.

Response: EPA's responses to each of the comments above regarding particular elements of the HHRA are addressed in the responses to specific comments below. However, EPA's responses to several points raised by CBS are presented below.

EPA agrees that the combined fish tissue EPC should be calculated based on the relative availability of sunfish and sucker in Stout's Creek. Risks and hazards associated with potential ingestion of fish tissue have been modified based on the revised combined fish tissue EPCs. Also, EPA acknowledges that the surface water EPC used in the HHRA represents an initial screening value. Because receptors are unlikely to be exposed to the maximum concentration of PCBs detected in surface water downstream of the site, the surface water EPC has been recalculated consistent with EPA guidance as the 95 percent upper confidence limit of the mean (95 UCL) of the surface water analytical results measured at the downstream sampling locations (EPA 1992, 2002) (see Attachment 1). Further, EPA agrees that the combination of an assumed exposure frequency of 68 days/year and an exposure time of 2 hours/day is overly conservative. Therefore, EPA has revised the exposure time to 1 hour/day; EPA continues to believe that an exposure frequency of 68 days/year is consistent with a reasonable maximum exposure (RME) scenario.

Recalculated risks and hazards are presented in Attachment 2. Reach-specific total risks are greater than or equal to 1E-06 (1 in 1,000,000) in all reaches and equal 1E-05 (1 in 100,000) in BD-2. EPA has the mandate and authority to address and risks greater than 1E-06. Recalculated hazards are less than 1 in all reaches. Further, PCBs are present in whole sunfish and suckers at concentrations greater than the Ambient Water Quality Criteria (AWQC)-derived fish tissue level of 0.025 part per million (ppm) and in sunfish

and sucker fillets at concentrations greater than the PCB action level of 0.05 ppm used to trigger Indiana's fish consumption advisories. EPA's decision to require remedial action (including, but not limited to, the halting of direct discharges of contaminated groundwater into the creek) is consistent with the National Oil and Hazardous Substances Pollutant Contingency Plan (NCP) (EPA 1990) and EPA policy.

Comment 228: Exhibit 1 - CBS Comments on the U.S. EPA's Human Health Risk Assessment for Bennett's Dump Site

The risk estimates that are provided in the HHRA still contain unnecessarily high levels of precautionary default assumptions and uncertainty. It appears that, in an effort to ensure that risks at the Site are not underestimated, a number of conservative default assumptions, which are not supported by available data or site characteristics, have been made and have resulted in substantially overestimated Site risks.

The key issues that have contributed to this overestimation include the following:

- *Risks due to fish consumption are still overestimated due to the fact that fish ingestion rates do not reflect realistic use of the resource. Further, the exposure EPCs are based on a limited number of samples and include sizes and species of fish that are not likely to be consumed by sport-fish consumers.*

- *Risks due to surface water contact are overestimated due to the use of an EPC, which is intended to represent long-term exposure but is based in stead on the maximum concentration obtained over 5-years of sampling. In addition, this concentration was measured immediately adjacent to the landfill and cannot be considered representative of the downstream reaches of the creek, where dilution will substantially reduce the water concentrations. Finally, the HHRA uses unrealistically high ingestion and dermal contact rates, and an unreasonably high exposure frequency.*

- *Risks due to sediment contact are also inflated due to unreasonably high sediment ingestion rates, exposed dermal surface areas and frequency of contact.*

In addition, the HHRA makes comparisons of fish tissue and water concentrations with Ambient Water Quality Criteria ("AWQC") and fish consumption advisories that have been established. Such comparisons are in appropriate give site-specific considerations, as discussed below, and thus should not be given substantial weight in risk management decisions.

Response: EPA will respond to each element of this general introduction in its responses below to each of the particular comments stated above on the HHRA.

Comment 229:

Fish Consumption – Development of EPCs

In developing its EPC for the fish consumption pathway, EPA has used an inconsistent approach. First, in cases where there are duplicate samples, EPA has sometimes averaged the duplicates before calculating the EPCs and, at other times, has used both concentrations as discrete samples in estimating the EPCs. In addition, they have combined individual fish sample concentrations data, without weighting the composite sample concentrations to reflect the number of fish associated with each. Finally, when attempting to derive an EPC for a combination of suckers and sunfish, EPA has fist averaged the average concentration for the sunfish fillets with the average for whole sunfish (converted to fillet concentrations) to derive an average sunfish concentration, and then has derived a final combined average concentration by averaging the new sunfish average concentration with the average concentration for sucker, assuming that both are consumed in equal proportions. This inappropriate averaging procedure results in a skewed EPC that does not reflect concentrations in fish tissues or the potential consumption habits of individuals who might consume fish from the creek.

CBS's consultant AMEC Earth and Environmental (AMEC) recalculated the species-specific EPCs for the fish consumption exposure pathway using a consistent approach. Duplicate samples have been averaged before they are incorporated as a single sample into the EPC calculation. In addition, when composite sampling data are combined with data for individual fish, the composite sample is given the appropriate weighting in the averaging process, based on the number of fish included in the composite sample. These revised EPCs are presented [table not included]).

CBS states that individuals are not likely to consume suckers. EPA has acknowledged those white suckers are "generally less desirable for consumption" than sunfish and that "white suckers are generally expected to make up a small portion of a typical angler's diet." EPA has stated however, that some anglers may be more opportunistic and thus may ingest a higher proportion of sucker. While this may be true if sucker were readily available in the creek, this is not the case. Opportunistic anglers catch and consume the fish that they can catch most easily. In the case of Stout's Creek, an opportunistic angler may catch and consume both sunfish and sucker but it is highly unlikely that that individual will consume only sucker, given its low availability in the creek. At best it is possible that individuals who consume both types of fish will consume them in a proportion that is reflective of their relative availability within the fishery itself.

AMEC recalculated the combination EPCs (for sucker and sunfish) for BD-2 and BD-3 using the following approach. First, each whole body sunfish tissue concentration has been adjusted, using EPA's fraction of 25 percent, to derive an estimated fillet concentration for each fish. Second, these estimated fillet concentrations (from the whole fish data) have been combined with the sunfish fillet concentrations that that were actually measured, and then averaged all of these sunfish data to derive an average concentration for sunfish fillets. The combination EPC for the consumption of suckers and sunfish has than been derive by calculating a weighted average using the average concentration for sunfish with the average concentration for sucker, along with weighting factors that reflect the relative availability of each species in each reach, as reported by

EPA. Thus, for BD-2, the combined EPC has been derived by assuming that 99.6 percent of the fish consumed are sunfish and 04 percent are sucker. For BD-3, the combined EPC has been derived by assuming that 97 percent of the fish consumed are sunfish and 3 percent are sucker, as shown in the following table:

	Concentration in Fish Tissue (µg/kg)			
	BD-2		BD-3	
Sample Type	Sunfish	Sucker	Sunfish	Sucker
Fillet	580	--	150	--
Fillet	580	--	130	--
Fillet	1400	--	130	--
Fillet	150	--	550	--
Whole (adj.)a	850	1350	150	550
Whole (adj.)a	400	2950	132.5	500
Whole (adj.)a	225	7000	135	650
Whole (adj.)a	400	1300	275	525
Whole (adj.)a	240	2100	215	550
Whole (adj.)a	550	6050	167.5	700
Whole (adj.)a	145.25	1135	155.25	317.5
Whole (adj.)a	145.25	1135	155.25	317.5
Whole (adj.)a	145.25	1135	155.25	317.5
Whole (adj.)a				382.5
Average	447	2684	192	481
Weighted Average	456		201	

a Whole (adj.) concentrations were derived by multiplying the whole fish concentrations provided in Tables B-1, B-2, and B-3 of the HHRA by 25%, for sunfish, and 50%, for sucker as discussed in Section 3.3.1 of the HHRA.

While EPA has also presented EPCs for dioxin toxicity equivalents (TEQ), these data are so limited that they provide little reliable insight into the potential risks associated with dioxin TEQ. For nearly all reaches and species, only one fish sample was analyzed for dioxin-like congeners so that the risk calculations are based on a single sample. These results cannot be considered representative or reliable without additional sampling to confirm their representation of site-specific tissue concentrations.

In addition, as discussed in previous comments to EPA on the HHRA for the Neal's Landfill Site (Viacom, 2004), there is considerable uncertainty associated with the use of dioxin TEQ to evaluate PCB congeners, including the uncertainties associated with the application of individual toxic equivalence factors, as well as the uncertainty associated with the selection of a cancer slope factor for dioxin. This uncertainty and the scientific validity of the approach are the subjects on considerable debate among members of the scientific community and, consequently, are a primary focus of the review of EPA's dioxin reassessment, which is currently underway by the National Academy of Sciences (NAS). Until such time as the approach has been deemed to be scientifically valid, the results of the use of this approach need to be considered with care. In addition, the HHRA has reported the result of an evaluation of the noncarcinogenic hazards posed by

the "dioxin-like" PCB congeners, using a reference dose of 1 [pictogram per kilogram – day] pg/kg-day, based on the value it states was proposed in EPA's draft dioxin reassessment. It should be noted that the EPA has never published a reference dose for dioxin and the draft Dioxin Reassessment does not recommend or propose a reference dose for dioxin or dioxin-like compounds. Therefore, the HHRA erroneously reports the existence of a reference dose that has neither been proposed by EPA nor has its scientific validity been established.

Response: EPA acknowledges some minor errors regarding the calculation of species-specific EPCs. It should be noted that reach-specific fillet EPCs calculated by EPA for sunfish are the same as those calculated by CBS. Also, the whole fish EPCs calculated by EPA are higher than, but similar to those calculated by CBS; the EPA whole fish EPCs are about 11 percent higher than those calculated by CBS. This difference in species-specific concentration will have little impact on exposures, risks, and hazards calculated based on these EPCs.

EPA agrees that the assumption that 50 percent of an angler's fish tissue intake can be attributed to sucker is overly conservative. Therefore, EPA has recalculated the reach-specific combined EPCs based on weighting factors that reflect the relative availability of each species in each reach, as reported in the HHRA. The combined EPCs calculated by EPA differ slightly from those calculated by CBS as discussed in the table notes. The EPA combined EPCs are 2 percent lower than (BD-2) and the same as (BD-3) those calculated by CBS.

	Concentration in Fish Tissue (µg/kg)			
	BD-2		**BD-3**	
Sample Type	**Sunfish**	**Sucker**	**Sunfish**	**Sucker**
Fillet	580	--	150	--
Fillet	580	--	130	--
Fillet	1400	--	130	--
Fillet	150	--	550	--
Whole (adj.)[a]	850	1350	150	550
Whole (adj.)[a]	400	2950	132.5	500
Whole (adj.)[a]	225	7000	135	650
Whole (adj.)[a]	--	2150[b]	--	--
Whole (adj.)[a]	400	1300	275	525
Whole (adj.)[a]	240	2100	215	550
Whole (adj.)[a]	550	3050[c]	167.5	700
Whole (adj.)[a]	145.25	1135	155.25	317.5
Whole (adj.)[a]	145.25	1135	155.25	317.5
Whole (adj.)[a]	145.25	1135	155.25	317.5
Whole (adj.)[a]	--	--	--	382.5
Average	447	2331	192	481
Weighted Average	455		201	

[a] Whole (adj.) concentrations were derived by multiplying the whole fish concentrations provided in Tables B-2 and B-3 of the HHRA by 25 percent for sunfish and 50 percent for sucker as discussed in Section 3.3.1 of the HHRA.
[b] This result was missing from the table prepared by CBS.
[c] This result was incorrectly reported as 6,050 by CBS.

EPA is aware that there is uncertainty associated with use of dioxin toxicity equivalents (TEQ) to evaluate PCB congeners. However, as stated in the HHRA, EPA recognizes that the use of the TEQ methodology as an official policy is still under internal review and that dioxin toxicity is being reviewed by the NAS. Nonetheless, use of the TEQ methodology "has a sound science basis and is widely applied in peer reviewed published literature" (EPA 2004d). Much of the current debate centers around the compound-specific toxicity equivalency factors (TEF) that should be applied and the uncertainty associated with these TEFs, rather than application of the TEQ methodology in general (EPA 2004c). EPA recognizes that a moderate to large amount of uncertainty is associated with use of the TEQ methodology. The presence of this uncertainty does not warrant dropping the TEQ methodology entirely (EPA 2004c).

With regard to the dioxin RfD of 1 pg/kg-day used in the HHRA to evaluate hazards associated with potential exposure to dioxin-like PCBs, EPA strongly disagrees with CBS's assertion that EPA has never published a reference dose for dioxin and that the scientific validity of the reference dose used in the HHRA has never been established.

EPA proposed an allowable daily intake (ADI) of 1E-06 μg/kg-day (equivalent to 1 pg/kg-day) as part of the Ambient Water Quality Criteria (AWQC) for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (EPA 1984). The ADI is equivalent to an RfD. In addition, the Agency for Toxic Substances and Disease Registry (ATSDR) derived an oral minimum risk level (MRL) of 1 pg/kg-day in the "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins" (ATSDR 1998). Therefore, the scientific validity of the 1 pg/kg-day value has undergone significant peer review. Finally, it is irrelevant that EPA's Dioxin Reassessment (EPA 2003) does not recommend or propose a RfD for dioxins or dioxin-like compounds. It is EPA policy to use previous toxicological values and policies until toxicity factors (including RfDs) are finalized.

Comment 230: EPA has substantially reduced its fish consumption rates from the previous version of the risk assessment in which the fish consumption rates could not be supported by either the level of angling activity at the site or the productivity of the creek in the specified reaches. It was appropriate for EPA to consider the productivity and sustainable harvest from the three reaches of Stout's Creek in revision its fish consumption rates. However, the analysis conducted by EPA indicates that even the fish consumption rates of 1 and 3 g/day that have been used in the revised HHRA are not supportable given the limited productivity of the stream and the size of the fish there.

Based on EPA's calculations, the number of "harvestable" fish in BD-1, BD-2, and BD-3 can support one, two, and one angler at the reach-specific fish tissue ingestion rates without impacting the sustainability of the fishery. As a result, the HHRA is essentially

predicting potential risks for a single angler [two anglers in BD-2] who might use the fishery. This is not consistent with typical risk assessment approaches.

As discussed by CBS (2005), these areas of Stout's Creek are not desirable fisheries. As a result, it is reasonable to assume that the size of the angler population is very limited, if it exists at all. However, if, as EPA asserts, Stout's Creek is used as a fishery, it is reasonable to assume that more than one individual would use it. Thus the fish ingestion rates are not reasonable as they will not allow the fishery to be sustained. If, for example, one assumes that a total of five individuals consume fish from each reach of the creek, then the total available fish mass needs to be divided among those individuals, as shown below.

Reach	Total Harvestable Fish (fish/year)	Sustainable/ Harvestable Fish (fish/year)a	Edible mass per harvestable fish (g/fish)	Total mass of edible harvestable fish (g/year)	Mass per person (g/year)	Ingestion rate (g/day)
BD-1	399	39.9	9.9	395	79	0.22
BD-2	953	95.3	22.8	2173	435	1.2
BD-3	1125	112.5	9.8	1103	221	0.60

a Based on EPA's assumption that 10 percent of available fish can be harvested without impacting sustainability of the fishery, as discussed on page A-8 of the HHRA.
b Assuming that a maximum of five individuals consume fish from each reach of Stout's Creek, this is derived by dividing the total mass of harvestable fish by 5.
c Derived by dividing the total mass per person (g/year) by 365 days/year.

This indicates that even if only five individuals consume fish from each reach of Stout's Creek as a fishery, a fish ingestion rate of approximately 1 g/day can be supported at BD-2 but only substantially lower fish ingestion rates of 0.22 g/day for BD-1 and 0.60 g/day for BD-3 can be supported by the available productivity information provided by EPA.

Alternatively, if EPA continues to use the consumption rates of 1 g/day for BD-1, and 3 g/day for BD-2 and BD-3, it is important for the HHRA to clearly point out, in its uncertainty analysis and risk summary, that the predicted risks presented could only occur for one individual in reaches B-1 and BD-3, and two individuals in BD-2. This information will allow risk managers who review the risk assessment to make informed decisions, taking into consideration the size of the population that is potentially at risk.

It should also be noted that it is probable that the "harvestable" mass of fish has been overestimated, making it likely that consumption would be even less than estimated above. This is because EPA has used all fish that are 3 inches or greater in length in estimating the total number of available fish for consumption. EPA has justified this by asserting that fish smaller than 4 inches in length, while difficult to fillet, are often pan-fried and subsequently consumed. However, such small fish are seldom consumed by anglers. As acknowledged by EPA, it is extremely difficult to capture small fish using a

hook and line because the hook and bait used would be too large to fit in the mouth of such small fish. While someone could conceivably use a net to obtain these smaller fish, it is highly unlikely that someone would bother to do so, given that these fish are not targeted species for fish consumers, as also acknowledged by EPA. In addition, while someone could pan fry such tine fish, it would be extremely difficult to remove the small amount of flesh available after cooking without also obtaining skin and/or viscera. All of these problems make it implausible that 3 to 4 inch fish are regularly consumed.

Response: The HHRA does not describe Stout's Creek as a fishery, implying that sufficient fish are present to be regularly caught and ingested by a large number of people. Instead, the HHRA establishes that "harvestable" fish are present in Stout's Creek and reasonably assumes that these fish may be caught by individual anglers. Also, the HHRA carefully evaluates the number of "harvestable" fish of different species present in different reaches of Stout's Creek and concluded that sufficient fish are present to support ingestion rates of 1 and 3 g/day depending on the reach of Stout's Creek at which the fish are caught.

EPA agrees that the number of "harvestable" fish in BD-1, BD-2, and BD-3 can support one, two, and one angler at the reach-specific ingestion rates considered in the HHRA (see Section 5.5.4 of the HHRA). EPA does not believe that consideration of potential exposures by a few individuals with regard to a particular exposure pathway is "not consistent with typical risk assessment approaches." Community concern regarding potential ingestion of fish from Stout's Creek is well established, especially in light of similar concerns at other Bloomington area sites. EPA believes that the evaluation of potential ingestion of fish from Stout's Creek is consistent with a conservative, health-protective RME methodology. EPA will clearly state in the proposed plan that the predicted fish ingestion risks presented could only occur for one individual in reaches B-1 and BD-3, and two individuals in BD-2. EPA agrees that "this information will allow risk managers who review the risk assessment to make informed decisions, taking into consideration the size of the population that is potentially at risk."

The HHRA already addresses various uncertainties associated with the assumption that fish as small as 3-inches in length are "harvestable." Specifically, the HHRA notes that "fish tissue EPCs based on analysis of fish 4 inches or more in length are expected to overstate the concentration of PCBs in the tissue of fish between 3 and 4 inches long." The HHRA also discusses the fact that Stout's Creek is not a particularly desirable fishing location. As noted above, the HHRA is evaluating potential ingestion of fish by one or two individuals. EPA continues to believe that it is not unreasonable to assume that "harvestable" fish (including fish between 3 and 4 inches long) may be regularly caught in Stout's Creek and consumed. Finally, EPA disagrees that it would be "extremely difficult" to remove edible tissue from fish between 3 and 4 inches long. The difficulty should be similar to that associated with removing edible tissue from fish 4 inches long (the minimum length assumed by CBS to be harvestable).

Comment 231: EPA has used an exposure duration of 30 years. While it is conceivable that an individual could fish Stout's Creek every year for 30 years, it is highly unlikely

that this would occur. Instead, an individual who regularly fishes from year to year is likely to be an avid sport angler who will visit higher quality fisheries during regular fishing trips. While it is possible that an individual might fish with this duration, it should be noted that this assumption is highly conservative and likely overstates potential for risk.

Response: EPA's use of a 30-year exposure duration is consistent with long-established residential exposure duration under RME conditions. An individual angler may fish a particular stream or a particular stretch of a stream for a variety of different reasons; in fact, these reasons may change during different periods of that angler's life. For example, an angler may fish in a particular stream (for example, Stout's Creek) based on its convenient location. Later in life, that same angler may continue to fish in Stout's Creek for nostalgic reasons; they have fished there in the past and continuing to fish in Stout's Creek may be relaxing and comforting. EPA has never asserted that anglers fish exclusively in Stout's Creek. Therefore, as suggested in CBS's comment, an avid sports angler may fish in higher quality fisheries in addition to Stout's Creek. However, EPA maintains that the assumption that an angler may fish in Stout's Creek to the extent necessary to meet the assumed fish tissue ingestion rates over a 30-year exposure duration is consistent with RME conditions.

Comment 232: EPA has limited its risk estimates for fish consumption to adults, but has conducted a semi-quantitative estimate of risk for young children based on an analysis of age-specific fish consumption rates and body weights. Based on this analysis, EPA has estimated that children may have higher risks than adults by a factor of roughly 2.

In this analysis presented in the HHRA, EPA took the rates of fish consumption that were provided for children aged 0-9 years and adults in Table 10-1 of EPA's Exposure Factors Handbook (EPA, 1997). The rates reported were the following:

	Intake g/person/day	
Receptor	Mean	95th Percentile
Child (0 to 9 years of age)	6.2	16.5
Adult (more than 20 years of age)	16.2	43.5

Then, to derive an estimate of relative dose on a body weight basis, the HHRA used a body weight of 15 kg for children and 70 kg for adults. When the ratios of intake rates to body weights for adults and children were compared, the ratio calculated for young children was determined to be higher than the ratio for adults by a factor of 1.8. The HHRA then went on, in an attempt to justify this finding, by comparing information in Table 10-61 of the same document, which reported mean fish intake by recreational angles on a body weight basis. When the fish intake for children aged 1 to 5 years was compared to fish intake for licensed anglers, the calculated ration indicated that children had a higher dose by a factor of 2.1.

This analysis is problematic for several reasons. First, the fish consumption rates used in both analyses are not representative of sport-caught freshwater fish. Second, the analysis erroneously assumes that average consumption for children aged 0-9 years is representative of consumption during each of those years. Third, the body weight used in the analysis, 15 kg, is the average body weight for children aged 1 to 6 years, not children aged 0-9 years upon whom the fish consumption rate is based. Finally, the confirmatory analysis, which is based on estimated rates from West et al. (1989) study, as interpreted by EPA (1997), is likely to be grossly inflated due to the methodology that EPA (1997) used to develop them for small children. Each of these issues is discussed below.

The first analysis conducted in the HHRA, using the fish consumption rates provided in the table above, was based on a study of seafood consumption conducted by the Tuna Research Institute, from which the data were subsequently analyzed and reported by Javitz (1980). These fish consumption rates were based on patterns of seafood consumption within the general population of the United States and were not representative of consumption of freshwater fish, as would be obtained from Stout's Creek or even consumption or recreationally caught fish. As a result, they include consumption of all types of commercially and recreationally available fish including such things a fish sticks and tuna, which are likely to be staples of the diets of young children but are not indicative of their consumption behavior of sport-caught freshwater fish. Similarly, while the rates of fish consumption reported in the West et al. (1989) study (which was used to corroborate the initial estimates) are based on a survey of recreational anglers, the rates themselves included consumption of all types of commercial and recreational fish within those households, and thus cannot be considered representative of consumption of sport-caught freshwater fish alone.

The difference in consumption of freshwater fish versus other types of fish is recorded in a study by Rupp et al. (1980), which used general population data collected by the National Marine Fisheries Service but broke the fish consumption rates out by age group, region of the country and type of fish (freshwater finfish, saltwater finfish, and shellfish). In that analysis, freshwater fish consumption by 1 to 11 year old children from the Eat North Central portion of the U.S. (which included Indiana) was reported to average 0.20 kg/year or 0.54 g/day. The average rate for adults reported by Rupp et al was 0.85 kg/year or 2.33 g/day. When consumption rates are adjusted for body weight for young children and adults, using age-specific body weights of 23.8 kg for 1 to 11 year old children (EPA, 1997) and 70 kg for adults, the result is 0.023 g/kg-day for 1-11 year old children and 0.033 g/kg-day for adults. Thus the relative intake for children aged1-11 years is only 70 percent of the rate for adults, indicating that intake rates for young children, and consequently exposure through fish consumption, are lower than those for adults, rather than higher, as reported in the HHRA.

The analysis in the HHRA also combines an average body weight for children aged 1 to 6 years with average consumption for children up to 9 years of age. This is inappropriate and skews the estimate substantially as it does not reflect the increase in relative consumption that is likely to occur as a child ages and grows. It is not reasonable to

assume that a one-year old child, if he ore she eats fish at all, eats the same portion size as a 9 year old child.

The confirmation analysis conducted in the HHRA, based on the West et al. (1989) study is also biased due to the methodology that was used by EPA (1997) to derive those estimates. In the survey upon which those rates were based, survey respondents were asked to indicate which household members, including both adults and children, ate fish. However, when asked about the portion size for each meal, respondents were given a choice of indicating the fish meals were either less than, equal to, or greater than an 8 ounce serving that was depicted in a photograph included in the survey materials. It is likely that for young children, most respondents indicated that the portion size for younger children was "less than" the 8-ounce portion depicted. However, when the consumption rates wee estimated by EPA (1997), all responses that indicted that portions sizes were less than 8-ounces were assumed to be 5 ounces in size. While this may have been a reasonable assumption for adults, it is likely to grossly overestimate portion sizes for children aged 1-6 years who would have portion sizes substantially less than 5 ounces in size. Thus, these consumption rates are likely to be exaggerated overestimates for this age group and thus do not provide a reliable point of comparison.

The date provided in the EPA (2002) reported entitled "Estimated Per Capita Fish Consumption in The United States" can be used to clarify the relative intakes by young children and adults. While the consumption rates provided in that report cannot be considered representative of long term consumption rates, due to the fact that they are based on short-term data, they do provide a point of comparison by age group. Table 5 (p.4-16) of that report provides estimates of freshwater fish and shellfish consumption by children of different age groups (beginning at age 3) on a body weight basis, while Table 4 provides comparable rates for adults. Based on these reported rates, an estimated rate of children aged 3 to 6 years can be calculated as follows and compared with adult rates.

	Freshwater Fish and Shellfish Intake Rates (mg/kg-day)	
Age Group	Mean	95th Percentile
3-5 years	82.93	283.55
6-10 years	59.25	188.77
3-6 years*	77.01	257
Adults	74.58	502.20

Source: EPA (2002), Section 4.1.1.2, Tables 5 (children) and 4 (adults)
*Weighted average of 3 years at 3-5 year rate, and 1 year at 6-10 rate

As is clear from this comparison, the mean body weight adjusted intake rates for children aged 3 to 6 years are roughly the same as the body-weight adjusted rates for adults (ratio of 1.03). However, the 95th percentile rates reported for these age groups are substantially higher for adults than they are for 3-6 year old children. As a result, it can be concluded that risk estimates calculated for adult fish consumers at the Bennett's Dump Site should also be adequately protective of young children who may consume those fish.

Response: EPA acknowledges some inconsistencies and uncertainties associated with the methodology used in the HHRA to compare child and adult fish tissue intakes. EPA also acknowledges that the CBS analysis is mathematically correct. However, the CBS analysis misses the point. Rather than compare child and adult fish tissue intakes based on national or regional age group-specific mean or 95th percentile ingestion rates, as was done in the CBS analysis as well as the initial EPA methodology, comparisons must be made based on the fish tissue ingestion rates assumed for the HHRA.

Specifically, the HHRA assumes that one (BD-1 and BD-3) or two (BD-2) individuals may consume 1 g/day (BD-1 and BD-3) or 3 g/day (BD-2) without adversely impacting the sustainability of the harvestable fish population in Stout's Creek. The HHRA calculated exposures for adult receptors only; however, the individual consuming the fish could just as easily be a child (1 to 6 years old). Therefore, the first step of the comparison is to calculate the body weight adjusted fish intake rates for child (age 1 to 6 years) and adults based on the daily fish tissue ingestion rates assumed for the HHRA. These calculations are presented in the table below.

Parameter	BD-1 and BD-3		BD-2	
	Child (age 1 to 6 years)	Adult	Child (age 1 to 6 years)	Adult
Fish tissue ingestion rate (mg/day)	1,000	1,000	3,000	3,000
Body weight (kg)	15	70	15	70
Age-adjusted fish tissue ingestion rate (mg/kg-day)	67	14.3	200	42.9
Ratio of child and adult age-adjusted fish tissue ingestion rate	4.7		4.7	

In order to evaluate the validity of the calculated ratios, the reasonableness of the child (age 1 to 6 years) and adult age-adjusted fish tissue ingestion rates was evaluated. Rupp and others (1980) the 90th and 99th percentiles of freshwater fish consumption by 1 to 11 year old children from the East North Central portion of the U.S. (which included Indiana) was reported to be 0.55 and 3.06 kg/year, respectively. Based on a body weight for this age group of 23.8 kg (Table 7-3, EPA 1997) the 90th and 99th percentile age-adjusted fish intakes rates for children 1 to 11 years of age (calculated as daily fish ingestion rate [mg/day]/body weight [kg]) are 63.3 and 352 mg/kg-day, respectively.

The age-adjusted fish tissue ingestion rates presented in the table below for children (age 1 to 6 years) fall within this range. However, this result must be further evaluated. First, consistent with an evaluation of RME conditions, the most appropriate fish tissue ingestion rates would be representative of 95th percentiles. However, Rupp and others (1980) does not present this information. Based on the information presented in Rupp and others (1980), the 95th percentile age adjusted fish intake for children 1 to 11 years of age is between 63.3 and 352 mg/kg-day.

Children 1 to 6 years of age are likely to ingest less fish (in terms of total mass consumed) than children 1 to 11 years of age. How much less is not known. However, the body weight for children 1 to 6 years of age (15 kg) is less than the body weight for children 1 to 11 years of age (23.8 kg). It should be noted that the mean fish intake (g/kg-day) among individuals who eat fish and reside in households with recreational fish consumption is higher for children 1 to 5 years of age as compared to children 6 to 10 years of age (see Table 10-61 in EPA 1997). This result indicates that the mean fish intake for children 1 to 6 years of age would exceed the mean fish intake for children 1 to 11 years of age.

Altogether, this discussion suggests that the body weight adjusted fish intake rates for children 1 to 11 years of age calculated from information presented in Rupp and others (1980) (see the table above) are adequately representative (though they may be lower than) of body weight adjusted fish intake rates for children 1 to 6 years of age. Therefore, it is reasonable to assume that children 1 to 6 years of age may ingest fish at 1 g/day (BD-1 and BD-3) or 3 g/day (BD-2) under RME conditions.

Similarly, Rupp and others (1980) report the 90th and 99th percentile of freshwater fish consumption by adults (18 to 98 years) from the East North Central portion of the U.S. (which included Indiana) was reported to be 2.28 and 9.40 kg/year, respectively. Based on a body weight for this age group of 70 kg (EPA 1997) the 90th and 99th percentile age-adjusted fish intakes rates for adults (calculated as daily fish ingestion rate [mg/day]/body weight [kg]) are 89.2 and 368 mg/kg-day, respectively. The age-adjusted fish tissue ingestion rates calculated for Stout's Creek are below this range. Therefore, adult receptors can certainly consume fish at 1 g/day (BD-1 and BD-3) or 3 g/day (BD-2) under RME conditions.

In conclusion, the analysis presented above indicates that the age-adjusted fish tissue ingestion rates presented in the table above for children 1 to 6 years and adults are consistent with and sustainable under an RME scenario. If a child who is 1 to 6 years of age consumes the same of mass of fish (e..g, either 1 or 3 g/day) as an adult, the child's intake of PCBs, after adjusting for his or her weight, will be almost 5 times greater than that of the adult. EPA's previous estimate that a child's intake (and associated hazards) will be about twice those calculated for adults is an underestimate. EPA will revise the proposed plan accordingly.

Comment 233: Tetra Tech has based its surface water exposure evaluation on the maximum surface water concentration detected immediately downstream of the Site, despite an acknowledgment (pp. 14 and 33) that this concentration is not representative of either the long-term surface water concentration to which recreationalists might be exposed, or of maximum conditions in locations downstream of the sampling location where concentrations are likely to be lower than they are immediately adjacent to the landfill.

In evaluating potential exposures to surface waters, EPA has developed a chronic exposure model that assumes that individuals are exposed for either 12 years (youths) or

30 years (adults). As acknowledged in the HHRA, surface water concentrations over an extended period of time will be most closely approximated by the average values over time. For Stout's Creek, there are five years of water sampling data available. Annual average surface water concentrations ranged from 0.16 [microgram per liter] μg/L in 2000 to 0.38 μg/L in 2004 immediately adjacent to the site, with an overall 5-year average of 0.27 μg/L. This value is more suitable as the EPC for this evaluation. Alternatively, as the HHRA reports that average concentrations appear to have increased every year during the 5-year period, it may also be appropriate to use the maximum of the average yearly concentrations measured as the EPC. If this number were to be selected, the EPC for the surface water evaluation would be 0.38 μg/L based on the data for 2004. Either of these sample concentrations could be considered representative of concentrations in a very short section of the Creek immediately adjacent to the landfill.

These concentrations are not, however, representative of concentrations in BD-1, BD-2, or BD-3, which are the reaches of focus in the HHRA. In these reaches, which are downstream of the source area, the stream is larger and there is more dilution with runoff and contributions from smaller tributaries. Thus, water concentrations will be substantially lower there than they are adjacent to the source area. The use of these concentrations to represent potential exposures downstream, where exposures are more likely to occur, substantially overestimates potential exposures in those areas.

Water samples collected by CBS in reaches BD-2 and BD-3 have demonstrated that PCBs are not detectable (at a detection limit of 0.02 μg/L) in these reaches. In addition, stream flow measurements have indicated that the flow in BD-1 is twice the flow at the sampling location upon which the HHRA has based its EPC. At a minimum, based solely on dilution, one would expect the concentration in BD-1 to be half that of the concentration measured adjacent to the landfill. Using the highest average concentration reported in the HHRA, 0.38 μg/L, one would estimate the maximum water concentration in BD-1 to be no more than 0.19 μg/L. For BD-2 and BD-3, where water samples have been non-detect (<0.02 μg/L), an estimated concentration of one-half the detection limit, or 0.01 μg/L, would be most appropriate as the EPC.

Response: The EPA used the maximum detected concentration of PCBs as the surface water EPC consistent with an initial conservative, health-protective approach. While EPA acknowledges that receptors will not be repeatedly exposed to the maximum detected total PCB concentration, EPA believes it is reasonable to assume that human receptors, particularly those who will live in the proposed Stoneybrook Park Subdivision to be located immediately south and west of the site between State Routes 37 and 46 and south of Arlington Road, may regularly recreate and potentially have direct exposure to surface water and sediment in Stout's Creek at a point close to the development. (Note: additional indirect exposure is assumed to occur through ingestion of fish caught downstream of the landfill at BD-1, BD-2, and BD-3.

Therefore, EPA has recalculated the surface water EPC as the 95 percent upper confidence limit of the mean (95 UCL) based on the same 5 years of surface water analytical data considered in the HHRA (analytical data collected from November 1999

through June 2004 at the Stout's Creek downstream locations) (Viacom 2005c). This approach is consistent with EPA guidance (EPA 1992, 2002). EPA calculated the 95 UCL using its ProUCL software (EPA 2004) as shown in Attachment 1. It should be noted that duplicate results were averaged and considered as a single analytical result consistent with EPA guidance (EPA 1989). Revised surface water risks and hazards were calculated based on the new surface water EPC, 0.32 μg/L. The revised surface water risks and hazards are approximately 25 percent of those presented in the HHRA (0.32/1.2).

Comment 234: The HHRA uses an extremely high exposure frequency of 68 days/year for the surface water exposure pathways. This frequency is based on the assumption that adult and youth recreationalists will spend 4 days per week for 13 weeks, from June through August, and 4 days per month at the Site during April, May, September, and October. This is no indication that this level of recreational activity is occurring along the Creek or would be likely to occur in the future. In fact, it is not likely that an individual would engage in regular recreational activity along the creek, due to its small size, the extreme limitations on access presented by steep banks in most areas, and the high degree of vegetation and overgrowth along those banks. Thus it would be more reasonable to assume that individuals could potentially visit this area once per week during these months, for a total of 30 days per year. This exposure frequency is similar to the exposure frequency of 36 days /year that EPA used to evaluate potential upper-bound exposures to sediment by adults and children aged 7 to 18 along the Housatonic River in Massachusetts (EPA, 2005), which is a substantially larger and more attractive recreational area than is Stout's Creek. The central tendency exposure frequency used in that risk assessment was 12 days/year. An exposure frequency of no more than 36 days per year would be most appropriate and representative of the potential for exposures at this Site.

Response: EPA is concerned about potential exposures throughout Stout's Creek downstream of the site. However, it is not unreasonable to expect that residents of the new development may choose to visit and recreate in and along Stout's Creek at a nearby location. In fact, the proximity of a small stream may be one reason some residents choose to live in the new development. To the extent that is the case, it is reasonable to assume residents will visit the stream more frequently than otherwise expected. While other surface water bodies may have a higher overall attractiveness, Stout's Creek is the "local" stream and its proximity and a sense of ownership by nearby residents cannot be overlooked. Also, EPA expects that exposure frequency will increase during the summer months, when the heat will make the stream water more attractive. The HHRA is intended to address a RME scenario. That is, not all individuals may be exposed as frequently as assumed, but EPA believes it is reasonable to assume some individuals may be exposed as often as 68 days/year.

Comment 235: EPA has used an exposure time of 2 hours/day to evaluate dermal exposure to surface water. This is a highly inflated estimate of the amount of time that individuals are likely to wade at the Site, particularly when considered in light of the exposure frequency of 68 days/year that is used in the assessment. It is highly unlikely

that an individual would spend this amount of time in the water from April through October. This is particularly true for older youths and adults who are not likely to spend substantial amounts of time in the water, even when visiting the creek.

Give the size of the creek and its lack of appear as a recreational location, it seems more reasonable to assume that an individual spends no more than one hour in contact with the surface water during every exposure event. Even this assumption would be likely to overestimate potential for contact for this exposure pathway.

Response: EPA acknowledges that the assumption that individuals are exposed for 2 hours/day on each day of exposure is conservative. In light of EPA's intention to retain an exposure frequency of 68 days/year, EPA is revising its exposure time assumption from 2 to 1 hour/day. Exposures, risks, and hazards associated with dermal exposure to surface water are revised accordingly.

Comment 236: EPA has selected a water ingestion rate of 0.0382 L/day for adults and 0.0765 L/day for youths, based on swimming. They have derived these water ingestion rates by using the incidental ingestion of 0.05 L/hour (EPA, 1989) for an exposure time of 2 hours to derive a total of 0.1 L/day. For youths, they have assumed that individuals will only ingest water during the summer months (13 weeks or 52 visits if there is a visit four day/week) and thus have adjusted the ingestion rate by a factor of 52/68 so that they can combine this ingestion rate with a frequency of 68 days/year to derive their water ingestion rate. EPA has then assumed that adults will ingest water for approximately half of the time that youth receptors will. This approach is unnecessarily convoluted and does not reflect potential for exposure due to this pathway.

EPA has clearly acknowledged that the potentially exposed individuals who visit the creek will not swim in the creek. In fact, it would be unusual for and individual to ingest any surface water while visiting a creek that is as shallow as Stout's Creek. As a result, the only occasion that an individual may have an opportunity to ingest water will be if that individual were to fall into a deeper pool and accidentally swallow some water. It would not be anticipated that this accidental exposure would happen every time an individual visited the creek. Instead, it is possible that this type of accidental exposure might occur one or two times per year. Using the approach that has been used in the HHRA, if it is assumed that an individual falls into the water two times during the year and incidentally ingests 50 [milliliter] mL of water during each fall, the long-term average water consumption rate will be 1.5 mL/day (50 mL * 2/68). This is a more realistic, but still highly conservative, water ingestion rate for both youth and recreationalists.

Response: EPA agrees that the approach used to calculate the rate of potential surface water ingestion rate was convoluted. Further, because the methodology assumed exposure during swimming (an activity that was not assumed to occur), this approach did not adequately reflect site-specific conditions.

However, EPA disagrees with CBS's assumption that "it would be unusual for an individual to ingest any surface water while visiting a creek that is as shallow as Stout's Creek." Individuals recreating in or along Stout's Creek may ingest surface water by scooping water from the creek to their mouth. One fluid ounce of water is equivalent to 29.6 mL. EPA considers one fluid ounce to be a reasonable amount of water to assume an individual ingests to temporarily alleviate a thirst they may have especially on warmer days. EPA also assumes that youths may ingest water in this fashion on 50 percent of the 68 days/year they are assumed to recreate in or along Stout's Creek. Adults are assumed to ingest water from the creek half as often as youths. Therefore, receptor-specific revised surface water ingestion rates are calculated below.

Youths

(0.030 L/day x 34/68) = 0.015 L/day

Adults

(0.03 L/day x 17/68) = 0.0075 L/day

These receptor-specific surface water ingestion rates are less than those assumed in the HHRA. Therefore, revised exposure, risks, and hazards are calculated by multiplying the values presented in the HHRA by the following ratios of surface water ingestion rates.

Youths

Adjustment factor = (0.015 L/day)/(0.0765 L/day) = 0.196 (or 0.2)

Adults

Adjustment factor = (0.0075 L/day)/(0.0382 L/day) = 0.196 (or 0.2)

Comment 237: EPA has assumed that feet and lower legs are in contact with the water for all modeled exposure events. While individuals could wade in the stream every time they were in the vicinity of the creek, it is unlikely, for several reasons, they will wade in water up to their knees every time they are there.

First, according to information recorded by Tetra Tech (2004), much of the stream is very shallow. Thus, in most cases, except some of the deeper pools, it is likely that only the feet and ankles would be in contact with surface water during wading. While some of the deeper pools would allow individuals to have their feet and entire lower legs in contact with surface water, it is unlikely that this would occur during every wading event modeled or would continue for two hours, as suggested in the HHRA. Thus a more reasonable assumption would be to assume that only the feet and half of the lower lets are in contact with surface water during each event. For 7 to 18 years old recreationalists,

this would result in a more realistic exposed surface area of 1,884 [square centimeters] cm2. For adults, this would result in a surface area of 2,410 cm2.

Second, it is not likely that individuals as old as 18 years of age would engage in this type of wading behavior. While it may be reasonable to assume that pre-adolescents between the ages of 7 and 13 years might be engaged in recreational activities that would involve regular wading, once children reach high-school age, this type of activity is likely to lose its appeal on a regular basis. As a result, the assumption that these behaviors occur every year for 12 years is likely to substantially overestimate exposure to those individuals.

Response: EPA is aware of the generally shallow water depth in Stout's Creek outside of some deeper pools. However, the amount of skin surface area potentially exposed by wading in the creek does not necessarily have to correspond exactly to the depth of the water in the creek. It is expected that skin surface areas above the water depth may become exposed as a result of splashing resulting from wading or other recreational activities. Also, other body parts (for example, hands and forearms) may become exposed as the result of reaching into the water to retrieve objects or explore the creek bed. It is difficult to anticipate the amount to time and precise amount of skin surface area exposed in these instances. Therefore, it was assumed that the feet and lower legs of an individual are exposed during each visit to the creek.

EPA acknowledges that teenagers and adults may find wading or playing in and along the creek less appealing than pre-adolescents. However, this observation is not an absolute. Therefore, consistent with an RME approach, EPA will continue to assume that individuals 18 or more years of age will engage in wading behavior. EPA will address the uncertainty associated with this assumption in the risk assessment uncertainty discussion.

Comment 238: While the sediment contact pathways are not important pathways in terms of their contribution to total risks, the risk estimates for this pathway are overstated. This is because the analysis uses (1) the maximum sediment concentration from the reach closest to the source (BD-1), (2) a very high exposure frequency of 68 days/year (as discussed in the preceding comments for the surface water pathways), (3) an inflated sediment ingestion rate that is not supported by the EPA guidance upon which it is purportedly based, and (4) an unreasonably high dermal adherence factor for youths, for which one would not expect dermal adherence of sediment to be any greater than it would be adults. However, the low risks that have been predicted in the HHRA for sediment contact pathways (cancer risk of 8.2E-08 and hazard index of 0.005 for all reaches), despite the use of these very conservative assumptions, indicate that sediments at the site do not pose a risk to the receptors evaluated. Any refinement of the exposure parameters to make them ore site-specific and relevant will further reduce risks. Thus it is not necessary or fruitful, from a risk point of view, to provide additional comments on these pathways.

Response: The EPA used the maximum detected concentration of PCBs as the sediment EPC consistent with an initial conservative, health-protective approach. However, as

noted above for potential surface water exposure, "receptors will [not] be repeatedly exposed to the maximum detected total PCB concentration." Again, as noted above with regard to potential surface water exposure, EPA believes it is reasonable to assume that human receptors, particularly those who will live in the proposed Stoneybrook Park Subdivision to be located immediately south and west of the site between State Routes 37 and 46 and south of Arlington Road, may regularly recreate and potentially have direct exposure to surface water and sediment in Stout's Creek at a point close to the development. (Note: additional indirect exposure is assumed to occur through ingestion of fish caught downstream of the landfill at BD-1, BD-2, and BD-3.

EPA would have further refined the sediment EPC if the initial conservative calculations had demonstrated potentially significant risk (greater than or equal to 1E-06) or hazard (greater than or equal to 1). However, as noted by CBS, the risk and hazard results presented in the HHRA related to potential sediment exposures are insignificant.

EPA believes that an exposure frequency of 68 days/year is consistent with a RME scenario as described above for potential surface water exposures. EPA also believes that the sediment ingestion rate used in the HHRA is reasonable and consistent with EPA guidance. CBS provides no specifics to support their opinion that the sediment ingestion rate is not consistent with EPA guidance.

EPA agrees with CBS's conclusion that sediment risks and hazards could be adjusted by refining (and potentially lowering) the sediment EPC; however, this effort would not be particularly helpful as the risks and hazards calculated using the conservative sediment EPC are insignificant.

Comment 239: In an effort to demonstrate the degree of overestimation of the risk estimates provided in the HHRA, AMEC has recalculated potential risks to thee receptors using the recommended assumptions outlined and discussed above.

Response: Because EPA does not agree with many of CBS's proposed parameter value revisions, review and comment on AMEC's revised risk estimates is not warranted. However, EPA has recalculated potential risks to adult, youth, and child receptors using the revised assumptions discussed above in EPA's responses. EPA's revised risk and hazard estimates, and the basis for each, are provided in the following sections.

EPA's revised risk and hazard calculations are presented in Attachment 2. Attachment 2 contains tables summarizing revised fish tissue EPCs (Table 1), revised fish tissue risks and hazards (Table 2), revised total risk estimates (Table 3), and revised total hazard estimates (Table 4). Also, it should be noted that documentation for the revised surface water EPC (0.32 μg/L) is presented in Attachment 1.

Comment 240: Section 5.3 of the HHRA reports that the levels of PCBs in the fish tissues indicate that the surface water likely exceeds the AWQC for PCBs. It states that PCB levels in fish tissues would need to be 0.025 mg/kg in order to be in compliance with the AWQC. However, as noted previously by CBS (2005), if the level of fish

consumption that is supportable by a small creek is less than the 6.5 g/day that has been used to derive the AWQC, that criterion should have little bearing on future risk management decisions. As has been demonstrated above and in the HHRA, the reaches of Stout's Creek that have been evaluated are not adequately productive to support a fish consumption rate of 6.5 g/day.

Response: The applicability of the State of Indiana's AWQC and fish consumption advisories to Stout's Creek and other Bloomington area streams is discussed in Section 5.5.6 of the HHRA. As of the date of this responsiveness summary, EPA assumes that the State of Indiana's AWQC and fish consumption advisories are applicable to Stout's Creek and can be used to assess the presence and magnitude or risks and hazards associated with potential ingestion of fish from Stout's Creek.

Comment 241: EPA has noted that the "Great Lakes states such as Indiana use a PCB action level of 0.05 mg/kg for fish tissue to trigger fish consumption advisories" and state that such an advisory is present for Stout's Creek. This is not completely accurate. While the HHRA states that the average concentration of PCBs in fish tissues in Stout's Creek exceeds the state fish advisory level of 0.05 mg/kg, it fails to point out that this advisory level is based on unlimited consumption and is not in place for Stout's Creek. In fact, the 2005 advisory for Stout's Creek that was published by the Indiana Department of Environmental Management ("IDEM") is a Group 3 to Group 5 advisory which recommends that no more than 1 meal/month of creek chub greater than 8 inches in length be consumed from Stout's Creek and lesser amounts of larger creek chubs (www.state.in.us/isdh/dataandstats/fish/2005). During the 2004 fish sampling effort, however, CBS found no creek chub greater than 6 inches in length indicating that it is rare that creek chub larger than this length are present in the creek and thus cannot be consumed from it at any reasonable rate. While it is possible that there could be a few creek chub of this size in the creek, it is unlikely that there are adequate numbers of these fish to raise these consumption advisories to an issue for risk management decisions.

In addition, according to the methodology used to derive the Great Lakes Advisories, an individual can safely eat up to six half-pound meals per year (equivalent to 3.7 g/day) if the fish tissue concentrations of PCBs do not exceed 1.9 mg/kg. As demonstrated in the HHRA and in the above analysis, these reaches cannot support consumption higher than this, even for just one individual. In addition, the EPCs calculated for sunfish and for sucker/sunfish combined are well below this concentration.

Response: The applicability of the State of Indiana's AWQC and fish consumption advisories to Stout's Creek and other Bloomington area streams is discussed in Section 5.5.6 of the HHRA. As of the date of this responsiveness summary, EPA assumes that the State of Indiana's AWQC and fish consumption advisories are applicable to Stout's Creek and can be used to assess the presence and magnitude or risks and hazards associated with potential ingestion of fish from Stout's Creek.

Comment 242: One commenter states, "[a]s you read on, you learn that sediment, mentioned in the first sentence as part of the Preferred Remedial Alternative has been

removed from further consideration because EPA has determined that it does not pose an unacceptable risk to human health or the environment." Yet later on within the Proposed Plan the word "sediment" is referred to in a way that seems to make EPA ambivalent about sediment.

Response: The U.S. EPA is not ambivalent about the presence of sediment at the Bennett's Dump site. In fact, sediment at the site has been sampled and analyzed for PCBs. The commenter is referred to the sampling results in Stout's Creek which show PCBs under 1 ppm and at levels that would not present an unacceptable risk. Therefore, it was determined that a sediment cleanup would not be necessary.

Comment 243: EPA's braggadocio (and wholesale promises) for its Preferred Remedial Alternative on the front page of the Proposed Plan, smacks of mind control, while its Preferred Alternative which we find eventually on page 12, turns out to be, after 7 or 8 years of global negotiations with CBS/VIACOM, a hypothetical non-remedy, although assuredly cost-effective for the Principal Responsible Party!

Response: EPA disagrees with the commenter. EPA is unsure what the commenter is referring to as "mind control." The implementation of the passive quarry drain and interceptor trench with water treatment is not a hypothetical non-remedy.

Comment 244: The Remedial Action Objectives, 3 in number, were not encouraging:

----- Reduce the amount of PCBs released from groundwater to Stout's Creek through mass reduction.

----- Improve PCB levels in fish for beneficial reuse by reducing PCBs released to Stout's Creek

----- Reduce the amount of PCB mass in sediments that may be available to fish by reducing PCBs released to Stout's Creek.

"Reduce" is the key word, but how much reduction of "PCB levels" will it take to make them edible again in Stout's Creek where the fish have been essentially inedible since Westinghouse started dumping capacitors at Bennett's Quarry Dump nearly 40 years ago. This is supposed to be a "final Remedial Action" for cleanup of Bennett's Dump. The Proposed Remedy should be capable of making fish edible again in Stout's Creek.

Response: Based upon the fish sampling data from Stout's Creek and the State of Indiana Fish Advisories, the fish can be eaten from Stout's Creek but only one meal per month. In addition, the EPA refers the commenter to the human health risk assessment for additional information on the risk associated with eating fish from Stout's Creek. EPA is of the opinion that with the implementation of the passive quarry drain and interceptor trench, with water treatment will reduce the PCB levels in fish within Stout's Creek. EPA would also like the have individuals who fish be able to eat fish more frequently from Stout's Creek.

Comment 245: One commenter states EPA officials are frustrated by the failure of the source control operable unit excavations conducted in 1999 at Bennett's quarry Dump, Neal's Landfill, and conducted in 2000 at the Lemon Lane Landfill. The commenter continues that the failure was not publicized, and PCBs are discharging into Stout's Creek at levels that are the same those prior to the excavation of the site and operable units 2 and 3 are being used to compensate for the failure of the first operable unit.

Response: The source control operable unit did not "fail" at Bennett's Dump. The large excavation reduced the on-site risk with commercial/industrial development possible at the site. The continuing release of PCBs into Stout's Creek was not anticipated before the excavation, but EPA addressed the problem through CBS doing a groundwater and sediment investigation with EPA subsequently choosing additional remedies. EPA is somewhat puzzled by the commenter with the suggestion that the failure was not publicized. EPA completed a Five-year Review describing the continuing problems with the continuing releases. Bennett's Dump has been discussed publicly at every Citizens Information Committee meeting.

Comment 246: One commenter states that the hotspot investigation at Bennett's Dump and other Bloomington PCB sites was not complete and has come back to haunt EPA. In addition, the commenter states that other buried quarry pits were used for disposal based upon the commenters discussion with an individual who was involved in the initial capping of the site by EPA. The commenter continues with stating that "Given so many scientific uncertainties, it seems time to bring some karst hydrologists in to study the Bennett's Dump Area prior to a decision to construct an engineering solution that is only conceptual and has not even reached a preliminary planning stage."

Response: Bennett's Dump did not have a hot spot removal and capping remedy like those completed at Neal's Landfill and the Lemon Lane Landfill. Instead, the Bennett's Dump site was remediated to commercial/industrial PCB standards. The governmental parties and CBS have investigated other open, water filled quarry pits during the investigation of the Bennett's Dump site. Ice box quarry was drained by Star Stone a few years ago and no capacitors were observed. We have sampled water in Icebox Quarry and PCBs have been detected, but this contamination is from groundwater. Water samples at the Wedge Quarry complex have shown no detections of PCBs in the water. EPA is aware of an area called Mule Hole near the Bennett's Dump site (now the intersection of 46 and 37) and this area was investigated and determined not to contain PCBs or PCB capacitors.

EPA is puzzled by the commenters statement that a karst hydrologist should study the site prior to constructing an engineering solution. EPA has used a karst geologist/hydrologist for all the Bloomington PCB sites. In addition, EPA has discussed the remedy with COPA's karst hydrogeologist. The Bennett's Dump groundwater has been studied extensively (please see the EPA Status Report) and the groundwater remedy proposed is not conceptual. The long-term pump down test clearly showed the reduction in spring flow and the technology of using a collection trench and carbon adsorption are

implementable. EPA is of the opinion that the remedy is feasible but the design has not been completed. The approach of doing pre-design work and then design is very common for Superfund sites.

Comment 247: One commenter states that Alternatives 1, 2, and 3 are meaningless alternatives, but states Alternative 4 is meaningful as it involves excavating the identified buried quarries and includes searches for other disposal areas to excavate.

Response: The commenter is incorrect in stating that Alternatives 1 through 3 are meaningless. EPA, however, is of the opinion that these three remedies would not produce the required risk reduction. The investigation of Bennett's Dump clearly showed that reducing the elevation of water in the Wedge Quarry complex reduced the spring flow at the Bennett's Dump site. Both short-term and long-term testing was completed to make this remedy viable. The commenter is unfamiliar with CERCLA since Alternative 1 – No Action is required to be evaluated.

Comment 248: One commenter states that EPA's preferred alternative (Alternative 5) is conceptual and EPA does not provide evidence that it will work. The commenter continues with the question if the passive quarry drain does not work or is flawed, then what happens to the remedy.

Response: The commenter is incorrect in stating that Alternative 5 is conceptual. The feasibility of implementing Alternative 5 has been completed and EPA is of the opinion that the remedy can be successful. The passive quarry drain has been evaluated with both a long-term and short-term pump tests and the results indicted that it is very feasible. The commenter is referred to document number 108 in the Administrative Record which reports the results of the long-term pump down test. In the unlikely event the passive quarry drain does not work, then EPA will reevaluate the site remedy.

Comment 249: One commenter asks whether an 8-foot deep trench will be sufficient given the depth of the quarries and the groundwater in that area. It would seem to need to be deeper to capture all discharges from the springs at the site as well as to collect contaminated groundwater that may be emerging from springs in and along Stout's Creek.

Response: As stated in the Proposed Plan, the 8-foot deep trench is a proposed depth but based upon the design, the trench depth may change. The commenter is correct that the final depth may require the trench to be deeper but the commenter gives no reason why they think the depth should be deeper. The final trench depth will be determined by the pre-design and design and will be based on conditions found at the site.

Comment 250: One commenter states that EPA has ignored volatilization of PCBs, especially when the water is turbulent.

Response: EPA has not ignored volatilization. EPA has evaluated the past air sampling data during the excavation phase and the PCB levels in the spring water and determined

that volatilization of PCBs would not be at levels producing an unacceptable risk. In addition, EPA in the human health risk assessment evaluated what the PCB levels in air would have to be to affect the inhalation pathway and determined that the levels in the water would not produce PCB air levels at unacceptable risk.

Comment 251: One commenter states that EPA must consider the nature of the type of springs and the commenter quotes the COPA hydrogeologist who states "Since all the springs at the site cease flowing and it is likely that the aquifer does not cease flowing and the springs are of the "overflow" type, that therefore the "baseflow" must be discharging elsewhere. If this base flow component has not been identified it will have to be if the migration and discharge of contaminants are to be properly understood. Smart (1982) and Worthington, 1991) describe overflow and underflow springs, but a century earlier Martel (1893) did so also, so there is nothing surprising and strange about this phenomenon. The vertical hierarchical nature of surface discharge from carbonates may qualify as one of the most misinterpreted phenomenon in hydrogeology. A spring can be recognized as an overflow type by a large variation in discharge or by the fact that the spring ceases to discharge at any time. A baseflow or underflow spring has a constant discharge and discharges constantly."

Response: Please see response to Comment 257.

Comment 252: One commenter requests that Alternative 5 be withdrawn since it will not work in karst terrain since you cannot control karst, cannot manipulate karst and cannot predict karst in any way shape or form. The only alternative to be considered the commenter continues is the complete removal of PCB contaminated soils and then the consideration of water treatment as a follow up residual removal action.

Response: EPA will not withdraw Alternative 5 and based upon the analysis of nine criteria, Alternative 5 is the remedy EPA will implement. The comment that karst cannot be manipulated or predicted in any way, shape, or form is not based on fact. Considering a majority of Bloomington and southern Indiana is over karst terrain does not support the commenter. The comment is also puzzling since water treatment, which previously the commenter indicated would not work is supported. EPA does not believe that additional excavation in the buried quarry pits would eliminate the need for water treatment, because of the PCBs are in the bedrock and not in a form or location that can be easily reached and excavated. Further, the difficulty of excavating former buried quarry pits for a small amount of PCB removal is not justified.

Comment 253: One commenter states "In general we are supportive of Alternate 5: Passive Quarry Drains with Interceptor Trench and Carbon Treatment. While we are in general support that Alternative 5 is protective of human health and the environment, is feasible and is cost effective, we strongly suggest that EPA consider additional excavation of the buried quarry pits to a depth and scope that is feasible. Removal of additional source PCBs would in the long run reduce the amount of PCBs released into the environment and therefore needed to be treated."

Response: Additional excavation in the buried quarry pits would not eliminate the need for water treatment. Moreover, due to the difficulty of excavation within the buried quarry pits and the low level of contamination at depth, the low levels of PCBs that are being released are best addressed through use of the passive quarry drains and interceptor trench.

Comment 254: One commenter states there is also concern that if the Interceptor Trench does not adequately catch all known and unknown releases, the EPA will at some point need to address the buried pits, and because they failed to excavate under terms of the current negotiations with CBS, EPA and the other governmental parties would then be liable for the full cost of such excavation.

Response: If the interceptor trench for some reason does not capture the releases, EPA may then use the reopener provision in the Consent Decree to force CBS to address the unknown conditions, or may use any of its other enforcement tools to ensure a protective remedy.

Comment 255: COPA would like to commend EPA for diligence in working to protect the public by not leaving us with the initial Bennett's remedial activities and for continuing to test, monitor and study contamination from Bennett's.

Response: The EPA would like to thank COPA for its continuing effort to keep the citizens informed on the PCB issues in the Bloomington, Indiana area.

Comment 256: The reference to spring locations being different from historical locations seen on aerial photographs is probably normal, springs discharge where the resistance is least. When spring orifices become overgrown, collapse or are covered by work activities the discharge moves to where the resistance is least.

Response: EPA agrees.

Comment 257: Since all the springs at the site cease flowing and it is likely that the aquifer does not cease flowing and the springs are of the "overflow" type, and therefore the "baseflow" must be discharging elsewhere. If this baseflow component has not been identified it will have to be if the migration and discharge of contaminants are to be properly understood. Smart (1982) and Worthington (1991) describe overflow and underflow springs, but a century earlier Martel (1893) did so also, so there is nothing surprising and strange about this phenomenon. The vertical hierarchical nature of surface discharge from carbonates may qualify as one of the most misinterpreted phenomena in hydrogeology. A spring can be recognized as an overflow type by a large variation in discharge or by the fact that the spring ceases discharging any time. A baseflow or underflow spring has a constant discharge and discharges constantly. Springs also sometimes discharge overflow components even though they discharge baseflow components themselves.

The statement "this flow pattern indicates that the springs are not fed by conduits in the karst bedrock" is illogical and impossible. If a spring exists then there must be a conduit that it is discharging from. Quinlan et al., (1996) cite that turbulent flow at a velocity of 0.001 m/s (about 90 m/day) is possible from a conduit a few millimeters in diameter. Conduits this small The problem is that the nature of springs their variability and discharge has been misunderstood. [Sic] Shuster and White (1971) described chemical variability of springs to be related to aquifer differences, and that low variable springs or discharge from aquifers without conduits. Even though in the same year Newson (1971) showed that there was a strong relationship between spring (chemical) variability and the percentage of sinking stream water in the catchment, (and said there was no evidence that there were differences in the aquifers, his paper was published in the geographic literature and many geologists and hydrogeologists never enlightened themselves to his thinking. In 1992 Worthington et al., wrote a paper with the idea of resolving this kerfufle showing that spring chemographs were very closely related to the percentage of allogenic (sinking stream) water, using a larger data set that included that of Shuster and White and Newson. Significantly, they showed in the Mammoth Cave aquifer where basin boundaries were accurately by tracing and hydraulic head mapping a multiple linear regression of percentage of sinking stream water and chemical (hardness) explained 99.3% of the variation. However that paper is also rather obscurely published in the proceedings of a Swiss karst conference. In any case the simplest test is to look at nine out of ten of the deepest caves in the world and five out of ten of the longest, which all have very low variability springs and by Shuster and White's model would mean that those aquifers should have no conduits! This reviewer has been in many of those caves so would have difficulty being convinced that there are no conduits in those aquifers! More recently Worthington et al., (2002a, 2002b) show that in any unconfined carbonate aquifer regardless of age of rock and matrix porosity, >94% of the flowing water in the aquifer is in conduits despite the fact that the matrix provides most of the storage. Discharge variability of a spring is a function of the elevation of the spring's outlet in comparison to the head and gradient in the bedrock. Springs that cease flowing are only discharging high-stage or overflow components. In each groundwater basin, at low stage one spring is discharging even though at high stage some basins discharge from orders of magnitude more overflow springs (Ray, 1997). The fact that the springs at the Bennett's Dump Site are all of the overflow type means that the ultimate discharge locations of the PCBs during low ground water stage have not been found and will have to be.

Response: The EPA appreciates the commentor's literature review regarding the relationships of spring flow variability and hydrogeologic regime in karst terrain. EPA notes several unique aspects of the referenced springs that set them apart from typical karst springs in the Bloomington area. Mound Spring is located at the downgradient edge of an extensive system of backfilled limestone quarry pits. It's name originates from the fact that it discharges from a large "mound" of quarry rubble used to backfill the quarry pits. The spring appears to occur at a low point on the rim of the buried quarry complex, and the spring flow is most analogous to overflow from a tilted bathtub.

EPA believes that the water discharging from Mound Spring is derived largely from channels in the rubble filled quarry pits rather than dissolution conduits in native

limestone bedrock. Groundwater discharging at Mound Spring is unique to other groundwaters in the area in that it contains elevated levels of chloride similar to water in open Quarry pits to the southeast. The chloride is believed to be derived from direct road salt runoff into the open quarry pits. The open quarry pits are in hydrologic connection to the downgradient buried quarry pits that feed Mound Spring.

Hydrologic investigations of Middle Spring suggest that it is a discharge point for groundwater circulating near the soil bedrock interface. As documented by numerous shallow piezometers in the area, the spring issues from a small pool in natural soils approximately 11 feet thick. The spring appears to be fed by upslope areas to the east, which receive overflow from buried quarry pits containing PCBs. The actual spring location appears to be controlled by a gravel-filled abandoned channel of Stout's Creek rather than a dissolution conduit in the native limestone. A pumping test of well, BC-10, was completed in the sand and gravel near Middle Spring. A short term pumping test of this well in November 2005 caused the spring to cease flowing and demonstrated the connection to the gravel layer.

EPA believes that groundwater and PCB discharge to Stout's Creek continues to occur after the on-site springs referenced above cease discharge and that an "underflow" component of groundwater flow does occur. There are at least two lines of evidence that support this. Hydrologic monitoring data for the Bennett's Dump site has shown that water levels in the abandoned quarry pits feeding Mound and Middle Spring continue to decline after flow ceases from the know springs. Further evidence comes from mass-balance studies of PCB discharges to Stout's Creek conducted in 2002 and 2003. Three sets of sample and flow gage data from 2002 indicated that only 15 to 64 percent of the PCBs present in downstream Stout's Creek could be accounted for by discharges from the known springs. A more comprehensive series of samples collected from Stout's Creek and springs in October 2003 again revealed more flow and PCB mass discharge in downstream Stout's Creek than could be accounted for by the known spring discharges. Only about 34 percent of the PCB mass discharge in downstream Stout's Creek could be accounted for by known spring discharge (see Attachment 1 of this Responsiveness Summary). Sampling directly within the channel of Stout's Creek suggests that that the most significant PCB mass influx occurs in the downstream part of the site near monitoring well MW-5A where the former abandoned gravel-filled channel of Stout's Creek intersects the current channel.

Comment 258: The flux of PCBs will be related to suspended solids at the springs so a sampling frequency "tuned" to storm events should be developed. Suspended solids often increase during storm events because velocities are higher and therefore transport of these particles increases. If the mass of PCBs inferred in discharges is less than inferred in the source areas the problems may be related to a lack of samples during storms and the overflow/ underflow problem cited previously.

Quantitative tracer testing using the most conservative injected dyes and careful stream-flow measurements at different stage conditions at downgradient locations could allow a water mass balance to be estimated. Underflows that are not being measured will be

revealed as a missing component in the discharge when allowing for reasonable measurement errors. Mass of tracer recovered could support the model also, but only if dyes that are used do not react with the substrate (such as CI AR 388, rhodamine WT, which is known to deaminoalkylate and change from a pink fluorescent compound to a green fluorescent compound. Filter fluorometry alone can mistake the green components for uranine (CI Acid Yellow 73; disodium fluorescein). If tracers cannot be recovered it will be evidence that monitoring locations for them have not yet been found and that the investigation is incomplete.

Response: During storm events, PCB levels in site springs typically remain in the same concentration range as for non-storm events. They do not show the pronounced spike typical of the karst springs at other Bloomington PCB sites.

Mass balance calculations to determine additional PCB sources to Stout's Creek in addition to the know springs have been conducted. See response to Comment --

Comment 259: The site location is not shown or described clearly so that anyone using applications such as Google Earth can easily locate it, for example, no latitude/longitude coordinates are published only rather vague descriptions about the location and figures that do not show enough local features such as major roads.

Response: A number of documents are available in the Administrative Index which describes the location clearly.

Comment 260: To begin, there are four fundamental problems with EPA's proposal: 1) The plan won't work, 2) EPA's description of the plan and the rationale for the plan is dishonest, 3) the plan violates the law, and 4) the plan will leave the public and environment at a continuing great risk of harm.

EPA's "Proposed Plan for the Record of Decision Amendment Operable Units Two and Three Bennett's Dump Superfund Site Bloomington Indiana" (hereafter "proposed plan") does not adequately protect public health and the environment. In order for such a plan to be protective, it would have to provide for the maximum feasible (from an engineering not cost perspective) removal of PCBs and contaminated material from the karst environment in which the PCBs have been disposed. Because of the karst features including sink holes, springs, and underground channels, there is no way to contain toxic contaminants such as PCBs disposed in karst. The karst environment simply provides underground transport routes for contaminated water that cannot be defeated. This is a truth that EPA's own scientists reported to EPA in the first few years of EPA's involvement with the Bennett's site(s) in the 1980s. EPA, motivated primarily by a desire to minimize polluter Westinghouse/CBS' and its own cleanup costs, has spent more than 20 years in denial of this fundamental truth, at the expense of great damage to the health of the public and both migratory and native wildlife.

EPA's proposed plan again makes the same fatal mistake as the EPA's original failed source control "hotspot removal" plan. It proposes to leave substantial amounts of highly toxic PCBs in the ground in a karst environment. But EPA has already proven through

its original failed source control hotspot removal plan that this approach simply does not work.

Response: EPA disagrees with the commenter. EPA's desire is not to minimize CBS's cleanup costs. On the contrary, CBS has spent multi-millions of dollars addressing PCBs in Bloomington and we expect CBS to spend additional millions of dollars to remediate the Bloomington PCB sites. EPA has not left substantial amounts of PCBs at the Bennett's Dump site. The area of excavation contained areas which were formerly quarried and filled with rubble, soil and debris. Groundwater was discovered contaminated with PCBs. The low levels of PCBs in groundwater will be captured in a collection trench and treated prior to discharge to Stout's Creek. The comment that "karst cannot be defeated" assumes that you cannot capture contaminated water in karst terrain. By using a collection trench, contaminated groundwater can be captured effectively over time with proper maintenance and monitoring. The commenter also references EPA scientists making the claim that karst cannot be defeated. Since the early 1980s much more information has become available that supports the use of water treatment at the site. The claim that substantial amounts of PCBs remain at the site is not supported by the extensive verification sampling data at the site. The site can be redeveloped to industrial/commercial standards with an average of 11.3 ppm PCBs. Finally, the commenter fails to recognize the nine criteria used to evaluate site remedies as described in the NCP. EPA does agree that excavating low levels of PCBs at depth below the groundwater elevation is the best approach, particularly when groundwater will still require treatment.

Comment 261: EPA admits that it still does not know the quantity of PCBs remaining in the quarry pits and surrounding soil, waste materials and limestone. Had EPA performed a Remedial Investigation and Feasibility Study (RI/FS) or an Environmental Impact Statement (EIS) as required by federal law to define the nature and scope of the contamination and alternatives for cleaning it up, EPA would not be facing the problem it now faces. EPA's decision to proceed once again with a remedial action in the absence of an RI/FS or EIS and public comment thereon violates federal law.

EPA fails to even consider or submit for public comment the obviously most protective and compliant alternative. This alternative would involve the following common sense approach: 1) prepare an adequate RI/FS to identify the location of the remaining PCBs and the location of the base groundwater flow as well as all overflow springs, 2) excavate all of those PCBs to the extent feasible from an engineering perspective (not based on cost) using an enclosure with air filtration to prevent PCB air releases, 3) then perform a water flow and PCB release study, and 4) then design and implement one or more interceptor trenches and water treatment systems, again within an enclosure having air filtration to prevent PCB air releases, as required to capture and treat any remaining PCB discharges including in the base flow. One can only presume this is because CBS (formerly VIACOM formerly Westinghouse) has refused to pay for such an imminently reasonable (but more expensive) approach.

Response: The commenter is incorrect. At the time the original remedy was selected it

an RI/FS was not required prior to remedy selection. To support the original remedy for Bennett's Dump, however, a large amount of data was collected, and this served as an RI/FS equivalent. Since the selection of the original Bennett's Dump remedy the Superfund Law was changed, as was the National Contingency Plan. Now, for new sites where no remedy has yet been selected, an RI/FS ordinarily would be required. However, for sites, like Bennett's, where a remedy has already been selected (here through an enforcement decision document and memorialized in a consent decree), even where an RI/FS has not previously been prepared, it is not necessary to start over with an RI/FS to support a change to the original remedy. Instead, U.S. EPA follows it's ROD amendment process, as it has done here, to develop data and other information that supports changes to a selected remedy.

In this case to support changes to the original Bennett's Dump remedy, a number of investigations were completed to characterize the Bennett's Dump site. The nature and extent of contamination was determined and a large investigation on the site hydrology was completed. A human health and ecological risk assessments were completed. Alternatives to remediate the site were evaluated and the subsequent Proposed Plan was issued for public comment. EPA did excavate PCBs based upon the nine criteria and air monitoring was completed during the excavation activities. The air monitoring did not show that PCBs were causing an unacceptable risk to workers or nearby homes. The preferred remedy does call for the design and implementation of interceptor trenches.

Comment 262: EPA predicts that PCB releases will be "reduced" by its proposed action but does not present data that justifies that prediction (in its public comment documents or in its administrative record or the public document repositories) or that allows the amount of reduction in current PCB releases from its proposal to be quantified. This is a critical point because even using EPA's own chosen risk assessment methods (which have the convenient advantage of ignoring the existing PCB and Dioxin overexposure for infants, children and adults), the risk to both humans and wildlife from the current PCB releases from the Bennett's site were found unacceptable by EPA many times over, as EPA reports in its public comment document. The PCB release reduction achieved by EPA's proposed plan for Bennett's Dump would have to be at least 95% to bring EPA's own risk calculations into a range that EPA itself would consider "acceptable."

However, even then, to find the remaining 5% PCB release to be "acceptable one would be forced to ignore EPA's risk policy which dictates either that existing exposures to the target compound be considered in the risk assessment if these exposures are known (which is the case for PCBs and Dioxin), or the conservative assumption be made that at least 75% of one's total exposure to the target compound will come from other sources (which requires that the hazard quotient acceptable risk standard not be 1.0 as EPA states in its Bennett's documents but rather 0.25). Either way, the remaining 5% PCB release would still result in an unacceptable risk given the calculations EPA presents in its Bennett's Dump public comment documents.

Response: PCB releases will be reduced with the implementation of Alternative 5 and, over time, the PCB concentrations in fish will decrease. EPA is unsure how the

commenter has calculated the 95% risk reduction. EPA has completed both a human health and ecological risk assessments using EPA approved guidance. EPA did evaluate exposures to PCBs and dioxin-like PCBs in its risk assessments and additional information on addressing background concentrations is discussed in the Response to Comment 265. The commenter's statement regarding the use of 75% of one's total exposure to the target compound coming from other sources is not part of EPA's Superfund risk assessment guidance and a Hazard Quotient of 1 continues to be EPA's point of departure. As noted in the Bennett's Dump Proposed Plan, revised total hazards are less than 1 at all locations. The remedy to be implemented will address the releases and over time, PCB concentrations in fish will decrease.

Comment 263: EPA appears oblivious to the fact that, given that the current U.S. population has PCB and Dioxin exposures that exceed the RfD and MRL for most members of the population of all ages, and all breast fed (and likely bottle fed) infants, and the population's exposure ranges past not only the hoped to be conservative RfD and MRL estimate of the real point at which harm occurs but ranges over as well PCB and Dioxin exposure levels at which animal studies have actually shown harm, that there is no way to rationalize an on-going release of PCBs or Dioxin as "safe." A release of these highly toxic persistent world traveling compounds will eventually result in the exposure of persons (and animals) whose existing exposure has already put them on the edge of the danger level, causing harm that otherwise would not have occurred because for those individuals (and animals) the threshold for harm would not otherwise have been crossed.

The long and short of this analysis is that EPA must take every possible step to prevent further release of PCBs and related compounds at Bennett's Dump and the other Bloomington sites, and EPA's current proposed plan simply does not do so. EPA should reject all five of the alternatives it has presented to the public and proceed expeditiously to select and implement the "omitted" common sense alternative identified and described above.

Response: Please see the Response to Comment 265 for a discussion of dioxin exposure. EPA has chosen a remedy that will prevent the further release of PCBs and related compounds. The EPA's approach has been similar to the approach described in Comment 261 in which the commenter suggests the use of interceptor trenches for groundwater.

Comment 264: Whatever approach EPA proceeds to follow, it needs to do so with a significantly greater degree of openness and honesty than it has demonstrated in proposing the Bennett's Dump plan under review. EPA can start by informing the public unqualifiedly that the original "operable unit 1" source control remedy has failed because it did not effectively remove or control the original source of PCB contamination at Bennett's Dump. EPA has admitted, reluctantly and between the lines, in its public comment documents for the proposed plan for Bennett's Dump "operable units two and three," that substantial amounts of PCBs remain at the Bennett's site and these PCBs continue to contaminate water and be released. This water being contaminated was not contaminated at the time of EPA's implementation of its waste removal effort in the

operable unit 1 source control remedy. This means simply that EPA's first PCB source control plan failed and a significant PCB source remains at the site uncontrolled.

EPA should, but has not admitted this. This failure of the first operable unit as a source control strategy is reflected in the design of the purported new proposed operable unit two, which EPA avoids calling source control but calls a water treatment operable unit instead. It is apparent that the new proposed operable unit two is in fact designed to address previously uncontaminated water that continues to become contaminated by flowing into contact with a remaining uncontrolled PCB "source" at the Bennett's site. This is the whole purpose of the plan component that involves draining the quarries that are thought to be feeding (relatively) uncontaminated water into the Bennett's site where the water becomes PCB contaminated and then is discharged to Stout's Creek. Because the new proposed "water treatment" plan is not really designed to address some body of pre-existing contaminated water (water contaminated by the PCB source since removed in operable unit 1) but is designed to address previously uncontaminated water that continues to become contaminated by a PCB source that has not been removed or controlled, it in reality is a follow-on second attempt at PCB source control because the first attempt failed. The proposed operable unit two attempts to control the still existing PCB source by reducing or eliminating the flow of uncontaminated water into the PCB source, and then treating the water that still manages to contact that PCB source. EPA should be honest about this with the public and not continue to represent that the first source control operable unit was successful.

Response: EPA has been open and honest with the public. EPA disagrees with the commenter that the first operable unit failed. The excavation was not a hot spot removal as described by the commenter but an excavation which remediated the site for commercial/industrial development. Substantial amounts of PCBs do not remain on the site as the commenter stated. The groundwater has been contaminated for many years and has been releasing to Stout's Creek but the buried quarry pits were unknown at the time of the 1999 excavation and this did affect the source control cleanup. The depth of the buried quarries and low levels of PCB contamination at the site does not make it practical to excavate additional material. The contaminated groundwater will be captured and treated to address the PCB releases.

Comment 265: As a second step towards being open and honest with the public that EPA is obligated by law to serve and protect, EPA should accurately report to the public the scientific facts regarding: 1) the mass of PCBs that have been released over time from the Bennett's Dump and other Bloomington sites not only via water discharges but also via releases to air, 2) the extent to which PCBs released to air are captured via a number of processes by plants and thereby enter the food web, and 3) the extent to which Bloomington and U.S. residents, including infants, are already exposed to PCBs, Dioxin and related compounds through food, water and air. EPA should likewise openly disclose how these existing exposures compare to ATSDR's MRL and EPA's Office of Water's RfD for dioxin and dioxin-like compounds, and to animal studies showing adverse effects. EPA should also fully report to the community the implications of the new studies regarding epigenetic effects of endocrine disrupting chemicals.

Response: EPA believes it is not practical (and would be of questionable valuable) to determine PCB mass releases to the air and water. The focus has been to address the unacceptable risk at the site through the implementation of source control and water treatment. To calculate the mass released would require a number of assumptions which would make the results questionable and inaccurate.

At every opportunity, EPA has provided extensive information to the public regarding dominant human exposure routes and risks regarding PCBs in Bloomington. EPA provided risk analyses regarding consumption of garden vegetables grown in soils contaminated with PCBs and implemented appropriate soil cleanup levels to protect public health. Short term releases of PCBs to the air do occur during cleanup operations and EPA has collected air samples and conducted risk assessments showing no significant risks to the public.

EPA believes it is impractical to conduct a theoretical modeling exercise on the amount of PCBs previously released to the air from area landfills. Such an analysis is subject to great uncertainty and it is extremely difficult to translate such evaluations into levels present on local vegetation. Historical air releases of PCBs, a small fraction of that released to the water, would have occurred but it improbable that amounts deposited from the air onto local vegetation and into the food chain would give rise to exposure levels measurably higher than those already occurring due to background air deposition resulting from global PCB use and dispersion. It should be recognized that the removal of thousands of tons of PCB wastes from the Bloomington area will reduce PCB releases to the air and address risk pathways which are more important to protect public health and wildlife.

PCB contamination of local vegetation and resultant risks of human exposure are orders of magnitude of less concern than are exposures which may occur from (1) fish consumption (2) direct ingestion of soils contaminated by capacitors, sludges and other wastes or (3) growing of garden vegetables in soils contaminated by wastes. EPA has made clear that the highest risks come from the consumption of fish and as a result has taken action to reduce PCB levels in wastewater discharges. Tests on drinking waters show no PCBs.

EPA has discussed the issue of background risks from exposures to PCBs, dioxins, and dibenzofurans which primarily occur due to the consumption of fatty foods (etc., beef, dairy). This is a global exposure issue. People can reduce exposures to PCBs present in certain commercially available foods by following a low-fat diet which has other health benefits. EPA's Office of Solid Waste and Emergency Response (OSWER) has not as yet made policy determinations regarding background exposures to PCBs and dioxin. The background exposure issue cuts both ways. If background exposures resulting from a particular chemical in the food supply is higher than those from exposure caused by a waste site, then it might be decided that there is no real value in addressing an environmental contamination problem.

Current background exposures, for people around the world exposed to dioxins and dibenzofurans, are in the range of 1-2 pg/kg-bw-day and have been declining over the past two decades. At background exposure levels there is some evidence of adverse health effects in the general population, including type II diabetes, endometriosis, and other endocrine effects. ADSDR's MRL and EPA's RfD have established at 1 pg/kg-bw-day. U.S. EPA is currently awaiting the National Academy's evaluation of EPA's dioxin reassessment to revise various health criteria.

Comment 266: As another step towards honesty, EPA can stop calling "doing nothing" an "operable unit" as they do with operable unit 3 for contaminated sediment at the Bennett's site. EPA should also consistently report risks to both humans and wildlife for each component of its proposed actions. EPA appears to ignore wildlife in discussing risks from its no action plan for sediments, although EPA made a point of discussing the considerable risks to wildlife when such risks supported selection of a "do something" alternative regarding water, where EPA had chosen to do "something."

Response: EPA evaluated sediment in the human health and ecological risk assessment. EPA did not ignore wildlife in its analysis in the ecological risk assessment. The sampling data showed concentrations under 1 ppm PCBs, along with the existence of a rocky bottom (that is, low sediment volume present) within Stout's Creek, lead EPA to propose No Action for operable unit 3.

Comment 267: We look forward to the day when our federal and State environmental agencies stop looking for ways to rationalize allowing toxic releases to the environment to continue in order to save the polluting corporations money (at the expense of public health) and start requiring the polluting corporations to pay for decisive actions that stop the toxic releases these corporations caused by their very profitable but very reckless business practices. We hope that day comes with EPA's final decision on its new remedy for Bennett's Dump.

Response: EPA did not rationalize allowing toxic releases to the environment. EPA decision making was based upon the large number of investigations which have taken place at the Bennett's Dump site and its human health and ecological risk assessment. The construction of the passive quarry drains and interceptor trench with treatment of water will prevent the release of PCBs into Stout's Creek at a concentration and mass that threatens human health and the environment.

Comment 268: White suckers are overrepresented in the modeled diets of mink and kingfish. "EPA relies on data concerning PCB exposures to chicken and pheasants for its calculations concerning exposure to kingfishers" but "recent scientific evidence ... shows that kingfishers are much less sensitive to PCBs than chickens or pheasants".

Response: The contribution of white suckers to modeled diets is addressed under Comment 278.

Toxicological studies of chicken or pheasant exposed to PCBs have no role in modeling exposure of kingfishers to PCBs at the site, but are used *in part* to assess the potential risks associated with the modeled exposures. PCB toxicological studies have not been performed with kingfisher. Uncertainty over the sensitivity of kingfisher is addressed by assessing potential risks with multiple sets of toxicity values to represent a range of sensitivities to PCBs. In addition to studies with chicken or pheasant, studies of PCB effects in doves are also used to assess potential risk to kingfisher. Doves are not considered highly sensitive to PCBs.

The comment that kingfisher has been shown to be insensitive to PCBs is addressed under Specific Comment 275.

Comment 269: Stout's Creek headwaters area "is currently being developed and will undergo substantial additional development over the next five to ten years", which will "limit the availability of suitable and desirable habitat near the Site for ecological receptors".

Response: See Specific Comment 277.

Comment 270: "[T]he portion of Stout's Creek affected is so small that very few ecological receptors will be impacted." In the worse case, only 1 mink or kingfisher "could be affected by PCBs in fish at this portion of Stout's Creek." "According to EPA's guidance, the focus of ecological risk assessment is to protect the population of a species, not individual animals. *See* U.S. EPA OSWER Directive 9285.7-28 "Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites" (October 7, 1999)."

Response: There are two parts to the response. First, the OSWER directive refers to local populations at or near the site, not regional populations. According to OSWER Directive 9285.7-28 P:

> "The goal of the Superfund program is to select a response action that will result in the recovery and/or maintenance of healthy *local* populations/communities of ecological receptors that *are or should be present at or near the site*, ... Contaminated media that are expected to constrain the ability of *local* populations and/or communities of plants and animals to recover and *maintain themselves in a healthy state at or near the site* (e.g., contamination that significantly reduces diversity, increases mortality, or diminishes reproductive capacity) should be remediated to acceptable levels." [emphases added].

Second, mink and kingfisher are selected as assessment endpoints to ensure protectiveness for many other species that are part of the same ecosystem. As discussed in the Problem Formulation section of the Bennett's Dump FERA, one of the reasons for assessing risk to mink and kingfisher is because protection of piscivorous wildlife from PCB-related risks is expected to be protective of fish and other aquatic organisms. The same rationale is used in setting the PCB federal ambient water quality criteria for

environmental effects. Therefore, populations of fish may be at risk of adverse effects in the stream reaches in which mink and kingfisher are potentially at risk. Although the number of mink or kingfisher potentially utilizing the affected portions of Stout's Creek at any one time may be small, the numbers of fish and other aquatic organisms in the same reaches are potentially large.

Comment 271: Selection of any remedy other than Alternatives 1 or 2 is not justified by either human or ecological risks."

Response: CBS's assessment of low risk to ecological receptors is based on non-conservative (low) estimates of exposure and non-conservative toxicity reference values (low estimates of toxicity), coupled with dismissal of any unacceptable risk estimates to mink or kingfisher based on a questionable assumption that development will reliably prevent foraging in contaminated reaches by mink or kingfisher. The multiple non-conservative assumptions are contrary to Superfund guidance and practice. Also, CBS ignores potential risks to other aquatic receptors (fish, amphibians, aquatic invertebrates) which were not directly evaluated in the FERA because actions to protect mink or kingfisher from unacceptable risk are expected to be protective for aquatic receptors. If potential risks to mink or kingfisher are disregarded, as recommended by CBS, the possible risks to fish, amphibians, and aquatic invertebrates in the affected reaches are left unknown. Evaluation of risk to mink and kingfisher serves as a surrogate for risk to other aquatic receptors only when remedial actions are taken to reduce unacceptable risks to mink or kingfisher. Evaluation of risk to mink and kingfisher is not protective for other aquatic receptors if findings of unacceptable risk to mink or kingfisher are peremptorily dismissed.

Comment 272: The methods used to derive some of the Toxic Reference Values ("TRVs") for both mink and birds are novel and their utility and accuracy have not been established." "Extrapolation of NOAELs and LOAELs from the combined data sets have several obvious limitations, including comparability of methods between studies." Mink TRV adjustment to account for two breeding seasons' exposure may not be scientifically valid. The uncertainty section should address "this new process and should contrast it with TRVs that would be appropriate from the more typical EPA process based on single high quality studies".

Response: Eight sets of TRVs are used in the FERA, the comments pertain to 2 of these 8 sets. The TRVs in question are based on meta-analysis of multiple toxicity studies, a procedure used to derive mink dietary no effect (500 μg total PCB/kg diet) and low effect (600 μg/kg) TRVs, and kingbird ingestion dose no effect (400 μg total PCB/kg_{BW}-d) and low effect (500 $\mu g/kg_{BW}$-d) TRVs (a second set of kingbird PCB ingestion TRVs used in the FERA are not based on meta-analysis). The remaining 5 sets of TRVs in the FERA are derived through other approaches.

The methods used for the meta-analysis are not novel. The approach is based on Leonards, et al. (1995), who used meta-analysis to interpolate mink tissue-based PCB TRVs on a dioxin-equivalent (TEQ) basis. The method used in the FERA for

normalizing data from multiple studies to combine them into a single meta-analysis is the same as used by Leonards, et al. (1995). Other examples of the same normalization approach for meta-analysis of ecotoxicological studies include Isnard, et al. (2001), Tanaka and Nakanishi (2001), and Calabrese (2005). The main differences between the methods in the FERA and Leonard, et al. (1995) are minor ones made for site-specific objectives. The FERA meta-analysis TRVs are derived for PCBs on an individual Aroclor basis, instead of TEQs; exposure to mink is quantified on a dietary basis, instead of tissue accumulation; a different regression method is used (adapted from USEPA guidance on effluent toxicity testing); and, consistent with Superfund practice, TRVs are based on the range between no adverse effects and the onset of adverse effects, while the Leonards, et al. (1995) TRVs are based on a high incidence of adverse effects (affecting 50 % of exposed mink).

CBS incorrectly states that the TRVs are extrapolated, but the meta-analytical method in the FERA is restricted solely to interpolation within the combined data sets, and extrapolation beyond the bounds of the empirical data is not allowed.

Incompatibilities between studies because of differences in study design or other factors are potentially important limitations of meta-analysis and, therefore, are evaluated as part of the meta-analysis performed for the FERA. Significant incompatibilities between studies are revealed by inconsistencies in the exposure-response plots of the combined data sets. There are no inconsistencies among the 3 studies performed by two sets of investigators combined in the meta-analysis of PCB effects on hatchability, to the contrary, the results of the various studies are remarkably consistent with each other (Figure 1). The mink PCB TRVs are based on 4 studies performed by three sets of investigators (two separate experiments reported in Aulerich and Ringer 1977 are included in Figure 2). The results are internally consistent except for an inconsistency between studies at 1 mg/kg PCB dietary concentration (Figure 2). For the FERA, the two data points are averaged before calculating the TRVs, but, if the data point showing greater toxicity at 1 mg/kg PCB is excluded (Aulerich and Ringer 1977), and the TRVs are calculated with only the Wren, et al. (1987) data point to represent the response at 1 mg/kg PCB (showing less toxicity), the TRVs increase by no more than 15 %. Therefore, the difference between studies at this dietary concentration has only a minor influence on the calculated TRVs. Mink reproduction is consistently suppressed in treatments at or above 2 mg/kg dietary concentrations.

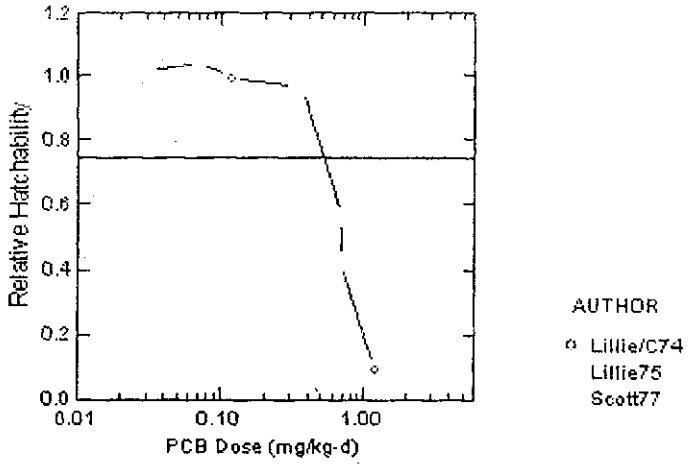


Figure 1. Hatchability, Aroclor 1248 Dose to Chicken Hens
(Lillie/C74 - Lillie, et al. 1974 and Cecil, et al. 1974 (reporting the same study); Lillie75 - Lillie, et al. 1975; Scott77 - Scott 1977)

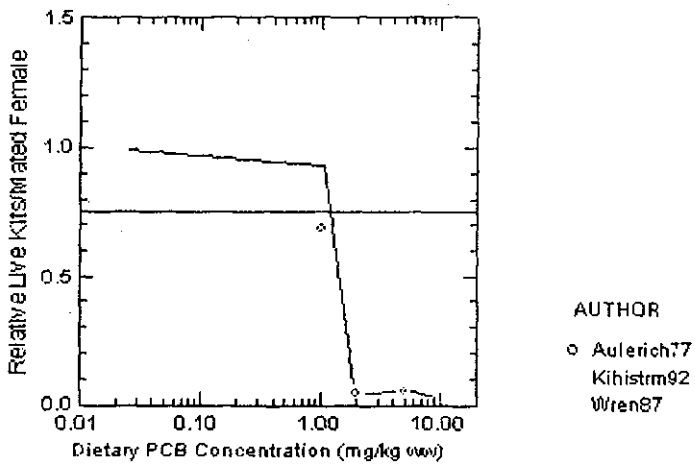


Figure 2. Live Kits per Mated Female Mink Exposed to Aroclor 1254 for 1 Breeding Season
(Aulerich77 - Aulerich and Ringer 1977; Kihistrm92 - Kihiström, et al. 1992; Wren87 - Wren, et al. 1987)

The mink PCB TRVs in the FERA are based on mink feeding studies performed over a single breeding season (longer duration Aroclor feeding studies with mink were not located). Prolonged mink feeding studies with field-contaminated fish (Restum, et al. 1998) or with a European PCB product (Brunström, et al. 2001) have shown increased toxicity after continuous exposure through 2 breeding seasons or to 2 generations of mink. The TRVs based on single-breeding season exposure to Aroclor 1254 are accordingly adjusted to reflect the increased toxicity with longer exposure as seen in

other mink studies. The findings of increased PCB toxicity with prolonged exposure over more than one breeding season or generation in two mink feeding studies are supported by similar findings in PCB studies with other mammals:

McCoy, et al. (1995) reported the PCB body burden in oldfield mice (*Peromyscus polionotus*) approximately doubled between generations at a constant exposure concentration, and was associated with increasingly adverse effects.

> "These observations indicate that, even at this low level, chronic exposure to PCBs has pronounced reproductive effects on mammals and that these effects are amplified through multigeneration exposure. ... It is apparent that continued exposure at a low level results in amplified body burdens over three generations. For wild populations that remain in the same area for many generations, cumulative effects may have serious consequences. ... In studies of wild populations, it is evident that the roles of maternal exposure and increasing body burdens must be considered in assessing the long term effects of PCB exposure."

Linzey (1988) reported for white-footed mice (*Peromyscus leucopus*) that

> "Reproductive success of second generation PCBs-treated white-footed mice was reduced in comparison with performance of the parental generation reported by Linzey (1987). ... These results confirm the expectation that effects of chronic exposure to PCBs are cumulative through generations, probably due to length of exposure as well as to exposure during critical periods of growth and development."

The PCB studies are consistent with an increase in the reproductive toxicity of dioxin (TCDD) associated with exposure to multiple generations of rats compared to exposure to a single generation (f_0 is the initial generation tested, f_1 is the offspring from f_0, and f_2 is the offspring from f_1) (Murray, et al. 1979).

> "At the intermediate dose of 0.01 μg TCDD/kg/day, many adverse effects seen in the f_1 and f_2 adults and their litters were not evident in the f_0 adults or their offspring. The most obvious difference is that the f_0 rats were given TCDD beginning at about 7 weeks of age whereas subsequent generations were exposed to TCDD, at least theoretically, from the time of conception. This suggests that some of the effects observed were initiated, perhaps, during the neonatal period."

Following a suggestion of CBS (then Viacom), an uncertainty analysis has been performed for the two sets of meta-analysis TRVs. The procedure, recommended by Dr. John Giesy, ENTRIX, consultant to CBS, is to remove data points individually from the combined data set to assess the effect of incompatibilities between studies and treatments on the TRV interpolation. The results show that the TRVs for PCB dietary exposure to mink, and PCB ingestion dose to birds, are robust to data variability in the upper range of exposures, but not in the lower range of exposures. In other words, the "actual" TRVs are unlikely to be higher than the values used in the FERA–the analysis recommended by

CBS resulted in no more than a 20 % increase in the calculated TRVs, and mostly less than 10 % changes related to variability in the upper range of exposures, but the "actual" TRVs might be lower than derived for the FERA–the procedure resulted in 35 to 90 % decreases in calculated TRVs related to variability in the lower range of exposures. This implies that risk calculations based on these TRVs are unlikely to overestimate risk, but the possibility that risk might be underestimated cannot be ruled out.

TRVs derived through what CBS characterizes as a "more typical EPA process based on single high quality studies" are presented in Appendix E of the FERA, and comparisons with the TRVs used in the FERA are discussed in FERA Sections 4.1 and 4.2. The discussion is expanded below:

Two high-profile applications of mink total PCB TRVs in USEPA Region 5 have been for the Great Lakes Initiative (GLI) and the Fox River Superfund site in Wisconsin. The TRVs were based on "single high quality studies", and were externally peer reviewed in both cases. Converted to a dietary basis, the Fox River mink LOAEC (0.5 to 0.7 mg PCB/kg diet) is highly consistent with the LOAEC of 0.6 mg PCB/kg diet in the FERA. The NOAEC for the Fox River (0.25 mg PCB/kg diet), is lower (more conservative) than the FERA NOAEC of 0.5 mg PCB/kg diet. The LOAEC for the GLI (2.0 mg PCB/kg diet) is higher than the FERA LOAEC, but is based on complete reproductive suppression in mink, which is inadequately protective for regulatory purposes (the GLI water quality criteria are based solely on no effect levels, and the LOAEC served only as a starting point for estimating a NOAEC). Again, the GLI NOAEC (0.2 mg PCB/kg diet) is more conservative than the FERA NOAEC. The low NOAEC values chosen for the Fox River and GLI are the result of wide dose spacing in individual experiments that missed the actual dose at which adverse effects begin to be observed. By combining multiple studies, the meta-analysis in the FERA provides a more detailed characterization of the relationship between exposure and reproductive effects compared to single-study approaches.

Outside of USEPA Region 5, the externally peer-reviewed mink TRVs for the Hudson River are much more conservative (LOAEC – 0.25 and NOAEC – 0.025 mg PCB/kg diet) than the mink TRVs in the FERA. A site-specific mink feeding study was performed for the Housatonic River Superfund site (Bursian, et al. 2006). The dietary concentration of the treatment resulting in decreased kit survival (3.7 mg PCB/kg diet) is higher than the LOAEC TRVs used at other Superfund sites, but resulted in high kit mortality (54 %). The investigators performed probit regression analysis to calculate the dietary concentrations lethal to 20 % and 10 % of kits (LC_{20} and LC_{10}, respectively) and the associated 95 % confidence intervals (CI). The LC_{20} is 1 mg PCB/kg diet (CI: 0.5 – 1.9 mg/kg), and the LC_{10} is 0.2 mg PCB/kg diet (CI: 0.03 – 0.5 mg/kg) (rounded values based on Bursian, et al. 2006). The Bursian, et al. (2006) LC_{20} differs from the FERA LOAEC by less than a factor of 2, reasonably consistent with the observed difference in toxicity between PCB exposure over 1 breeding season versus exposure over 2 breeding seasons. In contrast, the Bursian, et al. (2006) LC_{10} is lower (more conservative) than the FERA NOAEC. However, the 95 % confidence intervals for the Bursian, et al. (2006) LC_{20} and LC_{10} include the values of the LOAEC (0.6 mg PCB/kg diet) and NOAEC (0.5

mg/kg) TRVs, respectively, used in the FERA. The Housatonic River studies are discussed further in the response to Specific Comment 3.

Overall, the FERA mink PCB NOAEC is less conservative than the NOAECs based on "single high quality studies" at other sites. The estimated risk to mink would be much higher if the FERA NOAEC TRV were replaced with the externally peer-reviewed NOAEC TRVs for the Fox River Superfund site, the Hudson River Superfund site, or the Great Lakes Initiative, or with the LC_{10} of the Housatonic River study.

Overall, the FERA mink PCB LOAEC is a median value among the LOAECs based on "single high quality studies" at other sites. The estimated risk to mink would increase more than 2-fold if the FERA LOAEC TRV were replaced with the externally peer-reviewed LOAEC TRV from the Hudson River site, the risk estimate would not change if the externally peer-reviewed Fox River LOAEC TRV were used, and about 40 % less risk would be estimated based on the LC_{20} of the Housatonic River study with no adjustment for exposure duration.

Two high-profile applications of avian total PCB TRVs in USEPA Region 5 have been for the Great Lakes Initiative (GLI) and the Fox River Superfund site in Wisconsin. The TRVs were externally peer reviewed in both cases. The GLI LOAEL (0.6 mg PCB/kg_{BW}-d), based on a study with pheasant, is similar to the FERA LOAEL (0.5 mg/kg_{BW}-d), but the GLI NOAEL (0.2 mg/kg_{BW}-d) is lower (more conservative) than the FERA NOAEL (0.4 mg/kg_{BW}-d). The Fox River LOAEL (1.12 mg/kg_{BW}-d), based on effects in doves, is higher than the FERA LOAEL, but the Fox River NOAEL (0.11 mg/kg_{BW}-d) is much lower than the FERA NOAEL. The Fox River avian TRVs are incorporated into the FERA in addition to the meta-analysis TRVs to provide a range of risk estimates for kingfisher to account for unknown sensitivity to PCBs.

The TRVs for kingfisher at the Hudson River Superfund site (LOAEL – 7.1 and NOAEL – 1.8 mg PCB/kg_{BW}-d) are much higher than the TRVs for the FERA, Fox River, or GLI. The Hudson River TRVs are based on the same pheasant study used by the GLI, but a different and less sensitive endpoint was used for the Hudson River (egg production) than for the GLI (egg hatchability). Use of egg production for setting PCB TRVs is questionable for two reasons: first, egg production in chicken, a sensitive species to PCBs, shows no coherent relationship with PCB exposure (Figure 3), and second, there is "very little evidence" that egg production limits clutch size in the field (Mineau 2005). The GLI use of egg hatchability, not egg production, is a more ecologically relevant basis for deriving TRVs.

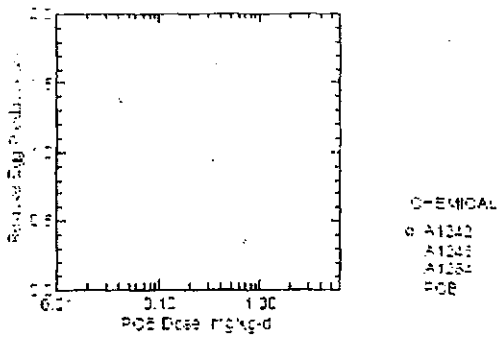


Figure 3. Egg Productivity, PCB Dose to Chicken Hens
(Sources: Britton and Huston 1973; Cecil, et al. 1974; Lillie, et al. 1974; Platanow and Reinhart 1973; Scott 1977; and Summer, et al. 1996a,b)

Comment 273: Housatonic River mink study "is the highest quality, most relevant study from which TRVs can be derived". "[I]t has been established that dioxin toxic equivalents ("TEQs") are the most accurate predictor of toxicity to mink." The relative potencies of dioxin-like activity are similar in Housatonic River and Stout's Creek fish. USEPA used NOAEL TRV for GBH in the Hudson River ERA based on Halbrook et al. (1999) field study where Aroclor 1260 was the contaminant. "If the EPA considered the TRVs derived from the Housatonic study, the calculated hazard quotients would be shown to be much smaller."

Response: The mink feeding study performed for the Housatonic River Superfund site is a high quality single-breeding season exposure study, but the applicability to the Bennett's Dump site is uncertain because of the differences in the major Aroclors released at each site. The predominant Aroclor released to the Housatonic River was Aroclor 1260 (USACE/USEPA 2004), reflected in both Housatonic River aquatic biota (Yanik, et al. 2003) and tree swallows (Custer and Read 2006).

Aroclor 1260 differs in composition and toxicity from Aroclor 1242, the predominant Aroclor disposed in Bennett's Dump. The dioxin-like toxicity of Aroclor 1260 is less than one-half of that of Aroclor 1242, as shown by bioassays that provide an integrated measure of total dioxin-like activity (Tillitt, et al. 1992). Aroclor 1260 differs in having a larger polychlorinated dibenzofuran (PCDF) co-contaminant component compared to other Aroclors—12 times as much as Aroclor 1242 (Wakimoto, et al. 1988). Most of the TEQ of Aroclor 1260 is due to PCDFs (70 %), not PCB coplanar congeners (29 %), in contrast to Aroclors 1248 and 1254 in which most of the TEQs are due to PCB coplanar congeners (at least 90 %) with only small PCDF contributions (less than 10 %) (Yamashita, et al. 2000). The predominant role of PCDFs in causing toxicity at the Housatonic River site is supported by a field study of tree swallows:

> "The hypothesis that the dioxin and furan congeners are contributing to reduced hatching success *more so* than the PCB congeners is further supported by the two-variable model results. In these models, TEQs associated with PCBs become nonsignificant in both analyses, while the WHO TEQs for dioxin/furans remained as a significant variable ..." (Custer, et al. 2003) [emphasis added].

PCDFs also bioaccumulate less overall compared to PCB coplanar congeners. The reported biota-sediment accumulations factors (BSAFs) in field studies are lower for PCDFs than for PCBs (Niimi 1996; van der Oost, et al. 1996; Marvin, et al. 2002; Naito, et al. 2003; Burkhard, et al. 2004). Similarly, diet-to-egg biomagnification factors (BMFs) for birds are lower overall for PCDFs compared to PCB coplanar congeners (Hoffman, et al. 1996; Henny, et al. 2003; Murata, et al. 2003).

Despite the differences in composition and bioaccumulation between the predominant Aroclors released at the sites, the ratios of TEQ to total PCBs in fish samples appear to be similar for fish from the Housatonic River and Stout's Creek. However, total PCBs are measured differently at the two locations: sum of PCB congeners for Housatonic River fish and total Aroclor for Stout's Creek fish. Aroclor analysis may overestimate or underestimate total PCBs compared to the sum of congeners (Sather, et al. 2003; Connor, et al. 2005). For Stout's Creek fish, the magnitude of the difference between Aroclor-based and congener-based analysis of total PCBs is unknown, so there is significant uncertainty over the comparison with the data on Housatonic River fish. TEQ is also measured differently at the two sites, for Stout's Creek samples it includes only dioxin-like PCB congeners, but for the Housatonic River Samples, TEQ also includes the contributions of dioxins and chlorinated dibenzofurans.

The statement that "If the EPA considered the TRVs derived from the Housatonic study, the calculated hazard quotients would be shown to be much smaller" is inaccurate. As discussed in the response to Specific Comment 2, the LC_{10} of the Housatonic River mink study is lower (indicates *more* toxicity) than the FERA NOAEC. The Housatonic River LC_{20} is somewhat higher than the FERA LOAEC (indicates about 40 % less toxicity), but the 95 % confidence interval for the LC_{20} includes the value of the FERA LOAEC, and the difference between the values is consistent with the observed increase in PCB toxicity with exposure over more than one breeding season.

Comment 274: FERA TRVs for kingfisher "are all from other bird species". "Gallinaceous birds, such as chicken and pheasants are among the most sensitive birds" to PCBs. EPA should base the kingfisher TRV on Housatonic field study (Henning and Brooks 2003). "[I]t has been established that the TEQs are the most accurate predictor of toxicity to fish eating birds." The TEQs of Housatonic fish (mg TEQ/kg PCB) are similar to Bennett's Dump fish. "There is a growing body of evidence that suggests that it is inappropriate to apply chicken based TRVs to piscivorous birds for TEQs." "[T]he raptor TEQ egg LOAEL ranges conservatively from 210 pg/g to 303 pg/g based on enzyme induction ... [which] occurs at much lower concentrations than effects on reproduction and development."

Response: Chicken are known to be sensitive to PCBs, and chicken PCB toxicity data are used to derive one set of TRVs to represent higher sensitivity to PCBs, but a second set of TRVs based on doves is also used in the FERA to represent middle sensitivity to PCBs, which brackets uncertainty over the sensitivity of kingfisher to PCBs. It would be

inappropriate to solely assess potential risk to kingfisher based only on TRVs for insensitive species when the sensitivity of kingfisher is not known.

Data from a dioxin study with pheasant is used for dose-based TEQ TRVs. Although pheasant are also a gallinaceous species, pheasant is less sensitive to dioxin than chicken. One of CBS's consultants described pheasant as "one of the more tolerant species" to dioxin-like effects (Giesy, et al. 1995; see also Bowerman, et al. 1995).

The kingfisher field study performed at the Housatonic River site is limited by several shortcomings in design, including an insufficiently broad exposure gradient, lack of a control or reference population, and a method of evaluation that is subject to confounding because the results of the field study are compared to that of a single study from the literature for a different location. According to the Housatonic River ERA (USACE/USEPA 2003 §8.5.4):

> "The belted kingfisher field study results do not definitively support the conclusions of low risk because the data are limited. There are several conclusions drawn by the authors that are not strongly supported by the information presented in the report. The conclusion that the kingfisher population is consistent with the quality of habitat present is speculative. ... It is inappropriate to conclude that the Housatonic River kingfishers fall within the range reported for other kingfisher populations when only one study is referenced."
>
> "... EPA was not provided with an opportunity to review these protocols prior to receiving the study. There were several shortcomings of the approach used. For example, there was no reference site, no information was provided regarding nest search intensity, the researchers were unable to determine clutch size, and there were too few visits to the nests during the reproductive cycle. These shortcomings limit the ability to draw rigorous conclusions."
>
> "The approach used to estimate dose in the belted kingfisher study had a number of shortcomings. ... As a result, the dose gradient achieved by this approach is likely too narrow to detect a significant dose-response relationship."
>
> "The sample sizes were very small (i.e., n=6) for the statistics used ..."

For these reasons, the Housatonic kingfisher field study is not considered an adequate study for reducing uncertainty over the relative sensitivity of kingfisher to PCBs. Other issues concerning the applicability of Housatonic River studies to the Bennett's Dump site are discussed under Specific Comments 1 and 2.

The comments on the differences between PCB toxicity in chicken and raptors (eagles, osprey, kestrels) are not germane because kingfisher is not a close relative of either chicken or raptors. Assuming kingfisher sensitivity to PCBs is similar to that of raptors is as uncertain as assuming it is similar to that of chicken. The FERA assesses risk to kingfisher based on a range of sensitivities to address this uncertainty. Also, in a review

of avian studies of dioxin-like toxicity performed by USEPA, chicken was not shown to be unusually sensitive:

> "A conclusion of these analyses is that the domestic chicken is, as is generally recognized, the most sensitive tested species, but it is not aberrantly sensitive. Given the wide range of sensitivities within birds and within mammals to dioxin-like chemicals, test data for chickens should be used." (USEPA 2003).

The review also compared TRVs derived through the species sensitivity distribution (SSD) approach for laboratory versus field studies. The egg TEQ TRVs are lower (showing greater toxicity) based on field studies compared to TRVs based on laboratory studies, even when chicken are included in the laboratory SSD (USEPA 2003). This indicates that the results of chicken studies are not necessarily overprotective for wild birds, and may even be underprotective in some situations.

The particular values of the egg TEQ TRVs used in the FERA are based on enzyme induction, but the TRVs were chosen because they represent a middle range between the values reported in multiple field studies that resulted in reproductive impacts, which are ecologically relevant endpoints.

Comment 275: The FERA assumes 100 % site utilization, but, "at most, approximately 30% of diet could be taken from the upper most reach."

Response: The FERA assumed 100 % site utilization as a starting point, but also assessed the proportion of diet a receptor could obtain from a given reach that would result in exposures equal to the TRVs (Sections 5.3 and D.5). The percent allowable consumption is somewhat overestimated because the receptors are unrealistically assumed to have no PCB exposure outside of the reach under consideration.

Comment 276: The upper most mile of Stout's Creek is currently being developed – North Park development will convert to "a busy commercial/residential district", which "will decrease the usage of this upper portion of the stream by ecological receptors"

Response: Residential and commercial development is not a generally accepted remedial technique for addressing contaminant releases. Development is not a reliable barrier to wildlife use of the remaining natural resources in a developed area. For example, the favored habitats of American mink include lakes, streams, rivers, wooded marshlands and swamps, but mink "also live near urban areas if there is sufficient cover and prey" (ISSG 2006). As documented by Mech (2003), even areas with minimal appropriate cover may be included within the foraging range of mink or otter. Over a 4-year period in a highly urbanized area between the twin cities of St. Paul and Minneapolis, Mech (2003) reported 3 road-killed mink, the tracks of a fourth mink, and river otter signs ("extensive tracks, slides, and feeding holes through thin ice"). Mech (2003) describes the area as follows:

> "It has long been a heavily populated residential, industrial, and business area interlaced with paved streets, highways, and parking lots, and a golf course. The

> only nearby natural vegetation is an embankment up to 15 m wide along each side of a railroad track. The only water is a pond of 1.1 ha [2.7 acres] (Walsh Lake) surrounded by a golf course and residential yards. A storm sewer feeds the pond. The nearest natural mink habitat is 3.3-5.7 km [2-3.5 miles] away, with houses, yards, businesses, and six to eight lanes of interstate highway intervening. The nearest extensive waterways where otters might be expected are 3.5-6.0 km [2.2-3.7 miles] away, also separated from the area by the same type of surroundings. ... *There was neither natural vegetation nor waterway between the pond and the* dead mink. Wherever the mink and otter came from, they had to have passed through yards, lawns, streets, highways, and parking lots, ditches, or possibly sewers."

In this case, the extensive commercial and residential development, and the lack of natural cover, did not deter mink or otter from regularly traveling to and utilizing a pond that is too small to fully support either species.

> "[T]he pond probably constituted only a small part of one mink's home range, despite the fact that there was no vegetation or waterway connecting it with any other natural mink habitat." (Mech 2003).

The main difference between the urbanization described by Mech (2003) and the proposed development around the upper portion of Stout's Creek is that a connecting waterway will remain in place. Receptors will be able to easily access the upper portion of Stout's Creek by moving upstream along the creek and will not have to cross miles of commercial and residential development.

Comment 277: Weighted mean PCB by abundance, not arithmetic mean (latter overestimates contribution of white suckers). Station 1 mink diet 3609 μg PCB/kg , ww, arithmetic mean to 2300, weighted mean. Station 2 mink diet 1629 μg PCB/kg , ww, arithmetic mean to 1111, weighted mean

Response: The mink and kingfisher exposure estimates in the FERA are based on a mix of fish prey to provide more realistic values compared to the conventional approach of modeling exposure based on a single, often most contaminated, fish species. However, the precise selection of prey species by mink or kingfisher is not known. Predators are often opportunistic, feeding predominantly on the most available prey, but this does not mean that predators consume prey in the exactly same proportions as their numbers in the environment. Several other factors also influence prey selection, for example, prey size, micro-habitat use by prey, capture effort, and individual preference. There is no guarantee that prey selection will closely track species composition.

Another issue is that the relative abundance of species varies both spatially and temporally. For example, in Richland Creek, the coefficient of variation (CV) for numbers of hog suckers (*Hypentelium nigricans*) collected by electroshocking four segments of a continuous reach is relatively high (0.85) (calculated from Gerking 1953).

In addition to spatial variability, seasonal and annual variability in abundance are also expected.

As shown by the revised calculation in the comment, the overall effect of the suggested change in dietary composition is relatively small. The revised exposure estimates are approximately two-thirds as high as the estimated in the FERA.

Comment 278: Appendix D, Table D-1, 65.33 pg/g LS TEQ at Maple Grove should be 13.9.

Response: The data entry errors in this table have been corrected, the TEQ for this sample recalculated, and the corresponding risk estimates have been revised.

Comment 279: *Weighted average for fish TEQ. Crayfish TEQ should not equal fish* TEQ

Response: Extrapolation of crayfish TEQ from single-sample fish data is highly uncertain. The ratios of PCB concentrations in fish to that in crayfish are based on mean values, and are not appropriately applied to single samples.

Comment 280: Beanblossom Creek is more attractive to potential receptors than Stout's Creek

Response: The comment is based on the seemingly common sense, but mistaken, assumption that differences in the use of different habitats by animals are directly related to differences in habitat quality. This is not necessarily the case, particularly in territorial species. As discussed by Van Horne (1983), in many cases greater densities of animals are found in suboptimal habitat because they have been excluded from the highest quality habitat by dominant individuals. See Garshelis (2000) for other causes of this counterintuitive pattern of habitat use.

Comment 281: While there may still be some hazard quotients estimated to be greater than 1 for the most upstream sections of the creek, because of the small size of these areas and pending high density development, few receptors, if any would actually be able to forage in these more upstream areas. ... The TRVs and receptors modeled were chosen to represent sensitive receptors and thus be protective of other less sensitive receptors. Therefore, after revising the hazard quotients per the above comments, EPA should be comfortable that populations of less sensitive receptors are not at risk."

Response: The opening and closing sentences of this comment are contradictory. If the risk to the selected receptors is disregarded because of the size of the affected area is claimed to be too small, or because of the presumed deterrent effect of development, then there is no basis for concluding that less sensitive receptors are not at risk. The reason for selecting kingfisher and mink as the receptors in the FERA was that actions protecting piscivores from the adverse effects of PCBs are expected to be protective as well for aquatic organisms (fish, amphibians, aquatic invertebrates). However, the home range of

these aquatic organisms is much smaller than for either mink or kingfisher, and the presumed unfavorable effect of development, even if it did deter mink or kingfisher use (which is not necessarily the case), would not deter or prevent aquatic organisms from utilizing the same reach.

Comment 282: A number of commenters stated that they would like to see the implementation of EPA's preferred remedy (Alternative 5).

Response: EPA agrees that Alternative 5 is the best alternative to address the continuing release of PCBs into Stout's Creek from the Bennett's Dump site.

Comment 283: A few commenters were concerned that their wells and water supply would be affected by the site remedy and PCBs.

Response: Lowering the water in the surrounding quarries at Bennett's Dump will not affect nearby drinking water wells or the City of Bloomington water supply. The groundwater elevation will only affect the groundwater flow locally at the site. The individuals using groundwater for drinking water will not be affected since the wells are within a different groundwater basin and the lowering of the groundwater elevation will only be localized. EPA has sampled nearby drinking water wells and those wells did not contain any PCBs. Additional drinking water sampling will occur in the near future. The City of Bloomington water supply will not be affected by the Bennett's Dump remedy since the source of the water is Lake Monroe.

Comment 284: A few commenters were concerned that the public meeting was held on Valentines Day which made attendance limited.

Response: The commenter is correct that the meeting was scheduled for Valentines Day. EPA apologizes for scheduling the meeting that day but the auditorium in the Monroe County Public Library was difficult to schedule. EPA will try not to schedule any other public meetings on holidays or special occasions.

Comment 285: One commenter stated that additional health studies should be done on the citizens of Bloomington and a health clinic should be built to address the problems in the county.

Response: The Agency for Toxic Substances and Disease Registry (ATSDR), which is part of the Centers for Disease Control, did complete a health study on the citizens in the 1990's and they continue to study the workers associated with the former Westinghouse capacitor plant. A recent update was presented and is available on the ATSDR web site. You may contact ATSDR about additional studies but EPA does not do health studies. In addition, EPA's mission does not include building a health clinic in Bloomington to address the health affects of PCBs. EPA would recommend that the commenter contact the Monroe County Health Department if they feel they have been affected by PCBs.

REFERENCES – Ecological Risk Assessment Responses

Aulerich, R. and R. Ringer. 1977. Current status of PCB toxicity to mink, and effect on their reproduction. Arch Environ Contam Toxicol 6: 279-292.

Bowerman, W., J. Giesy, D. Best, and V. Kramer. 1995. A review of factors affecting productivity of bald eagles in the Great Lakes region: Implications for recovery. Environ Health Perspect 103: 51-59.

Britton, W. and T. Huston. 1973. Influence of polychlorinated biphenyls in the laying hen. *Poultry Sci* 52: *1620-1624*.

Brunström, B., B. Lund, A. Bergman, L. Asplund, I. Athanassiadis, M. Athanasiadou, S. Jensen, and J. Örberg. 2001. Reproductive toxicity in mink (*Mustela vison*) chronically exposed to environmentally relevant polychlorinated biphenyl concentrations. Environ Toxicol Chem 20: 2318-2327.

Burkhard, L., P. Cook, and M. Lukasewycz. 2004. Biota-sediment accumulation factors for polychlorinated biphenyls, dibenzo-p-dioxins, and dibenzofurans in southern Lake Michigan lake trout (*Salvelinus namaycush*). Environ Sci Technol 38: 5297-5305.

Bursian, S., C. Sharma, R. Aulerich, B. Yamini, R. Mitchell, C. Orazio, D. Moore, S. Siversky, and D. Tillitt. 2006. Dietary exposure of mink (*Mustela vison*) to fish from the Housatonic River, Berkshire County, Massachusetts, USA: effects on reproduction, kit growth, and survival. Environ Toxicol Chem 25: 1533-1540.

Calabrese, E. 2005. Paradigm lost, paradigm found: the re-emergence of hormesis as a fundamental dose response model in the toxicological sciences. Environ Pollut 138: 379-412.

Cecil, H., J. Bitman, R. Lillie, G. Fries, and J. Verrett. 1974. Embryotoxic and teratogenic effects in unhatched fertile eggs from hens fed polychlorinated biphenyls (PCBs). Bull Environ Contam Toxicol 11: 489-495.

Connor, K., M. Eversen, S. Su, and B. Finley. 2005. Quantitation of polychlorinated biphenyls in fish for human cancer risk assessment: a comparative case study. Environ Toxicol Chem 24: 17-24.

Custer, C. and L. Read. 2006. Polychlorinated biphenyl congener patterns in tree swallows (*Tachycineta bicolor*) nesting along the Housatonic River watershed, western Massachusetts, USA, using a novel statistical approach. Environ Pollut 142: 235-245.

Custer, C., T. Custer, P. Dummer, and K. Munney. 2003. Exposure and effects of chemical contaminants on tree swallows nesting along the Housatonic River, Berkshire County, Massachusetts, USA, 1998-2000. Environ Toxicol Chem 22: 1605-1621.

Garshelis, D. 2000. Delusions in habitat evaluation: measuring use, selection, and importance. *In*: Boitani, L. and T. Fuller (eds.). 2000. Research Techniques in Animal Ecology, Controversies and Consequences. Columbia Univ. Press, New York. pp. 111-164.

Gerking, S. 1953. Evidence for the concepts of home range and territory in stream fishes. Ecol 34: 347-365.

Giesy, J., W. Bowerman, M. Mora, D. Verbrugge, R. Othoudt, J. Newsted, C. Summer, R. Aulerich, S. Bursian, J. Ludwig, G. Dawson, T. Kubiak, D. Best, and D. Tillitt. 1995. Contaminants in fishes from Great Lakes-influenced section above dams of three Michigan rivers. III: Implications for health of bald eagles. Arch Environ Contam Toxicol 29: 309-321.

Henny, C., J. Kaiser, R. Grove, V. Bentley, and J. Elliott. 2003. Biomagnification factors (fish to osprey eggs from Willamette River, Oregon, U.S.A.) for PCDDs, PCDFs, PCBs, and OC pesticides. Environ Monit Assess 84: 275-315.

Hoffman, D., C. Rice and T. Kubiak. 1996. PCBs and dioxins in birds. *In* Environmental Contaminants in Wildlife, Interpreting Tissue Concentrations. (W. Beyer, G. Heinz and A. Redmon-Norwood, eds.). Lewis, Boca Raton. pp. 165-207.

Isnard, P., P. Flammarion, G. Roman, M. Babut, P. Bastien, S. Bintein, L. Esserméant, J. Férard, S. Gallotti-Schmitt, E. Saouter, M. Saroli, H. Thiébaud, R. Tomassone, and E. Vindimian. 2001. Statistical analysis of regulatory ecotoxicity tests. Chemosphere 45: 659-669.

ISSG. 2006. *Mustela vison* (mammal), Ecology. Global Invasive Species Database, Invasive Species Specialist Group (ISSG), The World Conservation Union (IUCN). www.issg.org

Kihiström, J., M. Olsson, S. Jensen, Å. Johansson, J. Ahlbom, and A. Bergman. 1992. Effect of PCB and different fractions of PCB on the reproduction of the mink (*Mustela vison*). Ambio 21: 563-601.

Leonards, P., T. de Vries, W. Minnaard, S. Stuijfzand, P. de Voogt, W. Cofino, N. van Straalen and B. van Hattum. 1995. Assessment of experimental data on PCB-induced reproduction inhibition in mink, based on an isomer- and congener-specific approach using 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxic equivalency. Environ Toxicol Chem 14: 639-652.

Lillie, R., H. Cecil, J. Bitman, and G. Fries. 1974. Differences in response of caged white leghorn layers to various polychlorinated biphenyls (PCBs) in the diet. Poultry Sci 53: 726-732.

Lillie, R., H. Cecil, J. Bitman, G. Fries, and J. Verrett. 1975. Toxicity of certain polychlorinated and polybrominated biphenyls on reproductive efficiency of caged chickens. Poultry Sci 54: 1550-1555.

Linzey, A. 1987. Effects of chronic polychlorinated biphenyls exposure on reproductive success of white-footed mice (*Peromyscus leucopus*). Arch Environ Contam Toxicol 16: 455-460.

Linzey, A. 1988. Effects of chronic polychlorinated biphenyls exposure on growth and reproduction of second generation white-footed mice (*Peromyscus leucopus*). Arch Environ Contam Toxicol 17: 39-45.

Marvin, C., E. Howell, T. Kolic, and E. Reiner. 2002. Polychlorinated dibenzo-*p*-dioxins and dibenzofurans and dioxinlike polychlorinated biphenyls in sediments and mussels at three sites in the lower Great Lakes, North America. Environ Toxicol Chem 21: 1908-1921.

McCoy, G., M. Finlay, A. Rhone, K. James, and G. Cobb. 1995. Chronic polychlorinated biphenyls exposure on three generations of oldfield mice (*Peromyscus polionotus*): effects on reproduction, growth, and body residues. Arch Environ Contam Toxicol 28: 431-435.

Mech, D. 2003. Incidence of mink, *Mustela vison*, and river otter, *Lutra canadensis*, in a highly urbanized area. Can Field Naturalist 117: 115-116.
www.npwrc.usga.gov/resource/mammals/minkottr/minkottr/htm

Mineau, P. 2005. A review and analysis of study endpoints relevant to the assessment of "long term" pesticide toxicity in avian and mammalian wildlife. Ecotoxicol 14: 775-799.

Murata, M., S. Masunaga, and J. Nakanishi. 2003. Population-level ecological risk assessment of planar polychlorinated aromatic hydrocarbons in great cormorant (*Phalacrocorax carbo*) around Tokyo Bay, Japan. Environ Toxicol Chem 22: 2508-2518.

Murray, F., F. Smith, K. Nitschke, C. Humiston, R. Kociba, and B. Schwetz. 1979. Three-generation reproduction study of rats given 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in the diet. Toxicol Appl Pharmacol 50: 241-252.

Naito, W., J. Jin, Y. Kang, M. Yamamuro, S. Masunaga, and J. Nakanishi. 2003. Dynamics of PCDDs/DFs and coplanar-PCBs in an aquatic food chain of Tokyo Bay. Chemosphere 53: 347-362.

Niimi, A. 1996. Evaluation of PCBs and PCDD/Fs retention by aquatic organisms. Sci Total Environ 192: 123-150.

Platonow, N. and B. Reinhart. 1973. The effects of polychlorinated biphenyls Aroclor 1254 on chicken egg production fertility and hatchability. Can J Comp Med 37: 341-346.

Restum, J., S. Bursian, J. Giesy, J. Render, W. Helferich, E. Shipp, D. Verbrugge, and R. Aulerich. 1998. Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink: 1. Effects on mink reproduction, kit growth, and survival, and selected biological parameters. J Toxicol Environ Health Part A 54: 343-375.

Sather, P., J. Newman, and M. Ikonomou. 2003. Congener-based Aroclor quantification and speciation techniques: a comparison of the strengths, weaknesses, and proper use of two alterative approaches. Environ Sci Technol 37: 5678-5686.

Scott, M. 1977. Effects of PCBs, DDT and mercury compounds in chickens and Japanese quail. Fed Proceed 36: 1888-1893.

Summer, C., J. Giesy, S. Bursian, J. Render, T. Kubiak, P. Jones, D. Verbrugge, and R. Aulerich. 1996a. Effects induced by feeding organochlorine-contaminated carp from Saginaw Bay, Lake Huron, to laying white leghorn hens. I. Effects on health of adult hens, egg production, and fertility. J Toxicol Environ Health 49: 389-407.

Summer, C., J. Giesy, S. Bursian, J. Render, T. Kubiak, P. Jones, D. Verbrugge, and R. Aulerich. 1996b. Effects induced by feeding organochlorine-contaminated carp from Saginaw Bay, Lake Huron, to laying white leghorn hens. II. Embryotoxic and teratogenic effects. J Toxicol Environ Health 49: 409-438.

Tanaka, Y. and J. Nakanishi. 2001. Model selection and parameterization of the concentration-response functions for population-level effects. Environ Toxicol Chem 20: 1857-1865.

Tillitt, D., G. Ankley, J. Giesy, J. Ludwig, H. Kurita-Matsuba, D. Weseloh, P. Ross, C. Bishop, L. Sileo, K. Stromborg, J. Larson, and T. Kubiak. 1992. Polychlorinated biphenyl residues and egg mortality in double-crested cormorants from the Great Lakes. Environ Toxicol Chem 11: 1281-1288.

USACE/USEPA. 2004. Ecological Risk Assessment for General Electric (GE)/Housatonic River Site Rest of River. Prepared by Weston Solutions, Inc. for U.S. Army Corps of Engineers and U.S. Environmental Protection Agency. http://www.epa.gov/region1/ge/thesite/restofriver-reports.html

USEPA. 2003. Analyses of Laboratory and Field Studies of Reproductive Toxicity in Birds Exposed to Dioxin-like Compounds for Use in Ecological Risk Assessment. National Center for Environmental Assessment, Office of Research and Development, Cincinnati. EPA/600/R-03/114F.
http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=56937

Van der Oost, R., A. Opperhuizen, K. Satumalya, H. Heida, and N. Vermeulen. 1996. Biomonitoring aquatic pollution with feral eel (Anguilla anguilla) I. Bioaccumulation: biota-sediment ratios of PCBs, OCPs, PCDDs and PCDFs. Aquatic Toxicol 35: 21-46.

Van Horne, B. 1983. Density as a misleading indicator of habitat quality. J Wildlife Management 47: 893-901.

Wakimoto, T., N. Kannan, M. Ono, R. Tatsukawa, and Y. Masuda. 1988. Isomer-specific determination of polychlorinated dibenzofurans in Japanese and American polychlorinated biphenyls. Chemosphere 17: 743-750.

Wren, C., D. Hunter, J. Leatherland, and P. Stokes. 1987. The effects of polychlorinated biphenyls and methylmercury, singly and in combination on mink. I. uptake and toxic responses. Arch Environ Contam Toxicol 16: 441-447; and II. reproduction and kit development. Arch Environ Contam Toxicol 16: 449-454.

Yamashita, N., K. Kannan, T. Imagawa, A. Miyazaki, and J. Giesy. 2000. Concentrations and profiles of polychlorinated naphthalene congeners in eighteen technical polychlorinated biphenyl preparations. Environ Sci Technol 34: 4236-4241.

Yanik, P., T. O'Donnell, S. Macko, Y. Qian, and M. Kennicut II. 2003. Source apportionment of polychlorinated biphenyls using compound specific isotope analysis. Organic Geochem 34: 239-251.

REFERENCES – Human Health Risk Assessment Responses

Agency for Toxic Substance and Disease Registry (ATSDR). 1998. "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins." Public Health Service. U.S. Department of Health Services. December. On-Line Address: http://www.atsdr.cdc.gov/toxprofiles/tp104-p.pdf

CBS Corporation (CBS). 2005. Comments on BD Human Health Risk Assessment. October 10.

Javitz, H. 1980. "Seafood Consumption Data Analysis." SRI International. Final Report prepared for EPA Office of Water Regulations and Standards.

Rupp, E.M. and Others. 1980. "Some Results of Recent Surveys of Fish and Shellfish Consumption by Age and Region of U.S. Residents." *Health Physics*. Volume 39. Pages 165 through 175.

Tetra Tech EM Inc. (Tetra Tech). 2004. "Field Oversight Summary for May 25 through 28, 2004, Stout's Creek Investigation, Bennett's Dump Site, Monroe County, Indiana."

U.S. Environmental Protection Agency (EPA). 1984. "Ambient Water Quality Criteria for 2,3,7,8-Tetrachloro-dibenzo-p-dioxin." Office of Water Regulations and Standards. EPA 440/5-84-007. February. On-Line Address: http://www.epa.gov/waterscience/library/wqcriteria/dioxincriteria.pdf

EPA. 1989. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A)" (RAGS). Interim Final. Office of Emergency and Remedial Response (OERR). Washington, DC. EPA/540/1-89/002. December.

EPA. 1990. "National Oil and Hazardous Substances Pollutant Contingency Plan (NCP)." *Federal Resister*. Volume 55, Number 46. April 9.

EPA. 1992. "Supplemental Guidance to RAGS: Calculating the Concentration Term." Office of Solid Waste and Emergency Response (OSWER). Publication 9285.7-08I. May.

EPA. 1997. "Exposure Factors Handbook." Volumes 1 through 3. Office of Research and Development (ORD). EPA/600/P-95/002Fa, -Fb, and –Fc. August.

EPA. 2002a. "Estimated per Capita Fish Consumption in the United States." EPA-821-C-02-003. August.

EPA. 2002b. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OERR. OSWER 9285.6-10. December.

EPA. 2003. "Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds, National Academy of Science Review Draft." December. On-Line Address: http://www.epa.gov/ncea/pdf/doxin/nas-review/#part1

EPA. 2004a. "ProUCL Version 3.0 User Guide." Prepared by A. Singh, A.K. Singh, and R.W. Maichle for EPA Technical Support Center, Las Vegas, NV. April.

EPA. 2004b. Technical Memorandum Regarding Review of "Comments by Viacom, Inc. on U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill." From Dr. Rick Herzberg, Superfund Technical Support Center (STSC). To Patricia Daunt, Administrator, STSC, August 20. Forwarded to Dr. Milt Clark, Health and Science Advisor, Region 5, with cover sheet dated August 23, 2004.

EPA. 2004c. Memorandum Regarding Responses to February 26, 2004 document "Comments of Viacom, Inc. on the *U.S. EPA's Human Health Evaluation for Fish* Consumption at Neal's Landfill. From Milton Clark, Ph.D., Health and Science Advisor. To Thomas Alcamo, Remedial Project Manager. September 8.

EPA. 2005. "Human Health Risk Assessment GE/Housatonic River Site, Rest of River." February 11.

Viacom , Inc. (Viacom). 2004. Comments of Viacom, Inc. of the U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill. February 4.

Viacom. 2005. "Groundwater, Surface Water, Flow and Water Level Monitoring, Second Quarter 2004, Bennett's Dump, Monroe County, Indiana." January 25.

West, P.C., and Others. 1989. "Michigan Sport Anglers Fish Consumption Survey, A Report to the Michigan Toxic Substance Control Commission." Natural Resource Sociology Research Lab Technical Report #1. May

ATTACHMENT 1

REVISED SURFACE WATER EXPOSURE POINT CONCENTRATION
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA

ATTACHMENT 1

REVISED SURFACE WATER EXPOSURE POINT CONCENTRATION
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA

Raw Statistics	
Number of Valid Samples	36
Number of Unique Samples	25
Minimum	0.05
Maximum	1.15
Mean	0.264583
Median	0.225
Standard Deviation	0.201198
Variance	0.040481
Coefficient of Variation	0.760432
Skewness	2.603546

Gamma Statistics	
k hat	2.34182
k star (bias corrected)	2.165187
Theta hat	0.112982
Theta star	0.122199
nu hat	168.611
nu star	155.8934
Approx.Chi Square Value (.05)	128.0246
Adjusted Level of Significance	0.0428
Adjusted Chi Square Value	126.8792

Log-transformed Statistics	
Minimum of log data	-2.99573
Maximum of log data	0.139762
Mean of log data	-1.55805
Standard Deviation of log data	0.698088
Variance of log data	0.487327

RECOMMENDATION
Data follow gamma distribution (0.05)
Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.77741
Shapiro-Wilk 5% Critical Value	0.935
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.32124
Gamma Distribution Test	
A-D Test Statistic	0.333098
A-D 5% Critical Value	0.757622
K-S Test Statistic	0.088964
K-S 5% Critical Value	0.148442
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.322179
Adjusted Gamma UCL	0.325087
Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.967131
Shapiro-Wilk 5% Critical Value	0.935
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.343409
95% Chebyshev (MVUE) UCL	0.413213
97.5% Chebyshev (MVUE) UCL	0.476727
99% Chebyshev (MVUE) UCL	0.601487
95% Non-parametric UCLs	
CLT UCL	0.31974
Adj-CLT UCL (Adjusted for skewness)	0.335288
Mod-t UCL (Adjusted for skewness)	0.323665
Jackknife UCL	0.32124
Standard Bootstrap UCL	0.317298
Bootstrap-t UCL	0.346663
Hall's Bootstrap UCL	0.458477
Percentile Bootstrap UCL	0.323472
BCA Bootstrap UCL	0.339167
95% Chebyshev (Mean, Sd) UCL	0.41075
97.5% Chebyshev (Mean, Sd) UCL	0.473997
99% Chebyshev (Mean, Sd) UCL	0.598232

Data
0.37
0.39
0.28
0.19
0.29
0.39
0.13
0.39
0.23
0.62
0.4
0.43
0.15
0.255
0.29
0.44
1.15
0.12
0.12
0.12
0.18
0.22
0.11
0.35
0.17
0.35
0.25
0.05
0.13
0.18
0.21
0.235
0.085
0.05
0.15
0.05

ATTACHMENT 2

REVISED EXPOSURE, RISK, AND HAZARD CALCULATIONS
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA

TABLE 1

REVISED FISH TISSUE EXPOSURE POINT CONCENTRATIONS[a]
HUMAN HEALTH RISK ASSESSMENT
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA

Fish Species	Sample Type	Location BD-1[b]		Location BD-2[b]		Location BD-3[b]	
		Total PCB EPC (μg/kg)	WHO-TEQ EPC (ng/kg)	Total PCB EPC (μg/kg)	WHO-TEQ EPC (ng/kg)	Total PCB EPC (μg/kg)	WHO-TEQ EPC (ng/kg)
Green Sunfish	Fillet	503	NA	678	NA	240	NA
Green Sunfish (Longear Sunfish at Location BD-3)	Whole body (converted to fillet)	832	6.74	402	3.42	176	3.48
White Sucker	Whole body (converted to fillet)	NA	NA	2,331	20.35	481	6.32
Weighted Average[c]	–	NA	NA	455	3.49	201	3.57

Notes:

μg/kg = Microgram per kilogram
ng/kg = Nanogram per kilogram
EPC = Exposure point concentration
NA = Not applicable
PCB = Polychlorinated biphenyl
TEQ = Toxicity equivalent
WHO = *World Health Organization*

[a] See Appendix B and Section 3.3.1.
[b] Sampling locations BD-1, BD-2, and BD-3 are about 1, 3, and 5 miles downstream of the Bennett's Dump site, respectively (see Figure 5).
[c] Weighted average concentrations are discussed in EPA's response regarding Fish Consumption – Development of EPCs.

TABLE 2

REVISED FISH TISSUE RISK AND HAZARD SUMMARY
HUMAN HEALTH RISK ASSESSMENT
BENNETT'S DUMP
BLOOMINGTON, MONROE, COUNTY, INDIANA

	Risk[a]		Hazard[a]	
Location[b]	PCB	TEQ[c]	PCB	TEQ[c]
BD-1 (Hunter Road)				
Green Sunfish (fillet)	3.1E-06	NA	1.8E-01	NA
Green Sunfish (whole -> fillet)	5.1E-06	3.1E-06 (2.1E-05)	3.0E-01	4.80E-02
BD-2 (Acuff Road)				
Green Sunfish (fillet)	1.2E-05	NA	7.3E-01	NA
Green Sunfish (whole -> fillet)	7.4E-06	4.7E-06 (3.1E-05)	4.3E-01	7.3E-02
White Sucker (whole -> fillet)	4.3E-05	2.8E-05 (1.9E-04)	2.5E+00	4.4E-01
Combination	8.3E-06	4.8E-06 (3.2E-05)	4.8E-01	7.5E-02
BD-3 (W. Maple Grove Road)				
Green Sunfish (fillet)	4.4E-06	NA	2.6E-01	NA
Longear Sunfish (whole -> fillet)	3.2E-06	4.8E-06 (3.2E-05)	1.9E-01	7.5E-02
White Sucker (whole -> fillet)	8.8E-06	8.7E-06 (5.8E-05)	5.2E-01	1.4E-01
Combination	3.7E-06	4.9E-06 (3.3E-05)	2.2E-01	7.2E-02

Notes:

Avg = Average
EPA = U.S. Environmental Protection Agency
mg/kg-day = Milligrams per kilogram per day
NA = Not applicable
PCB = Polychlorinated biphenyl
RME = Reasonable maximum exposure
TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalent

[a] Results calculated as described in the HHRA using revised exposure point concentrations (see Table 1).

[b] See Figure 5 for locations BD-1 through BD-3.

[c] Values are presented in the form a(b), where a = risk based on current EPA slope factor of 1.5E+05 $(mg/kg\text{-}day)^{-1}$, and b = risk based on EPA's alternative slope factor of 1E+06 $(mg/kg\text{-}day)^{-1}$. See Section 4.2 of the HHRA.

TABLE 3

REVISED TOTAL RISK ESTIMATES[a]
HUMAN HEALTH RISK ASSESSMENT
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Pathway	Location[b]		
	BD-1 (Hunter Road)	BD-2 (Acuff Road)	BD-3 (W. Maple Grove Road)
Fish Ingestion[c]	5.1E-06[d]	8.3E-06	3.7E-06
Surface Water - Incidental Ingestion[e]	5.3E-09	5.3E-09	5.3E-09
Surface Water - Dermal Contact[f]	3.7E-06	3.7E-06	3.7E-06
Sediment - Incidental Ingestion	4.3E-08	4.3E-08	4.3E-08
Sediment - Dermal Contact	3.9E-08	3.9E-08	3.9E-08
TOTALS[g]	9E-06 (57)	1E-05 (69)	7E-06 (49)

Notes:

RME = Reasonable maximum exposure

[a] Calculated as described in the HHRA with the revisions described below for individual pathways. All risk values presented are for adult receptors.

[b] See Figure 5 for locations BD-1 through BD-3.

[c] Risks presented represent PCB risks based on weighted average exposure point concentrations (EPC) (see Table 1), unless otherwise noted.

[d] Risks presented represent PCB risks based on green sunfish (whole=>fillet) consumption.

[e] Calculated as described in the HHRA with the following revisions: (1) ingestion rate - surface water for adults was revised from 3.8E-02 to 7.5E-03 L/day and (2) the surface water EPC was revised from 1.2 to 0.32 µg/L (see Attachment 1).

[f] Calculated as described in the HHRA with the following revisions: (1) the surface water EPC was revised from 1.2 to 0.32 µg/L (see Attachment 1) and (2) the exposure time was revised from 2 hours/day to 1 hour/day.

[g] Parenthetical values represent the percent of the total risk represented by the fish ingestion risk.

TABLE 4

TOTAL HAZARD ESTIMATES[a]
HUMAN HEALTH RISK ASSESSMENT
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Pathway	Location[b]		
	BD-1 (Hunter Road)	BD-2 (Acuff Road)	BD-3 (W. Maple Grove Road)
Fish Ingestion[c]	3.0E-01[d]	4.8E-01	2.2E-01
Surface Water - Incidental Ingestion[e]	3.3E-04	3.3E-04	3.3E-04
Surface Water - Dermal Contact[f]	2.1E-01	2.1E-01	2.1E-01
Sediment - Incidental Ingestion	2.5E-03	2.5E-03	2.5E-03
Sediment - Dermal Contact	2.3E-03	2.3E-03	2.3E-03
TOTALS[g]	5.2E-01 (58)	7.0E-01 (69)	4.4E-01 (51)

Notes:

RME = Reasonable maximum exposure

[a] Calculated as described in the HHRA with the revisions described below for individual pathways All hazard values presented are for adult receptors.

[b] See Figure 5 for locations BD-1 through BD-3.

[c] Hazards presented represent PCB hazards based on weighted average exposure point concentrations (EPC) (see Table 1), unless otherwise noted.

[d] Hazards presented represent PCB hazards based on green sunfish (whole=>fillet) consumption.

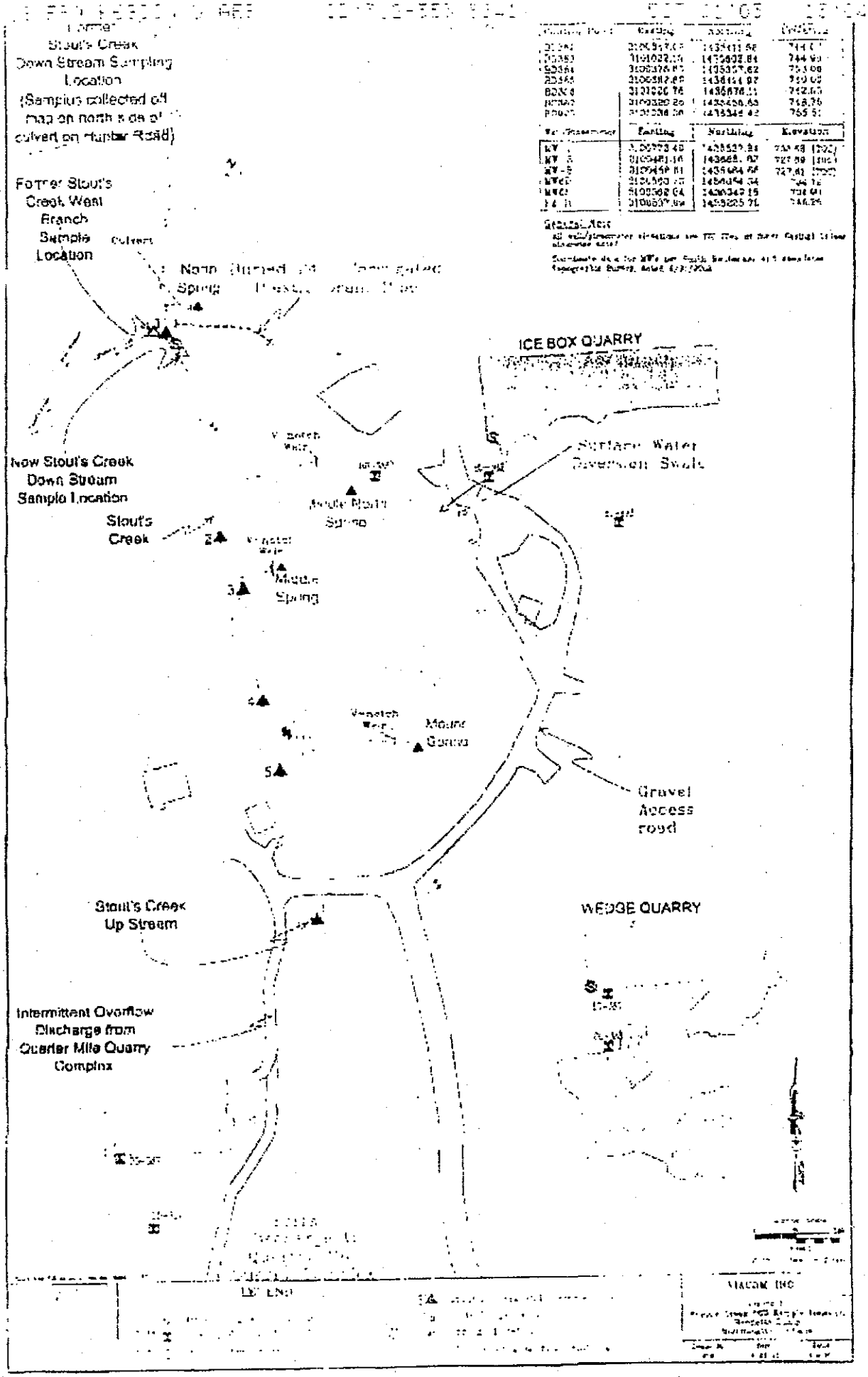
[e] Calculated as described in the HHRA with the following revisions: (1) ingestion rate - surface water for adults was revised from 3.8E-02 to 7.5E-03 L/day and (2) the surface water EPC was revised from 1.2 to 0.32 µg/L (see Attachment 1).

[f] Calculated as described in the HHRa with the following revisions: (1) the surface water EPC was revised from 1.2 to 0.32 µg/L (see Attachment 1) and (2) the exposure time was revised from 2 hours/day to 1 hour/day.

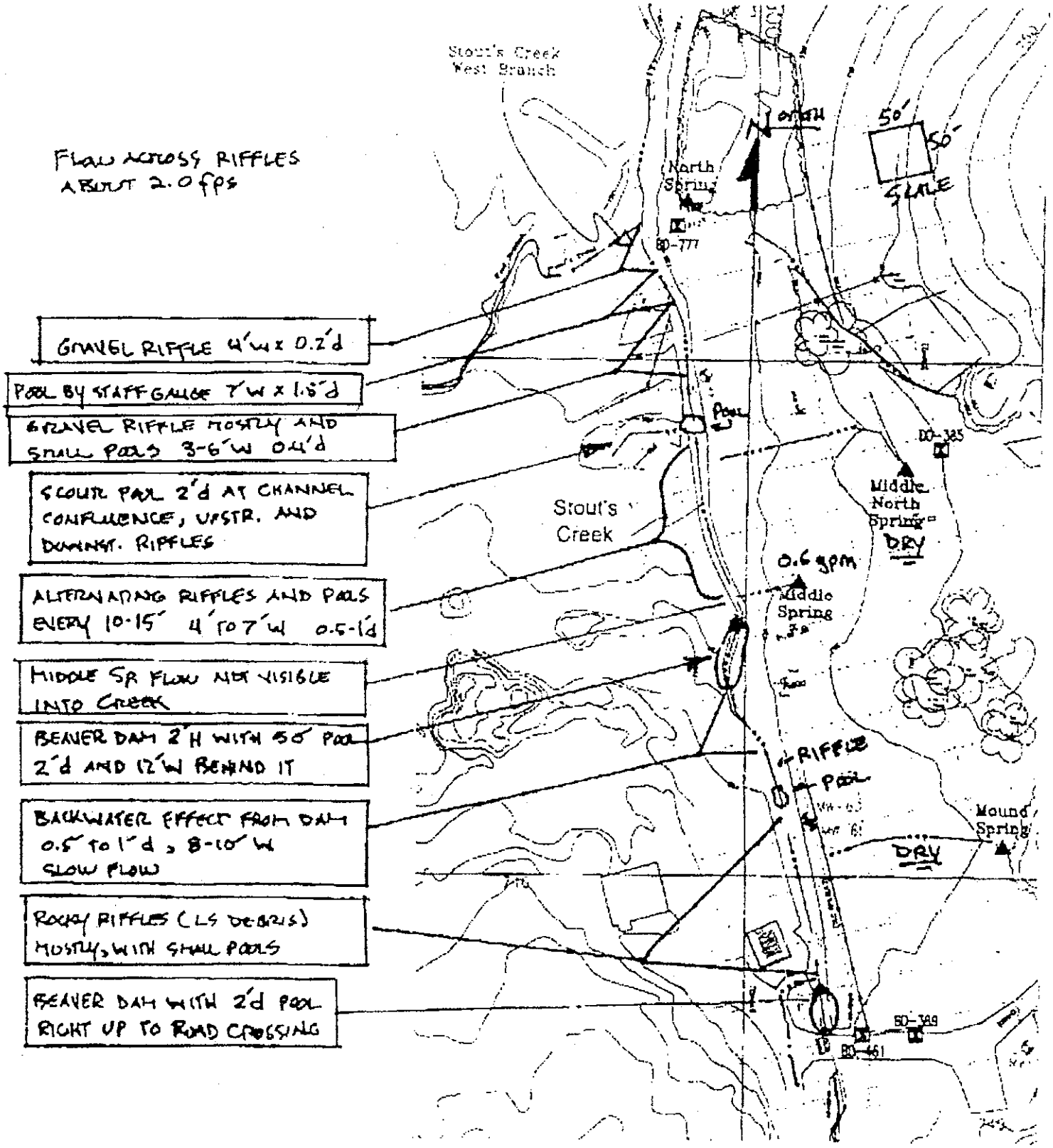
[g] Parenthetical values represent the percent of the total hazard represented by the fish ingestion hazard.

ATTACHMENT 3

MASS BALANCE CALCULATIONS IN STOUT'S CREEK
BENNETT'S DUMP
BLOOMINGTON, MONROE COUNTY, INDIANA


Former Stout's Creek Down Stream Sampling Location (Samples collected off map on north side of culvert on Hunter Road)
Former Stout's Creek West Branch Sample Location
Culvert
Spring
ICE BOX QUARRY
Now Stout's Creek Down Stream Sample Location
Stout's Creek
Middle North Spring
Middle Spring
Mount Garfield
Gravel Access road
Stout's Creek Up Stream
WEDGE QUARRY
Intermittent Overflow Discharge from Quarter Mile Quarry Complex
LEGEND
VIACOM INC

STOUT'S CREEK 9-23-08
1000 - 1130 hrs



FLOW ACROSS RIFFLES ABOUT 2.0 fps

GRAVEL RIFFLE 4'W x 0.2'd

POOL BY STAFF GAUGE 7'W x 1.6'd

GRAVEL RIFFLE MOSTLY AND SMALL POOLS 3-6'W 0.4'd

SCOUR POOL 2'd AT CHANNEL CONFLUENCE, UPSTR. AND DOWNSTR. RIFFLES

ALTERNATING RIFFLES AND POOLS EVERY 10-15' 4' TO 7'W 0.5-1'd

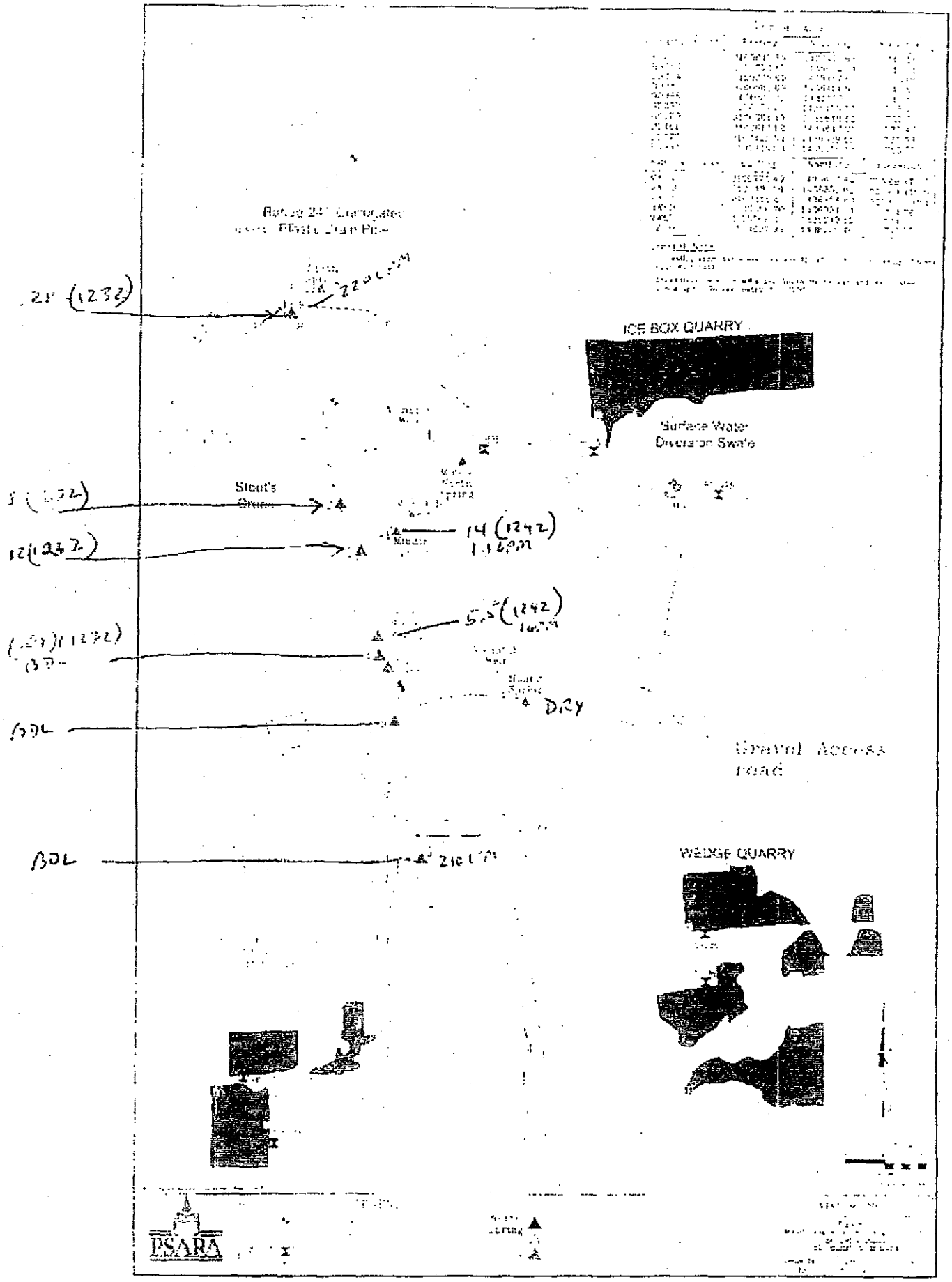
MIDDLE SP FLOW NOT VISIBLE INTO CREEK

BEAVER DAM 2'H WITH 50' POOL 2'd AND 12'W BEHIND IT

BACKWATER EFFECT FROM DAM 0.5' TO 1'd, 8-10'W SLOW FLOW

ROCKY RIFFLES (LS DEBRIS) MOSTLY, WITH SMALL POOLS

BEAVER DAM WITH 2'd POOL RIGHT UP TO ROAD CROSSING



ICE BOX QUARRY
Surface Water
Diversion Swale
Stout's
Gravel Access
road
WEDGE QUARRY
DRY
BDL
BDL
PSARA

Mass Loading of PCBs in Stout's Creek 10/24/03

Desc	Sample Pt Number	PCB (ug/L)	Aroclor	Flow (gpm)	Mass Rate (ug/min)
SC Downstream	1	0.28	1232	220	246
	2	0.18	1232	218	157
Middle Spring		14	1242	1.1	62
	3	0.12	1232	215	103
Rusty Spring Down		5.5	1242	1	22
	4	0.08	1232	213	68
	5	< 1	NA	212	NA
SC Upstream	6	< 1	NA	210	NA



Appendix E

STATEMENT OF WORK
FOR GROUNDWATER, SURFACE WATER AND SEDIMENT OPERABLE UNITS
REMEDIAL DESIGN AND REMEDIAL ACTION
AT BENNETT'S DUMP
BLOOMINGTON, INDIANA

I. PURPOSE

The purpose of the Statement of Work ("SOW") is to set forth requirements for implementation of the Remedial Action selected by the U.S. Environmental Protection Agency ("U.S. EPA") to address polychlorinated biphenyl ("PCB") contamination in the groundwater, surface water, and sediments at Bennett's Dump (the "Site"). This Remedial Action was selected by U.S. EPA in the Bennett's Dump Record of Decision ("ROD") Amendment for Operable Units 2 and 3 ("BD RODA OU2/3"), which was signed by the Superfund Division Director of U.S. EPA Region V on September 26, 2006. In the BD RODA OU2/3, U.S. EPA decided that no further remedial action was required to the sediment. CBS Corporation shall perform the Work in the BD RODA OU2/3, this SOW, and in all plans and schedules reviewed and approved by U.S. EPA in accordance with this SOW after reasonable opportunity to review and comment by the other Governmental Parties -- all of which are part of the Amendment to the Consent Decree signed by CBS Corporation ("CBS"), and by the United States (including U.S. EPA), the State of Indiana (including the Indiana Department of Environmental Management ("IDEM")), the City of Bloomington (including City of Bloomington Utilities), and Monroe County (collectively, "the Parties"). For purposes of this SOW, the United States (including U.S. EPA), the State of Indiana (including the IDEM), the City of Bloomington (including City of Bloomington Utilities)("the City"), and Monroe County ("County") are referred to as the "Governmental Parties." In performing this Work, CBS shall refer to U.S. EPA guidance in preparing deliverables for designing and implementing the Remedial Action to address PCB contamination in groundwater and surface water.

II. DESCRIPTION OF THE REMEDIAL ACTION/PERFORMANCE STANDARDS

CBS shall design and implement the Remedial Action and Operation and Maintenance ("O&M") activities to meet the Performance Standards and specifications set forth in the BD RODA OU2/3, this SOW, and all plans developed by CBS and approved by U.S. EPA under this SOW. Performance Standards shall include cleanup standards, standards of control, quality criteria and other substantive requirements, criteria or limitations as described in the BD RODA OU2/3, this SOW, and in all plans developed by CBS and approved by U.S. EPA under this SOW. These shall include Applicable or Relevant and Appropriate Requirements ("ARARs") identified in the BD RODA OU2/3. Notwithstanding the designation of 327 IAC 2-1-6, Table 1 and IAC 5-2-11.1(h) as ARARs in the BD RODA OU2/3, the only limitation that will apply to the discharge of

pollutants from any water treatment plant operated pursuant to this SOW will be 0.3 parts per billion ("ppb') for PCBs.

The Remedial Action selected by U.S. EPA in the BD RODA OU2/3 is intended to protect human health and the environment from risks posed by PCB contamination in groundwater and surface water at the Site. This contamination is being released into Stout's Creek from Springs and Seeps located at the Bennett's Dump Site. The Source Control Operable Unit, together with a sediment removal in Stout's Creek, was completed in 2000 and addressed the principal threat waste through the excavation and offsite disposal of high concentrations of PCB waste, including the incineration of PCB oil-filled capacitors.

A. Definitions

Whenever the terms listed below are used in this SOW, or in plans, reports and schedules submitted pursuant to this SOW, the following definitions shall apply:

1. The term "Icebox Quarry" shall mean the abandoned limestone quarry in the northeast corner of the Site, as shown on Figure 1.

2. The term "Middle Spring" shall refer to the intermittent groundwater spring that emerges to surface water at the location shown on Figure 1.

3. The term "Mid-North Spring" or "Middle North Spring" shall refer to the intermittent groundwater spring that emerges to surface water at the location shown on Figure 1.

4. The term "Mound Spring" shall refer to the intermittent groundwater spring that emerges to surface water at the location shown on Figure 1.

5. The term "North Spring" shall refer to the intermittent groundwater spring that emerges to surface water at the location shown on Figure 1.

6. The term "Pit A Area" shall refer to the area marked on Figure 1 where groundwater collects at or very near ground surface.

7. The term "Rusty Down Spring" shall refer to the intermittent groundwater spring that emerges to surface water at the location shown on Figure 1.

8. The term "Seeps" shall refer to any location at or near the Site where PCB-contaminated groundwater is released into Stout's Creek from a source other than the Springs.

9. The term "Site" shall refer to the area within the geographic boundaries shown on the map at Appendix A to the Amendment to the Consent Decree

10. The term "Springs" shall refer to Middle Spring, Mid-North Spring, Mound Spring, North Spring, and Rusty Down Spring.

11. The term "Stout's Creek" shall refer to the surface water stream shown on Figure 1.

12. The term "Wedge Quarry Complex" shall mean the complex of five abandoned limestone quarries -- Wedge Quarry, Wedge South Quarry, Quarry A, Quarry B and Quarry C -- in the southeast corner of the Site, as shown on Figure 1.

B. Performance Standards

CBS shall meet the following performance standards with respect to the remedial components described in the BD RODA OU2/3:

Remedial Component	**Performance Standard**
Design, build, and operate a passive quarry drain system that will drain the Wedge Quarry Complex and Pit A Area to Stout's Creek.	Water in the Wedge Quarry Complex shall be maintained at an elevation at or below 737 feet above mean sea level, unless the Parties mutually agree upon an alternative elevation, by connecting a passive drain to Stout's Creek.
If required by U.S. EPA, CBS shall design, build, and operate a passive drain system to lower the water level in Icebox Quarry.	1) Achieve and maintain water level elevation within Icebox Quarry as specified by U.S. EPA upon completion of the investigation described at Paragraph II.C.2 below. 2) Discharges from Icebox Quarry shall not exceed a maximum daily concentration of 0.3 ppb PCBs. In the event that the water from Icebox Quarry is discharged into the passive drain system for the Wedge Quarry Complex and the Pit A Area, CBS shall monitor PCB concentration to determine compliance with the 0.3 ppb effluent limit prior to the water from Icebox Quarry mixing with clean water from the Pit A Area or the Wedge Quarry Complex. 3) Comply with Shut-Off Criteria in Paragraph III.D.5.

Remedial Component	Performance Standard
If required by U.S. EPA, design, build, and operate a groundwater collection system and treatment plant to capture and treat groundwater prior to emergence at the Springs and Seeps.	1) Achieve and maintain Performance Standards determined by U.S. EPA for collection of Springs and Seeps. U.S. EPA shall make such a determination taking into account the final flow from the Springs and Seeps and the mass of PCBs released to surface water after implementation of the passive drain system(s) to lower the water elevation in the quarries. 2) Effluent from treatment plant shall not exceed a maximum daily concentration of 0.3 ppb PCBs. Notwithstanding the designation of 327 IAC 2-1-6, Table 1 as an ARAR, only the discharge limit of 0.3 ppb for PCBs is designated as a Performance Standard. 3) Comply with other substantive requirements identified by the State of Indiana under the National Pollutant Discharge Elimination System ("NPDES") with respect to any discharges from the water treatment plant, subject to CBS' right to dispute such substantive requirements before the Court as arbitrary and capricious or otherwise not in accordance with law, as specified in Section II.F.6, below 4) Comply with Shut-Off Criteria in Paragraph III.D.5.

C. Major Remedial Action Components

The Remedial Action selected by U.S. EPA in the BD RODA OU2/3 addresses PCBs that are migrating from the Site into Stout's Creek through Springs and Seeps. CBS shall implement the Remedial Action selected by U.S. EPA in the BD RODA OU2/3 by performing the following:

1. CBS shall design, install and maintain a passive quarry drain system to drain the Wedge Quarry Complex so that the water level within the quarry complex does not exceed an elevation of 737 feet above mean sea level ("msl"). The purpose of this system is to reduce the groundwater elevation and thereby reduce groundwater flow from Springs and Seeps into Stout's Creek. The elevation of 737 feet above msl may be revised, subject to review and approval by U.S. EPA, if CBS can

demonstrate to U.S. EPA that a different elevation will improve the effectiveness of the passive quarry drain system in reducing the groundwater flow from Springs and Seeps into Stout's Creek. The passive quarry drain system shall also drain the Pit A Area into the Wedge Quarry Complex to further reduce groundwater flow from the Springs and Seeps.

2. After completing the passive quarry drain system for the Wedge Quarry Complex, CBS shall (i) investigate the impact of the passive quarry drain system and (ii) investigate lowering the water level in Icebox Quarry. CBS shall conduct these investigations in accordance with a plan approved by U.S. EPA after reasonable opportunity for review and comment by the other Governmental Parties. The approved plan shall require CBS to investigate the impact of the Wedge Quarry Complex passive quarry drain system upon groundwater elevation, the flow from Springs and Seeps, and PCB concentrations in Springs and Seeps. The approved plan shall also require CBS to investigate the feasibility of lowering the water level in Icebox Quarry on a permanent basis, as well as the effect of such action upon groundwater elevation, the flow from Springs and Seeps, and PCB concentrations in Springs and Seeps. After completing the investigations, CBS shall report its findings in a written report submitted to U.S. EPA for review and approval after reasonable opportunity for review and comment by the other Governmental Parties.

3. Based upon the results of the investigation of Icebox Quarry, U.S. EPA may require CBS to lower the water level in Icebox Quarry on a permanent basis, either by extending the passive quarry drain system for the Wedge Quarry Complex to include Icebox Quarry or by discharging water from Icebox Quarry into Stout's Creek. If U.S. EPA requires CBS to lower the water level in Icebox Quarry on a permanent basis, discharges from Icebox Quarry shall not exceed a daily maximum concentration of 0.3 ppb PCBs. If water from Icebox Quarry is discharged to the Wedge Quarry Complex, treatment of Icebox Quarry water prior to entering the Wedge Quarry Complex shall be completed if PCB concentrations are greater than 0.3 ppb. In determining whether to require CBS to drain and treat water from Icebox Quarry, U.S. EPA shall weigh the benefit of reducing the flow of PCB-contaminated groundwater from Springs and Seeps versus the benefit of collecting this water before it is released from Springs and Seeps and treating it in an on-Site water treatment plant. CBS shall comply with U.S. EPA's determination with respect to draining and treating water from Icebox Quarry, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law.

4. Subject to the "Suspension of Work" provision in Paragraph II.D of this SOW, CBS shall install a collection trench to capture groundwater feeding Springs and Seeps and thereby prevent flow from Springs and Seeps from entering into Stout's Creek. The collection trench shall convey the water to a water treatment plant, which CBS shall design, construct and operate. Discharges from the water treatment plant shall not exceed a daily maximum effluent limit of 0.3 ppb for PCBs and shall comply with other substantive requirements developed by the State of Indiana under the National

Pollutant Discharge Elimination System ("NPDES"). Based upon the conceptual design of the collection trench in the BD RODA OU2/3, the trench will be located along the east side of Stout's Creek and will be approximately 800-feet long and 8-feet deep. The trench will collect groundwater feeding Springs and Seeps and convey this water to the water treatment plant. Groundwater emerging from Springs and Seeps is assumed to flow at a maximum rate of 100 gallons per minute ("gpm") during storm events, although CBS shall be required to capture and treat groundwater emerging from Springs and Seeps even if the flow exceeds 100 gpm.

5. CBS shall prepare an Operations and Maintenance Plan for the passive quarry drain system and the collection and treatment system for flow from the Springs and Seeps and prepare a Long-term Groundwater Monitoring Plan to monitor the effectiveness of the Remedial Action.

6. CBS shall use best efforts to put into place appropriate deed restrictions upon the property currently owned by the Star Stone Company ("Star Stone") that is within the boundaries of the Site or may impact the Site.

7. CBS shall install and maintain fencing around the treatment system.

8. CBS shall use best efforts to put into place an agreement with the owner of the Site to ensure long-term access to the Site for itself and its contractors.

D. Suspension of Work Relating to Collection Trench and Water Treatment Plant

1. CBS may petition U.S. EPA for authorization to suspend work relating to the design, installation, and operation of the collection trench and water treatment plant described in Paragraph II.C.4, Paragraph II.E.2.b, and Paragraph III.B.2.b after:

a. CBS has completed construction of the Wedge Quarry Complex passive drain system specified in Paragraph II.C.1, Paragraph II.E.1.a, and Paragraph III.B.1.a, and has achieved the Performance Standard pertaining to the water level elevation in the Wedge Quarry Complex;

b. CBS has completed the requirements set forth in Paragraph II.C.2, Paragraph II.E.1.b, and Paragraph III.B.1.b with respect to (i) investigating the effect of the Wedge Quarry Complex passive quarry drain system and (ii) investigating the feasibility and effect of lowering the water level in Icebox Quarry; and

c. If required by U.S. EPA, CBS has completed construction of the system to lower the water elevation of Icebox Quarry in accordance with Paragraph II.C.3, Paragraph II.E.2.a, and Paragraph III.B.2.a, and has achieved the performance standards pertaining to the water level elevation in Icebox Quarry.

2. In its petition, CBS shall demonstrate either that (i) maintaining the specified water level elevations in the quarries has eliminated releases of PCBs from Springs and Seeps into Stout's Creek or (ii) maintaining the specified water level elevations in the quarries is likely to be protective of human health and the environment, taking into account the final flow from Springs and Seeps and the mass of PCBs released into Stout's Creek. In the event that U.S. EPA determines that CBS has not demonstrated either of these two conditions, then CBS shall proceed with the design, construction, and operation of the collection trench and water treatment plant, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law. Nothing in this Paragraph or in this SOW authorizes CBS to challenge (i) the remedy set forth in the BD RODA OU2/3 or (ii) the risk assessments upon which that remedy is based.

3. In the event that U.S. EPA determines that CBS has demonstrated either of the conditions set forth in Paragraph II.D.2 (i.e., maintaining the specified water level elevations in the quarries has eliminated releases of PCBs from Springs and Seeps into Stout's Creek, or alternatively, maintaining the specified water level elevations in the quarries is likely to be protective of human health and the environment, taking into account the final flow from Springs and Seeps and the mass of PCBs released into Stout's Creek), then CBS may suspend work with respect to designing, installing, and operating the collection trench and water treatment plant.

4. In the event that CBS suspends work relating to the design, installation, and operation of a collection trench and water treatment plant, CBS shall implement enhanced monitoring under the Long-term Groundwater Monitoring Plan to measure (i) the flow, if any, from Springs and Seeps into Stout's Creek and (ii) the mass of PCBs, if any, released into Stout's Creek.

5. After work is suspended with respect to the design, installation and operation of the collection trench and water treatment system, U.S. EPA may lift the suspension if it determines that the justification for the suspension no longer applies. In the event that U.S. EPA lifts the suspension, CBS shall proceed with the design, construction and operation of the collection trench and water treatment plant, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's decision to the lift the suspension on the grounds that the decision is arbitrary and capricious or otherwise not in accordance with law. To prove that U.S. EPA's decision is arbitrary and capricious or otherwise not in accordance with law, CBS must demonstrate that (i) maintaining the specified water levels in Stout's Creek has eliminated releases of PCBs from Springs and Seeps, (ii) maintaining the specified water level elevations in the quarries is protective of human health and the environment notwithstanding the on-going releases of PCBs into Stout's Creek, or (iii) U.S. EPA's decision is otherwise not in accordance with law.

6. In the event that U.S. EPA does not lift the suspension, CBS may petition U.S. EPA to make the suspension of work permanent when U.S. EPA conducts its 5-year review of the remedy selected in the BD RODA OU2/3. In submitting such a petition, CBS must demonstrate that the collection trench and treatment plant required under the BD RODA OU2/3 are not necessary because maintaining the specified water elevations in the quarries has been and will continue to be protective of human health and the environment. In the event that U.S. EPA determines that CBS has successfully made such a showing, U.S. EPA shall propose to eliminate the requirement to design, build and operate the collection trench and water treatment plant by proposing to amend the BD RODA OU2/3 consistent with the substantive and procedural requirements of CERCLA and the National Contingency Plan. In the event that U.S. EPA amends the BD RODA OU2/3, the Parties shall petition the Court to modify the Consent Decree to delete the requirement to design, build, and operate a collection trench and water treatment plant at Bennett's Dump. In the event that U.S. EPA determines that CBS has been unable to show that the collection trench and treatment plant are not necessary to protect human health and the environment, CBS may challenge U.S. EPA's determination under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that the determination is arbitrary and capricious or otherwise not in accordance with law.

7. In the event that the Consent Decree is modified to delete the requirement to design, build, and operate a collection trench and water treatment plant at Bennett's Dump, CBS shall continue to conduct long-term monitoring of groundwater in accordance with the plan approved by U.S. EPA under Paragraph II.F.5 of this SOW. CBS may petition U.S. EPA to eliminate this requirement when U.S. EPA conducts its 5-year review of the remedy set forth in the ROD amendment modifying the BD RODA OU2/3. In the event that U.S. EPA denies that petition, CBS may exercise its rights under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's denial of the petition on the ground that the denial is arbitrary and capricious or otherwise not in accordance with law.

E. Remedial Action Phases

As described more fully in Section III below, CBS shall implement the Remedial Action set forth in the BD RODA OU2/3, which will take place in two phases, as follows:

1. Phase 1

a. CBS shall design and implement a plan approved by U.S. EPA to build a passive drain system for the purpose of permanently draining the Wedge Quarry Complex and the Pit A Area into Stout's Creek.

b. CBS shall develop and implement a plan approved by U.S. EPA to investigate (i) the impact of the Wedge Quarry Complex passive drain system upon groundwater elevation, the flow of water from Springs and Seeps and the concentration of PCBs in water from Springs and Seeps and (ii) the feasibility of lowering the water elevation in Icebox Quarry on a permanent basis, as well as the impact

that such action will have upon groundwater elevation, the flow of water from Springs and Seeps and the concentration of PCBs in water from Springs and Seeps. CBS shall report the results of this investigation in a written report submitted to U.S. EPA for review and approval after reasonable opportunity for review and comment by the other Governmental Parties.

2. Phase 2

a. If required by U.S. EPA, CBS shall design and implement a plan approved by U.S. EPA to lower the water level in Icebox Quarry on a permanent basis, subject to CBS's right to challenge this requirement under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that the requirement is arbitrary and capricious or otherwise not in accordance with law. The water discharged from Icebox Quarry shall not exceed a maximum daily concentration of 0.3 ppb PCBs.

b. CBS shall design and implement a plan approved by U.S. EPA to capture and treat groundwater flow from Springs and Seeps, unless U.S. EPA approves suspension of this work under Paragraph II.D of this SOW. The approved plan shall require CBS to construct a collection trench, which shall capture all groundwater feeding Springs and Seeps and convey this water to a water treatment plant, which CBS shall design, build and operate in accordance with a plan approved by U.S. EPA after reasonable opportunity for review and comment by the other Governmental Parties.

c. In the event that U.S. EPA determines under Paragraph II.D that maintaining the specified water level elevations in the quarries is likely to be protective of human health and the environment, CBS may suspend work relating to the design, installation and operation of a system to collect and treat flows from Springs and Seeps, in which case CBS shall begin enhanced monitoring in accordance with a Long-term Groundwater Monitoring Plan.

d. In the event that CBS suspends work relating to the design, installation and operation of a system to collect and treat flows from Springs and Seeps, U.S. EPA may lift the suspension under Paragraph II.D.5. In the event that U.S. EPA lifts the suspension, CBS shall design and implement a plan approved by U.S. EPA to capture and treat groundwater flow from Springs and Seeps, subject to CBS's right under Paragraph II.D.5 to challenge U.S. EPA's decision to lift the suspension.

F. Remedy Components

1. Site Security

CBS shall implement Site security during the Remedial Action to prevent any access to the Site or disturbance of the Site activities during construction. After construction is complete, CBS shall install and maintain a fence to prevent access to the treatment plant.

2. Site Access

The Bennett's Dump site is owned by Star Stone, which has entered into an agreement with the North Park Development Group to develop the property. All property to which access is required for the implementation of the Consent Decree, the BD RODA OU2/3 and this SOW is owned or controlled by persons other than CBS. CBS shall use its best efforts to secure from such persons access for CBS, as well as for the Governmental Parties and their representatives, including but not limited to, their contractors, as necessary to effectuate the Consent Decree, the BD RODA OU2/3 and this SOW. If any access required to complete the Remedial Action is not obtained within 30 days after the date U.S. EPA notifies CBS in writing that additional access beyond that previously secured is necessary, then CBS shall promptly notify the United States in writing, and shall include in that notification a summary of the steps CBS has taken to attempt to obtain access. The Parties all remain subject to the requirements of Paragraph 88 of the Original Consent Decree, provided that nothing herein or in the Original Consent Decree shall require the United States to violate the Anti-Deficiency Act, 31. U.S.C. 1341 *et seq.*

3. Institutional Controls

a. Pursuant to the schedule in Section VI, CBS shall submit an Institutional Controls ("ICs") Work Plan for review and approval by U.S. EPA that includes the following:

i) A map that identifies the current boundaries of the restricted areas, boundaries of the Site, property ownership, streets, easements, encumbrances, assessor's parcel number or other recorded plat or survey information;

ii) A legal description of each restricted area prepared according to current ALTA Survey guidelines;

iii) Draft restrictive covenants and easements for the restricted areas that are enforceable under the laws of the State of Indiana and are substantially in the form set forth in Attachment A;

iv) A current title insurance commitment in the form of ALTA Commitment form -1982 (as amended) from a title company, which shows title to the restricted areas to be free and clear of all prior liens and encumbrances;

v) Copies of encumbrances referenced in the Title commitment. Identification of encumbrances that negatively impact the restricted areas. Copies of requests for subrogation agreements for such encumbrances. Identification of the encumbrances on paper and maps that depict parcel numbers and the area impacted by the encumbrance.

b. The institutional controls shall set forth the following unless the Parties mutually agree otherwise:

i) Development shall be prohibited or restricted based upon final cleanup levels and protection of remedial components. Future land use at the Site that is not consistent with cleanup levels or components of the remedy selected by U.S. EPA for Operable Units 1 or 2 shall be prohibited;

ii) Excavation in areas of the Site where PCBs greater that 25 ppm on average remain in the ground shall be prohibited;

iii) Drinking water wells shall not be installed on-Site;

iv) Fencing of the water treatment plant;

v) Give access rights to U.S. EPA, IDEM, and CBS and their successors, and

vi) Give rights to U.S. EPA, IDEM and CBS to enforce land use restrictions and access rights.

vii) Any stormwater collection basin constructed within the Site boundaries shall be lined with an impermeable liner to prevent recharge of Site groundwater.

c. Pursuant to the schedule in Section VI, CBS shall arrange for the execution of such restrictive covenants and recording of such executed restrictive covenants with the Monroe County recorder. CBS shall use best efforts to secure the execution of the restrictive covenants from such owners. The United States and the State of Indiana may consider, in their unreviewable discretion, using their enforcement authorities (including condemnation) to assist CBS in obtaining implementation of restrictive covenants in appropriate circumstances. In the event that any such use of enforcement authorities (including condemnation) results in an obligation to pay just compensation, CBS shall reimburse the United States or the State of Indiana, as applicable, for just compensation. Such payment shall be made in accordance with the procedures provided to CBS by the United States or the State of Indiana, as applicable. If both the United States and the State of Indiana decide not to use their enforcement authorities (including condemnation) to obtain a restrictive covenant from a property owner, and CBS has not been able to reach agreement with the property owner to obtain the restrictive covenant after exerting its best efforts, CBS shall not be required to take any further action to obtain the restrictive covenant.

4. Interim Monitoring Program for Remedial Design and Remedial Action

CBS shall continue to monitor surface water, flow and groundwater in accordance with the 2002 Long-term Groundwater Monitoring Plan for the Bennett's Dump Site from the Entry of the Amendment to the Consent Decree until approval of the updated Long-term Groundwater Monitoring Plan described in Paragraph II.F.5 below. CBS may request

modifications to the interim monitoring program based upon the requirements of the investigation of the impact of the passive quarry drain system and investigation of Icebox Quarry.

5. Long-term Groundwater Monitoring Plan

In accordance with the schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and approval a revised and updated version of the 2002 Long-Term Groundwater Monitoring Plan, supplementing the existing requirements for the source control operable unit with new requirements for the groundwater operable unit. As part of this plan, CBS shall include a plan for enhanced monitoring in the event that U.S. EPA approves CBS's request to suspend work relating to the construction of the collection and treatment system for the Springs and Seeps. The plan shall also include a well-water user survey conducted by CBS as specified below in this paragraph. Upon approval by U.S. EPA, CBS shall implement the approved Long-term Groundwater Monitoring Plan.

In the well-water survey, CBS will identify well-water users within a 5,000-foot radius of the Site and within the hydrogeological zone of influence of the Site. The survey shall identify the name of the property owner, the address of the property, and the primary use of the well. Once the survey is complete, the U.S. EPA may make a determination in its unreviewable discretion that identified wells require sampling and testing for PCBs. If U.S. EPA makes such a determination, CBS shall conduct the sampling and testing in accordance with a plan and schedule approved by U.S. EPA after reasonable opportunity for review and comment by the other Governmental Parties. As part of its 5-year review of the Remedial Action, U.S. EPA may determine that CBS shall update the well-survey and conduct further sampling and testing of wells within a 5,000-foot radius of the Site and within the hydrogeological zone of influence. In the event that U.S. EPA makes such a determination, CBS shall implement the well survey and conduct the sampling and testing, subject to CBS's right to challenge U.S. EPA's determination under Section XXIV (Dispute Resolution) in the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law. In the event that domestic wells within the 5,000-foot radius of the Site and within the hydrogeological zone of influence contain detectable concentrations of PCBs, CBS shall provide an alternative potable water supply by either hooking up the well-user to municipal water supplies or by providing a water treatment system for PCBs to ensure that user is neither consuming nor using water containing PCBs in concentrations greater than the maximum contaminant level ("MCL").

6. National Pollution Discharge Elimination System Substantive Requirements

Based upon correspondence from IDEM at the time of the BD RODA OU2/3, the effluent limit for PCBs discharged to waters of the State of Indiana is set at a daily maximum concentration of 0.3 ppb, and discharge criteria for other constituents are not required. After IDEM develops other substantive NPDES requirements pursuant to the ARARs described in the BD RODA OU2/3, CBS shall include these requirements in the

Operational & Maintenance Plan to be developed in accordance with Paragraph III.D.4 below, except that CBS may challenge IDEM's determination under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that new substantive requirements are arbitrary and capricious or otherwise not in accordance with the law.

III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION

CBS shall implement the Remedial Design and Remedial Action ("RD/RA") for the groundwater and sediment operable units in accordance with plans approved by U.S. EPA, after reasonable opportunity to review and comment by the Governmental Parties, and in accordance with the schedule set forth in Section VI.

A. RD/RA Work Plan

In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a Draft RD/RA Work Plan describing in detail the implementation of the phased RD/RA required by this SOW. The Draft RD/RA Work Plan shall describe the general construction approach to complete the two phases described below, Site environmental controls, additional data collection, cleanup confirmation methods, and proposed schedule of activities. After receipt of U.S. EPA's comments, CBS shall submit to U.S. EPA for review and approval a Final RD/RA Work Plan in accordance with the schedule set forth in Section VI. Following approval, CBS shall implement the Final RD/RA Work plan in accordance with the approved schedule.

B. Remediation Phases

1. Phase 1 Activities

a. Passive Quarry Drain System

i) In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a preliminary design of a passive quarry drain system to lower the water elevation within the Wedge Quarry Complex to 737 feet above msl, as well as to drain water from the Pit A Area into the Wedge Quarry Complex. CBS may propose an alternative water elevation for U.S. EPA's consideration, although U.S. EPA's decision to accept or reject this proposal is a matter within its sole, unreviewable discretion. The proposed passive quarry drain system shall be designed to prevent water from accumulating in the Wedge Quarry Complex and in the Pit A Area by establishing a permanent drainage system to Stout's Creek.

ii) After receipt of U.S. EPA's comments on the preliminary design of the passive quarry drain system, CBS shall submit to U.S. EPA for review and approval a final design of the passive quarry drain system in accordance with the schedule set forth in Section VI.

iii) Upon receipt of U.S. EPA's approval of the final design for the passive quarry drain system, CBS shall complete construction of the system in accordance with the approved plan and the schedule set forth in Section VI.

b. Investigation of the Impact of the Passive Quarry Drain System and Investigation of Icebox Quarry

i) In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a draft plan to investigate the impact of the Wedge Quarry Complex passive quarry drain system upon groundwater elevations, the flow from Springs and Seeps, and the concentrations of PCBs in groundwater and surface water. The draft plan shall also include an investigation of the feasibility of lowering the water elevation within Icebox Quarry on a permanent basis, as well as the effect of such action upon the groundwater table and upon releases of PCB-contaminated groundwater and surface water into Stout's Creek. CBS shall also determine how PCB contamination is entering Icebox Quarry and whether additional Springs or Seeps within the quarry will require treatment to meet the daily maximum effluent limit of 0.3 ppb PCBs before the water can be discharged to Stout's Creek or to the Wedge Quarry Complex. To conduct this investigation, CBS shall temporarily drain Icebox Quarry and shall treat all discharges into Stout's Creek using a temporary, mobile treatment system if such water contains a daily maximum concentration of PCBs greater than 0.3 ppb.

ii) After receipt of U.S. EPA's comments on the preliminary design of the investigation plan, CBS shall submit to U.S. EPA for review and approval a final investigation plan in accordance with the schedule set forth in Section VI.

iii) Upon approval of the final investigation plan, CBS shall proceed with the approved investigation. During the investigation, CBS shall not discharge water from Icebox Quarry into Stout's Creek with a daily maximum PCB concentration greater than 0.3 ppb. In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and approval a final report describing in detail the results of its investigation. In the report, CBS shall state its findings with respect to the feasibility of lowering water levels in Icebox Quarry, as well as its findings as to the impact that such action is likely to have on the groundwater elevation, the flow of water from Springs and Seeps, and the concentration of PCBs in Springs and Seeps. In the event that CBS finds that draining Icebox Quarry is feasible, CBS shall submit to U.S. EPA for review and comment a draft design to lower the water level in Icebox Quarry permanently.

2. Phase 2 Activities

a. Lowering the Water in Icebox Quarry

i) Based upon CBS's report of its investigation of Icebox Quarry, U.S. EPA may require CBS to lower the water level in Icebox Quarry on a permanent basis, either by extending the passive quarry drain system to include Icebox Quarry or by discharging water from Icebox Quarry into Stout's Creek. In determining whether to require CBS to lower the water level in Icebox Quarry, U.S. EPA shall weigh the benefit of reducing the flow of PCB-contaminated groundwater from Springs and Seeps versus the benefit of collecting this water after it is released from Spring and Seeps and treating it in an on-Site water treatment plant. CBS shall comply with U.S. EPA's determination with respect to lowering the water level in Icebox Quarry, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law.

ii) In the event that U.S. EPA determines that lowering water levels in Icebox Quarry is not necessary, CBS may nevertheless elect to proceed with lowering water levels in the quarry on a permanent basis, provided that U.S. EPA reviews and approves the final design for the project. For instance, CBS may wish to fill the quarry to accommodate the plans of the North Park Development Group, which may want to use Icebox Quarry for the placement of clean fill and stone.

iii) In the event that U.S.EPA requires CBS to lower the water in Icebox Quarry on a permanent basis, CBS shall submit to U.S. EPA for review and approval a final plan and a proposed schedule for completing this work. In the event that CBS's investigation established that Icebox Quarry is fed by seeps or springs with a daily maximum PCB concentration greater than 0.3 ppb, CBS shall propose a method for treating this spring water to reduce PCB concentrations to 0.3 ppb as daily maximum before the spring water is discharged into Stout's Creek or into the Wedge Quarry Complex.

iv) Upon U.S. EPA's approval of the final plan for lowering the water elevation in Icebox Quarry, CBS shall implement the project in accordance with the approved schedule.

b. Collection and Treatment System

i) In accordance with the schedule set forth in Section VI, CBS shall submit to U.S. EPA for review and comment a draft design for the groundwater collection trench and water treatment plant, unless U.S. EPA approves suspension of this work under Paragraph II.D of this SOW. CBS shall design the groundwater interceptor trench to capture groundwater feeding Springs and Seeps and thereby to prevent flow from Springs and Seeps from entering into Stout's Creek. The trench shall convey captured groundwater to a treatment facility which CBS shall design,

build and operate. The discharge from the treatment plant will not exceed a daily maximum concentration of 0.3 ppb PCBs and shall comply with other substantive requirements identified by IDEM under the NPDES program. Groundwater is assumed to flow at a maximum of 100 gpm during storm events, although CBS shall be required to capture and treat groundwater emerging from Springs and Seeps even if the flow exceeds 100 gpm.

ii) Following receipt of U.S. EPA's comments on the draft design for the collection trench and water treatment system, CBS shall submit to U.S. EPA, in accordance with the schedule set forth in Section VI, a final design plan for review and approval.

iii) Upon receipt of U.S. EPA's approval of the final design, CBS shall proceed with the construction of the collection trench and treatment system in accordance with Section VI and the approved final design. During the construction activities, PCB-contaminated soils and rock may require excavation. CBS shall implement the approved testing program for detecting residual contamination during construction activities. Pursuant to the Toxic Substances Control Act ("TSCA") - 40 CFR § 761.60 and CERCLA off-site policy, 40 CFR § 300.440, CBS shall dispose of off-site in a chemical waste landfill, approved under and compliant with 40 CFR § 761.75, all excavated soils and sediments containing concentrations great than or equal to 50 ppm PCBs. At its option, CBS may propose to dispose of all soils and sediments contaminated with PCBs, regardless of concentration, at a TSCA Landfill.

C. Submittal of Preliminary and Final Design

In accordance with Paragraph III.B (Remediation Phases), CBS shall submit to U.S. EPA for review and approval, with a copy to the other Governmental Parties, Preliminary Designs for (1) the installation of the Wedge Quarry Complex passive quarry drain system, (2) the groundwater collection trench and the water treatment plant, and (3) if required by U.S. EPA, the system for permanently lowering the water elevation in Icebox Quarry. The Preliminary Design submittals shall be at the 50% completion point and include the following:

- Preliminary drawings and sketches
- Design assumptions and parameters, including design restrictions
- Design calculations
- Results of additional field sampling or tests
- Compliance with ARARs
- Technical Specifications

- Proposed siting/locations of processes/construction activities

- Real estate, easement and substantive permit requirements

CBS shall resolve with U.S. EPA, after reasonable opportunity for review and comment by the Governmental Parties, all comments on the Preliminary Design for the three design submittals described above. The Final Design submittals, which shall be at the 100% completion point, shall include construction details, project schedules, and bid specifications and shall be subject to the approval process set forth in Section V.

D. Remedial Action Construction

1. Remedial Action Construction

Following approval of each Final Design submittal, CBS shall implement the construction activities in accordance with the approved Final Design submittal and the schedules in Section VI. During the construction activities, weekly construction meetings shall be held to discuss the construction progress, future activities and present changes for approval. CBS may modify the frequency of these meetings with approval of U.S. EPA in consultation with the other Governmental Parties. Telephone calls may be substituted for a meeting if agreed upon by CBS and U.S. EPA.

2. Final Construction Inspection

Within 45 days after completion of all construction activities required pursuant to this SOW, CBS shall notify U.S. EPA and the State of Indiana for the purpose of conducting a pre-final inspection. The purpose of the inspection is to determine if the construction is complete and consistent with the approved design and plans, this SOW and the BD RODA OU2/3. CBS shall prepare and submit to U.S. EPA for review and approval (after reasonable opportunity for review and comment by the other Governmental Parties) a final construction inspection report documenting items that need to be resolved and actions required to resolve them along with a schedule to complete such work.

3. Completion of Remedial Action Report

Within 90 days after CBS concludes that the Remedial Action has been fully performed and the Performance Standards have been attained, CBS shall schedule and conduct a pre-certification inspection to be attended by CBS, U.S. EPA, the City, the County and the State of Indiana. If, after the pre-certification inspection, CBS still believes that the Remedial Action has been fully performed and the Performance Standards have been attained, it shall within 30 days of the inspection submit to U.S. EPA for approval (with a copy to the State of Indiana) a written report requesting certification. In the report, a registered professional engineer and CBS shall state that the Remedial Action has been completed in full satisfaction of the requirements of the Amendment to the Consent Decree and this SOW. The written report shall include as-built drawings signed and

stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of CBS or CBS's project Coordinator:

> "To the best of my knowledge after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after completion of the pre-certification inspection and receipt and review of the written report, U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties, determines that the Remedial Action or any portion thereof has not been completed in accordance with this Amendment to the Consent Decree or that the Performance Standards have not been achieved, U.S. EPA will notify CBS in writing of the activities that must be undertaken by CBS to complete the Remedial Action and achieve the Performance Standards, provided, however, that U.S. EPA may only require CBS to perform such activities consistent with this SOW, the BD RODA OU2/3 and the Amendment to the Consent Decree. The U.S. EPA will set forth in the notice a schedule for performance of such activities consistent with the Amendment to the Consent Decree, the BD RODA OU2/3 and the SOW or require CBS to submit a schedule to U.S. EPA for approval. CBS shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge the activities described in the notice. CBS shall bear the burden of demonstrating that its position or actions complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

If U.S. EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by the other Governmental Parties, that the Remedial Action has been performed in accordance with the Amendment to the Consent Decree and the SOW and that the Performance Standards have been achieved, U.S. EPA will so certify in writing to CBS. Certification of Completion of the Remedial Action shall not affect CBS's uncompleted obligations under previously-approved design documents and work plans.

4. Operation and Maintenance Plan

In accordance with the schedule in Section VI, CBS shall submit an Operation and Maintenance ("O&M") Plan for the passive quarry drain system, groundwater collection trench and treatment plant. Further, CBS shall include in the O&M Plan any requirements for Icebox Quarry. The O&M Plan shall include the State of Indiana NPDES substantive requirements. The O&M Plan will be submitted in accordance with the schedule in Section VI for review and approval by U.S. EPA, after reasonable opportunity to review and comment by the Governmental Parties. Upon approval by the U.S. EPA, CBS shall implement the O&M Plan in accordance with the schedules therein.

5. Shut-Off Criteria

CBS shall operate and maintain the passive drain system, the collection trench and the water treatment plant until the PCBs in water flowing from the Springs and Seeps is equal to or less than 0.3 PCBs for a 12-month period. CBS may propose an alternative shut-off criteria and, if U.S. EPA determines that the alternative shut-off criteria provides a standard that is protective of human health and the environment, U.S. EPA shall propose to amend the BD RODA OU2/3 consistent with the substantive and procedural requirements of CERCLA and the National Contingency Plan. In the event that U.S. EPA amends the BD RODA OU2/3 to include the new shut-off criteria, the Parties shall petition the Court to modify the Consent Decree to include the new shut-off criteria. CBS may propose to decommission certain remedy components based upon flow in Springs and Seeps and PCB concentration in the future.

Regardless of whether the shut-off criteria in this Paragraph III.D.5 remains the unchanged or whether it is superseded by an alternative shut-off criteria, any dispute about whether the shut-off criteria has been achieved will be resolved in accordance with Section XXIV (Dispute Resolution) of the Original Consent Decree. CBS shall bear the burden of demonstrating that its position complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

6. Completion of the Work

Within 90 days after CBS concludes that all phases of the Work (including O & M) have been fully performed, CBS shall schedule and conduct a pre-certification inspection to be attended by CBS, U.S. EPA, the City, the County and the State of Indiana. For the purposes of this Paragraph III.D.6, the term "Work" shall include all Work relating to Bennett's Dump, including Work relating to the Source Control Operable Unit required under Paragraph IV.A.1 of the Amendment to the Consent Decree.

If, after the pre-certification inspection, CBS still believes that the Work has been fully performed, CBS shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of the Amendment to the Consent Decree and this SOW. The report shall contain the following statement, signed by a responsible corporate official of CBS or CBS's Project Coordinator:

> "To the best of my knowledge after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after review of the written report, U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties, determines that any portion of the Work has not been completed in accordance with this Amendment to the Consent Decree,

documents incorporated by reference under Paragraph IV.A.1 of the Amendment to the Consent Decree, the BD RODA OU2/3, and this SOW, U.S. EPA will notify CBS in writing of the activities that must be undertaken by CBS pursuant to this Amendment to the Consent Decree to complete the Work, provided, however, that U.S. EPA may only require CBS to perform such activities consistent with the Amendment to the Consent Decree, the BD RODA OU2/3, this SOW and documents incorporated by reference under Paragraph IV.A.1 of the Amendment to the Consent Decree. U.S. EPA will set forth in the notice a schedule for performance of such activities consistent with the Amendment to the Consent Decree, BD RODA OU2/3, this SOW, and the documents incorporated by reference under Paragraph IV.A.1 of the Amendment to the Consent Decree or require CBS to submit a schedule to U.S. EPA for approval. CBS shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge the activities described in the notice. CBS shall bear the burden of demonstrating that its position or actions complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

If U.S. EPA concludes, based on the initial or any subsequent request for Certification of Completion by CBS, and after a reasonable opportunity for review and comment by the other Governmental Parties, that the Work has been performed in accordance with the Amendment to the Consent Decree, U.S. EPA will so notify CBS in writing.

7. Closure Plan

No later than 30 days after receipt of U.S. EPA's certification of completion of Work, CBS shall submit to U.S. EPA for review and approval a plan for the closure of the portions of the Site relating to operable unit 2. The closure plan shall detail closure activities, post-closure activities and schedules of implementation. Upon approval of the closure plan, CBS shall implement the plan in accordance with the approved schedule. In the event that U.S. EPA rejects the proposed closure plan or conditionally approves the plan, CBS may challenge U.S. EPA's decision under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that U.S. EPA's decision is arbitrary and capricious or otherwise not in accordance with law.

IV. CONTENT OF SUPPORTING PLANS

In accordance with the schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and comment, after reasonable opportunity for review and comment by the other Governmental Parties, a draft and final Health and Safety Plan. Likewise, in accordance with the schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and approval, after reasonable opportunity for review and comment by the other Governmental Parties, a draft and final Quality Assurance Project Plan. The following section describes the required contents of each of these supporting plans. During all Work performed pursuant to this SOW, CBS shall implement and comply with the approved Health and Safety Plan and Quality Assurance Project Plan.

A. Health and Safety Plan

CBS shall develop a Health and Safety Plan which is designed to protect on-Site personnel and area residents from physical, chemical and all other hazards posed by this Remedial Action. The Health and Safety Plan shall address the areas listed below and include performance levels and criteria to assure protection of personnel and residents.

- Facility Description
- Personnel
- Levels of Protection
- Safe work practices and safeguards
- Medical surveillance
- Personal and environmental air monitoring
- Personal protective equipment
- Personal hygiene
- Decontamination
- Site work zones
- Contaminant control
- Contingency and emergency planning
- Logs, reports and record keeping

B. Quality Assurance Project Plan

CBS shall develop any necessary amendments to the existing CBS Quality Assurance Project Plan ("QAPP") to address sampling and analysis along with data handling for samples collected in all phases of future Site work. CBS shall follow the latest U.S. EPA guidance on the development of QAPPs (Instructions on the preparation of a Superfund Division Quality Assurance Project Plan, revision 0, June 2000).

V. APPROVAL OF DELIVERABLES

CBS shall provide to the other Governmental Parties a copy of each plan, report, or other item that CBS is required to submit to U.S. EPA for approval pursuant to this SOW. After review of any plan, report, or other item that is required to be submitted for approval pursuant to this SOW, U.S. EPA, after a reasonable opportunity for review and comment by the other Governmental Parties, shall, in writing: (i) approve the submission; (ii) approve the submission upon specified conditions; (iii) approve part of the submission and disapprove the remainder; or (iv) disapprove the submission.

If the submission is approved, then CBS shall take all actions required by the plan, report, or other document, in accordance with the schedules and requirements of the plan, report, or other document, as approved. If the submission is conditionally approved, then CBS shall, upon written direction of U.S. EPA, take all actions required by the approved plan, report or other item, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to dispute the conditions upon which U.S. EPA based its approval. If the submission is approved only in part, then CBS shall, upon written

direction of U.S. EPA, take all actions required by the approved plan, report, or other item that U.S. EPA determines are technically severable from any disapproved portions, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's determination as to the severability of the approved submission. CBS may dispute before the Court U.S. EPA's disapproval of part or all of any submission as arbitrary and capricious or otherwise not in accordance with law.

Within 45 days of U.S. EPA's disapproval of any submission (or such longer time as the Parties may agree to in writing), CBS shall correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval, unless CBS has timely invoked dispute resolution under Section XXIV (Dispute Resolution) of the Original Consent Decree. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole or in part, U.S. EPA may again require CBS to correct any deficiencies, in accordance with the preceding paragraphs, or may itself correct any deficiencies, subject to CBS's right to dispute U.S. EPA's decision under Section XXIV (Dispute Resolution) of the Original Consent Decree as arbitrary and capricious or otherwise not in accordance with law.

VI. SUMMARY OF MAJOR DELIVERABLES/SCHEDULES

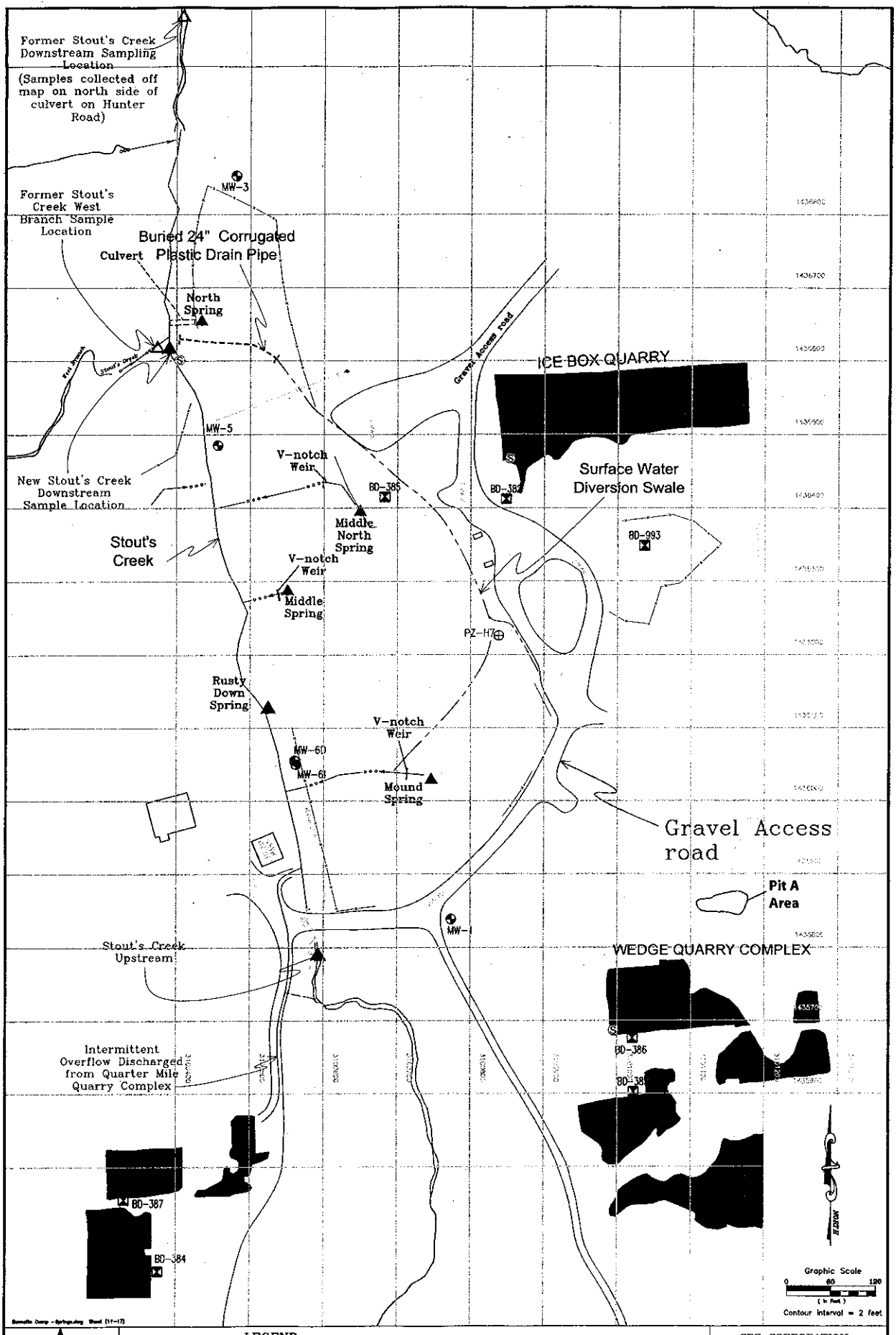
The following schedule shall be followed unless the Parties mutually agree otherwise:

Task	Completion
Draft Remedial Design/Remedial Action Work Plan	30 days after entry of the Amendment to the Consent Decree
Final Remedial Design/Remedial Action Work Plan	30 days after receipt of comments from the Governmental Parties
Revised Draft Quality Assurance Project Plan and Draft Health and Safety Plan	30 days after entry of the Amendment to the Consent Decree
Final Quality Assurance Project Plan And Health and Safety Plan	30 days after receipt of Comments from the Governmental Parties
Preliminary Design of Wedge Quarry Complex/Pit A Passive Quarry Drain	60 days after Entry of the Amendment to the Consent Decree

Final Design of the Wedge Quarry Complex/Pit A Passive Quarry Drain	30 days after receipt of comments from the Governmental Parties
Draft Investigation Plan on the Impact on Springs and Seeps of the Passive Quarry Drain and Icebox Quarry Investigation	60 days after Entry of Consent Decree
Final Investigation Plan on the Impact on Springs and Seeps of the Passive Quarry Drain and Icebox Quarry Investigation	30 days after receipt comments on the Draft Investigation Plan
Completion of construction of the passive quarry drain	60 days after approval of Final Design of Passive Quarry Drain
Complete investigation of the Impact on Springs and Seeps of the Passive Quarry Drain and Icebox Quarry Investigation and submit report of results to U.S. EPA	12 months after completion of construction of the Passive Quarry Drain
Preliminary Design of Collection Trench and Treatment plant	30 days after Report on the results of the Passive Quarry Drain/Icebox Quarry Investigation
Final Design of the Collection Trench and Treatment Plant	30 days after receipt of comments on the Preliminary Design
Completion of Construction of Collection Trench and Treatment Plant	26 months after entry of the Amendment to the Consent Decree
Draft Operation and Maintenance Plan	26 months after entry of the Amendment to the Consent Decree
Final Operation and Maintenance Plan	30 days after receipt of Comments on the Draft Operation and Maintenance Plan

Revised Long-Term Groundwater Monitoring Plan	26 Months after entry of the Amendment to the Consent Decree
Institutional Controls Work Plan	26 Months after entry of the Amendment to the Consent Decree
Completion of Institutional Controls	28 months after entry of the Amendment to the Consent Decree
Completion of Remedial Action Report	30 Months after entry of the Amendment to the Consent Decree
Request for Certification of Completion of Work	Within 90 days after CBS concludes that all phases of Work (including O & M) have been fully performed
Closure Plan	Within 30 days after receipt of U.S. EPA's Certification of Completion of Work

FIGURE 1


Former Stout's Creek Downstream Sampling Location
(Samples collected off map on north side of culvert on Hunter Road)
Former Stout's Creek West Branch Sample Location
Buried 24" Corrugated Culvert Plastic Drain Pipe
MW-3
North Spring
MW-5
New Stout's Creek Downstream Sample Location
V-notch Weir
BD-385
Middle North Spring
Stout's Creek
V-notch Weir
Middle Spring
Rusty Down Spring
MW-60
MW-61
V-notch Weir
Mound Spring
PZ-H7
ICE BOX QUARRY
Gravel Access road
BD-382
Surface Water Diversion Swale
BD-993
Gravel Access road
Pit A Area
MW-1
Stout's Creek Upstream
WEDGE QUARRY COMPLEX
BD-386
BD-383
Intermittent Overflow Discharged from Quarter Mile Quarry Complex
BD-387
BD-384
Graphic Scale
0 60 120
(In Feet)
Contour Interval = 2 feet
LEGEND
MW-1 Monitoring Well
PZ-H Piezometer
BD-389 Survey Control Point
Staff Gauge
North Spring Springs Location
Stream Gauging and Sampling Point
Stout's Creek PCB Sample Location
PSARA TECHNOLOGIES, INC.
CBS CORPORATION
FIGURE 1
BENNETT'S DUMP
OPERABLE UNITS 2 AND 3 SOW
Drawn By: RLR
Date: 11/7/07
Scale: 1"=120'

ATTACHMENT A

ENVIRONMENTAL PROTECTION EASEMENT
AND
DECLARATION OF RESTRICTIVE COVENANTS
BENNTT'S STONE QUARRY AKA BENNETT'S DUMP

This Environmental Protection Easement and Declaration of Restrictive Covenants is made this ____ day of _____, 20___, by and between _____, ("Grantor"), having an address of _____, and _____ _____ ("Grantee"), having an address of _____ _____.

[Note: Grantor and Grantee cannot be the same entity. Grantee may be a State agency other than IDEM or a local authority]

WITNESSETH:

WHEREAS, Grantor is the owner of a parcel of land located in the County of Monroe, State of Indiana, more particularly described on Exhibit A attached hereto and made a part hereof (the "Property");

[Note: Exhibit A is to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of the Environmental Protection Easement and Restrictive Covenant.]

WHEREAS, the Property is part of and/or relates to Bennett's Dump Superfund Site ("Site"), which the U.S. Environmental Protection Agency ("EPA"), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9605, placed on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 21, 1984;

WHEREAS, in two Record of Decision Amendments, dated October 16, 1998 and September 26, 2006 respectively, (collectively the "ROD Amendments"), the EPA Region Five (5) Regional Administrator selected a Remedial Action for the Site, which provides, in part, for the following actions: excavation of PCB contaminated material and off-site disposal in a landfill, placement of a soil cover, cleanup of sediment contaminated with PCBs, installation of a passive quarry drain, and construction of a collection trench and on-site treatment for spring water. With the exception of the matters identified in Exhibit B, the Remedial Action has been implemented at the Site;

[Note: Exhibit B is to be prepared and customized to fit the facts and circumstances that exist at the time that the Environmental Protection Easement and Restrictive Covenant is prepared and executed.]

WHEREAS, the areas of the Property where hazardous substances remain above levels allowing for unrestricted use and unlimited exposure are depicted in Exhibit C and described in Exhibits D and E, attached thereto.

[Note: Exhibits C, D and E are to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of Environmental Protection Easement and Restrictive Covenant. Exhibit C shall be a map of the Property depicting the different areas where restrictions on uses of Property shall apply. Exhibit D shall be a legal description of the remedy components on the Property – passive quarry drain, monitoring well, etc. Finally, Exhibit E shall be a legal description of the areas of restricted uses.]

WHEREAS, the remedial action for the Site is being conducted pursuant to CERCLA;

WHEREAS, the Grantor hereto has agreed to grant a permanent right of access over the Property to the Grantee for purposes of implementing, facilitating and monitoring the remedial action;

WHEREAS, the parties hereto have agreed to impose on the Property use restrictions as covenants that will run with the land for the purpose of protecting human health and the environment;

WHEREAS, Grantor wishes to cooperate fully with the Grantee in the implementation of all response actions at the Site;

WHEREAS, the Grantor and Grantee intend that the provisions of this Environmental Protection Easement and Declaration of Restrictive Covenants also be for the benefit of the United States and the Indiana Department of Environmental Management ("IDEM") as third party beneficiaries ("Third Party Beneficiaries"); and

WHEREAS, the Commissioner of IDEM has approved of this instrument and Grantor and Grantee intend this instrument to be a restrictive covenant pursuant to Indiana Code (IC) 13-11-2-193.5 that IDEM may enforce in a court action pursuant to IC 13-14-2-6(5).

NOW, THEREFORE:

1. Grant: Grantor, on behalf of itself, its successors and assigns, in consideration of the Remedial Action performed at the Site by the Grantee, IDEM or the EPA under the Consent Decree in the case of United States of America v. CBS Corporation, No. 1:81-cv-0448-RLY-KPF (S.D. Ind.), does hereby covenant and declare that the Property shall be subject to the restrictions on use set forth below, and does give, grant and convey to the Grantee, and its assigns, with general warranties of title, 1) the perpetual right to enforce said use restrictions,

and 2) an environmental protection easement of the nature and character, and for the purposes hereinafter set forth, with respect to the Property.

2. Purpose: It is the purpose of this instrument to convey to the Grantee real property rights, which will run with the land, to facilitate remediation of past environmental contamination and to protect human health and the environment by reducing the risk of exposure to contaminants. It is also the purpose of this instrument that the EPA and IDEM and each of their successors and assigns as Third Party Beneficiaries shall have the right to enforce the terms of this instrument and that IDEM shall also have the authority to enforce this instrument pursuant to IC 13-14-2-6(5).

3. EPA and IDEM as Third Party Beneficiaries: Grantor on behalf of itself and its successors, transferees, and assigns and the Grantee on behalf of itself and its successors, transferees and assigns hereby agree that the EPA and IDEM and their successors and assigns shall be Third Party Beneficiaries under this instrument.

4. Restrictions on use: The following covenants, conditions, and restrictions apply to the use of the Property, run with the land for the benefit of the Grantee and are binding upon the Grantor including its successors, transferees, assigns or other persons acquiring an interest in the Property and their authorized agents, employees, or persons acting under their direction and control.

[Note: Restrictions on use shall be developed in accordance with the ROD Amendments, the Bennett's Dumpl Statement of Work for Operable Units 1, 2 and 3, and the facts and circumstances relating to Property that is the subject of the Environmental Protection Easement and Restrictive Covenant.]

5. Modification or Recission of restrictions: Any request for modification or rescission of this instrument or of provisions of this instrument shall be made to the Grantee, IDEM and EPA at the addresses given below. This instrument may be modified or rescinded only with the prior written approval of EPA, IDEM and the Grantee. Grantor on behalf of its successors, transferees, assigns or other persons acquiring an interest in the Property agrees to file any modification to or rescission of this Environmental Protection Easement and Declaration of Restrictive Covenants approved by EPA, IDEM and the Grantee with the appropriate Registrar of Deeds and a certified copy shall be returned to the EPA, IDEM and the Grantee at the addresses listed below.

6. Environmental Protection Easement: Grantor hereby grants to the Grantee for its use an irrevocable, permanent and continuing right of access unless rescinded pursuant to paragraph 5 at all reasonable times to the Property for purposes of:

a) Implementing, operating and maintaining the response actions in the ROD Amendments, including but not limited to those actions generally described herein;

b) Verifying any data or information submitted to EPA or IDEM;

c) Verifying that no action is being taken on the Property in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

d) Monitoring response actions on the Site and conducting investigations relating to contamination on or near the Site, including, without limitation, sampling of air, water, sediments, soils, and specifically, without limitation, obtaining split or duplicate samples;

e) Conducting periodic reviews of the remedial action, including but not limited to, reviews required by applicable statutes and/or regulations; and

f) Implementing additional or new response actions that the EPA or IDEM determine that such actions are necessary to protect public health or the environment because (i) either the original remedial action has proven to be ineffective or (ii) that new technology has been developed which will accomplish the purposes of the remedial action in a significantly more efficient or cost effective manner; and will not impose any significantly greater burden on the Property or unduly interfere with the then existing uses of the Property.

7. Reserved rights of Grantor: Grantor hereby reserves unto itself, its successors, and assigns, all rights and privileges in and to the use of the Property which are not incompatible with the restrictions, rights and easements granted herein.

8. EPA and IDEM Entry, Access, and Response Authority: Nothing in this document shall limit or otherwise affect EPA and IDEM's rights of entry and access or EPA's and IDEM's authority to take response actions under CERCLA, the National Contingency Plan ("NCP"), or other federal and state law. The Grantor and Grantee consent to officers, employees, contractors, and authorized representatives of the EPA and IDEM entering and having continued access to this property for the purposes described in paragraph 6.

9. No Public Access and Use: No right of access or use by the general public to any portion of the Property is conveyed by this instrument.

10. Notice requirement: Grantor agrees to include in any future instrument conveying any interest in any portion of the Property, including but not limited to deeds, leases and mortgages, a notice which is in substantially the following form:

NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS, DATED _____, 20__, RECORDED IN THE PUBLIC LAND RECORDS ON _____, 20___, IN BOOK _____, PAGE _____, IN FAVOR OF, AND ENFORCEABLE BY _____ AS GRANTEE, AND IN FAVOR OF AND ENFORCEABLE BY THE UNITED STATES OF AMERICA AND THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT AS THIRD PARTY BENEFICIARIES.

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor must provide Grantee with a certified true copy of said instrument and, if it has been recorded in the public land records, its recording reference.

11. Enforcement: The Grantee, and the EPA and IDEM as Third Party Beneficiaries shall be entitled to enforce, individually or jointly, the terms of this instrument by resort to specific performance or legal process. IDEM shall be entitled to enforce this document pursuant to IC 13-14-2-6(5). All remedies available hereunder shall be in addition to any and all other remedies at law or in equity, including CERCLA. Enforcement of the terms of this instrument shall be at the discretion of the Grantee, the EPA and IDEM and any forbearance, delay or omission to exercise its rights under this instrument in the event of a breach of any term of this instrument shall not be deemed to be a waiver by the Grantee, EPA or IDEM of such term or of any subsequent breach of the same or any other term, or of any of the rights of the Grantee, the EPA or IDEM.

12. Waiver of certain defenses: Grantor hereby waives any defense of laches, estoppel, or prescription.

13. Covenants: Grantor hereby covenants to and with the Grantee and its assigns, that the Grantor is lawfully seized in fee simple of the Property, that the Grantor has a good and lawful right and power to sell and convey it or any interest therein, that the Property is free and clear of encumbrances, except those noted on Exhibit F attached hereto, and that the Grantor will forever warrant and defend the title thereto and the quiet possession thereof.

[Note: Exhibit F is to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of Environmental Protection Easement and Restrictive Covenant.]

14. Recordation: Unless this Instrument is rescinded under Paragraph 5, the Grantor, its successors or assigns shall re-record this Instrument including any subsequent modifications and amendments forty-nine (49) years from the date of first recording, or any subsequent recordings, to insure its continued applicability under the Marketable Title for Real Property Act found in IC 32-20.

15. Notices: Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and shall either be served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantor:

_____
_____
_____

To Grantee:

_____
_____
_____

To Third Party Beneficiary:

U.S. Environmental Protection Agency
Superfund Division Director
77 West Jackson Boulevard
Chicago, IL 60604

To Third Party Beneficiary:

Indiana Department of Environmental Management
Office of Land Quality
100 N. Senate Avenue
Mail Code – 66-31 IGCN 1101
Indianapolis, IN 46204-2251

16. General provisions:

a) Controlling law: The interpretation and performance of this instrument shall be governed by the laws of the United States or, if there are no applicable federal laws, by the law of the State of Indiana.

b) Liberal construction: Any general rule of construction to the contrary notwithstanding, this instrument shall be liberally construed in favor of the grant to effect the purpose of this instrument and the policy and purpose of CERCLA. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this

instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability: If any provision of this instrument, or the application of it to any person or circumstance, is found to be invalid, the remainder of the provisions of this instrument, or the application of such provisions to persons or circumstances other than those to which it is found to be invalid, as the case may be, shall not be affected thereby.

d) Entire Agreement: This instrument sets forth the entire agreement of the parties with respect to rights and restrictions created hereby, and supersedes all prior discussions, negotiations, understandings, or agreements relating thereto, all of which are merged herein.

e) No Forfeiture: Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

f) Joint Obligation: If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

g) Successors: The covenants, terms, conditions, and restrictions of this instrument shall be binding upon, and inure to the benefit of the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property. The term "Grantor", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantor" and their personal representatives, heirs, successors, and assigns. The term "Grantee", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantee" and their personal representatives, heirs, successors, and assigns. The rights of the Grantee and Grantor under this instrument are assignable, subject to the notice provisions hereof.

h) Termination of Rights and Obligations: A party's rights and obligations under this instrument terminate upon transfer of the party's interest in the Easement or Property, except that liability for acts or omissions occurring prior to transfer shall survive transfer.

i) Captions: The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

j) Counterparts: The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the Grantee and its assigns forever.

IN WITNESS WHEREOF, Grantor has caused this Environmental Protection Easement and Declaration of Restrictive Covenant to be signed in its name.

Executed this _____ day of _____, 20__.

NAME OF GRANTOR

By: _____

STATE OF INDIANA

) ss

COUNTY OF MONROE

On this __ day of _____, 20__, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____, known to be the _____ of _____, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they are authorized to execute said instrument.

Witness my hand and official seal hereto affixed the day and year written above.

_____
Notary Public in and for the
State of _____

My Commission Expires: _____.

This Environmental Protection Easement and Declaration of Restrictive Covenant is accepted this ____ day of _____ , 20__.

NAME OF GRANTEE

By: _____

_____

Attachments:	Exhibit A	-	legal description of the Property
	Exhibit B	-	Remedial Actions to be completed
	Exhibit C	-	map of Property depicting the different areas of restrictions
	Exhibit D	-	legal description of the remedy components on the Property
	Exhibit E	-	legal description of the areas of restricted uses
	Exhibit F	-	list of recorded encumbrances

Appendix F

EPA Region 5 Records Ctr.
259521

DECLARATION FOR THE LEMON LANE LANDFILL RECORD OF DECISION AMENDMENT

SITE NAME AND LOCATION

The Lemon Lane Landfill site is located in Bloomington, Indiana. The National Superfund Database identification number is IND980794341. This Record of Decision (ROD) Amendment addresses contaminated water and sediment and is referred to as operable unit 2 and operable unit 3.

STATEMENT AND BASIS AND PURPOSE

This decision document presents the Selected Remedy for the Lemon Lane Landfill site, located in Bloomington, Indiana. This ROD Amendment presents the remedial action selected in accordance with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This ROD Amendment will become part of the Administrative Record file per Section 300.825(a)(2) of the NCP. The Administrative Record, which contains the information on which selection of the remedial action was based, is available for review at the Monroe County Public Library in Bloomington, Indiana, as well as at the U.S. Environmental Protection Agency, Region 5 Superfund Records Center.

ASSESSMENT OF SITE

The response action selected in the ROD Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for the Lemon Lane Landfill site addresses groundwater and sediment contaminated by PCBs from springs located near the site. The source control operable unit one was completed in 2000 and addressed the principal threat waste through the excavation and off-site disposal and off-site incineration of high concentrations of PCB waste, including PCB oil-filled capacitors. The Selected Remedy for the site consists of expanding the treatment capacity of the current 1,000 gallon per minute (gpm) treatment plant through the implementation of a storage tank overflow treatment system that is capable of treating 5,000 gpm. The major components of the water operable unit consist of the following:

- Continue to treat Illinois Central Spring with the 1,000 gpm water treatment plant with 1.2 million gallons of stormwater storage.
- Expand the current water treatment plant by treating water which bypasses the 1,000 gpm treatment plant during large storm events by implementing a stormwater storage tank treatment system capable of treating 5,000 gpm. The system would consist of 8 Calgon

Model 12 or their equivalent carbon adsorption vessels each with 20,000 pounds of granular activated carbon. Based upon a treatability study, the stormwater storage system is expected to remove about 95% of the PCBs from the storage tanks. During the design phase, it may be determined that a different configuration may be an improvement to the 8 carbon adsorption vessels proposed and the storage tank overflow treatment system may be modified. The combined treatment systems will treat nearly 100% of the ICS spring water and treat 99.9% of the PCB mass from ICS.

- Install a new effluent line to handle all treated water and stormwater.
- Capture and treat Quarry B Spring and Rinker Spring at the ICS water treatment plant.
- An Operations and Maintenance Plan will be developed for the collection and treatment system and a monitoring program to monitor the effectiveness of the remedy.
- Implement a soil/sediment cleanup at the ICS emergence, swallowhole area and Quarry Springs area. The cleanup criteria is 1 ppm PCBs on average in drainage ways and 5 ppm PCBs in non-drainage ways. The amount of PCB contaminated material is 3,000 cubic yards and this will be disposed of in an off-site permitted landfill. Final volumes will be determined based upon a pre-design sampling event.
- Institutional controls / deed restrictions will be required to prevent development on the landfill cap and prevent development within the drainage ways.

STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e. reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is protective of human health and the environment. The first five-year review was completed in June 2005 and next scheduled review is in June 2010.

RECORD OF DECISION AMENDMENT DATA CERTIFICATION CHECKLIST

The following information is included in the Decision summary section of the Record of Decision Amendment. Additional information can be found in the Administrative Record located at the Monroe County Public Library.

- Chemicals of concern and their respective concentrations are located on Pages 5 and 10.
- Baseline risks represented by the chemicals of concern are located on Pages 15 through 18.
- Cleanup levels established for chemicals of concern and the basis for these levels are located on Pages 28 and 35.

- Description of how source materials constituting principal threats are addressed is addressed on Page 34.
- Description of the current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD Amendment are located on Page 12.
- Description of the potential land and groundwater use that will be available at the site as a result of the implementation of the passive quarry drain and groundwater interceptor trench with treatment is located on Page 12.
- Description of the estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected is located in Table 8.
- Description of the key factors that led to selecting the remedy is located on Page 30.

AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

The United States Environmental Protection Agency is the lead Agency for developing and preparing this Record of Decision Amendment. The State of Indiana, City of Bloomington, and Monroe County are signatories to the Consent Decree and those parties have all submitted letters of concurrence for the implementation of the above referenced alternative.

Richard C Karl

Richard C. Karl, Director
Superfund Division

9-29-06

Date

RECORD OF DECISION AMENDMENT
LEMON LANE LANDFILL
OPERABLE UNITS 2 AND 3

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

CBS Corporation (formerly known as Westinghouse Electric Corporation and Viacom Inc.) owned and operated a capacitor production facility in Bloomington. The insulating fluid used in the manufacture of the capacitors contained polychlorinated biphenys (PCBs). The Lemon Lane Landfill was operated as a sanitary landfill from the late 1930s to 1964. From 1958 until the fall of 1964, PCB filled capacitors, PCB contaminated rags, sawdust, and filter clay were disposed of at the Lemon Lane Landfill. Extensive salvaging of capacitors along with large scale burning of landfill material occurred during the landfill operation. In addition, evidence indicates other industrial wastes were disposed of in the landfill. The landfill is situated over two sinkholes that were filled with landfill material prior to PCB disposal. The total volume of landfill material was approximately 200,000 cubic yards based on landfill borings completed in 1996.

The Lemon Lane Landfill is located on the northwest side of the City of Bloomington in Monroe County, Indiana. Figure 1 is a general site location map. The original landfill covered approximately 10 acres. The City of Bloomington owns a majority of the landfill property. Lemon Lane Road and a residential area along Lemon Lane bounds the east side of the landfill. The CSX Railroad tracks border the southern edge of the landfill and directly south of the railroad tracks is Valhalla Cemetery. Jerry Pelfree owns the property directly north of the site. The northern part of the landfill occupies a small part of property that Mr. Pelfree owns. Bordering the northeast corner of the site outside the fence is the Sexton property. On the east side of Lemon Lane Road are the Bender and Elliot properties. CBS owns the undeveloped land to the west of the landfill. The Griffin property borders the southern portion of the east fence line of the landfill.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Lemon Lane Landfill was placed on the National Priorities List (NPL) in October 1982 and was one of the six sites to be remediated under the terms of a Consent Decree (CD) entered by the United States District Court for the Southern District of Indiana on August 22, 1985. The Consent Decree called for the construction of a permitted, Toxic Substances Control Act (TSCA) approved, dedicated, municipal solid waste-fired incinerator to be used to destroy PCB contaminated soils and materials excavated from the six sites.

Public opposition to the incinerator arose before and after entry of the Consent Decree. CBS submitted applications for the necessary permits to design and build the incinerator in 1991. The Indiana State Legislature, however, passed several laws which prevented any immediate consideration of CBS's permit application. In February 1994, the parties settled upon a set of principles to guide the process of exploring alternative remedies. These principles, known as the

Operating Principles, provided, among other things, that the selection of remedial alternatives would be conducted in accordance with EPA's Record of Decision (ROD) Amendment process.

In November 1997, Judge S. Hugh Dillin issued an Order requiring that the six Consent Decree sites be remediated by December 1999. Judge Dillin also assigned Special Master Kennard Foster to oversee the progress of the parties toward meeting the December 1999 deadline. On February 1, 1999, Judge Dillin issued another Order approving and adopting the Report and Recommendations of Special Master Kennard Foster which (1) extended the deadline for completion of the source control at the remaining five sites until December 31, 2000, and (2) ordered the parties to engage in future settlement discussions with respect to other issues, including remedial measures to address groundwater and surface water contamination. The source control remedies were completed by the December 31, 2000 deadline and CBS and the governmental parties are in the process of negotiating a global settlement[1] for all of the remaining issues regarding the six Consent Decree sites.

Interim measures were implemented by CBS and the U.S. EPA at and near the Lemon Lane Landfill. In 1987, CBS removed, and incinerated off-site, 404 capacitors from the landfill surface. In addition, CBS placed a temporary flexible membrane liner over the landfill surface to prevent water from infiltrating into the waste material. A sediment cleanup was completed in Clear Creek for approximately 2,770 feet near the Winston Thomas Wastewater Treatment Plant site. EPA funded the construction of a 1,000 gallon per minute (gpm) water treatment plant, along with storage for 1.2 million gallons of storm water at the Illinois Central Spring (ICS), which is hydraulically connected to the Lemon Lane Landfill, through a time-critical removal action. The water treatment plant went online in May 2000 and was operated by the EPA until August 2001. The operation and maintenance was then funded for three years by the Indiana Department of Environmental Management (IDEM). Since August 2004, an agreement has been in place for EPA, CBS, the City of Bloomington and IDEM to fund the operation and maintenance of the treatment plant.

EPA issued the Proposed Plan for the Lemon Lane Landfill source control operable unit 1 (OU 1) on January 3, 2000 and held 60 days of public comment. The other governmental parties (IDEM, City of Bloomington, Monroe County) concurred on the Record of Decision (ROD) Amendment. The ROD Amendment was signed by the U.S. EPA on May 12, 2000.

The source control operable unit involved the following:

- Excavation and disposal of 80,087 tons of PCB contaminated material greater than or equal to 50 parts per million (ppm) to Environmental Quality Company's Wayne Disposal Landfill in Belleville, Michigan.

- Excavation and transport of total of 4,402 capacitors to Onyx Environmental in Port Arthur, Texas for incineration.

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[1] The global settlement will include both technical and non-technical issues.

- Consolidation of 40,000 cubic yards of landfill material within the landfill boundary to shrink the size of the landfill to approximately 9 acres.

- Installing a Resource Conservation Recovery Act (RCRA) Subtitle C compliant cap over the remaining landfill material. The cap consists of 6-inches of topsoil, 18-inches clean granular fill, a geocomposite drainage layer, 40 millimeter thick geomembrane, geosynthetic clay layer and perimeter drainage/stormwater retention pond.

- Installing 4 piezometers into the landfill to determine if the landfill waste is becoming backflooded and getting wet.

- Cleaning up areas outside the landfill boundary.

- Implementing a Groundwater Monitoring Plan and Cap Inspection Plan.

The Lemon Lane RCRA Cap Inspection and Maintenance Plan was approved in June 2001 and the following activities are performed by CBS:

- Routine site inspections are completed quarterly to determine if damage has occurred to the landfill cap and repairs made as needed.

- Mowing is completed as needed.

- Application of herbicide at the fence line and rip rap drainage ways completed annually.

- Topographic survey/subsidence report is completed biennially (every two years).

The continuing release of PCBs and other hazardous constituents from springs connected to the Lemon Lane Landfill and the subsequent contamination of soils and sediment from the releases from these springs requires the need for two additional operable units.

COMMUNITY PARTICIPATION

The community has been involved at the Lemon Lane Landfill site. The EPA has funded a Technical Assistance Grant (TAG) with a citizens group called Citizens Opposed to PCB Ash (COPA). In addition to hiring experts to review documents, COPA has also developed a web page (www.copa.org) to distribute information to the public. The EPA and State have participated in at minimum, quarterly Citizens Information Committee meetings with the public to update them on the recent site activities. These meetings are shown on the local Bloomington cable access station.

The Proposed Plan for the water treatment operable unit (OU 2) and sediment operable unit (OU 3) for the Lemon Lane Landfill site was made available to the public for 30 days on June 14, 2006. A 30-day extension of the public comment period was granted

and the public comment period ended on the Proposed Plan on August 12, 2006. The Administrative Record (AR) in electronic form was placed in the Monroe County Public Library. Interested parties were able to receive copies of the AR for review and for the development of comments on the Proposed Plan for OU 2 and OU 3. Approximately 5,000 OU 2 and OU 3 Proposed Plan postcards were mailed to residents in the Bloomington area and an Internet link was provided to a fact sheet for review.

A public meeting was held on July 13, 2006, to present the Proposed Plan for OU 2 and OU 3 to the public. Representatives from EPA and the State of Indiana were present to answer questions. EPA response to comments received during the public comment period is included in the Responsiveness Summary, which is part of this Record of Decision Amendment for operable units 2 and 3.

SCOPE AND ROLE OF THE OPERABLE UNITS

This action is the final action for the Lemon Lane Landfill site and addresses both contaminated groundwater and sediment, known respectively as operable units 2 and 3. The 2000 ROD Amendment addressed the source control and addressed the principal threat waste by disposing of PCB contaminated material off-site in a chemical waste landfill and incinerating PCB capacitors filled with PCB contaminated oil off-site at a permitted facility. The remaining landfill material was capped with a RCRA Subtitle C compliant cap. These final two operable units are intended to prevent current and future exposure to contaminated media through treatment and containment of groundwater and sediment. The treatment of groundwater in this response is intended to permanently reduce the toxicity, mobility, and volume of the releases of PCBs into Clear Creek.

SITE CHARACTERISTICS

A number of investigations were completed to characterize the site and determine the nature and extent of contamination at the Lemon Lane Landfill. The investigations include the following:

- Borings and corings to delineate site stratigraphy.
- Borehole and surface geophysics.
- Monitoring well development, water level measurement and sampling.
- Aquifer hydraulics testing using slug tests and pump tests.
- Spring flow measurement and storm flow hydrograph analysis.
- Spring flow contaminant sampling during non-storm and storm conditions.
- Basin delineation and flow analysis using dye tests and modeling.
- Site and area field surveys and historical photo reviews to identify key surface features related to karst development and structure.
- Sediment and soil sampling at the Illinois Central Spring (ICS) emergence, swallowhole area and Quarry Springs area.
- Sediment sampling including surface sampling, deep borings, bank sampling, and floodplain sampling in Clear Creek.

Site Geology

The Lemon Lane Landfill lies on the eastern margin of the Mitchell Plain. The Lemon Lane Landfill and surrounding area is a karst terrain. Karst terrain is a landscape produced through the interaction of slightly acidic rainwater with soluble limestone bedrock. This process known as dissolution forms a variety of landscape features, including sinkholes, subterranean voids, solution conduits, caves, and springs. Drainage in the Lemon Lane Landfill area is predominantly subterranean through the karst features. The drainage is characterized by rapid groundwater flow from sinkholes through a branchwork of subterranean solution conduits and caves to discharge points at springs. Contaminants in karst groundwater may move rapidly through the drainage network to springs located miles from the source area without the benefit of normal natural attenuation processes.

The site is near the watershed divide between Clear Creek to the south and Stout's Creek to the north. The landfill is underlain by 70 to 80 feet of the St. Louis Limestone and the soil cover over the St. Louis Limestone ranges in thickness from 5 to 20 feet at the landfill site. The Salem Limestone (70 to 80 feet thick) underlies the St. Louis Limestone and the Harrodsburg Limestone underlies the Salem. The St. Louis Limestone in the vicinity of the landfill is thinly bedded and contains limestone, dolomite, and shale. Solution cavities, joints, and other fractures serve as routes for groundwater movement.

Site Hydrogeology

A number of investigations were completed for groundwater and surface water at the Lemon Lane Landfill. Water studies, including dye trace studies, demonstrated that a majority of low flow and storm water drainage from the Lemon Lane Landfill discharges at ICS, located about 2,500 feet southeast of the site. ICS is the headwater of Clear Creek, which runs through the City of Bloomington and joins Salt Creek near the Monroe Dam. Other springs located near the landfill are also connected to the site. Sampling has shown PCB contamination from the Lemon Lane Landfill in the following springs:

- Illinois Central Spring
- Quarry Springs
- Slaughterhouse Spring
- Rinker Spring

Figure 2 shows the location of spring, sink, and surface water locations.

The spring water discharge from ICS varies in direct response to precipitation. During very dry periods, spring flow is under 30 gpm, but during storm periods peak flow rates at the spring may approach 5,000 gpm. The PCB content of the spring water varies with spring flow. Generally, under low flow conditions, PCB concentrations range from about 5 to 20 parts per billion (ppb). During storms, PCB concentrations in excess of 500 ppb may occur as well-defined concentration peaks. These peaks appear to represent "flushes" of PCBs from storage in the shallow, highly cavernous, "epikarst" portion of the

limestone bedrock. The travel time of the PCB flush from the landfill to ICS is inversely related to the flow rate, with the maximum PCB concentration appearing between two hours before and 40 hours after the peak flow rate. Generally, larger intense storms generate larger peak PCB concentrations.

Prior to 1999, discharge from ICS flowed through a culvert beneath the Indiana Central Railroad embankment and southeastward down the ICS Branch. With the construction of the current Illinois Central Spring Treatment Facility (ICSTF) in 1999, this culvert was plugged. A new culvert was driven beneath the railroad embankment to route the spring flow into the new Spring Receiving Sump (SRS). The SRS pumps ICS spring water for treatment to the ICSTF. Treated ICS water is returned to the surface channel and operates cyclically as water is pumped from the SRS to the ICSTF for treatment.

Formerly, water discharged from ICS followed a surface channel southeastward approximately 500 feet to a karst swallowhole (principal swallowhole). Currently, the ICSTF discharge drains to this swallowhole. Under low flow conditions, the principal swallowhole accepts all the spring flow. At spring discharges exceeding about 200 to 300 gpm, the hydraulic capacity of the principal swallowhole is exceeded and overflow of the principal swallowhole occurs. This overflow follows a network of shallow surface channels to the overflow swallowhole. During times of heavy rainfall, the capacity of the overflow swallowhole is exceeded and surface drainage occurs through a culvert beneath a former railroad embankment. Figure 3 identifies the site features and shows the flow path for the effluent.

Additional springs discharge downstream of the overflow swallowhole. A spring called Quarry A is located at the toe of the railroad embankment near the current ICSTF entrance gate. Downstream from the Quarry A Spring, the ICS Branch flows southeast in a shallow channel. The channel bends abruptly to the west 350 feet below Quarry A and flows an additional 100 feet to the base of the ICSTF entrance road embankment. The flow from an 18-inch culvert enters the channel from the west at this point and is referred to as the Quarry B culvert.

To determine if ICS was connected to the Quarry Springs area, in 1988, CBS completed a dye trace study into the ICS Branch at ICS. The dye plume was observed to enter the principal swallowhole and was observed at Quarry A Spring about 30 minutes later and at Quarry B Spring about 1 hour later. This dye trace established a direct hydraulic connection from the principal swallowhole to both Quarry A Spring and Quarry B Spring.

The culvert that extends beneath the ICSTF entrance road extends to a 13.5 foot deep stormwater manhole on the west side of the road. Flow is always observed in the bottom of this manhole. An analysis of aerial photography from 1949 shows a spring located about 150 feet northwest of the Quarry B manhole. The spring has been covered with approximately 25 feet of post-1949 fill. The flow in the bottom of the Quarry B manhole is probably derived from this buried spring. This buried spring is referred to as Quarry B Spring. Another dye trace was completed in October 2001 in which water, including

effluent, was prevented from entering the principal swallowhole. Dye was placed at the landfill and was observed at ICS, but was not observed at Quarry B Spring. This dye trace established that ICS was not connected directly to Quarry B Spring.

Evaluating the flow from both Quarry A Spring and Quarry B Spring is difficult due to a number of factors that influence the flow. Flow at Quarry A appears to be greatly increased when water overflows the ICS principal swallowhole. When the ICS principal swallowhole is able to take all of the ICSTF discharge, flow at Quarry A is lower, but does not cease except during very dry periods. Quarry A Spring appears to be fed by both the principal and overflow swallowholes. Quarry B Spring appears to maintain a much higher base flow than Quarry A. It is clearly fed by the ICS principal swallowhole but may have additional drainage area to the west.

Rinker Spring is located northeast of the Quarry A Spring. Two 8-inch pipes discharge from an embankment to form Rinker Spring.

Monitoring of the Quarry A, Quarry B and Rinker discharge was conducted at the downstream culvert. Sampling data from 1995 and 1996 at the downstream culvert generally indicate a PCB concentration of 3 to 10 ppb PCBs. After the ICSTF began operation the PCB concentrations at the culvert reduced to 0.5 to 2 ppb PCBs. Quarry A and B springs have been monitored on a monthly basis since September 2004 and Rinker Spring has been monitored on a monthly basis since May 2005. These sampling data suggest that Quarry A and Quarry B all have similar PCB concentrations. Concentrations are generally 0.5 to 1 ppb PCBs. Rinker Spring PCB concentrations tend to be slightly higher and range from 1 to 3 ppb PCBs.

Slaughterhouse Spring is located north of the Lemon Lane Landfill (See Figure 2). Dye trace studies establish that Slaughterhouse Spring is hydraulically connected to Lemon Lane Landfill. Slaughterhouse Spring has been sampled quarterly since November 2000. Three detections just above the PCB laboratory detection limit of 0.1 ppb have occurred. The spring samples have been non-detect for PCBs since May 2001. Two storm event sampling events were conducted in October 2003 and November 2003. Sampling took place hourly for 36-hours in the October 2003 storm event and 48 hours of hourly sampling for the November 2003 storm event. Sampling from the October 2003 event did not produce any detections of PCBs and the November 2003 sampling event produced 2 detections slightly above the 0.1 ppb PCB level.

In addition, monitoring wells surrounding the Lemon Lane Landfill also have shown PCB contamination.

Between September 1995 and June 1996, CBS completed the sampling of 29 residential wells within a one mile radius of the Lemon Lane Landfill. The results showed those wells were not contaminated with PCBs. These wells are not currently used by residents for drinking water.

Discharge/Capture Model

To evaluate the flow and PCB mass released at ICS, a discharge/capture model was developed to estimate the fraction of ICS spring flow and PCB mass treated by various water treatment plant capacities and storage scenarios. The EPA constructed an interim water treatment plant designed to treat 1,000 gpm and have approximately 1.2 million gallons of storage for stormwater.

The model was developed through analyzing ICS flow records from August 21, 2001 to February 24, 2004, and by evaluating the results from 659 PCB samples. Since PCB data was not collected continuously, relationships were developed for both non-storm and storm data to predict PCB concentrations based upon a flow rate from ICS. The PCB mass discharged and the ICS flow data were placed into a model to evaluate the current interim water treatment plant and to evaluate other plant expansion scenarios. A number of assumptions were used in the development of the model and are as follows:

- The storm event PCB mass is evenly distributed over a four hour period extending from one hour prior to the peak to three hours after the peak.

- The model considers only data from August 2001 to February 2004. It may give PCB capture values indicative of typical yearly capture values to the extent the distribution and magnitude of storms for this period were average.

- The captured PCB mass is treated and the PCBs are quantitatively removed from all spring flow volume passing through the plant.

Discharged volumes exceeding plant storage are considered to be untreated with no reduction in PCB mass. That is, the model considers no treatment or PCB removal by settling of PCBs from water passing through storage. Some sampling events have shown as much as an 80% reduction in PCB mass due to PCBs settling out of the water in the tanks, but an exact percentage cannot be determined due to the variability of the storm events.

During the August 21, 2001, to February 4, 2004, timeframe, ICS discharged 401,317,000 gallons of PCB contaminated water and the ICSTF treated 366,120,197 gallons or 91.2 percent of the spring discharge. An estimated 20,900 grams (46.1 pounds) of PCBs were released from the spring and 15,612 grams (34.4 pounds) or 74.7 percent of the total PCB discharge was captured. The difference between the volume captured and mass is due to "back to back" storm events that prevent the treatment of storm water once the 1.2 million gallons of storage is filled. Table 1 and Table 2 are developed from the model which gives percentages of ICS water treated and percentage of ICS PCBs treated based upon different storage and plant capacity scenarios.

The percentages calculated from the model are conservative because the model does not assume that PCBs settle out in the storage tanks. Testing has shown that the storage tanks are effective in settling PCBs and sampling of sediment at the bottom of the storage

tanks after they have been drained have shown high concentrations of PCBs. Sampling shows PCB mass reduction as high as 80% through settling in the two stormwater storage tanks. Table 3 shows the percentage of PCBs treated with 80% settling in the storage tanks.

Percentage of ICS Water Treated			
Storage in million gallons	Plant Treatment Capacity (gpm)		
	1,000	1,500	2,000
1.2	91.2	95.8	98.1
1.8	92.8	96.8	98.6
2.4	94.1	97.6	99.0

Table 1 – Percentage of ICS Water Treated

Percentage of ICS PCBs Treated			
Storage in million gallons	Plant Treatment Capacity (gpm)		
	1,000	1,500	2,000
1.2	74.7	85.0	92.2
1.8	78.2	88.1	93.9
2.4	81.6	90.5	95.6

Table 2 – Percentage of ICS PCBs Treated

Percentage of ICS PCBs Treated With 80% Settling in Storage Tanks			
Storage in million gallons	Plant Treatment Capacity (gpm)		
	1,000	1,500	2,000
1.2	94.9	97.0	98.4
1.8	95.6	97.6	98.9
2.4	96.3	98.1	99.1

Table 3 – Percentage of ICS PCBs Treated with 80% Settling

Conduit Study

Since 1998, CBS has undertaken a karst conduit study adjacent to the Lemon Lane Landfill. The purpose of this investigation was to determine if source areas and pathways could be found beneath the site area and to determine if remediation activities at the landfill could be implemented to reduce or eliminate PCBs at ICS. Specific goals of CBS's investigation are as follows:

- Identify particular locations within the karst aquifer near the site where high concentrations of PCBs reside and are being mobilized into the conduit system, especially during high flow storm events.
- Discover local pathways that PCBs were taking as they are mobilized from the source area.
- Identify sources of recharge that mobilize the PCBs from their specific location.
- Locate the conduit or conduits that transmit the PCBs to the Illinois Central Spring.

The karst conduit investigation has consisted of many different types of investigation activities. A number of different geophysic techniques were used to identify possible conduits for drilling. Using that information, a large number of wells and piezometers were installed to understand how groundwater leaves the site area and travels to ICS. Dye trace tests were completed to identify karst conduit pathways and to help in the identification of source areas in the rock outside of the landfill cap. A series of pump tests were completed to determine if PCBs can be captured near the site. Also, a series of flush tests were completed to mobilize PCBs in the rock outside of the landfill cap to help discern source areas and karst conduits.

Even though the remedial actions selected in this ROD Amendment constitute the final remedy for the Lemon Lane Landfill, CBS may continue to perform its karst conduit investigation for areas outside the landfill cap. Pumping groundwater at the landfill does not appear feasible at this time, but CBS has identified possible source areas southeast of the landfill cap and deep in the rock. If the conduit investigation produces possible remedial alternatives to improve the effectiveness and reduce costs of this final remedy, EPA may issue a new Proposed Plan for public comment.

Sediment Investigation

Sediment investigations were completed for the area surrounding ICS, the area surrounding the principal swallowhole, the area around Quarry Springs, and in Clear Creek to where it meets Salt Creek. Sampling for PCBs includes surface sampling, sampling at depth by the use of borings, bank sampling, and floodplain sampling.

Sampling at the ICS emergence includes both sediments and soils. PCB results for sediments range from 1.7 to 73 ppm. Soil at the ICS emergence show PCB concentrations that range from 0.13 to 200 ppm. Figure 4 shows the results of the sampling at the ICS emergence.

At the swallowhole area, PCB results for sediment sampling range from 9.6 to 130 ppm. Soils show PCB results ranging from non-detect to 47 ppm PCBs. Figure 5 shows the results of the sampling at the swallowhole area.

The area around the Quarry Springs also was sampled and the results establish that drainage areas have PCBs ranging from 0.24 to 48 ppm and soils show a range from non-detect to 28 ppm. Figure 6 shows the results of the sampling at the Quarry Springs area.

The sediment investigation for Clear Creek began with EPA completing a sediment thickness study which consisted of measuring the thickness of sediment in Clear Creek from the Gordon Pike Road to the point where Clear Creek meets Salt Creek. The data from the sediment thickness study was used to develop sediment sampling plans. For this analysis, Upper Clear Creek was broken up into two sections along with Lower Clear Creek. The data was evaluated through mathematical interpolation. The depth of sediment in upper North Clear Creek (6.3 miles downstream of where Gordon Pike Road crosses Clear Creek) shows a mean depth of 1.05 inches with a majority of locations having no sediment. Lower North Clear Creek (6.4 miles from the farthest point downstream point of Upper Clear Creek) shows a sediment thickness on average of 1.10 inches with a majority of locations not having sediment present. Lower Clear Creek (from where Old State Route 37 crossed Clear Creek to where Clear Creek intersects Salt Creek) shows an average sediment thickness of 13.17 inches. Figure 7 shows a representation of the sediment thickness in Clear Creek.

A number of sampling events in Clear Creek have taken place over the years. The first sampling event in Clear Creek took place in lower Clear Creek in June 2004. A total of 73 locations were sampled and included 50 instream surface samples, 13 instream cores and 10 bank samples. In September 2005, Lower Clear Creek was sampled again and consisted of 10 instream surface samples, 24 banks samples at 8 locations, and 17 core samples at 5 locations.

Upper Clear Creek was sampled in May 2005 and 20 in-stream samples, 40 bank soil samples at 20 locations, and 12 core samples at 4 locations. Upper Clear Creek floodplain sampling was completed in September 2005 and consisted of 16 samples at 12 locations.

The floodplain sampling at Fluckmill Road, disclosed a sewage sludge disposal site contaminated with high concentrations of PCBs. During the 1970s, sewage sludge from the former Winston Thomas wastewater treatment plant was available to citizens to use as fill. Unknown at the time, PCBs from the Westinghouse capacitor plant had contaminated the sewage sludge. Based upon the sampling results and the type of soil at the Fluckmill location, it appears that sewage sludge may have been used to fill in low areas of the property. This floodplain contamination will be addressed through a separate action.

Figures 8 and 9 show the results of the sediment sampling events in Clear Creek.

PCB concentrations were also evaluated and the north section (Gordon Pike to Old 37) showed an average PCB concentration of 0.19 ppm, with a maximum PCB value of 1.2 ppm. The south section (Old State Route 37 to Salt Creek) showed an average PCB concentration of 0.91 ppm, with a maximum concentration of 9.2 ppm PCBs. Since much more sediment is present in the southern portion of the creek, PCB concentrations were interpolated based upon depth of sediment. From 0 to 3 inches the average sediment PCB concentration was 0.62 ppm to 0.66 ppm. From 3 to 6 inches the average PCB concentration was 1.10 to 1.21 ppm. From 6 to 12 inches, the average PCB concentration was 1.27 ppm to 1.28 ppm. Finally, from 12 to 31 inches, the average PCB concentration is 2.19 to 2.25 ppm PCBs.

CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

The area surrounding the Lemon Lane Landfill is a mixture of both residential and commercial property. CBS owns a large piece of undeveloped property west of the landfill and this property may be used for commercial development in the future. The source control completed in 2000 reduced the size of the landfill and the landfill was fenced. Institutional controls, including deed restrictions to prevent disturbance of the landfill cap will be put in place.

Drinking water for the City of Bloomington is supplied by Lake Monroe which is not affected by the Lemon Lane Landfill. The continuing release of PCBs into Clear Creek from the springs connected to the landfill has, however, impacted fish and sediment in the Creek. EPA evaluated the incidental ingestion of water and sediment from Clear Creek along with the affect on recreational fishing in the Human Health Risk Assessment.

SUMMARY OF SITE RISKS

EPA completed two focused risk assessments for the purpose of quantifying the threat to public health and the environment from actual or threatened releases of hazardous substances into the environment. The chemical of concern is PCBs. One risk assessment focused upon the current and future effects of such releases on human health. The other assessment focused upon the current and future effects of such releases upon the environment. Each risk assessment is discussed, in turn, below.

Human Health Risks

A Superfund human health risk assessment estimates the baseline risk to human health. The human health risk assessment is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers

Step 4: Characterize Site Risk

In Step 1, EPA evaluates the data collected at a particular site to determine which data is appropriate to consider in the risk assessment. For example, the most recent data are used rather than historical data because concentrations of PCBs in water and fish tissue can change over time and current data are most reflective of future concentrations. Next, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies helps EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a reasonable maximum exposure (RME) scenario, which represents the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA identifies and summarizes the basis for information on the toxicity of each of the contaminants identified in Step 1. Specifically, toxicity factors reflecting each chemical's potential for causing cancer or other noncarcinogenic health effects are identified and documented in accordance with EPA guidance.

In Step 4, EPA combines, evaluates, and summarizes the results of the previous three steps in order to characterize site risks. EPA adds up risks from the individual contaminants and exposure pathways to generate total site risks. EPA then assesses whether site risks are great enough to cause health problems for people living or recreating near the site.

As part of a Superfund risk assessment, EPA considers two types of risk: carcinogenic and noncarcinogenic. The likelihood of any cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a 1 in 10,000 chance. In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates risk differently. The key concept here is that a threshold level exists below which non-cancer health effects are no longer predicted. This threshold level is conservatively represented by a reference dose (RfD). Noncarcinogenic risks are calculated as the ratio of potential exposure to the RfD; this ratio is referred to as a hazard quotient (HQ). A HQ of greater than 1 indicates a potential for adverse health effects.

EPA calculated PCB risks at the Lemon Lane Landfill site through two methods (Aroclor and Toxicity Equivalent). As background, PCBs are mixtures of up to 209 individual chlorinated compounds called congeners. Many commercial PCB mixtures are known in the United States as Aroclors. Laboratory analysis included measuring PCBs by the

Aroclor method and the congener method. With the congener method, thirteen of the 209 congeners are referred to as dioxin-like PCBs, as they produce a toxic response similar to 2,3,7,8-tetrachloro-p-dioxin (TCDD). The concentration of each congener is converted to a dioxin equivalent which is referenced as the toxicity equivalent (TEQ).

In evaluating the human health risks posed by the on-going PCB releases from the Lemon Lane Landfill, EPA focused on the health effects to children, youths and adults coming into contact with water, sediment, and soil (including bank soil, floodplain soil, and surface soil) in and along Clear Creek and the Quarry Springs area, along with eating fish from Clear Creek. EPA believes that human exposure to PCBs from the site results from a variety of pathways:

- Consumption of fish from Clear Creek
- Exposure to sediment within Clear Creek and Quarry Springs area through skin contact and incidental ingestion
- Exposure to surface water within Clear Creek and Quarry Springs area through skin contact and ingestion
- Exposure to soil (including bank soil, floodplain soil, and surface soil) in and along Clear Creek and Quarry Springs area through skin contact and ingestion

Extensive fish sampling occurred over the years in Clear Creek. To evaluate the risk to humans, however, 2004 sampling data was used because it is the most recent data. Fish tissue was sampled in 2004 at the following locations:

- Allen Street (1.5 miles downstream from the site)
- Country Club Road (3 miles downstream from the site)
- Fluckmill Road (10 miles downstream from the site)
- Strain Ridge Road (20 miles downstream from the site)

Both pelagic fish (water-column swimming fish such as green sunfish, longear sunfish, rock bass, largemouth bass) and benthic fish (bottom-dwelling fish such as white sucker, northern hogsucker, redhorse) were sampled and a conversion of one-quarter was used to convert whole fish PCB concentrations to fillet PCB concentrations for pelagic fish and one-half was used for benthic fish. Table 4 below is a summary of the average PCB fish concentrations. EPA recognizes that anglers are unlikely to consume large amounts of benthic fish and are more likely to consume pelagic fish. However, a variety of large benthic fish are present in Clear Creek. Therefore, for the purposes of the risk assessment, EPA calculated the concentration of PCBs in fish tissue consumed by anglers as a weighted average assuming 90 and 10 percent of the fish consumed by anglers is pelagic and benthic fish, respectively. The calculated weighted average PCB and TEQ concentrations used in the risk assessment are also presented in Table 4 below:

Table 4 - Summary of Average PCB Fish Tissue Concentrations

Fish Tissue	Country Club Road	Fluckmill Road	Strain Ridge Road
Pelagic – PCBs in ppb	416	768.8	480.9
Pelagic – TEQ in ppt	9.6	9.5	9.3
Benthic – PCBs in ppb	744.5	895.8	1243.8
Benthic – TEQ in ppt	10.1	7.1	15.5
Weighted Average – PCBs in ppb	448.9	781.5	557.2
Weighted Average – TEQ in ppt	9.65	9.3	9.9

ppb – parts per billion; ppt – parts per trillion

As part of evaluating risks to human from the consumption of fish from Clear Creek, an analysis of the amount of fish within the creek was completed to determine if enough fish were available to consume. Reach-specific fish tissue ingestion rates were developed based on (1) the expected fish tissue biomass present in each Clear Creek reach, (2) the fish tissue ingestion rates supported in other Bloomington area streams, and (3) fish tissue ingestion rates discussed in the literature. Based on this analysis, EPA determined that the following reach-specific fish tissue ingestion rates should be evaluated:

- Country Club Road – 3 grams fish per day
- Fluckmill Road – 12 grams fish per day
- Strain Ridge Road – 25 grams fish per day

Note: In evaluating the risk, EPA determined that the fish at Allen Street were not of sufficient size or type to justify further consideration in the human health risk assessment.

Though Table 4 shows that the concentrations of PCBs in fish tissue assumed for the risk assessment are similar across all three reaches evaluated, the differences in reach-specific fish tissue ingestion rates resulted in greater risks as the distance downstream from the site increased (in other words, risks at Country Club Road are less than risks at Fluckmill Road, are less than risks at Strain Ridge Road). Specifically, using EPA risk assessment guidance and procedures the following carcinogenic and noncarcinogenic risks were calculated for an adult RME recreational angler eating fish from Clear Creek[2]:

- Carcinogenic risks based on PCBs between 1 in 1,000,000 (1E-06) and 1 in 10,000 (1E-04) at all three reaches: Country Club Road (8.3E-06); Fluckmill Road (5.7E-05); and Strain Ridge Road (8.5E-05).
- Carcinogenic risks based on dioxin-like PCBs (TEQs) greater than 1 in 100,000 (1E-05) at Country Club Road (1.3E-05) and Fluckmill Road (5.1E-05) and greater than 1E-04 at Strain Ridge Road (1.1E-04).
- Noncarcinogenic risks for adults based on PCBs less than 1 at Country Club Road

[2] Please see the Response to Comments on the U.S. EPA's Human Health Risk Assessment for a more detailed analysis

(0.48), and greater than 1 at Fluckmill Road (3.4) and Strain Ridge Road (5.0). (Note: noncarcinogenic risks for children are about 2.5 times higher than those for adults and exceed 1 at all three locations).

- Noncarcinogenic risks for adults based on dioxin-like PCBs less than 1 at Country Club Road (0.21) and Fluckmill Road (0.80) and greater than 1 at Strain Ridge Road (1.8). (Note: noncarcinogenic risks for children are about 2.5 times higher than those for adults and exceed 1 at Fluckmill Road and Strain Ridge Road).

Using the EPA point of departure of 1 in 1,000,000 (1 E-06) excess cancer risk and a hazard index greater than 1, an evaluation of the risks throughout the creek shows that unacceptable risks based on fish tissue ingestion are present at all three reaches: Country Club Road, Fluckmill Road, and Strain Ridge Road.

Other exposure pathways in both Clear Creek and the Quarry Springs area were evaluated for risk. Table 5 below is a summary of the average PCB concentrations in surface water, soil and sediment for use in the risk calculations.

Table 5 - Summary of Average PCB Surface Water, Soil and Sediment Sampling

Medium	Quarry Springs Combined	Quarry Springs A	Quarry Springs B	Quarry Springs C	Country Club Road	Fluck-mill Road	Strain Ridge Road	Upper Clear Creek	Lower Clear Creek
Surface Water	1.15E-03				2.6E-05	3.65E-05	2.4E-05		
Soil									
Surface	19.6								
Floodplain								2.09	
Bank								0.61	1.6
Sediment		29.3	3.5	0.6				0.36	1.37

The values in Table 5 were used in the calculation of dermal contact and incidental ingestion risks and the following is a summary of the results for PCBs:

- Dermal contact and incidental ingestion of surface water in Clear Creek produces a carcinogenic risk of less than 1 in 1,000,000.
- Dermal contact and incidental ingestion of surface water in Clear Creek produces a noncarcinogenic risk of less than 1.
- Dermal contact and incidental ingestion of Clear Creek bank and floodplain soil and sediment produces a carcinogenic risk of less than 1 in 1,000,000.
- Dermal contact and incidental ingestion of Clear Creek bank and floodplain soil and sediment produces a noncarcinogenic risk of less than 1.
- Dermal contact and incidental ingestion of surface water, sediment, and surface soil at the Quarry Springs area produces a carcinogenic risk of between 4 in 1,000,000 and 2 in 100,000 and a hazard index of about 1 or less depending on which portion of the Quarry Springs area the exposure takes place.

In summary, the results from the human health risk assessment show that unacceptable risk exists at exposure points up to 20 miles downstream from Lemon Lane Landfill. The total carcinogenic and noncarcinogenic risks are driven by ingestion of fish tissue.

Ecological Risks

To evaluate the risk to ecological receptors, EPA follows a procedure similar to the four-step procedure described above with respect to the human health risk assessment. The ecological risk assessment for the Lemon Lane Landfill site focused on whether exposure to PCBs by mammals and birds feeding on contaminated fish and crayfish from Clear Creek is high enough to potentially cause reproductive problems. Protection of fish-eating birds and mammals is expected to be protective of aquatic organisms as well because PCBs bio-accumulate in species as they progress up the food chain. Therefore, animals that feed on fish are exposed to higher levels of PCBs compared to the fish themselves. Fish-eating mammals are represented by mink, and fish-eating birds are represented by the kingfisher.

The exposures to mink and kingfisher are based on analyses of fish collected from Clear Creek in 2000, 2002, and 2004 and crayfish from 2004. Locations where fish were collected and used in the risk assessment are Allen Street, Country Club Road, Fluckmill Road and Strain Ridge Road. Crayfish were collected at Allen Street. Since crayfish were not collected and sampled for PCBs at all sampling sites and only in the years 1996 and 2004, the ratio of fish and crayfish PCB concentrations were used to model PCBs in crayfish at the locations not sampled.

Risk is evaluated both for total PCBs and for dioxin toxic equivalents (TEQ). Data on dioxin toxic equivalents are available for only a small subset of the fish collected as part of the ecological risk assessment. Accordingly there is greater uncertainty associated with the risk estimates based on TEQ when compared to risk estimates based on total PCBs which have much more sampling data available. Total PCB risks are calculated for both reasonable maximum exposure (RME) based on an upper estimate of the average PCB exposure, and central tendency exposure (CTE) based on the average measured exposure. Data are insufficient for calculating RME dioxin toxic equivalents, so TEQ risk is calculated only for CTE.

Mink exposure is modeled with a dietary composition of 66% fish, 13% crayfish and 21% prey from land, based on a field study in Michigan, and assuming no PCB contribution from non-aquatic prey. Risk is estimated by hazard quotients (HQ) calculated by dividing the modeled dietary PCB concentrations by the dietary concentration resulting in no adverse effects in mink feeding studies (no effect HQ) and the lowest concentration that caused adverse effects (low effect HQ)[3].

The results for total PCBs using 2004 sampling data show that mink are potentially at risk of adverse reproductive effects at Allen Street, Country Club Road, Fluckmill Road and Strain Ridge Road. Using the RME exposure, no effect HQs range from 2 to 4 and "low effect" HQs range from 2 to 3. Using the CTE scenario, again mink are potentially at risk for adverse reproductive effects at the four sampling stations with "no effect"

[3] Please see the Focused Ecological Risk Assessment for a more detailed analysis

HQs ranging from 2 to 3 and "low effect" HQs ranging form 1 to 2. Similar results are also obtained by using the TEQ approach with "no effect" HQs ranging from 4 to 19 and low effect HQs ranging from 0.9 to 5.

Kingfisher exposure is modeled with a dietary composition of 80% fish and 20% crayfish based on several field studies that were conducted earlier in mid-western states. PCB toxicity studies have not been performed with kingfisher. Therefore, to allow use of toxicity data for other species of birds, kingfisher dietary exposure was converted to dose (PCBs per kilogram bodyweight per day). Since the sensitivity of kingfisher to PCBs is unknown, two sets of PCB toxicity values were used to represent higher and lower sensitivities to PCBs. The risk associated with TEQ dose was evaluated with a single high-quality set of toxicity values. TEQ risk was also evaluated through a separate procedure by modeling the accumulation of dioxin-like PCB congeners in kingfisher eggs. The risks associated with TEQ in eggs were assessed with two sets of toxicity values to represent higher and lower sensitivities to dioxin-like effects.

The results for total PCBs using 2004 sampling data show that kingfisher are potentially at risk of adverse reproductive effects at all of the stations. Using the RME scenario, "no effect" HQs range from 2 to 3 and 7 to 11 for the two PCB sensitivities. The RME "low effect" HQ range is 0.7 to 1 and 2 at all stations for the two PCB sensitivities. Using the CTE scenario, the "no effect" HQs range from 1 to 2 for both sensitivities, and the "low effect" HQs range from 0.5 to 0.7 and 1 to 2 for the two sensitivities. The TEQ dose "no effect" HQs range from 9 to 40, and the "low effect" HQs range from 0.9 to 4. TEQ egg HQs have a broader range compared to the other approaches with "no effect" HQs ranging from 2 to 11 and 18 to 106 for the two PCB sensitivities, and "low effect" HQs ranging from 0.5 to 3 and 6 to 36 for the two sensitivities. Although the values vary among the approaches, most lead to a similar conclusion that kingfisher are potentially at risk at Allen Street, Country Club Road, Fluckmill Road, and Strain Ridge Road.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) provide a general description of what the cleanup will accomplish. The continuing release of PCBs from the spring system connected to the Lemon Lane Landfill has produced unacceptable risks to human health and the environment. The RAOs for operable units two and three are as follows:

- Reduce the amount of PCBs released from groundwater to Clear Creek through mass reduction.

- Reduce PCB levels in fish for beneficial reuse by reducing PCBs released to Clear Creek.

- Reduce the amount of PCB mass in sediments that may be available to fish by reducing PCBs released to Clear Creek.

DESCRIPTION OF ALTERNATIVES

Groundwater Operable Unit

In the Proposed Plan for the Lemon Lane Landfill site, which was made available to the public for comment on June 14, 2006, EPA identified four remedial alternatives to address groundwater contamination at the Site. In its public comments, CBS argued that the remedial alternatives evaluation in the Proposed Plan violates the NCP because EPA did not to consider the alternative of ceasing operations at the current interim water treatment plant. As explained in the attached responsive summary, CBS misreads the requirements of the NCP. While 40 C.F.R. § 300.430(e)(6) states that EPA shall develop a "no action" alternative, it clarifies that the "no action" alternative may be "no further action if some removal or remedial action has already occurred at the site." Here, EPA has already constructed a water treatment plant at the site as part of a time critical removal action. Thus, EPA was under no legal duty to consider the alternative of ceasing operation of the water treatment plant.

Moreover, EPA, did evaluate the alternative of shutting down the plant and determined this option was neither protective of human health and the environment nor complaint with Applicable or Relevant and Appropriate Requirements (ARARs). (See response to Comment 56 in the attached Responsiveness Summary). Specifically, the alternative would not reduce the amount of PCBs released from groundwater to Clear Creek. On the contrary, "no action" would increase the amount of PCBs being released, because the treatment plant would no longer exist to capture and remove PCBs. Likewise, the alternative would increase (not decrease) PCB levels in fish. PCB levels in fish immediately below the site have dropped since the plant began operations in 2000. EPA expects that this trend would reverse if plant operations were discontinued. Finally, this alternative would not comply with ARARs under the Clean Water Act because it would result in PCBs entering into State waters at a concentration ranging between 5 and 1,600 ppb – a level that is significantly above the 0.3 ppb discharge criteria set by the State.

CBS also argues that the "no further action" alternative in the proposed plan is not compliant with the NCP because, according to CBS, EPA did not consider the option of making no capital improvements to the existing water treatment plant. As explained in response to comment 56 in the attached summary, EPA did, in fact, consider this option. In a document titled "Alternative Evaluation: Screening of Remedial Alternatives" issued in June of 2006 ("AE Report"), EPA specifically considered the "no further action" alternative where "no changes would be made to the existing physical facility." (AE Report at Section 4.5). EPA also developed a cost analysis for this alternative where EPA determined the net present value of this alternative to be $5.3 million based upon $0 capital costs and $348,000 in annual O&M costs. (AE Report, Appendix C, Table 1-1 to 1-3). EPA nevertheless determined that all remedial actions selected for further review – including the "no further action" alternative -- should be combined with Modifications A (moving the outfall location from the treatment plant) and Modification B (capturing and treating springs downstream from the treatment plant).

EPA based this determination on the fact that water discharged from the plant would become recontaminated when it entered into the swallowhole area downstream from the plant unless Modification A and B were implemented. This recontamination problem is evident from the fact that site investigations show that treated water entering into the swallowhole area has lower concentrations of PCBs than the water emerging from two springs (Quarry A and Quarry B) downstream from the swallowhole that are hydrologically connected to the swallowhole area. Thus, to prevent water discharged by the treatment plant from becoming recontaminated with PCBs, EPA determined that all the remedial alternatives, including the "no further action" alternative, should include Modifications A & B.

In any event, an evaluation of the "no further action" alternative proposed by CBS (i.e., an evaluation of an alternative making no physical changes to the water treatment plant and not implementing Modifications A and B) shows that this alternative is not the most appropriate remedy for addressing groundwater releases. In response to comment 56 in the attached responsive summary, EPA evaluates the "no further action" alternative proposed by CBS using the nine evaluation criteria mandated by CERCLA and the NCP. Based on this evaluation, EPA determines that any advantage to CBS's proposed "no further action" alternative is far outweighed by advantages afforded by the other remedial alternatives reviewed by EPA in terms of overall protectiveness, long-term (and short-term) effectiveness, and reduction of toxicity and mobility.

The four remedial alternatives reviewed by EPA are discussed below. A Technical Impracticability (TI) waiver is common to all of the alternatives, as well as institutional controls to prevent interference with or disturbance of the remedial action components as well as residential development within the ICS emergence area, the swallowhole area, and the Quarry springs area. Further, long-term multi-media monitoring will be required for each alternative.

Remedy Components

In addition to institutional controls described thereafter, two common elements were considered as part of each of the water operable unit alternatives (excluding the no action alternative) and consist of additional modifications to the existing plant. Modification A will include the treatment of the Quarry B Spring and Rinker Spring and Modification B is the installation of a new effluent line for treated water and stormwater for discharge directly to the Third Street culvert.

Modification A was arrived at based on the analysis of monitoring data for Quarry B Spring and Rinker Spring. It is estimated that Quarry B Spring flows on average 5 gpm with a maximum flow of 500 gpm. Rinker Spring has been estimated to flow at 2 gpm on average with a maximum flow of 100 gpm. The installation of the new effluent line will alter the current groundwater flow conditions and a final flow will be determined for both springs after the installation is complete and the new circumstances evaluated. Quarry A Spring will not be captured since it is anticipated that the Quarry A Spring will

not produce any water due to changes in surface water drainage and the scheduled sealing of the principal swallowhole. A sump will be used to collect both springs and the collected water would be pumped back to the water treatment plant for treatment. Capital costs and annual operation and maintenance (O&M) costs for Modification A are $696,000 and $29,000 respectively. Figure 11 shows a conceptual approach for the collection system.

Modification B consists of the installation of a new effluent line which will handle all treated water and stormwater from the ICS water treatment plant. The effluent line will directly discharge to the Third Street culvert, thereby bypassing the swallowhole and Quarry Springs area. It is anticipated that a 36-inch line will be required. Capital costs and annual O&M costs are $272,000 and $9,000 respectively. Figure 11 shows the proposed location of the new effluent line. The location and size of the effluent line may change based upon the final design.

As described below, a TI waiver is common to all of the alternatives.

Alternative 1: No Change to the Current Treatment Plant (1,000 gpm Treatment with 1.2 Million Gallons Stormwater Storage) and Implement Modification A and B

Estimated Capital Cost: $968,000
Estimated Annual O&M: $386,000
Estimated Present Worth Cost: $6,851,000
Estimated Construction Timeframe: 12 months

In this alternative, the water treatment plant capacity would remain the same at 1,000 gpm with 1.2 million gallons of stormwater storage and both Modification A and B would be implemented. The water treatment plant uses an inclined plate clarifier to remove large settleable solids, 3 multi-media filters to further remove particles from the spring water, 2 bag filters to remove very fine particles from the spring water and 4 carbon adsorption vessels each with 20,000 pounds of granulated carbon to remove any dissolved phase PCBs and semi-volatile and volatile organic compounds. Sludge produced from the treatment process contains PCBs and is dewatered on-site in a filter press and testing of the sludge for PCBs and the Toxicity Characteristics Leaching Potential (TCLP) to determine the appropriate off-site landfill disposal.

Evaluating Alternative 1 through the use of the discharge/capture model developed for ICS, approximately 91% of the ICS flow is treated and approximately 75% to 95% of the PCB mass released from ICS is captured based upon no settling in the storage tanks and 80% settling of PCBs in the storage tanks.

Alternative 2: Increase Treatment Plant Capacity to 2,000 Gallon Per Minute with 1.2 Million Gallons Stormwater Storage and Implement Modification A and B

Estimated Capital Cost: $3,136,000
Estimated Annual O&M: $526,000

Estimated Present Worth Cost: $11,151,000
Estimated Construction Timeframe: 12 months

In this alternative, additional treatment capacity would be installed to increase the treatment to 2,000 gpm and Modification A and B would also be implemented. This would include the installation of additional process equipment and controls. The equipment would consist of units identical to those already used in the 1,000 gpm design but the process equipment would be doubled. Sludge would be addressed as described in Alternative 1.

Evaluating Alternative 2 through the use of the discharge/capture model developed for ICS, approximately 98% of the ICS flow is treated and approximately 92% to 98% of the PCB mass released from ICS is captured based upon no settling in the storage tanks and 80% settling of PCBs in the storage tanks.

Alternative 3: Continue to Operate the Current Treatment Plant and Capture and Treat the Overflow from the Two Existing Storage Tanks and Implement Modification A and B

Estimated Capital Cost: $2,223,000
Estimated Annual O&M: $452,000
Estimated Present Worth Cost: $9,112,000
Estimated Construction Timeframe: 12 months

In this alternative, the current 1,000 gpm treatment plant with 1.2 million gallons of storage would continue to operate and Modification A and B would be implemented. During large storm events, water currently overflows the storage tanks and is directly discharged to Clear Creek without treatment. In this alternative, the water that overflows from the two storage tanks would be routed to a treatment system consisting of 8 Calgon Model 12 (or their equivalent), carbon adsorption vessels using 20,000 pounds each of granular activated carbon. The storage tank overflow treatment system would process 5,000 gpm. Based upon a treatability study, the EPA expects the proposed granular activated carbon storage tank overflow treatment system to remove about 95% of the PCBs from the water overflowing the storage tanks. During the design phase, it may be determined that a different configuration may be an improvement to the 8 carbon adsorption vessels proposed and the storage tank overflow treatment system may be modified.

Evaluating Alternative 3 taking into consideration the 1,000 gpm treatment plant system and the addition of the storage tank overflow treatment system would produce nearly 100% treatment of ICS flow and approximately 99% of the PCB mass released from ICS. Figure 12 is a conceptual approach for the overflow treatment system.

Alternative 4: Increase Bulk Stormwater Storage Capacity to 2.4 Million Gallons From 1.2 Million Gallons and Implement Modification A and B

Estimated Capital Cost: $2,320,000
Estimated Annual O&M: $408,000
Estimated Present Worth Cost: $8,538,000
Estimated Construction Timeframe: 12 months

In this alternative, the stormwater storage would be doubled to 2.4 million gallons and Modification A and B would be implemented. Two new storage tanks would be installed as shown in Figure 13. The additional storage of stormwater would allow additional treatment of PCB contaminated water to occur. Evaluating Alternative 4 through the use of the discharge/capture model developed for ICS, 94% of the ICS flow is treated and 82% to 96% of the PCB mass released from ICS is captured based upon no settling in the storage tanks and 80% settling of PCBs in the storage tanks.

Common Elements and Distinguishing Features of Each Alternative

The water and sediment operable units contemplated for the site are subject to two types of ARARs. First, action-specific ARARs set forth requirements on how certain actions must be performed at the site. Second, chemical-specific ARARs set forth numeric values or methodologies for the handling of certain hazardous substances. Each category of ARARs is discussed below.

a. Action Specific ARARs

1. NPDES Requirements

The water operable unit remedial alternatives (except the no further action alternative) requires the expansion and operation of an on-site water treatment plant. This plant will not need to obtain a National Pollutant Discharge Elimination System (NPDES) permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARs:

- Surface Water Quality Criteria for Specific Substances - 327 IAC 2-1-6, Table 1
- Conditions applicable to all permits - 327 IAC 5-2-8 (3), (7), (8), (9), (10), (11), (12), (13), (14)
- Considerations in the calculation and specification of effluent limitations - 327 IAC 5-2-11 (a) (1), (2), (3), (4), (5)(C); (d), (e), (f), (g), (h)

- Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system - 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

- Applicability of Best Management Practices - 327 IAC 5-9-2 (a), (c), (d), (e), (i), (j) and

- Monitoring - 327 IAC 5-2-13 (a), (c), (d), (e), (f).

As noted previously, the State of Indiana has stated in correspondence that it typically sets an effluent limit of 0.3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits. If appropriate, the State of Indiana will determine effluent limits for such contaminants.

Under CERCLA Section 121 (d)(4)(C) EPA may select a remedial action that does not attain a level or standard of control at least equivalent to ARARs if EPA finds that compliance with such requirements is Technical Impracticable from an engineering perspective. As discussed below, EPA is implementing a Technical Impracticability (TI) waiver pursuant to CERCLA Section 121 (d)(4)(C) for certain ARARs that otherwise apply to water that is not treated by the 1,000 gpm treatment plant. Disposal of PCB contaminated oil at the landfill resulted in PCBs migrating deep into the karstic limestone bedrock. High concentrations of PCBs associated with bedrock voids in the southeast portion of the site were discovered during the source control excavation and during CBS's karst conduit investigations. Drilling and sampling indicate that this contamination extends to depths of at least 68 feet below the bedrock ground surface. The southeast corner of the landfill represents a reservoir of PCBs that is potentially mobile, and numerous hydrologic tests show this area to be in direct hydraulic connection to the ICS. The PCBs present in the ICS spring water are likely associated with groundwater drainage originating in, or near, the southeast corner of the landfill.

The hydrologic tests further indicate that ICS is the discharge point for an approximate 300 acre groundwater drainage basin. The spring flows in direct response to rainfall and infiltration to the groundwater system within this area. EPA analyzed spring flow records for a 917 day period from August 21, 2001, to February 24, 2004, and determined that the mean hourly spring flow rate was about 300 gpm. Although flow rates were as low as 10 gpm, peak flow rates during storm events were as high as 4,500 gpm. PCBs are present in the ICS discharge at all flow rates.

The Lemon Lane Landfill area occupies only about 11 acres of the 300 acre ICS drainage basin. Figure 10 is a delineation of the groundwater basin for ICS. Hydrologic tests since 1998 have not successfully demonstrated that PCBs in the karst bedrock can be effectively contained, removed, or treated by remedial action focused at the landfill. Hydrologic tests also have not identified any location between the landfill and ICS where

the landfill groundwater drainage can be captured and the PCBs removed. EPA thus considers the capture of PCBs at any point, or points, within the karst drainage system upstream of ICS is unlikely based upon the information to date. EPA's approach is therefore to control PCBs released from the landfill by treating the discharge from ICS, the upstream point where it is feasible to capture the PCBs emerging from the groundwater system. In doing so, EPA recognizes that flow volume from the entire 300 acre ICS drainage basin must be treated to effectively remove PCBs from the 11 acre, or less, portion of the basin that contributes PCBs. As described in the Remedial Action Objectives Section, the objective of the groundwater operable unit is to reduce the amount of PCBs that are released into Clear Creek. In the development of the discharge/capture model by EPA, it was determined that spring water bypassing the 1,000 gpm water treatment plant occurs infrequently, and occurs mainly during large storm events. The water treatment plant became operational in May 2000 and the storage tanks for stormwater went into service in June 2001. From June 2001 to February 2006, large storms have only produced 61days in which water has bypassed the 1,000 gpm treatment plant. In addition, beginning January 3, 2005, the largest volume of water produced from storm events since the ICS plant became operational produced flows at ICS for 8 days greater than the 1,000 gpm. The volume of water produced in excess of the 1,000 gpm plant capacity during this period was 18,311,800 gallons. The volume of water from the storm event shows that 30.5 additional storage tanks (600,000 gallons of water storage for each tank) would have been required to prevent spring water from bypassing the 1,000 gpm treatment plant. Due to the infrequent and episodic nature of the PCB releases at ICS, the large quantities of dense nonaqueous phase liquids (DNAPL) deep in the rock near the landfill, and the volume of water requiring treatment, the EPA is granting a TI waiver of NPDES substantive requirements for spring water which is not treated within the existing 1,000 gpm treatment plant.

The TI waiver applies to all the alternatives for the water operable unit. The specific ARARs being waived pursuant to CERCLA Section 121(d)(4)(C) on the basis of their technical impracticability from an engineering perspective are discussed in the Evaluation Criteria for Superfund Remedial Alternatives, Compliance with ARARs section.

The following ARARs will be waived for water not treated within the existing 1,000 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 1,000 gpm treatment plant.

2. Fugitive Dust Requirements

Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for "fugitive dust," i.e., particulate matter that escapes beyond the boundaries of the Site. These emission limits are relevant and appropriate with respect to dust resulting from the excavation of the ICS emergence, the swallowhole, and the Quarry Springs area. Likewise, the emission limits are relevant and appropriate with respect to on-site construction for the expansion of the water treatment facilities, including the installation of Modification A and B.

Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust. This requirement is relevant and appropriate not only with regard to the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area, but also for all the construction activities contemplated under the water operable unit.

b. Chemical-specific ARARs

1. 329 IAC 4.1-4 Requirements for storage and disposal of PCB wastes

Under 329 IAC 4.1-4, any sludge, soil, or other material generated by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR § 761.61. This requirement is relevant and appropriate with respect to PCB-contaminated soil/sediment generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area and the alternatives for the water operable unit. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

2. 329 IAC 3.1 Universal Waste Rule

Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether they meet the characteristics of hazardous waste. If they meet these characteristics, then they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. §§ 260-280. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the construction of the water capture and treatment facilities. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility

3. 329 IAC 10 Solid Waste Land Disposal Facilities

Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the expansion of the water treatment facility, including

Modification A and B. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

4. 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants

Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

5. 326 IAC 2-5.1-3(a)(1)(D) Permits for New HAP Source

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

6. 326 IAC 2-5.1-2(a)(1)(A) Registrations

Under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. EPA does not anticipate that any of the proposed remedies will meet this threshold.

To be protective of human health and the environment, each alternative described within this ROD requires use or access restrictions to prevent residential development in the ICS emergence area, the swallowhole area, and the Quarry Springs area. Use restrictions or access restrictions will be implemented through the use of institutional controls. Institutional controls are administrative or legal constraints that minimize the potential for exposure to contamination by limiting land or resource use. Specific actions taken at sites to restrict access or use could include: Governmental Controls - such as zoning restrictions or ordinances; Proprietary Controls - such as easements or covenants; Enforcement Tools - such as consent decrees or administrative orders; and Informational Devices- such as deed notices or state registries. Several types of access or use restrictions employed simultaneously can increase the effectiveness of institutional controls.

The goal of these institutional controls is to prevent residential development in the ICS emergence area, the swallowhole area, and the Quarry Springs area.

There will be a program of Operation, Monitoring and & Maintenance, and this will include routine inspection. It is anticipated that institutional controls will be relatively simple to develop, likely through a layered approach, including: proprietary controls (easements and/or covenants); deed restrictions; and enforcement tools (AOCs and/or consent decrees), which will ensure the long-term reliability of the controls.

CBS may to continue the karst conduit study near the Lemon Lane Landfill. The investigation will focus on ways to reduce the cost of the operation and maintenance of the ICS water treatment plant. If the investigation determines that improvement to the final remedy is possible, EPA will put forth another Proposed Plan for public comment.

Sediment Operable Unit

The release of PCBs from Lemon Lane Landfill has contaminated sediment with PCBs at the ICS emergence, swallowhole area, Quarry Springs area and Clear Creek. Evaluating the sampling data described previously shows that the PCBs should be removed from soils and sediments at the ICS emergence, the swallowhole area, and the Quarry Springs area to reduce unacceptable risk. A cleanup criteria of less than 1 ppm PCBs will be required in any drainage areas and 5 ppm PCBs on average, with a maximum of 10 ppm PCBs in any grid for the other areas not used for drainage.

In its comments, CBS argues that, in addition to considering sediment removal in the area of the swallowhole, EPA must also consider a "no action" alternative. EPA disagrees. Under 40 C.F.R. § 300.430(f)(1)(i)(A), an remedial alternative must meet threshold requirements to be eligible for selection. Specifically, the remedial alternative must be protective of human health and the environment and must be in compliance with ARARs. The "no action" alternative proposed by CBS meets neither of these threshold criteria, and hence, it is not eligible for selection. First, the PCB concentrations at the ICS emergence, swallowhole and Quarry Springs area show unacceptable levels of PCBs based upon the risk assessments, with some areas greater than 50 ppm. Also, the effluent from the water treatment plant travels through the swallowhole and Quarry Springs area and transfers PCB contamination downstream due to the high concentrations of PCBs in those areas.

The estimated volume of contaminated sediment in both drainage areas and non-drainage areas at the ICS emergence, the swallowhole area, and Quarry Springs area is estimated to be 3,000 cubic yards. Additional sampling to finalize the volumes along with the exact location of the drainage ways will be completed in the design phase.

The PCB contaminated material will be disposed of in an off-site permitted landfill. It is assumed that 25% of the PCB contaminated sediment/soil is contaminated at levels greater than or equal to 50 ppm PCBs and this material will require disposal in a chemical waste landfill. PCB material contaminated at levels less than 50 ppm can be disposed of

in a special waste landfill. The estimated cost to remediate the ICS emergence, the swallowhole area, and the Quarry Springs area is $1,183,613.

To evaluate the PCB contaminated sediment in Clear Creek, a concept called the surface weighted average concentration (SWAC) was developed. The SWAC was calculated for both the top three inches of sediment and top six inches of sediment. The SWAC is defined as the average PCB concentration of estimated values that are in the top 3 inches and 6 inches of sediment. PCB concentrations from the sediment sampling events were used and interpolated (estimated) using a conservative and aggressive scenarios. In upper north Clear Creek, the SWAC for 0 to 3 inches ranged from 0.134 ppm PCBs to 0.136 ppm PCBs. Lower north Clear Creek SWAC ranged from 0.184 to 0.193. For south Clear Creek, which is the area where most of the sediment in Clear Creek is located, the SWAC ranged from 0.62 ppm PCBs to 0.66 ppm PCBs. In comparison, the SWAC for 0 to 6 inches in south Clear Creek is very similar to the 0 to 3 inch values at 0.634 ppm PCBs to 0.679 ppm PCBs.

In addition to using the SWAC as an evaluation tool, the PCB sampling and sediment thickness results were used to estimate the volume of contaminated sediment. Once the volume was estimated, a model was developed to simulate the removal of PCBs greater than 1 ppm and 5 ppm for a number of different sediment depths. The results show volume removed estimates, pre-remediation PCB values, and post-remediation PCB values by depth. These results are summarized in the Table 6 below:

Table 6 - Simulated Post Remediation Concentrations

Remediation of PCBs > 1 ppm				
Depth in Clear Creek (in)	Volume Removed (m^3)	Pre-max conc. (ppm)	Pre-mean conc. (ppm)	Post mean conc. (ppm)
0-3	970	4.9	0.615	0.306
3-6	1,973	4.8	1.04	0.40
6-12	2,680	2.7	1.04	0.43
12-31	4,953	8.1	2.9	0.46

Remediation of PCBs > 5 ppm				
Depth in Clear Creek (in)	Volume Removed (m^3)	Pre-max conc. (ppm)	Pre-mean conc. (ppm)	Post mean conc. (ppm)
0-3	0	4.9	0.6	0.56
3-6	0	4.8	1.04	1.1
6-12	0	2.7	1.04	1.04
12-31	2,714	8.1	2.9	1.6

The results show that the removal of sediment greater than 1 ppm PCBs, particularly at the 0 to 3 inches and 3 to 6 inches of sediment provides little benefit. Using this information and the calculation of the SWAC, removing sediment will not greatly improve the PCB concentrations in fish since the PCB contamination levels in sediment are already low. Therefore, no sediment removal will be implemented in Clear Creek.

Expected Outcomes of Each Alternative

EPA expects an improvement of PCB concentrations in fish within Clear Creek with the implementation of each groundwater operable unit remedy. Since the startup of the 1,000 gpm treatment plant in May 2000, the fish PCB concentrations in Clear Creek have decreased approximately 80% at Allen Street. Farther downstream in Clear Creek PCB concentrations in fish have not decreased, but with the implementation of the sediment cleanup and continued treatment of PCB contaminated water from ICS, Quarry Springs and Rinker Spring are expected to reduce PCB concentrations over time.

COMPARATIVE ANALYSIS OF ALTERNATIVES

The EPA uses nine criteria to evaluate the remedial alternatives against each other to determine the most appropriate remedy for the site. Each alternative is compared to the other to determine the best balance of the nine criteria. The discussion below is a description of comparative analysis and Table 7 provides a summary of the comparison.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, for controlled, through treatment, engineering controls, and/or institutional controls.

All four of the alternatives evaluated for the water operable unit are protective of human health and the environment. Alternative 3 (storage tank overflow treatment) is the most protective because it treats most of the water through a storage tank overflow treatment system. In descending order of protectiveness are Alternative 2 (increase treatment capacity to 2,000 gpm), then Alternative 4 (double stormwater storage) and Alternative 1 (no change in treatment plant treatment plant capacity) would be the order of protectiveness. The order is based upon the amount of ICS water treated and the percentage of PCB mass removed from ICS as described in the Summary of Alternatives Section.

In the sediment operable unit, the remediation of the ICS emergence, the swallowhole area, and Quarry Springs area to a 1 ppm PCB standard in drainage ways and 5 ppm PCB on average in non-drainage ways is protective of human health and the environment. These areas could be developed for industrial or commercial reuse.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP Section 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a State in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent that Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver.

The water and sediment operable units contemplated for the site are subject to two types of ARARs. First, action-specific ARARs set forth requirements on how certain actions must be performed at the site. Second, chemical-specific ARARs set forth numeric values or methodologies for the handling of certain hazardous substances.

The water operable unit remedial alternatives requires the expansion and operation of an on-site water treatment plant. This plant will not need to obtain a NPDES permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant. In the Common Elements and Distinguishing Features of Each Alternative section, the ARARs that are required to be met are listed. In addition, EPA is implementing a TI waiver pursuant to CERCLA Section 121 (d)(4)(C) for certain ARARs that would otherwise apply to water that is not treated by the 1,000 gpm treatment plant. Due to the high concentrations of PCB oil in the rock that has been found at depths of up to 68 feet near the Lemon Lane Landfill and the infrequent nature of storm events that bypass the 1,000 gpm treatment plant, a TI

waiver from an engineering perspective is justified. It is technically impracticable from an engineering standpoint to have a large water treatment plant with multiple process units (like those in the 1,000 gpm system), which would remain idle much of the time. The following ARARs will be waived for water not treated within the 1,000 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 1,000 gpm treatment plant.

All ARARs will be met, excluding the ARARs associated with the TI waiver.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Evaluating the alternatives for the water operable unit shows that Alternative 3 would have the most long-term effectiveness, because it treats the most water compared to the other alternatives and provides the most PCB mass reduction in the long-term. Ranking the alternatives in descending order of effectiveness after Alternative 3 results in Alternative 2, then Alternative 4, and Alternative 1 as the most effective in the long-term.

By cleaning up sediment/soils to 1 ppm PCBs in drainage ways and 5 ppm PCBs in non-drainage areas, PCBs associated with these sources will not migrate downstream into Clear Creek. The residual risk will be acceptable for industrial/commercial development. With the installation of a new effluent line, future migration will be further eliminated because water will not come into contact with the area.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy

Evaluating each alternative with respect to the reduction of toxicity, mobility, or volume of contaminants through treatment results in Alternative 3 as the best alternative, because it treats nearly 100% of the water from ICS and removes approximately 99% of the PCB mass from ICS. Alternative 2 at 98% of the ICS flow treated and 92% of the ICS PCB mass removed would be the next best alternative. Alternative 4 and Alternative 1 are the

least effective in treating PCB flow and mass from ICS. Alternative 4 treats approximately 93% of the flow and 78% of the PCB mass from ICS and Alternative 1 treats 91% of the flow and 74% of the PCB mass from ICS. Alternative 3 will produce the most treatment residuals, but the carbon from the water treatment plant residuals will be managed in accordance with the Resource Conservation Recovery Act.

Remediating the sediment and soils at the ICS emergence, the swallowhole area, and the Quarry Springs area to 1 ppm in drainage areas and 5 ppm in non-drainage areas will mitigate the further migration of PCBs into Clear Creek. The PCB contaminated material greater than 50 ppm will be disposed of off-site in a landfill permitted to accept PCBs greater than 50 ppm. Material less than 50 ppm will also be disposed of off-site in a permitted landfill. The off-site disposal will not reduce the toxicity, mobility or volume through treatment since no treatment will occur at the landfill. Based upon the small volume of material and past activities implemented for contaminated soil/sediment, treatment was not considered

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

All four alternatives for the water operable unit can be implemented. Standard construction methods can be used and the short-term risk to construction workers and potential contact with contaminated soils and groundwater will be eliminated through engineering controls and the implementation of health and safety protocols. The ICS emergence, the swallowhole area, and the Quarry Springs area will be addressed first, then the installation of the new effluent line. The new effluent line will change the current conditions and the study of the flow of Quarry B Spring and Rinker Spring will be completed before determining what the final flow rates are for the two springs. The sediment/soil excavation at ICS emergence, the swallowhole area, and the Quarry Springs area will be monitored to ensure that the surrounding community and workers are protected from PCBs either through fugitive dust or volatilization.

The water treatment system will require operation and maintenance for an estimated 30 years or until the springs reach acceptable levels of PCBs so that the treatment system can be shut down.

Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The four alternatives for the water operable unit can all be implemented. The necessary equipment is available and the ability to construct and operate the technology is common practice. The proposed excavation activities also can be implemented and will not pose unacceptable problems or risk.

Cost

To calculate the cost for each alternative, a 7% discount rate was used along with a 2% inflation rate. Present worth calculations were completed. In descending order of cost are Alternative 2, Alternative 3, Alternative 4, and Alternative 1.

The estimated cost to remediate sediment/soil at the ICS emergence, the swallowhole area, and the Quarry Springs area is $1,183,613.

State/Support Agency Acceptance

The State of Indiana along with the City of Bloomington and Monroe County support the implementation of Alternative 3 and completion of the soil/sediment cleanup at the ICS emergence, swallowhole and Quarry Springs area.

Community Acceptance

The public comments are addressed in the attached Responsiveness Summary. A few commenters submitted a large volume of comments not supporting Alternative 3 and recommending a complete excavation remedy. CBS submitted a large volume of comments stating that No Action was the appropriate remedy.

PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever practicable (NCP 300.430(a)(1)(iii)(A). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source material that generally can be reliably contained and that would present only a low risk in the event of exposure.

During the source control excavation and during CBS's conduit study investigation, oil containing high concentrations of PCBs was found in bedrock as deep as 70 feet below ground surface. CBS attempted to pump the oil at a number of locations without success. Due to this residual PCB oil within rock and the karst geology, which is a source of the PCBs that emerge at ICS, a TI Waiver has been granted for the ARARs that would otherwise apply to the water not treated by the 1,000 gpm water treatment plant. The residual PCB contaminated oil in bedrock is producing the high concentrations of PCBs at ICS during storm events. The groundwater alternatives will address the residual PCB

oil through treatment of ICS spring water. CBS has stated that it may continue to evaluate the location of the residual PCB oil to determine if operation and maintenance costs can be reduced over time.

SELECTED REMEDY

Groundwater Operable Unit

EPA selects Alternative 3 (Continue to Operate the Current 1,000 gpm Treatment Plant and Capture and Treat the Overflow from the Two Existing Storage Tanks and Implement Modification A and B) to address the continuing release of PCBs from ICS, Quarry Springs and Rinker Spring. Alternative 3 is the best alternative for overall protection of human health and the environment, long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment. In addition, the alternative can be implemented and is cost effective. Table 7 is a summary of the comparative analysis of the alternatives.

The storage tank overflow system will treat 5,000 gpm and when combined with the current 1,000 gpm system will be able to address a 25-year, 6-hour storm event. Alternative 3 treats nearly 100% of ICS flow and approximately 99% of the PCB mass released from ICS. The storage tank overflow system uses eight Calgon Model 12 or equivalent carbon adsorption vessels, each with 20,000 pounds of granular activated carbon. The vessels will have backwash capability to remove solids that build up within the vessels. The storage tank overflow system conceptual design will be based upon a completed treatability study and is expected to remove 95% of the PCB mass. Figure 12 shows an approach for the vessels but, during the design phase, it may be determined that a different system may be an improvement to the eight vessels proposed and the storage tank overflow treatment system may be modified.

Alternative 3 will meet the RAO's through reducing the PCB mass released from the springs associated with the Lemon Lane Landfill. Alternative 3 is expected to remove 99% of the PCB mass released from ICS and the treatment plant will continue to operate until water from the ICS emergence is less than 0.3 ppb PCBs for a 12-month period. An alternative shut-off criteria may be proposed and, if EPA determines that the alternative shut-off criteria provides a standard that is protective of human health and the environment, then the shut-off criteria identified in this decision document may be modified consistent with the substantive and procedural requirements of CERCLA and the NCP.

The capital cost for Alternative 3 is $2,223,000 with an annual operation and maintenance cost of $452,000. Using a 7% discount rate and 2% inflation rate, the present worth cost is $9,112,000. Table 8 is a detailed breakdown of capital costs, operation and maintenance costs and present worth costs.

Sediment Operable Unit

Consistent with the other soil and sediment cleanups for PCBs associated with the Westinghouse capacitor plant, EPA is selecting excavation and off-site disposal in a permitted landfill for contaminated sediment and soil at the ICS emergence, swallowhole and Quarry Springs area. A cleanup criteria of less than 1 ppm PCBs will be required in any drainage areas and 5 ppm PCBs on average, with a maximum of 10 ppm PCBs in any grid for the other areas not used for drainage.

Based upon sampling to date, the estimated volume of contaminated sediment in both drainage areas and non-drainage areas at the ICS emergence, the swallowhole area, and Quarry Springs area is approximately 3,000 cubic yards. For costing purposes, it has been assumed that 25% of the soils/sediment are contaminated at levels of greater than 50 ppm PCBs, which will require disposal in a chemical waste landfill permitted to accept PCBs greater than 50 ppm. The estimated cost to remediate the ICS emergence, the swallowhole area, and the Quarry Springs area is $1,183,613. Additional sampling to finalize the volumes along with the exact location of the drainage ways will be completed in the design phase.

Completing the cleanup in the swallowhole and Quarry Springs area along with installing Modification B will help to reduce PCB concentrations downstream in Clear Creek. As described previously, clean effluent from the ICS water treatment plant leaves the facility and travels through the swallowhole and Quarry Springs area which are currently contaminated with PCBs. Low levels of PCBs are transferred downstream by the effluent. This transfer mechanism will be eliminated with the remediation of the soils and sediments along with installation of the new effluent line. Deed restrictions will be placed on the ICS emergence, swallowhole and Quarry Springs area to prevent obstructing the drainage way.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Selected Remedy, Alternative 3, will protect human health and the environment through the treatment of PCB contaminated water by collecting and treating spring water

from ICS, Quarry Springs and Rinker Spring. The soil/sediment remediation of the ICS emergence, swallowhole and Quarry Springs area will help to reduce PCB levels downstream in Clear Creek. The release of PCBs into Clear Creek will be reduced through the implementation of the Selected Remedy and over time, the risk levels should improve toward reaching the 1 in 1,000,000 excess cancer risk and a Hazard Index of less than 1. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled and no cross-media impacts are expected from the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedies for the groundwater operable unit and sediment operable unit will meet the respective ARARs and a TI waiver has been granted for water treated by the storage tank overflow treatment system. A list of ARARs are presented below:

Action Specific ARARs

1. NPDES Requirements

The water operable unit remedial alternatives requires the expansion and operation of an on-site water treatment plant. This plant will not need to obtain a National Pollutant Discharge Elimination System (NPDES) permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARs:

- Surface Water Quality Criteria for Specific Substances - 327 IAC 2-1-6, Table 1
- Conditions applicable to all permits - 327 IAC 5-2-8 (3), (7), (8), (9), (10), (11), (12), (13), (14)
- Considerations in the calculation and specification of effluent limitations - 327 IAC 5-2-11 (a) (1), (2), (3), (4), (5)(C); (d), (e), (f), (g), (h)
- Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system - 327 IAC 5-2-11.1 (a), (d), (f), (g), (h)
- Applicability of Best Management Practices - 327 IAC 5-9-2 (a), (c), (d), (e), (i), (j)
- Monitoring - 327 IAC 5-2-13 (a), (c), (d), (e), (f)

- Permit modification, revocation and reissuance, and termination - 5-2-16 (c)(2), (d)(2)

As noted previously, the State of Indiana has stated in correspondence that it typically sets an effluent limit of 0.3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits. If appropriate, the State of Indiana will determine effluent limits for such contaminants.

EPA is implementing a TI waiver pursuant to CERCLA Section 121 (d)(4)(C) for water that is not treated by the 1,000 gpm treatment plant. Due to the high concentrations of PCB oil in the rock at depths greater than 68 feet near the Lemon Lane Landfill and the infrequent nature of storm events that bypass the 1,000 gpm treatment plant, a TI waiver from an engineering perspective is justified. It is technically impracticable from an engineering standpoint to have a large water treatment plant with multiple process units (like those in the 1,000 gpm system), which would remain idle much of the time. The following ARARs will be waived for water not treated within the 1,000 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (c)(2), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 1,000 gpm treatment plant.

2. Fugitive Dust Requirements

Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for fugitive dust, i.e., particulate matter that escapes beyond the boundaries of the Site. These emission limits are relevant and appropriate with respect to dust resulting from the excavation of the ICS emergence, the swallowhole, and the Quarry Springs area. Likewise, the emission limits are relevant and appropriate with respect to on-site construction for the expansion of the water treatment facilities, including the installation of Modifications A and B.

Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust. This requirement is relevant and appropriate not only with regard to the excavation of the ICS emergence, the swallowhole area, and

the Quarry Springs area, but also for all the construction activities contemplated under the water operable unit.

b. Chemical-specific ARARs

1. 329 IAC 4.1-4 Requirements for storage and disposal of PCB wastes

Under 329 IAC 4.1-4, any sludge, soil, or other material generated by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR § 761.61. This requirement is relevant and appropriate with respect to PCB-contaminated soil/sediment generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area and the alternatives for the water operable unit. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

2. 329 IAC 3.1 Universal Waste Rule

Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether they meet the characteristics of hazardous waste. If they meet these characteristics, then they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. §§ 260-280. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the construction of the water capture and treatment facilities. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility

3. 329 IAC 10 Solid Waste Land Disposal Facilities

Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the expansion of the water treatment facility, including Modification A and B. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

4. 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants

Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

5. 326 IAC 2-5.1-3(a)(1)(D) Permits for New HAP Source

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A Source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

6. 326 IAC 2-5.1-2(a)(1)(A) Registrations

Under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. EPA does not anticipate that any of the proposed remedies will meet this threshold.

Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money spent. In making this determination, the following definition was used. "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP 300.430.(f)(1)(ii)(D)). This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The capital cost for Alternative 3 for the groundwater operable unit is $2,223,000 with $452,000 per year estimated to be operation and maintenance costs. Calculating a net present value using a 7% discount rate shows a cost of $9,112,000. The cost for the sediment operable unit is $1,183,613.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the Selected Remedy for the groundwater operable unit represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at the site. Of those alternatives that are protective of

human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

The Selected Remedy treats PCB contaminated spring water prior to discharge to Clear Creek. The Selected Remedy satisfies the criteria for long-term effectiveness through the collection and treatment of spring water. The Selected Remedy does not present short-term risks and the technology to implement the remedy is not unusual. The remediation of soils/sediment at the ICS emergence, swallowhole and Quarry Springs area does not utilize permanent solutions and alternative treatment technologies for the estimated 3,000 cubic yards but is consistent with previous PCB cleanups in which off-site disposal was utilized.

Community Acceptance

Community acceptance is an important part of the remedy selection process and was assessed during the public comment period and associated public participation activities. Community acceptance of the preferred alternative identified in the Proposed Plan for the ROD Amendment was fully evaluated at the conclusion of the public comment period. The public comments are addressed in the attached Responsiveness Summary.

State/Support Agency Acceptance

The State of Indiana, the City of Bloomington, and Monroe County all support the implementation of Alternative 3.

Preference for Treatment as a Principal Element

By treating the contaminated spring water through adding 5,000 gpm to the current 1,000 gpm system, the Selected Remedy addresses the remaining threats posed at the site through the use of treatment technologies. By utilizing treatment for the groundwater operable unit, the statutory preference for remedies that employ treatment as a principal element is satisfied. Treatment is not employed for the sediment operable unit but the remedy is consistent with the other soil/sediment cleanups completed in Bloomington and the surrounding area.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow unlimited use and unrestricted exposure, the Five-year Review requirements will continue. The first Five-Year Review was completed on June 23, 2005 and the next review is scheduled to be completed by June 2010.

DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan for the Lemon Lane Landfill Site was released for public comment on June 14, 2006. The Proposed Plan identified Alternative 3 as the Preferred Alternative for addressing the continuing release of PCBs from springs into Clear Creek and a soil/sediment cleanup at the ICS emergence, swallowhole and Quarry Springs area. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Tables 7 – Comparative Analysis of Remedial Alternatives

Table 8 – Estimated Net Present Value Costs, Estimated Capital Costs, Annual Operation and Maintenance Costs

Table 7
Comparative Analysis of Remedial Alternatives
Bloomington, Indiana

Criteria	Alternative 1: No Further Action Maintain Exisitng Operation	Alternative 2: Increase Plant Treatment Capacity (2000 gpm)	Alternative 3: Overflow Capture / Passive Treatment Tank	Alternative 4: Increase Bulk Storage to 2.4 MGAL
OVERALL PROTECTION OF HUMAN HEALTH & THE ENVIRONMENT	**(+) → Increasing Protection → (++++)**			
Protection of Human Health	+	+++	++++	++
Ecological Protection	+	+++	++++	++
COMPLIANCE WITH ARARS	**(-) Does Not Meet (+) Meets**			
Chemical-Specific ARARs	+	+	+	+
Location-Specific ARARs	+	+	+	+
Action-Specific ARARs	+	+	+	+
Other Criteria, Advisories, Guidance	+	+	+	+
LONG-TERM EFFECTIVENESS AND PERMANENCE	**(+)→ Increasing Effectiveness→(++++)**			
Magnitude of Residual Risk - Human Health	+	+++	++++	++
Magnitude of Residual Risk - Ecological	+	+++	++++	++
Adequacy and Reliability of Controls	+	+++	++++	++
REDUCTION OF TOXICITY, MOBILITY , AND VOLUME THROUGH TREATMENT	**(+) → Greater Reduction →(++++)**			
Treatment/Recycling Processes Utilized	+	+++	++++	++
Amount of Hazardous Materials Destroyed or Treated	+	+++	++++	++
Degree of Expected Reductions in Toxicity, Mobility or Volume	+	+++	++++	++
Irreversibility	+	+++	++++	++
Type and Quantity of [Process] Residuals	++++	++	+	+++
SHORT-TERM EFFECTIVENESS	**(+) → Increasing Effectiveness→ (++++)**			
Protection of Community and Workers During Remedial Actions	++++	++++	++++	++++
Environmental Impacts	++++	++++	++++	++++
Time Until Remedial Action Objectives are Achieved	++++	++++	++++	++++
IMPLEMENTABILITY	**(+) →Increasing Potential → (++++)**			
Ability to Construct and Operate the Technology	++++	++++	++++	++++
Reliability of the Technology	++++	+++	+++	+++
Ease of Undertaking Additional Remedial Actions, if Necessary	+	+++	++++	++
Ability to Monitor Effectiveness of the Remedy	++	+++	++++	++
Ability to Obtain Approvals from Other Agencies	+	+++	++++	++
Coordination with Other Agencies	++++	++++	++++	++++
Availability of Off-Site Treatment, Storage, and Disposal Services	++++	++++	++++	++++
Availability of Necessary Equipment and Specialists	++++	++++	++++	++++
Availability of Prospective Technologies	++++	++++	++++	++++
COST	*** Comparative Cost (without Mod A & B)**			
Capital	$968,000	$3,136,000	$2,223,000	$2,320,000
O&M	$386,000	$526,000	$452,000	$408,000
Present Worth	$6,851,000	$11,151,000	$9,112,000	$8,538,000

TABLE 8
ESTIMATED NET PRESENT VALUE COSTS
REMEDIAL ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

PROJECT: ICS
PROJECT NUMBER: 71261.01
DATE: 14-Sep-06

Input Data		Results		
Interest Rate (%):	7	NPV		($2,261,000)
Inflation Rate (%):	2			

Year	Investment	Expenses	Cash Flow	Discount Factor	Discounted Cash Flow
0	$1,255,000	$0	($1,255,000)	1.000	($1,255,000)
1	$0	$66,000	($66,000)	0.935	($61,682)
2	$0	$67,320	($67,320)	0.873	($58,800)
3	$0	$68,666	($68,666)	0.816	($56,052)
4	$0	$70,040	($70,040)	0.763	($53,433)
5	$0	$71,441	($71,441)	0.713	($50,936)
6	$0	$72,869	($72,869)	0.666	($48,556)
7	$0	$74,327	($74,327)	0.623	($46,287)
8	$0	$75,813	($75,813)	0.582	($44,124)
9	$0	$77,330	($77,330)	0.544	($42,062)
10	$0	$78,876	($78,876)	0.508	($40,097)
11	$0	$80,454	($80,454)	0.475	($38,223)
12	$0	$82,063	($82,063)	0.444	($36,437)
13	$0	$83,704	($83,704)	0.415	($34,734)
14	$0	$85,378	($85,378)	0.388	($33,111)
15	$0	$87,086	($87,086)	0.362	($31,564)
16	$0	$88,827	($88,827)	0.339	($30,089)
17	$0	$90,604	($90,604)	0.317	($28,683)
18	$0	$92,416	($92,416)	0.296	($27,343)
19	$0	$94,264	($94,264)	0.277	($26,065)
20	$0	$96,150	($96,150)	0.258	($24,847)
21	$0	$98,073	($98,073)	0.242	($23,686)
22	$0	$100,034	($100,034)	0.226	($22,579)
23	$0	$102,035	($102,035)	0.211	($21,524)
24	$0	$104,075	($104,075)	0.197	($20,518)
25	$0	$106,157	($106,157)	0.184	($19,559)
26	$0	$108,280	($108,280)	0.172	($18,645)
27	$0	$110,446	($110,446)	0.161	($17,774)
28	$0	$112,655	($112,655)	0.150	($16,943)
29	$0	$114,908	($114,908)	0.141	($16,152)
30	$0	$117,206	($117,206)	0.131	($15,397)
Totals:	$1,255,000	$2,677,493	($3,932,493)		($2,260,902)

TABLE 8
ESTIMATED CAPITAL COSTS
ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

CLIENT:	ICS
PROJECT:	FS
PROJECT NUMBER:	71261
DATE:	14-Sep-06

SHIPPING FOR THIS PROJECT (%): (cost of shipping equipment to site as a percentage of total equipment cost)	5
CONTINGENCIES FOR THIS PROJECT (%): (contingencies based on total installed equipment cost)	15
ENGINEERING FOR THIS PROJECT (%): (estimate of engineering is based on total installed equipment cost)	10
CONSTRUCTION MANAGEMENT FOR THIS PROJECT (%): (estimate of construction management is based on total installed equipment cost)	5

GAC and GAC filter costs were obtained from Calgon Carbon. Building costs were obtained from Varco-Pruden.
Other costs presented in this estimate are based on vendor quotes or past experience.
Some unit costs may have been obtained from cost estimating references.

TABLE 8
ESTIMATED CAPITAL COSTS
ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

ITEM #	WORK ITEM	UNIT	Estimated Quantity	Equipment Unit Price	Equipment Estimated Total Cost	Installation Unit Price	Installation Estimated Total Cost	Estimated Total Cost
(1).	GAC Feed Tank & Pad	EA	1	$12,000	$12,000	$10,000	$10,000	$22,000
(2).	Tank pads with foundation/footings	EA	8	$600	$4,800	$1,000	$8,000	$12,800
(3).	GAC treatment tank	EA	8	$57,500	$460,000	$1,500	$12,000	$472,000
(4).	Freight for tanks	EA	8	$0	$0	$4,000	$32,000	$32,000
(5).	First charge of GAC	EA	8	$15,000	$120,000	$200	$1,600	$121,600
(6).	Wastewater influent pipes from storage tank overflow including fittings	LF	300	$15	$4,500	$10	$3,000	$7,500
(7).	Wastewater effluent pipe to connect to NPDES outfall pipe	LF	360	$15	$5,400	$10	$3,600	$9,000
(8).	GAC Feed Pumps (2000 gpm)	ea	3	$9,000	$27,000	$2,800	$8,400	$35,400
(9).	Backwash influent pipe from backwash tank including fittings	LF	400	$15	$6,000	$10	$4,000	$10,000
(10).	Wastewater effluent flow meter	EA	1	$4,000	$4,000	$1,000	$1,000	$5,000
(11).	Influent flow meter	EA	2	$3,000	$6,000	$500	$1,000	$7,000
(12).	Electrical supply for heat trace	LS	1	$3,000	$3,000	$2,000	$2,000	$5,000
(13).	Pipe racks for elevated pipe	LS	1	$4,000	$4,000	$6,000	$6,000	$10,000
(14).	Bypass pipe including fittings	LF	200	$15	$3,000	$10	$2,000	$5,000
(15).	Valves for all pipe lines	LS	1	$10,000	$10,000	$2,500	$2,500	$12,500
(16).	Trenching/excavation/backfill for underground pipe	LF	380	$0	$0	$15	$5,700	$5,700
(17).	Heat trace and insulate influent	LF	60	$10	$600	$10	$600	$1,200
(18).	Provide access to tank for GAC change outs	LS	0	$2,000	$2,000	$2,000	$0	$0
(19).	Power, control & monitoring wiring with connections to existing PLC	LS	1	$13,000	$13,000	$13,000	$13,000	$26,000

TABLE 8
ESTIMATED CAPITAL COSTS
ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

ITEM #	WORK ITEM	UNIT	Estimated Quantity	Equipment Unit Price	Equipment Estimated Total Cost	Installation Unit Price	Installation Estimated Total Cost	Estimated Total Cost
(20).	Health and Safety Plan	LS	1	$0	$0	$3,000	$3,000	$3,000
(21).	Startup and Shakedown	LS	1	$2,000	$2,000	$10,000	$10,000	$12,000
(22).	Meetings	EA	3	$1,000	$3,000	$1,000	$3,000	$6,000
(23).	Percent labor multiplier for enhanced PPE for work in contaminated zone	LS	1	$2,000	$2,000	$5,000	$5,000	$7,000
(24).	Pilot Testing	LS	1	$3,000	$3,000	$15,000	$15,000	$18,000
	TOTAL INSTALLED COST:				$695,300		$152,400	$845,700
	SHIPPING (5%):							$34,800
	MARKUP ON EQUIPMENT & INSTALLATION (10%):							$84,600
	ROUNDED SUBTOTAL:							**$965,000**
	ENGINEERING:							**$97,000**
	CONSTRUCTION MANAGEMENT:							**$48,000**
	CONTINGENCIES:							**$145,000**
	GRAND TOTAL:							**$1,255,000**

TABLE 8
ANNUAL OPERATION AND MAINTENANCE COSTS
REMEDIAL ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

PROJECT: ICS
PROJECT NUMBER: 71261
DATE: 14-Sep-06

Item No.	O&M Cost Item	Units	No. of Units	Unit Cost	Estimated Cost
(1).	Electrical costs for backwash pumps (1200 gpm x 5 days/event x 4 events/yr)	Kw-hr	10,000	$0.08	$800
(2).	Electrical costs for GAC Feed Pumps (6000 gpm x 5 days/event x 4 events/yr)	Kw-hr	50,000	$0.08	$4,000
(3).	Electrical costs for heat trace	Kw-hr	30,000	$0.08	$2,400
(4).	Electrical for indoor/outdoor lights	Kw-hr	10,000	$0.08	$800
(5).	Labor for monitoring, records & change outs (2 hrs/wk.)	hr	104	$50	$5,200
(6).	GAC consumption rate (40,000 lbs/year) (2 filters/year)	lbs	40,000	$0.700	$28,000
(7).	Transportation & installation for GAC change outs (2 filters/year)	filter	2	$1,250	$2,500
(8).	Transportation & disposal of spent GAC ($2,600 per 20,000 lbs for transport & incineration assuming > 50 ppm PCBs)	filter	2	$2,600	$5,200
(9).	Analytical testing to support disposal options	filter	2	$1,000	$2,000
(10).	Equipment repair and replacement (instruments, pumps, building)	LS	1	$2,500	$2,500
(11).	inlet and outlet (2 samp ea/3 events/yr for TSS & PCBs)	samples	6	$250	$1,500
(12).	Performance sampling & analytical of	samples	3	$250	$750
(13).	Miscellaneous supplies	LS	1	$2,000	$2,000
(14).	Building maintenance	LS	1	$2,000	$2,000
	Annual O&M subtotal				$59,650
	General Consulting/ Project Management (5				$3,000
	Contingencies (5%):				$3,000
	Total estimated annual O&M cost:				$66,000

Figures

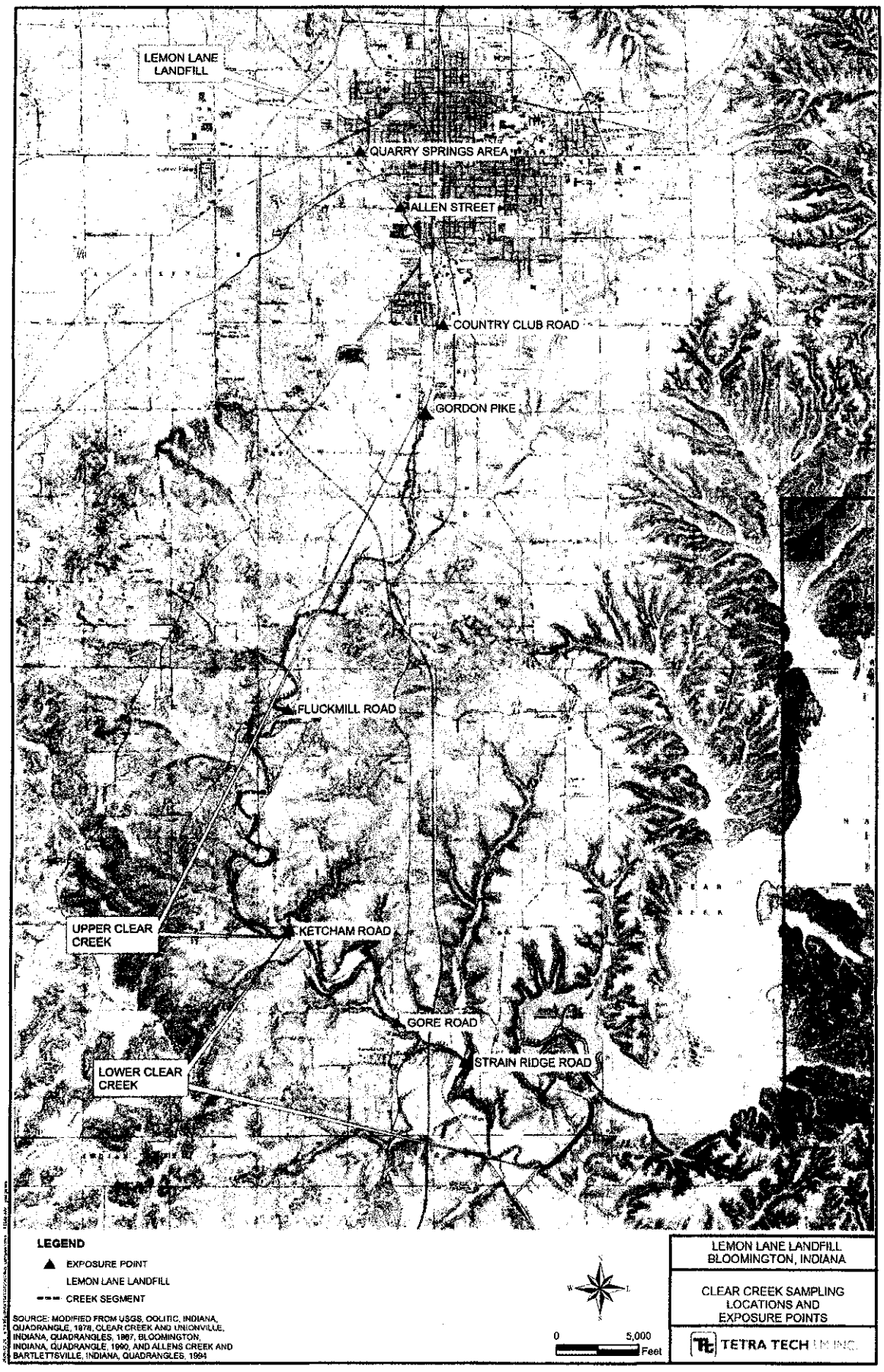
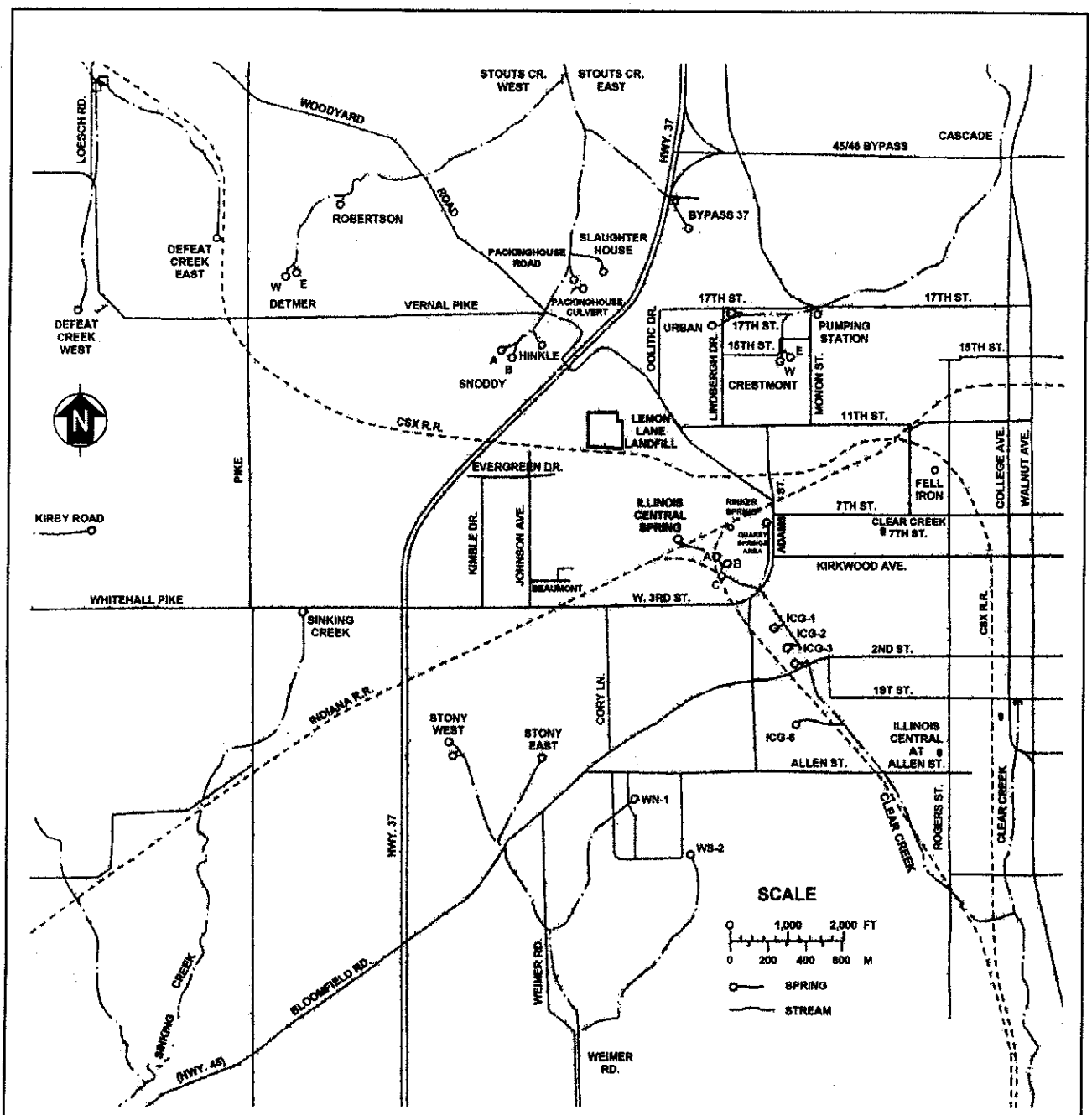


Figure 1. General Site Location Map



LEMON LANE LANDFILL
BLOOMINGTON, INDIANA

FIGURE 2
LOCATIONS OF LEMON LANE LANDFILL, ILLINOIS CENTRAL SPRING, RINKER SPRING, QUARRY SPRINGS AREA, AND CLEAR CREEK

TETRA TECH

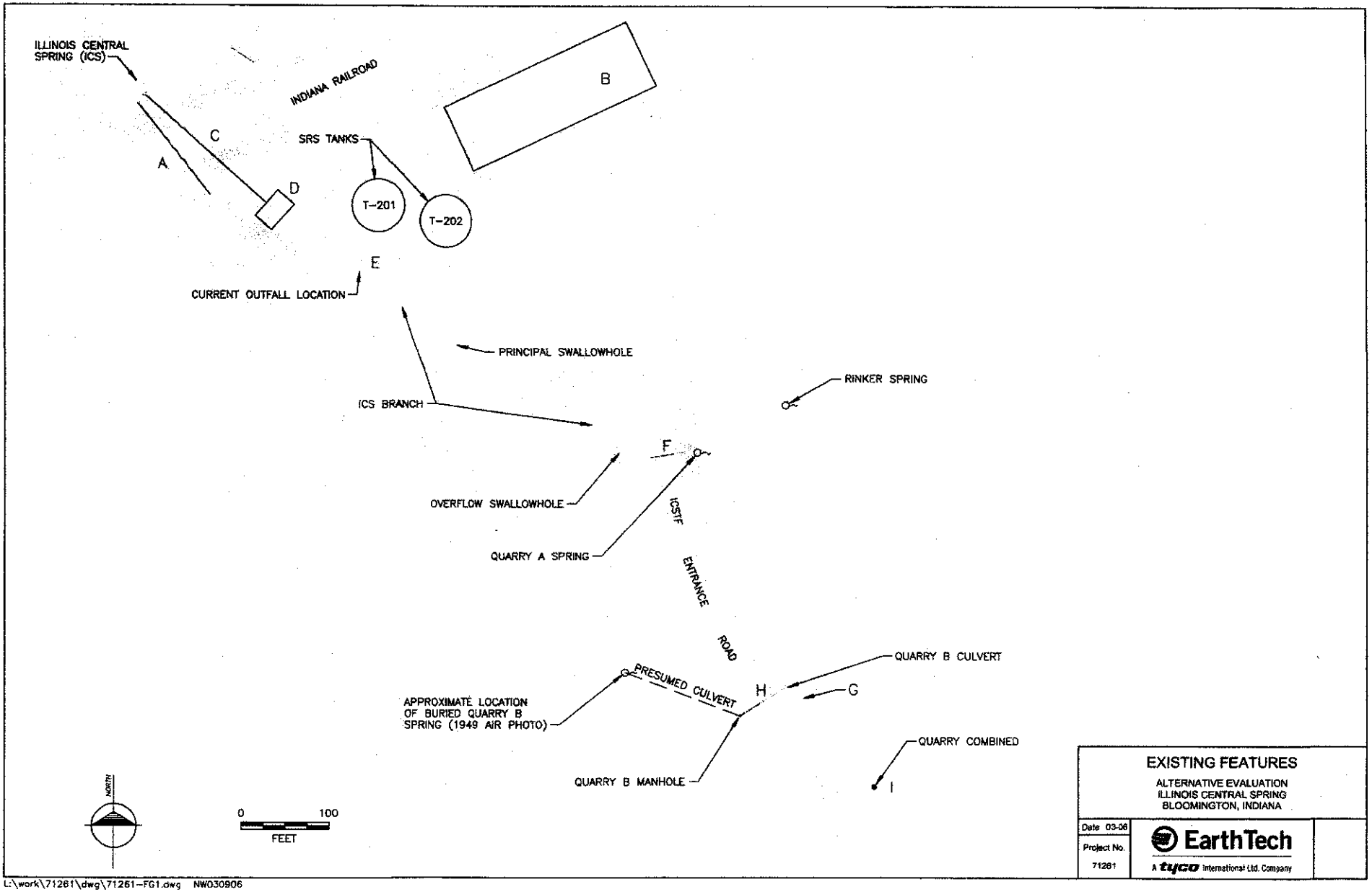


Figure 3. Site Features and the flow path of the effluent

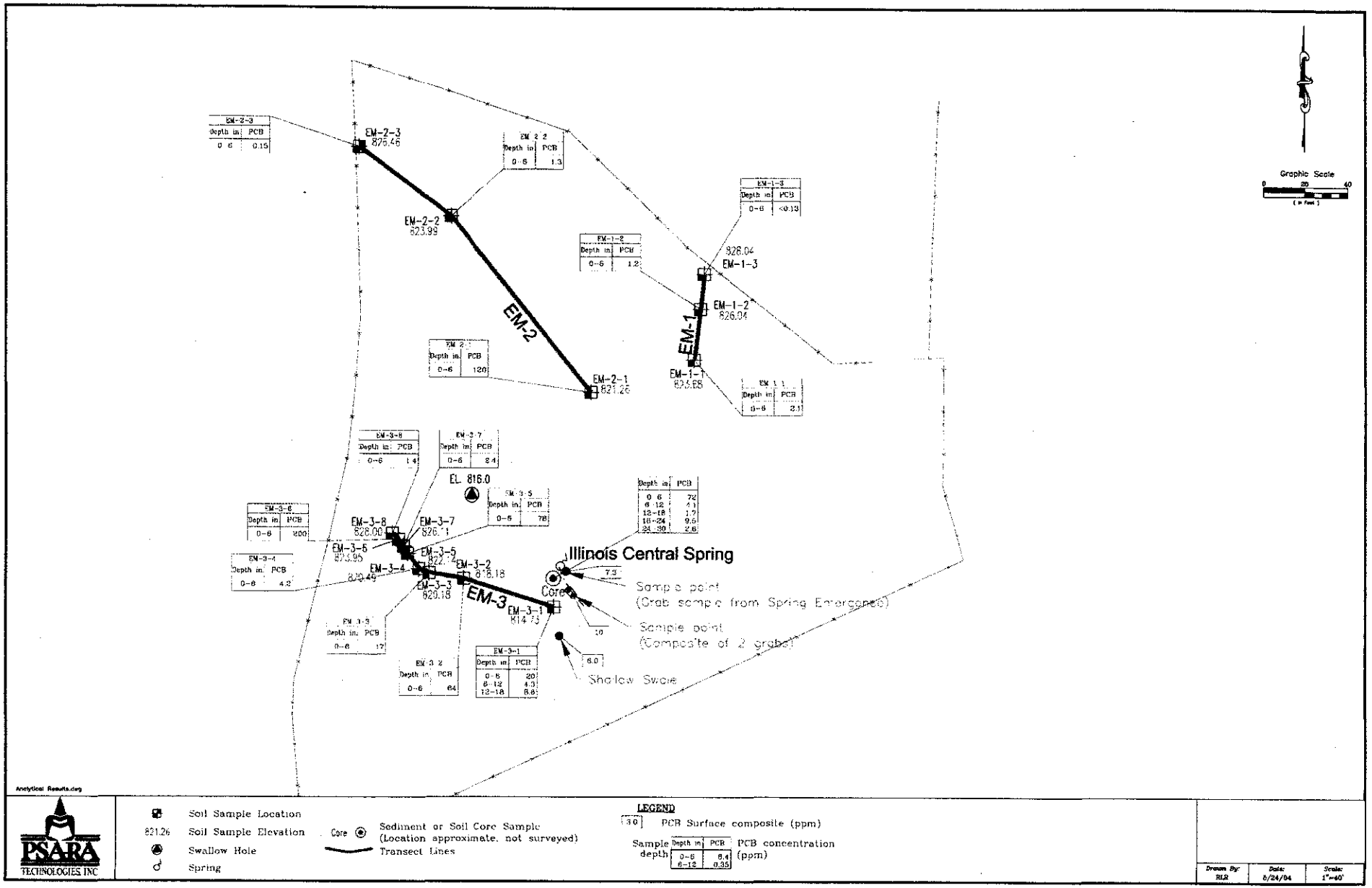


Figure 4. Sampling results at the ICS emergence

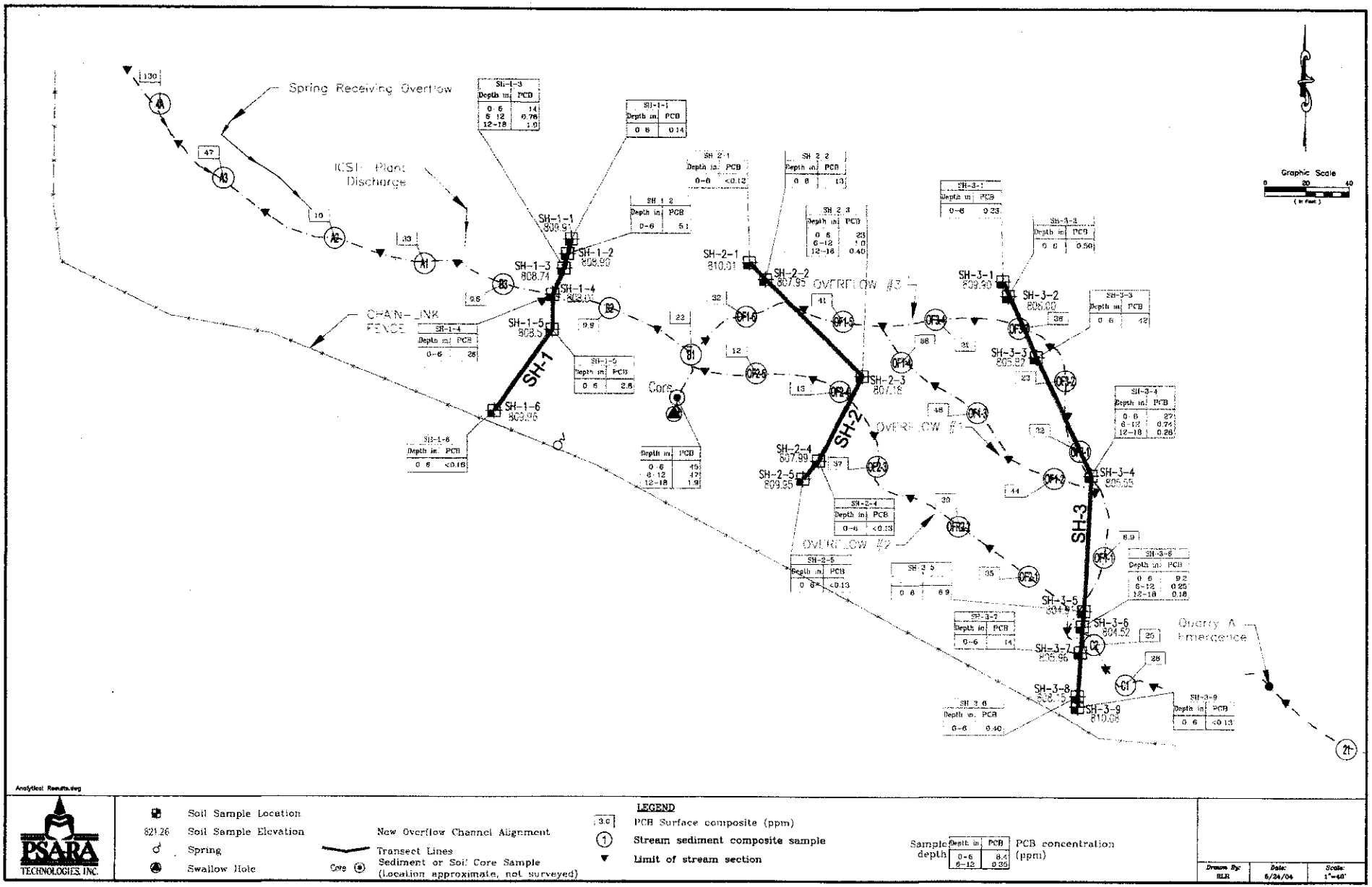


Figure 5. Sampling results at the swallowhole area

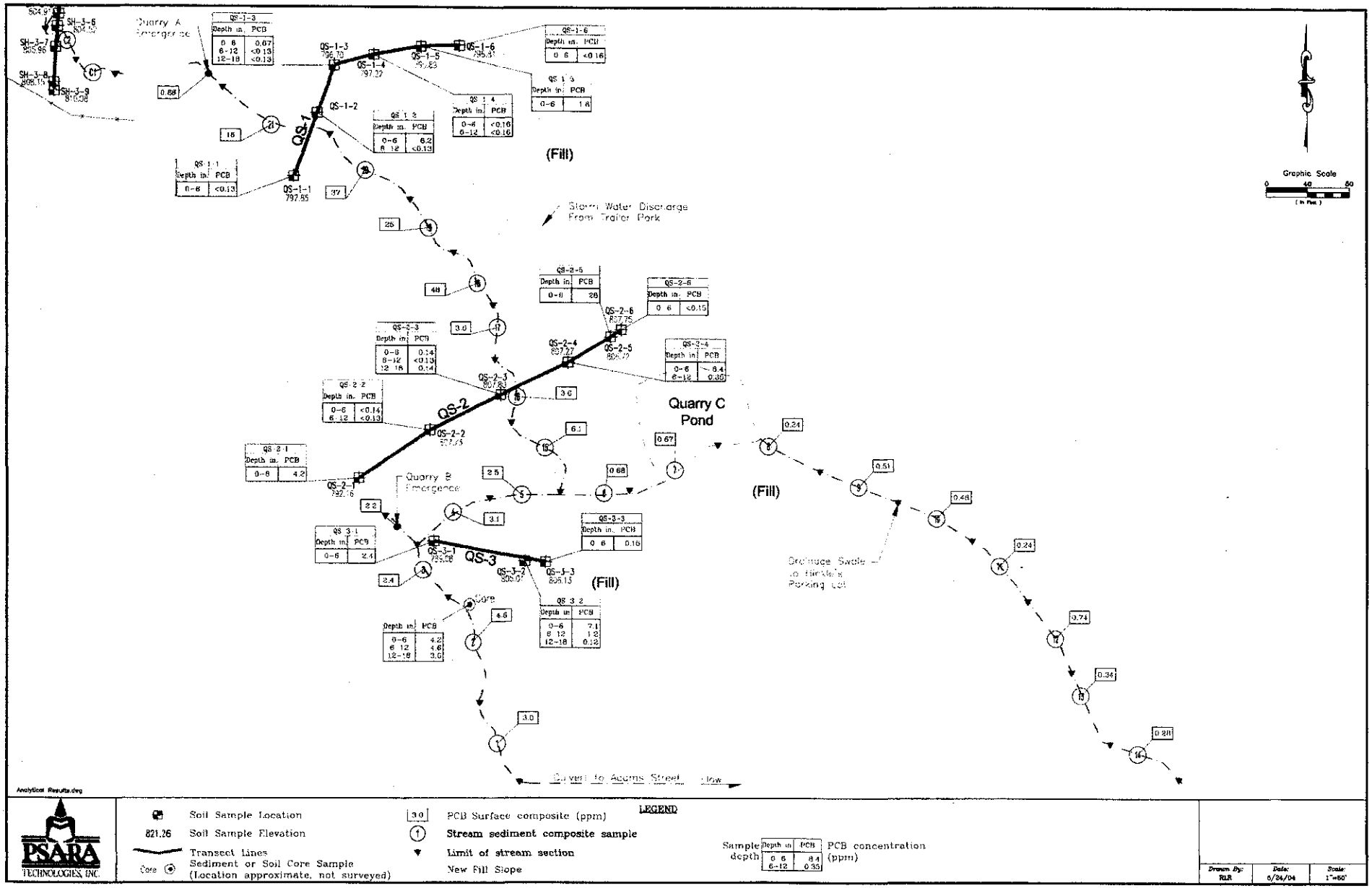
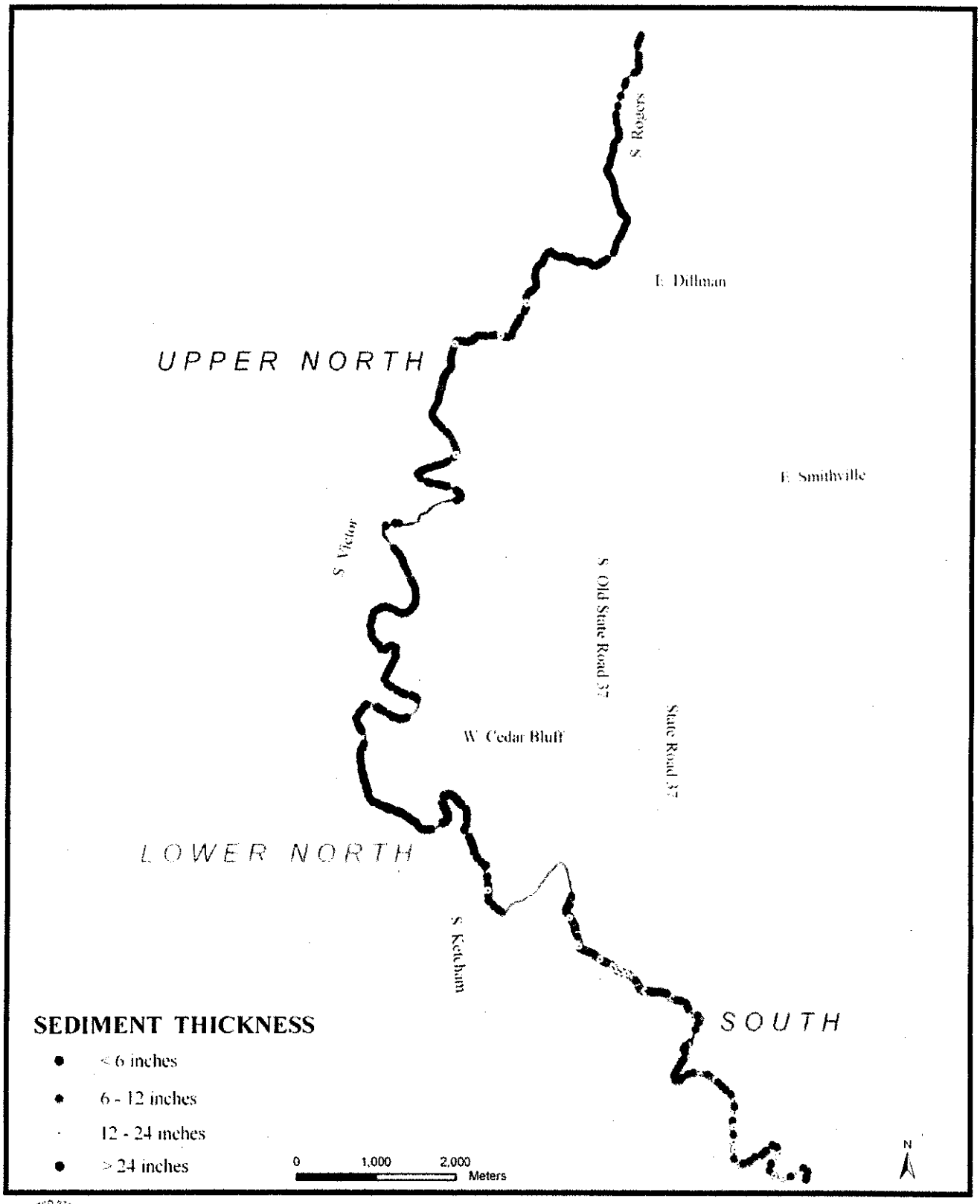


Figure 6. Sampling results at the Quarry springs area



LOCATION OF SEDIMENT POKE SAMPLES USED TO DETERMINE SEDIMENT THICKNESS

FIELDS

Figure 7. Representation of the sediment thickness in Clear Creek

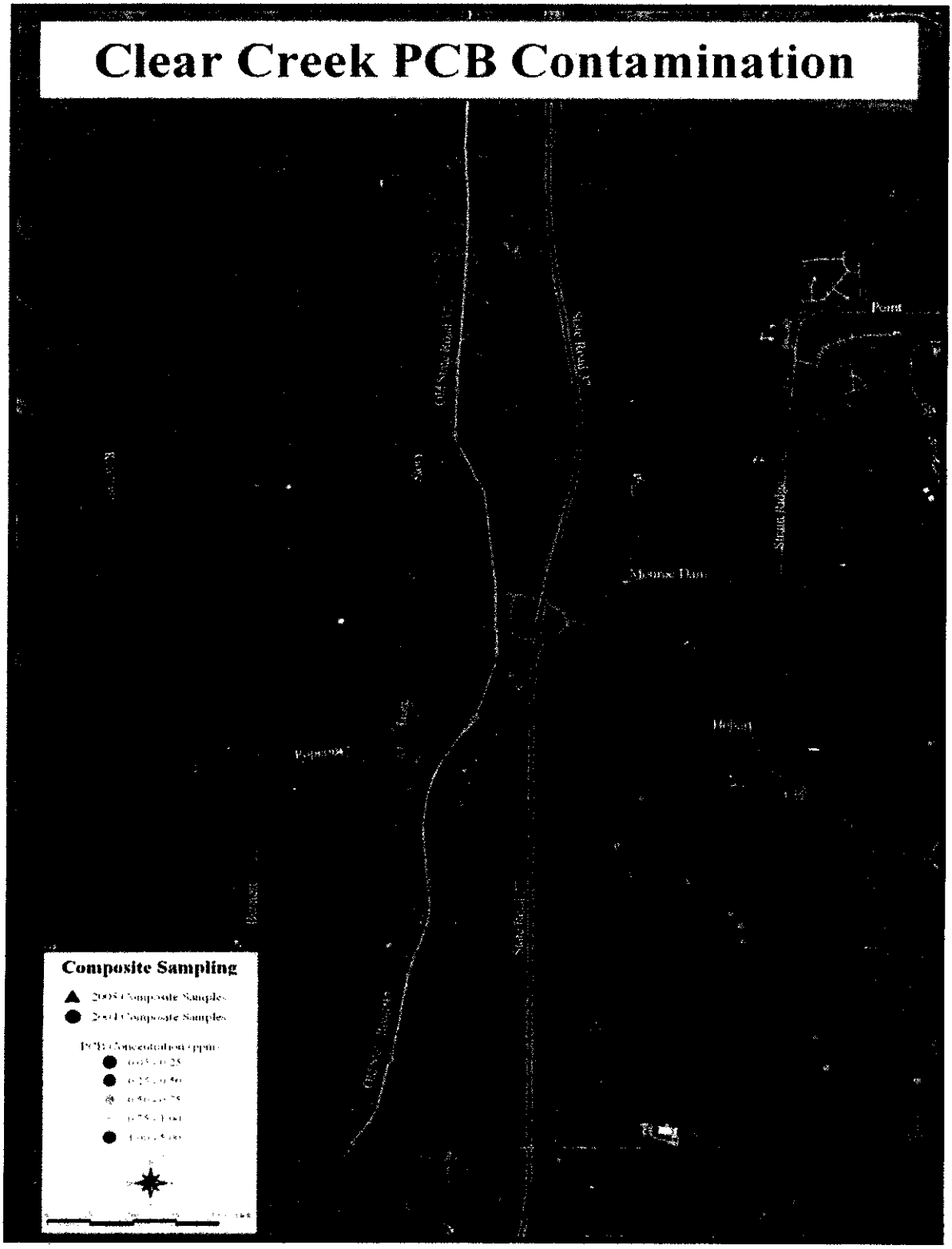


Figure 8. Results of the sediment sampling events in Clear Creek

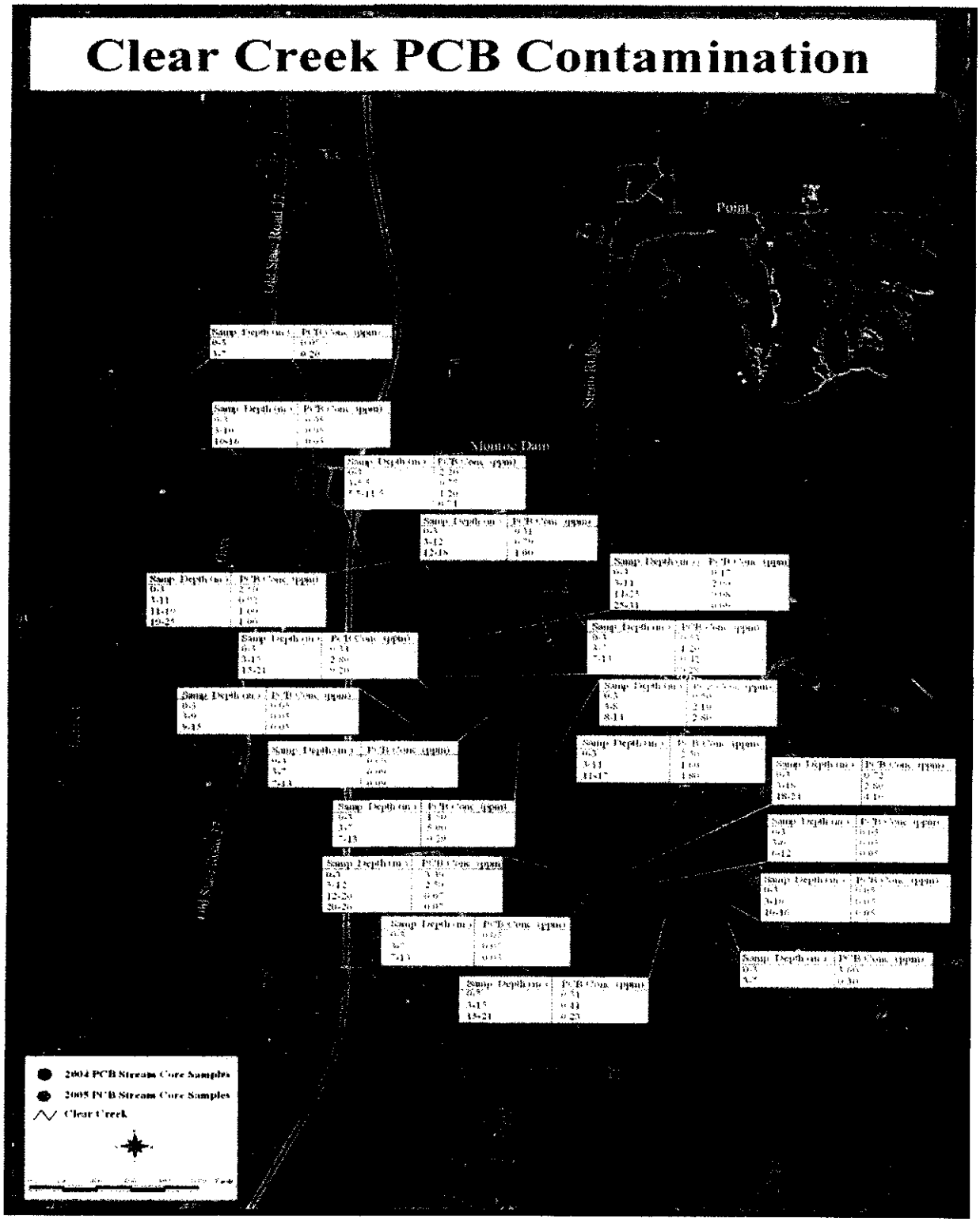


Figure 9. Results of the sediment sampling events in Clear Creek

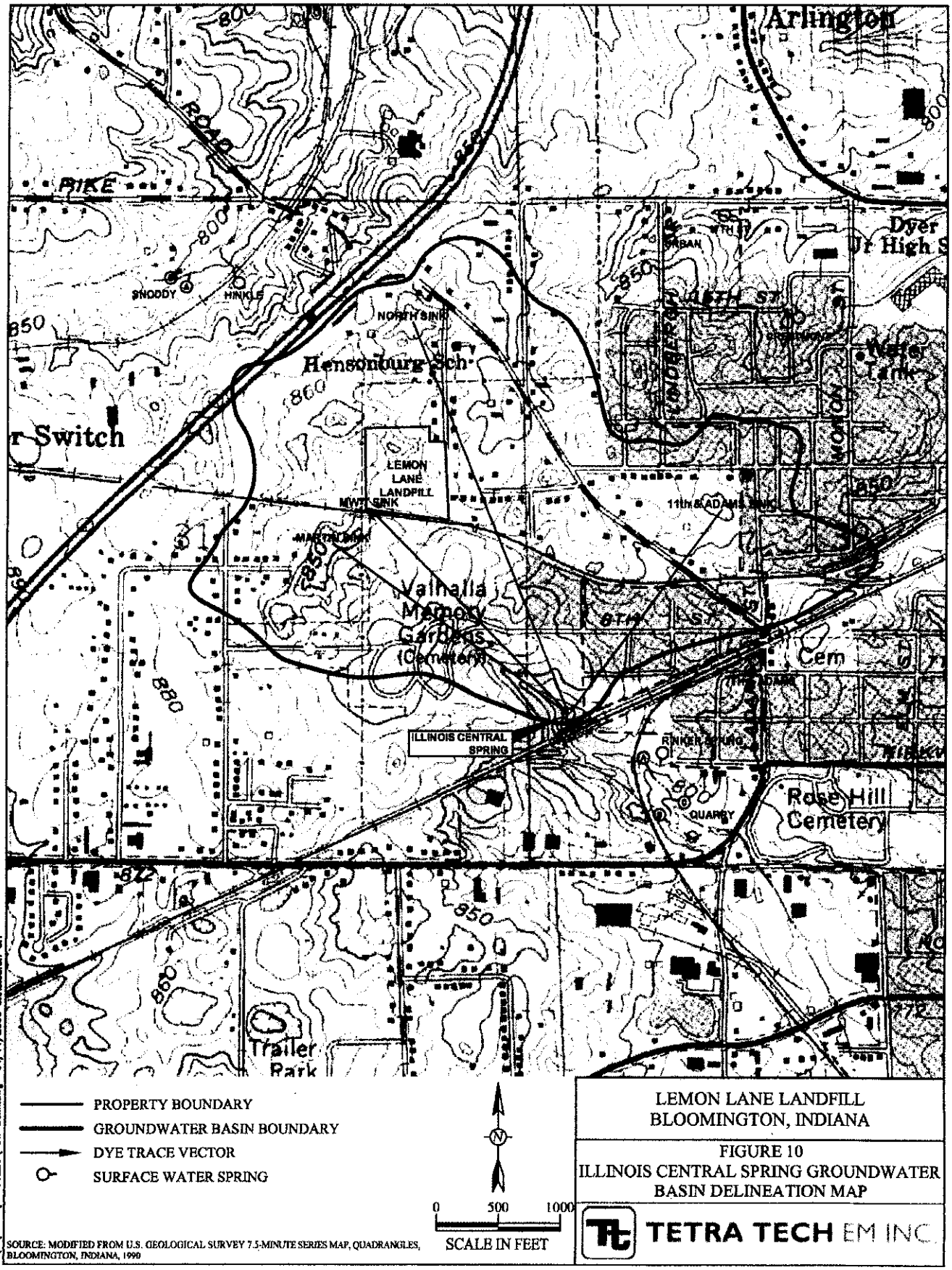


Figure 10. Delineation of the groundwater basin for ICS

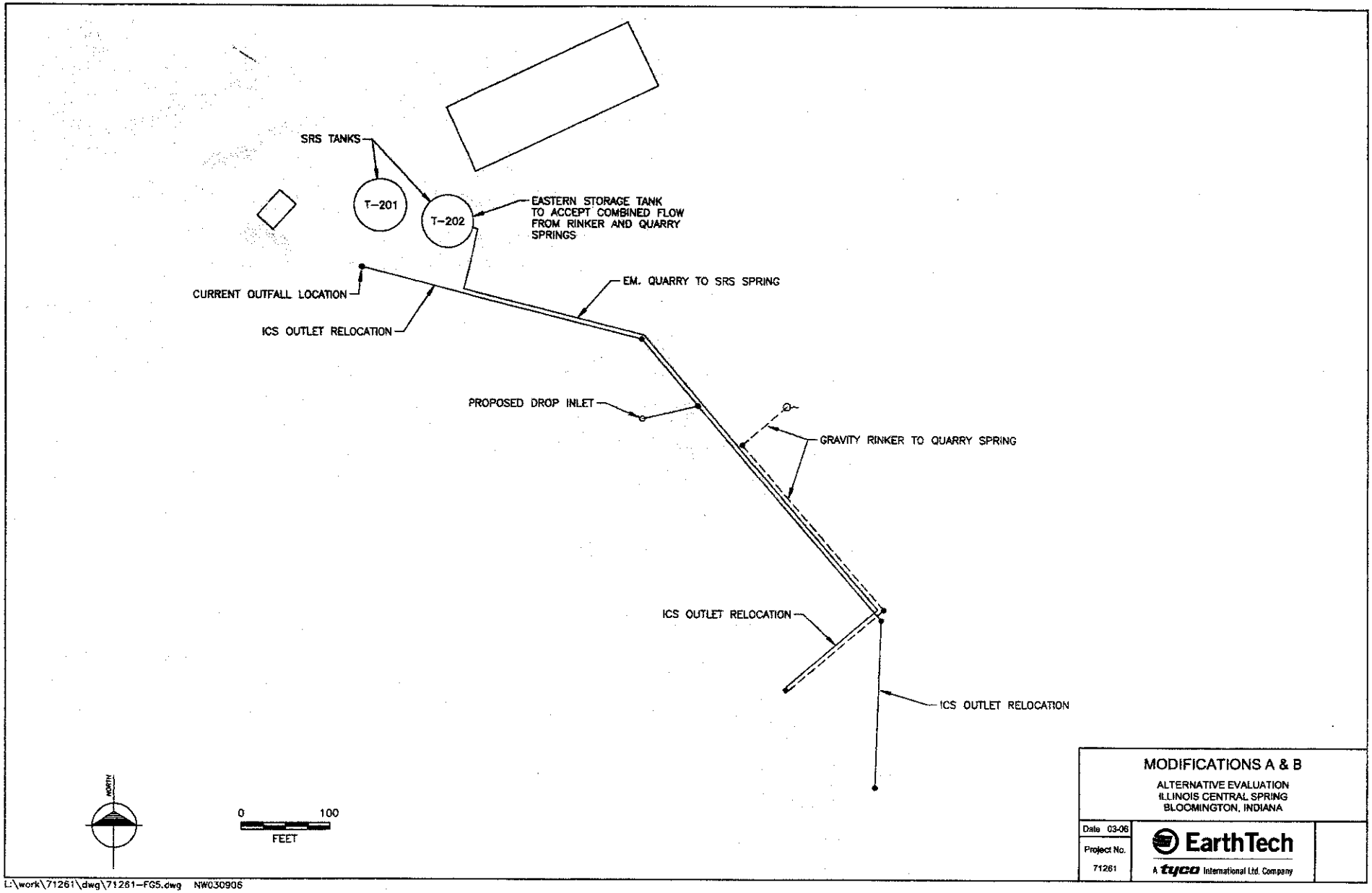


Figure 11. Conceptual approach for the collection system and proposed location of the new effluent line

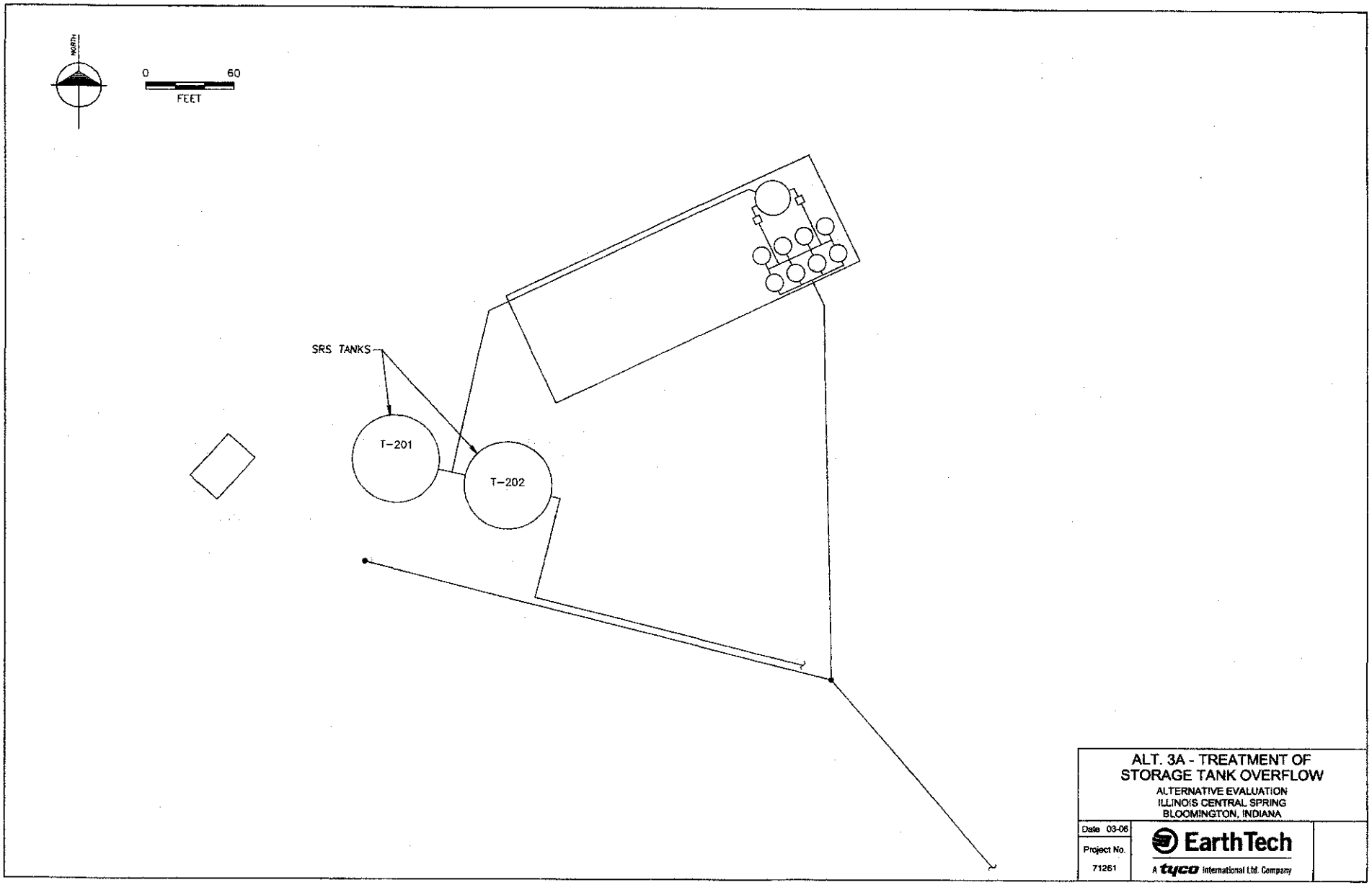


Figure 12. Conceptual Approach for the Overflow Treatment System

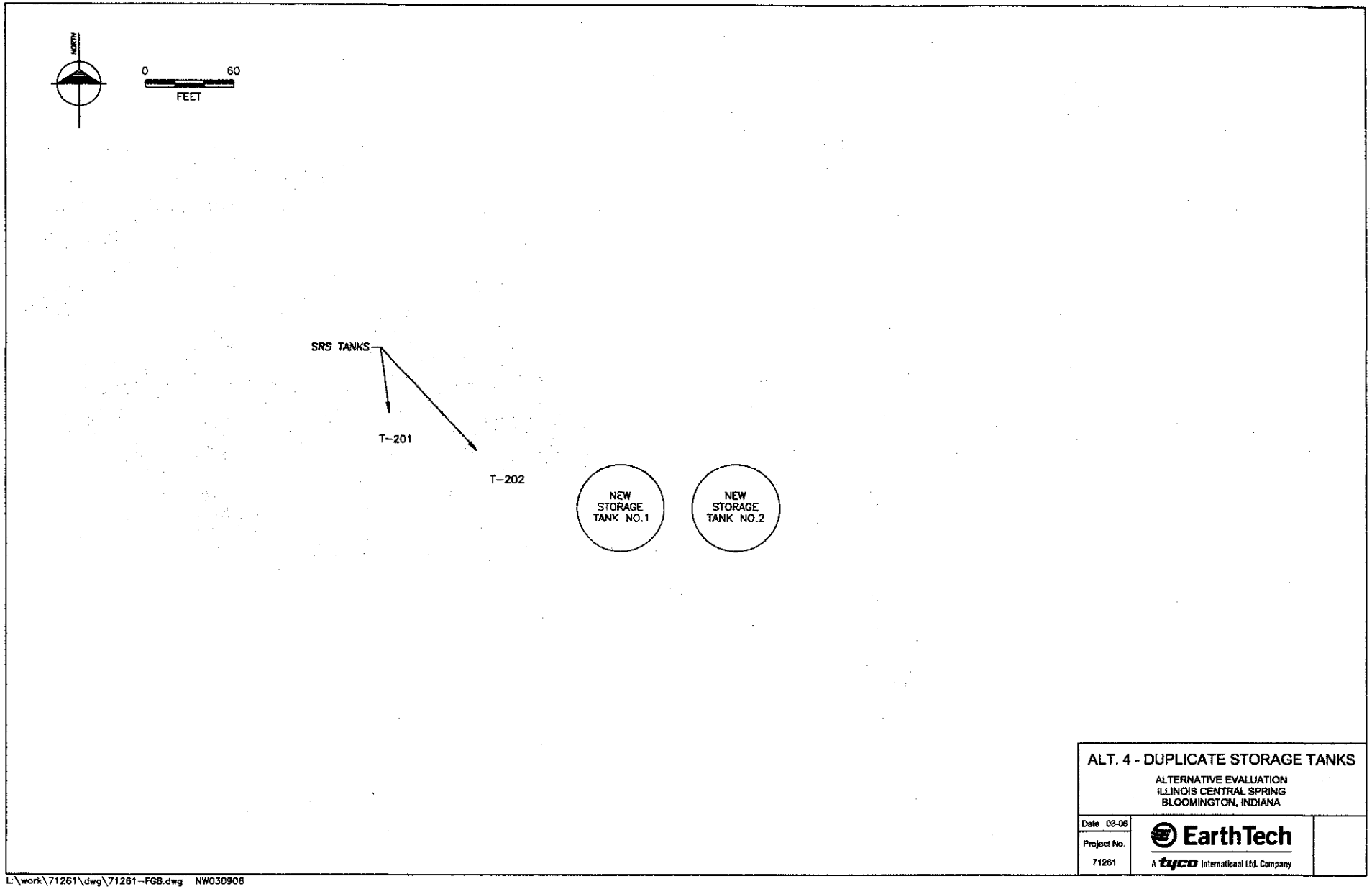


Figure 13. Locations of two new storage tanks

RESPONSIVENESS SUMMARY FOR OPERABLE UNITS 2 AND 3
LEMON LANE LANDFILL

Comment 1: Apparently only the bypass water is to be treated at ICS. There are many other springs draining the site (despite contentions that ICS is the drainage point for a multi-acre "drainage basin". These include Slaughterhouse, Weimer, and Cascades. Where is the comprehensive drainage basin study that proves this assumption?

Response: Sampling has shown PCB contamination from the Lemon Lane Landfill in the following springs:

- Illinois Central Spring
- Quarry A and B
- Slaughterhouse Spring
- Rinker Spring

The additional water to be treated under EPA's proposed plan includes the Quarry B and Rinker Spring discharges, and overflow from the existing ICS storage tanks. Quarry A spring will not be captured since it is anticipated that the Quarry A Spring will not flow due to changes in surface water drainage and the scheduled sealing of the Illinois Central Spring swallowholes.

Hydrologic investigations at Lemon Lane Landfill have occurred over a long period of time and have involved numerous dye tracing investigations, pump tests, and sampling events. These data are discussed in Westinghouse (1994) *Summary Report – Lemon Lane Landfill Dye Tracer Tests*, Viacom (March 13, 2002) Lemon Lane Landfill Karst Aquifer Test Reports from October-November 2001, and Viacom (April 2003) *Long-Term Groundwater Monitoring Plan for Lemon Lane Landfill.* Subsequent data have been presented at numerous Citizen Information Committee meetings. Figure 10 of the Proposed Plan shows the configuration of the Illinois Central Spring groundwater basin synthesized from all of these data.

Based on the data as a whole, EPA does not dispute the fact that minor and ephemeral connections may exist between ground water in the vicinity of Lemon Lane Landfill and a few small springs in the area. However, EPA is convinced that substantially all of the PCBs releases derived from Lemon Lane Landfill and emergent in karst spring flow occur via the Illinois Central Spring flow system and its discharge point at Illinois Central Spring. The three springs of the Slaughterhouse Spring Complex appear to have a temporary high-flow connection to Lemon Lane Landfill and transmit a minor PCB discharge. Pursuant to the Long-Term Groundwater Monitoring Plan, Slaughterhouse Spring was sampled during both a low and high flow storm event in October and November 2003. PCBs were detected in low levels in only two of 82 samples collected.

The referenced Weimer springs (WN-1 and WS-2) were among the nine peripheral springs where water samples were collected in 1992 and multiple sediment samples were

collected in 1995. PCBs were not detected in any of 1992 water samples, or in any of the five sediment samples collected at each of these locations in 1995.

The referenced Cascade location was a backup location used for dye trace sampling. It is downstream of Crestmont, Urban, 17th Street, and Pumping Station Springs. No PCBs were detected at any of these springs in multiple 1992 sample events, and no PCBs were detected in five sediment samples collected from Urban and Crestmont in 1995.

The EPA emphasizes, and it should be kept firmly in mind, that tracer detection is not PCB detection. The commenter is reminded that the tracer test results from Lemon Lane Landfill were also reviewed for the Citizens Opposed to PCB Ash (COPA) by Gareth Davies, an independent karst consultant and ground water tracing expert. Mr. Davies concluded that:

> *"From a combination of geomorphological, contaminant, PCB, hydraulic gradient, and discharge data, it can therefore be hypothesized that the most likely discharge locations for ground water from beneath the landfill are the Illinois Central and Quarry Springs.*
>
> *It should be emphasized that the results of the initial tracing experiments performed at the site suggested that the discharge locations for the site were principally Illinois Central Spring and Quarry Springs (McCann and Krothe (1992). The high-flow results suggested dye had migrated to many surface and ground-water locations far beyond these springs.*
>
> *There would be no logical reason why ground water would flow to these other distal locations given low gradient, long, and thus inefficient flow paths, rather than use the more efficient pathways to Illinois Central Spring and Quarry Spring, where most of the PCBs are being discharged. The third most efficient pathway based upon hydraulic gradient would be the Slaughterhouse Spring Complex, also a site where PCBs have been detected.*
>
> *Based upon the tracing results it is logical to conclude that the springs where both dyes and PCBs were detected are the discharge locations for Lemon Lane Landfill. The detection of dyes elsewhere but without PCBs in most cases suggests that the source of those dyes must be different than the source of the PCBs."*

Comment 2: Page 4 –Despite contentions that the OU-1 was implemented, little evidence shows that it was effective. The contention that removal of the source was impossible; a strong effort to actually penetrate the sourcing zones has never been attempted. Even when found, no attempt to 'suck out' the pollution was not implemented. In spite of the Viacom attempt to hit the primary conduit, evidence exists that, in addition to the SE corner, other areas are loaded with PCBs and are amenable to removal. Why not? Most of the effort to characterize the site by wells has been done at the periphery,

not the essential area. Penetrating the RCRA cover with 6" holes will not damage the overall protection. Little justification is presented to justify any technical implacability waivers.

Response: EPA disagrees with the commenter. CBS has spent over 7 years working on trying to find the main conduit and pump PCB contaminated water from the southeastern part of the site. The original shallow bedrock well LF-6 had accumulations of DNAPL and was bailed on several occasions to remove the free product. During the source removal, a pit 30 feet deep into rock was excavated to the 840 elevation around LF-6 and LF-7, and many of the excavated grids in this area extended to bedrock. PCB staining on the bedding plane partings of the rock excavated was noted. In a clay-shale layer at the 840' elevation free product had accumulated and stained the rock. Nowhere else in the landfill area were these conditions so extreme.

Prior to and subsequent to the excavation numerous borings into the underlying rock in the southeast corner of the landfill were made and showed high levels of PCBs in the groundwater, indicative of DNAPL. These results were obtained from water samples from the elevation 850-852' range in LF-1, the 840-848' elevation range in the various LF-6 and 7 borings and in PZ-E, and in the 810-820' elevation range in PZ-F.

Two test wells penetrating the sourcing zones were installed in the southeast corner of the landfill (SE-1 and SE-2) were installed in August 1995. Oil staining with light PCB contamination was observed on rock cores from these holes. Clay recovered at elevation 841.2' at SE-1 had 60 mg/kg PCBs, and confirmed the widespread contamination of clay-shale rock layers at that elevation. A deeper clay layer at elevation 832.2' showed 270 mg/kg PCBs. A clay-shale rock layer at elevation 827.3' had 250 mg/kg PCBs. Even at depths of 52.8' and 66.0' (elevations 819.7' and 806.5' respectively) there was still 11 mg/kg of PCBs found in the clay layers. In SE-2 the clay at depth 53.15-53.25' (elevation 820.25') had 26 mg/kg of PCBs.

Groundwater encountered in SE-1 and SE-2 also had high levels of PCBs (up to 9,700 ug/L). These results clearly show that high levels of PCB contamination reside in the bedrock in the southeast corner of the landfill to a depth of at least 70 feet below the ground surface. The development of these wells in August 2005 is believed have contributed to supplying PCBs to Illinois Central Spring at 1,600 ug/L concentration during a storm resulting from Hurricane Katrina. This is the highest PCB concentration ever recorded, and occurred despite active groundwater removal during a pump test conducted during the storm to test the feasibility of removing PCB via these wells. These pump tests suffered from the same difficulty that has plagued all well recovery tests at Lemon Lane Landfill. That is, wells have not been shown to be effective at controlling or intercepting PCBs migrating in groundwater away from the landfill. This leads EPA to the conclusion that well recovery of PCBs in the deep bedrock is an impracticable solution, based on the current state of knowledge and timelines for completing remedy selection. In EPA's view, the best approach to controlling the PCB releases is to capture the groundwater at the most upstream location where is has been demonstrated that the

groundwater may be effectively recovered. This is at the Illinois Central Spring resurgence.

Penetrating the flexible membrane liner would reduce the effectiveness of the cap and allow leakage into the waste material. Sampling data shows the southeastern portion of the site was the most contaminated area and the commenters statement that evidence exists that other areas are loaded with PCBs is incorrect. The large amount of PCB oil at depth in the bedrock justifies a Technical Impracticability waiver with respect to ARARs that would otherwise apply to water that will be treated by the bypass treatment system.

Comment 3: Page 5 – A suggestion that the ST. Louis/ Harrodsburg contact is the basal resistant for further penetration ignores that this contact dips SW to the Illinois Basin. Whether it slows deeper penetration it does not inhibit the lateral transport in the subsurface. How is this taken into consideration?

Response: EPA believes that groundwater flow in the karst of the U.S Midcontinent may be conceptually visualized as a patchwork series of independent (although in some cases stacked or overlapping) groundwater basins that drain to discrete underflow spring discharge points. A considerable amount of work has been done successfully mapping such groundwater basins in the karst of Kentucky, and a series of groundwater basin maps have been published. EPA acknowledges that there may be some groundwater recharge to deeper hydrostratigraphic units, but monitoring data for wells completed in the phreatic zone below the spring level nowhere indicates levels of PCB contamination typical of the Illinois Central Spring.

Comment 4: Page 9 – Why are discharged volumes untreated? Also, discharges after settling are considered to be PCB-reduced, but there is little evidence that this is actually so. No mass balance study of the system has been done and presented. The sludge sampling plan was made available at the library, but not a report on results. Claims of 'settling' in the tanks as a treatment method have never been substantiated. Because the tanks are open to the atmosphere, it is quite likely that a large component of this 'treatment' is probably volatilization. The air study near the plant did show significant releases from the facility.

Response: The commenter is incorrect. The two storage tanks have shown evidence of settling of solids. Document number 348, dated March 8, 2006 shows the results of the sampling of sludge at the bottom of the two storage tanks. Concentrations greater than 200 ppm were discovered in the sludge and was disposed of in a TSCA landfill. The commenter is incorrect that significant releases from volatilization have occurred. The air sampling data and the subsequent risk analysis completed at ICS (located in Administrative Record) does not support the commenter conclusion. The commenter is also referred to *Alternative Evaluation Report, Illinois Central Spring Water Treatment Facility* (June 2006), Appendix A.

Comment 5: Page 10 – Although this document considers the Viacom attempt to target a 'source' conduit, have they suggested a better plan to extract the contamination than

waiting for it to exit ICS? Further, groundwater contamination has actually not been addressed. Everything seems to focus on ICS as the total of the water from the site. Actually two other significant components are the waters exiting the site via other springs, and what does not come out of the springs, but is still in the subsurface. The springs act as 'overflows' of the karst, but without a water budget study, we are ignoring the contamination in the subsurface water system.

Response: No better plan to extract the groundwater contamination has been proposed. As noted in the response to Comment 2, field testing well extraction schemes has been unsuccessful in controlling spring discharges. Based on the long history of investigative sampling at Lemon Lane Landfill, EPA does not believe that there are other significant PCB discharges.

EPA does not believe that it is correct to consider Illinois Central Spring as a mere "overflow" of the karst system. As pointed out in the response to Comment 3, PCB concentrations at Illinois Central Spring far exceed those found in the deeper groundwater at the landfill. The spring is the *underflow* discharge of the groundwater basin. The focus on ICS is justified as it is the upstream source of contamination to both human and ecologic receptors utilizing Clear Creek. There are no affected groundwater users at the site.

Comment 6: Page 18 – Risk assessments focusing on cancer are incomplete. Far more serious are the chronic effects of PCBs as endocrine disruptors. Why has this element not been addressed?

Response: The risk assessment addressed potential noncarcinogenic effects of PCBs in addition to evaluating carcinogenic effects of PCBs. Consistent with EPA policy, noncarcinogenic effects were evaluated using an oral reference dose (RfD) identified in accordance with the hierarchy of sources established by EPA. The RfD identified for PCBs (2E-05 milligram per kilogram body weight – day) was referenced to EPA's Integrated Risk Information System (IRIS). IRIS is EPA's most preferred source of toxicity factors for use in human health risk assessments. RfDs are designed to be protective of the general population including sensitive subpopulations and development of RfDs considers the potential for a wide variety of noncarcinogenic health effects including immunological, developmental, and others. Therefore, the risk assessment identified and used a health-protective toxicity factor (the RfD) to evaluate the potential noncarcinogenic health effects (including endocrine effects) of PCBs.

Comment 7: Page 20 – Clear Cr. is not the only drainage that needs addressing. In fact the plan basically and incorrectly concludes to do nothing suggests why ignoring other stretches of Lemon Lane drainage are ignored. For example the stretch from ICS at 3rd street south to the confluence with Clear Cr. has long been ignored. Why?

Response: It is unclear to the EPA why the commenter believes the reach of West Fork Clear Creek from Third Street to the Clear Creek main stem has been ignored. EPA

notes springs in this reach of the channel were sampled repeatedly during dye tracer studies and for PCBs several times in 1995.

Comment 8: What basis is there to the assumption that ICS drains a 300 acre site? There are other springs that radiate all around the landfill. Dye trace studies with injection into karst feature are not definitive. Just because traces are found in ICS does not preclude transport to other areas or drainages. Were they all tested simultaneously and in a mass balance scheme to ensure recovery of all dye injected? It really appears that you have an answer and a re stretching the flimsy data to fit it.

Response: EPA has repeatedly addressed these issues, and similar issues, with the commenter and provided written responses. The basis for the 300 acre drainage basin estimate is dye tracing data from various sources, and this figure is in good agreement with spring flow modeling efforts conducted by Viacom. The groundwater basin boundary is shown in Figure 10. Yes, there are obviously other springs around the landfill that were sampled during dye tracing investigations. Mass balances for dyes have been calculated and previously reported to the commenter. See the response to Comment 1 for an independent review of these issues by COPA.

Comment 9: Page 22 – Where does the figure of 30.5 extra tanks come from? Please justify. Just because the total untreated volume may require 30.5 tanks, that is not the mode of operation. The storage tanks are not for long-term storage, but just as 'load-leveling' devices. Even one additional tank would significantly add to the ability of the 1,000 gpm system to catch up with storm events without releases. A TI waiver is not justified. If it is based on 30.5 tanks, it is specious.

Response: Please refer to the data for the January 3, 2005 storm event as cited on Page 22. EPA developed a spreadsheet model to evaluate PCB capture by the ICS Water Treatment Facility. The model may be used to track storage necessary to totally contain a hydrograph based on a measured, input spring flow hydrograph given any plant processing rate. The plant processing rate was taken to be 1,000 gpm, the current design capacity. For the January 3, 2005 storm the spring flow volume to be held (area under the hydrograph above 1,000 gpm) was 18,311,800 gallons. This may be seen to be equivalent to 30.5 storage tanks by dividing this excess volume by the volume of one of the existing storage tanks (600,000 gallons). EPA disagrees with the commenter on the significance of adding one additional tank. This analysis has previously been performed and is presented in *Alternative Evaluation Report, Illinois Central Spring Water Treatment Facility* (June 2006), Appendix A, and is summarized in Table 2 of the Propose Plan. It is estimated that one additional tank only increases the percentage of water treated from 91.2 to 92.8 percent without changing the treatment capacity.

Comment 10: Deed restrictions at the area behind Hinkle's to restrict residential use are reasonable, but ignores the whole stretch of the properties south of the 3rd street which includes many residential areas. Why?

Response: EPA does not have evidence that the areas referenced are contaminated at levels which require deed restrictions. This area will be reevaluated during the Five-Year Review.

Comment 11: Page 24 – What is 'Estimated Present Worth Cost' and what is its significance in this situation?

Response: EPA guidance requires the use of a present worth calculation to facilitate the comparison of the cost of each alternative. Present worth is defined as the amount of money that would be required now to implement the entire remedy. EPA requires the use of a 7% interest rate. EPA also used a 2% rate of inflation in calculating costs.

Comment 12: Table 6 shows Alternative 3 is so much superior to the present system. Why not switch over to this new and improved technology? At a capacity of 5,000 gpm it certainly can increase system capacity. Of course nothing is presented to technically justify these glowing pluses? Where has the technology been field tested? Actually, direct exposure of activated carbon to sediment loaded water is carbon-killer. For the same reason that the present system takes elaborate steps to filter out solids before passage thro the GAC, shows the need for protecting carbon from sediments. How does the 'new' technology get around that? Table 6 admits this but with no verification of the 3+ mark for 'Reliability of Technology'.

Response: The selected remedy for the storage tank overflow system is not superior to the 1,000 gpm system. The 1,000 gpm treatment system will continue to operate with the 5,000 gpm treatment system. The 5,000 gpm system will be used only a few times per year and will have backwash capability to prevent the buildup of solids trapped in the carbon. The system design was based upon a treatability study completed by Earth Tech and the results are present in the Alternative Evaluation report (document number 357, dated June 2006 in the Administrative Record). In addition, Earth Tech has been in discussion with carbon vendors and discussed the solids loading with them and based upon information to date, filtration will not be needed. If during design phase it is determined that the system will operate more efficiently with some type of filtration, then it will be added.

Comment 13: The whole concept of 'clarification' as a treatment process has never been tested or proven. Please discontinue relying on that step as a viable component. With open tanks, air emissions are part of the reason we might see a reduction in PCB levels in the water. The air testing that was done a few years ago showed significant air releases from the plant. Hopefully the plant operators are knowledgeable about their exposure and are routinely assessed for cumulative threat to their endocrine system.

Response: Clarification is a viable treatment process within the storage tanks. Sampling has shown large concentrations of PCBs at the bottom of the tanks. Please see response to Comment 4. Air monitoring completed for worker safety shows levels 1000 times lower than the Occupational Health and Safety Administration (OSHA) requirements for PCBs.

Comment 14: In Table 6 criteria 4 mentions 'Type & Quantity of (Process) Residuals' provides poor effectiveness for Alternative 3, but superior marks for Alternative 1, i.e., the current system. What does this mean? Are we getting a worse result with the proposed alternative than we have now?

Further the 'ability to monitor effectiveness' is low for Alt 1, but high for #3. What changes in measurement technology cause this difference, and for that matter, the variability over all the alternatives?

Response: Alternative 3 will produce much more solids through the backwashing of the 8 carbon vessels along with the solids produced from the 1,000 gpm system. This will require much more effort to manage compared to the current 1,000 gpm system. The production of additional sludge can be managed with the current system. Alternative 3 treats nearly 100% of the water from ICS and removes approximately 99% of the PCB mass released from ICS. With this amount of water treatment, compared with 91% of water treated and 75% of PCB mass removed for Alternative 1, the monitoring of the effectiveness will be easier since much more water is treated.

Comment 15: Page 27 – Operable Unit 3 seems to 'focus' on Clear Cr. alone. What about the sediments in the stretch south of 3rd St. before joining Clear Cr. It passes through residential areas with children playing in the water (personally observed).

Response: Sediment sampling in the past has not shown PCB contamination. This area will be reevaluated during the Five-Year Review. The human health risk assessment did evaluate children playing in the quarry springs area.

Comment 16: Further, the whole discussion with data that definitely requires attention, and then, a conclusion that nothing to be done. Is that appropriate?

Response: EPA is unsure as to what the commenter is referring to. The sediment sampling and data analysis shows that sediment based upon the surface weighted average is below 1 ppm PCB. EPA is not of the opinion that removing PCBs would greatly change the surface weighted average PCB concentration.

Comment 17: If the cleanup target is 1 ppm, why not remove everything that is above 1 ppm and not manipulate the data with averages of 5 ppm? (And additionally, what is an average with a range? statistically meaningless.) And, again how does the EPA justify a 'no action' decision with such strong evidence of contamination? Is there a reliance on nature to cleanse itself? The sediment is not locked in place. Every storm event moves it> Are we back to the 'solution to pollution is dilution'?

Response: The cleanup target is 1 ppm PCB in sediment and the concept of surface weighted average was used. This concept is used at sediment sites and takes into consideration that fish will see an average concentration over time. In addition, the highest concentrations of PCBs were at depth which would not be available to fish. The

source control cleanup at the landfill and the treatment of contaminated water from the spring system associated with Lemon Lane Landfill are together expected to improve the sediment in Clear Creek over time.

Comment 18: Table 4 indicates that all sediment should be removed, particularly the deeper material. To get at it requires removal of the upper material. Do it all! Every storm event spreads the contamination further downstream.

Response: Please see the response to Comment 17.

Comment 19: What is a 'non-drainage' area?

Response: A non-drainage area is an area that does not consistently have surface water flow. This term is being used to describe areas that will not become wet during the excavation of soils and sediments at the ICS emergence, swallowhole and quarry springs areas.

Comment 20: Table 5 shows differences in pre-mean concentrations for 12-31" differ ring from Table 4. Why?

Table 5 goals of 5 ppm are unjustified for consideration. First the goal is 1 ppm. Second, to get at the 5 ppm hotspots actually mobilizes contaminated material for transport downstream. Do it all!

And then to conclude that 'no-action' is acceptable is pure mendacity. Why, when your own data says that total removal is needed? And, don't forget the stretch south of 3rd ST before Clear Cr.

Response: Thank you for pointing out the typographical error in Table 4. The 5 ppm goal was used as an example to show the effects of remediating at 5 ppm PCBs. The goal is 1 ppm and using the surface weighted average concentration shows that we are well under the 1 ppm PCB cleanup goal. Our data does not show that total removal is needed. By evaluating the top 6 inches of sediment which is available to fish, EPA is of the opinion that PCB concentrations in fish will not likely improve by removing sediment.

Comment 21: Page 28 – More on Table 6. Why does Alt 1 have a significant reduction of toxicity compared to the marginal acceptability of Alt 3? It would seem that this would be a primary goal of the whole cleanup. Why is it not considered as significant? Again, what makes Alt 3 a 4+ in measuring effectiveness? Won't it be the same technology as used now for Alt 1 (which doesn't meet the state's maximum discharge level for PCBs?) And, again, there is no evidence that Alt 3 is a proven technology. It needs more evidence than a paper explanation. Smacks of 'dry labbing' an experiment.

Response: The commenter is referred to the Alternatives Evaluation document for a discussion on the treatability study. The conceptual design of the 5,000 gpm system was developed using the treatability study and numerous discussions with Calgon (carbon

adsorption vendor). The commenter has misread the Table since Alternative 3 has the most reduction in toxicity. Also, please see response to Comment 14.

Comment 22: Page 30 – The ARARs discussion blithefully dismisses the need for an NPDES permit. What justifies this? Previous explanations that the ICS treatment facility was an 'emergency' response was too glib, but to continue this in the face of discharging a hazardous substance to waters is unconscionable. Why not use a technology that gets to the state's goal and a monitoring method to prove it under an NPDES permit? Because the EPA has the power to get around regulations, does not justify doing so. Greater confidence in the system would be to hold the EPA to its own regs.

Response: The commenter is referred to the CERCLA Section 121 for a discussion on why a permit is not required. EPA still must meet the substantive requirements of the NPDES program but not the administrative requirements. As discussed in the Proposed Plan, the proposed remedy will meet the substantive requirements of the State NPDES program. EPA is meeting the requirements of the law.

Comment 23: How can Indiana DEM accept a 0.3 ppb goal when there is a legal requirement for a much lower limit? Analytical technology does exist to get reliable data. Although it does require some innovations in sample handling, concentration, and instrumentation, it can be done, if there is a will to accomplish it. The TI waiver is a copout. Alt 3 claims significant improvements in managing the storm excesses, yet there is a clear implication that 1,000 plus gpm will still be released. Does this also imply that the current storage tanks will not be used?

Response: IDEM is responsible for developing the NPDES substantive requirements pursuant to their regulations. The 0.3 ppb level is based upon the level of quantitation described in the regulations. Please see Administrative Record document number 355, dated April 13, 2006 for a complete description of the States reasoning for using the 0.3 ppb PCB standard. The use of the TI waiver is not a copout. The 1,000 gpm system and the storage tanks will continue to be used but the selected remedy will treat bypass water from the two storage tanks through a new treatment system capable of handling 5,000 gpm.

Comment 24: Under 329 IAC 4.1 – 4 waste sludge generated by the plant must be appropriately managed. First, does the facility adhere to the 90 day limit on storage before disposal? Because no mass balance study on the removal effectiveness has been done, and exposure of wet sludge to air allows significant volatilization of PCBs, reliance on sludge analyses that permit disposal in a Vigo Co. landfill rather than a hazardous waste landfill are very questionable. If the EPA was scrupulous about protection of human health and ecological systems, there would actually be proof that these systems worked in isolating PCBs rather than wasting money on sham cleanups.

Response: The commenter wrongly assumes that the waste sludge falls under the 90-day storage requirements under Resource Conservation Recovery Act. The sludge is not RCRA characteristic waste which is determined by the toxicity characteristic leaching

potential (TCLP) test or a RCRA listed waste, therefore the 90 day storage requirements would not apply. The commenter makes a claim that significant volatilization of PCBs occurs without providing any evidence. EPA has completed air sampling both inside and outside the building along with worker safety monitoring and significant levels of PCBs were not released to the air. EPA and the State follow all the pertinent regulations for disposal and depending on the PCB concentration in the sludge determines the disposal site.

Comment 25: Page 31 – One of the problems with 326 IAC 2-4.1 is that it specifies tonnages. It doesn't take into account the varying toxicities of the substances. A serious loophole that you are using to promote 'the solution to pollution is dilution'. Unconscionable. PCBs are endocrine disruptors and there is no evidence of a lowest tolerance limit for the impacts.

Response: EPA requests from the State applicable or relevant and appropriate requirements (ARARs) which are the regulations which apply to the remediation. The State does not have any regulations that are applied as the commenter suggests. EPA has not used dilution as a remediation tool. A risk assessment was completed on the air sampling done both inside and outside the ICS water treatment plant and determined that PCB concentrations in the air were within acceptable levels.

Comment 26: The dismissal of the clear evidence of sediment contamination in Clear Cr. that calls for total removal to prevent ongoing damage as the sediment moves downstream is again unjustified and unconscionable. Every storm disturbs the contaminated material and moves it downstream.

Response: EPA disagrees with the commenter that sediment contamination is widespread in Clear Creek. The first 6 inches of sediment have a surface weighted average of less than 1 ppm PCBs.

Comment 27: Page 32 – Alt 3 is not clear about 'multimedia' approach. This needs further clarification and explanation. Simple passage through activated carbon suggests that the current system is somewhat elaborate and over-engineered. However the explanation that the solids need removal before carbon treatment would not be overwhelmed and inactivated still seems reasonable. What component in the 'new' technology of Alt 3 avoids the need to remove solids?

Response: Please see Response to Comment 12.

Comment 28: Since PCBs were first detected leaving the Lemon Lane Landfill the general public of Bloomington has been pleading to collect and treat all water leaving Lemon Lane. EPA's building of the Illinois Central Water Treatment facility has greatly reduced the amount of PCBs escaping into the environment.

COPA also agrees that the "hot spot" excavation at Lemon Lane also greatly reduce the total volume of PCBs at the site. Although EPA readily admits that it was virtually

impossible to do a 100% total excavation of PCBs due to the fact the PCBs have migrated below bedrock at the site, all subsequent testing by EPA and CBS strengthen the position that additional excavation and water treatment are necessary. Not only has further testing by CBS demonstrated that there are still heavily contaminated areas within Lemon Lane, like along and under the rail road tracks adjacent to the site, the testing has also proven that understanding the geology under and surrounding the site is limited at best. (See Attached Davies comments)

Response: EPA agrees with the commenter that additional water treatment is required. Regarding the additional excavation, CBS may continue to investigate the southeast portion of the site to determine if operation and maintenance costs at the water treatment plant over time can be reduced. The difficulty in doing further excavation of rock at depths of up to 70 feet lead EPA to focus on expanding the water treatment plant to address the continuing release of PCBs.

Comment 29: The continued release of PCBs from the site, the less than 100% effectiveness of the Illinois Central Sprint Water Treatment facility, the less than exact understanding of the karst geology beneath the site, and the fact that Lemon Lane contains significant amounts of PCbs, all support EPA selected remedy of additional excavation, increase capacity of treating all the water and continual monitoring of the site.

The water treatment facility has a proven track record of effectively treating 80% of water released from the site. The facility has a proven track record of operating effectively and all testing by EPA and CBS at Lemon Lane support the need for the treatment facility to be expanded. Even the total cost of the proposed remedy is low compared to all the expense incurred by all parties in trying to understand the site better.

CBS argues there is no risk and EPA argues there is sufficient risk to address. Both EPA and CBS will have supporting documentation to support their side of the debate but even the most optimistic conclusion related to risk would acknowledge the fact that PCBs are not a good thing to continually be released into an environment where people fish, play, or live. The proposed remedy addresses the environmental risks with a proven method of treatment at a reasonable cost.

The cost to the Bloomington community debating the risk of continued releases for over 20 years is beyond calculation. The delay by CBS in wanting to easily eliminate the risk from future releases is mind boggling to say the least. The patience of the government parties over the last six years in continual testing by CBS, and the continual delay of addressing the releases is also difficult to understand.

So now after 20 years of debate on how to deal with Lemon Lane, after 20 additional years of releases from the site, after millions of dollars have been spent by all parties in better understanding the site how could this proposed remedy not be completed.

It would be false to assume COPA or the majority of the Bloomington community would not favor total excavation of the site if it were physically possible or financially acceptable to all parties, especially CBS which has a proven record of spending money to block doing anything when the same amount of money would satisfy most of the general public and all the governmental parties.

Years and yeas of debate and testing, monitoring, drilling, excavating at Lemon Lane has proven one thing for sure, there is still significant PCBs at the site and escaping from the site and the public should not accept this to continue any longer than it already has.

The proposed EPA selected remedial actions should be implemented as soon as possible. And continual monitoring at the site and at the treatment facility should continue until all water leaving the site is tested to contain below acceptable limits of PCBs.

Response: EPA agrees and is working diligently toward a resolution of all these issues.

Comment 30: Page 4: Site Characteristics - Borings and wells have a very low probability of intersecting conduits and there is no mention of this. Also, using borings and wells implicitly assumes that a site is a porous medium. This clearly not the case in carbonates and/or karst, so the data collected from these devices must be treated skeptically until tested using methods that do not make porous medium assumptions.

Response: EPA agrees with these statements. As the commenter is aware, many of the referenced borings and wells were installed to evaluate recovery of PCBs directly at the landfill, a proposition the EPA knows the commenter has been skeptical of since 2000.

Comment 31: Page 5. Site Geology Worthington et al., (2001) show that it is likely that > 99% of the flow is in conduits in karst terrains in Paleozoic rocks. Even in any type of carbonate probably > 94% of the flow is in conduits. Rather than say flow is in karst features the word conduit should be used. If a spring exists then there must be a conduit that the water is discharging from conduits are continuous from sinkholes (swallow holes or swallets) and springs. The term "solution cavities" is used and implies an isolated opening not connected to a conduit. So, if there is solution (or dissolution) it implies that the aquifer is exposed to atmospheric water - which would have initial very high aggressiveness. The question would be how would this water enter a piece of solid rock and initiate the dissolution process if "cavities" formed? The cavity concept possibly comes from the fact that sinuous conduits are sometimes intersected when drilling wells. The term 'solution cavity" is misleading and should not be used.

Response: EPA is aware of the cited literature, and appreciates the commenter's studious views. The referenced section of the document also describes the groundwater flow as through a "branchwork of solution conduits", perhaps a more palatable description for the commenter.

Comment 32: Page 5. Site Hydrogeology - The word majority in terms of low flow and storm water drainage would be much more useful if quantitative tracing had been done

and the actual fraction estimated. The difference between the low and high discharge is > 150 times but still suggests that most of the flow from the basin discharges through ICG Spring.

Response: EPA agrees with the commenter.

Comment 33: Figure 2.The location of Rinker Spring appears to be inaccurate.

Response: Acknowledged. A correct location is shown in Figure 3. For the record, the spring is located approximately 140 feet of the centerline of the ICS water treatment plant entrance road

Comment 34: Page 7. Connection between ICS and Quarry springs area. It appears from the text that this was simply a visual tracer test. I doubt this to be the case - so describe what was done in more detail. It would have been much more useful if a quantitative tracer test had been done to see if there were significant losses to underflow springs. The interpretation of the tracing to Quarry A and Quarry B springs from the swallets needs to be rewritten. It is obvious that there is a lack of knowledge and understanding about the vertical hierarchical nature of flow in carbonates. There are also some logic problems with what is stated about the hydraulic connections in the proposed plan. For example - it cannot be stated that there is no direct connection between ICS and the Quarry B spring because the flows that affect both springs are related by overflow components and the conditions that would allow flow from Lemon Lane Landfill to both springs were not observed and not that they cannot happen. The fact that the Quarry B spring has a reported higher baseflow and comparable PCB data to Quarry A spring suggests that they are related to the same pathways. One is probably discharging more of an overflow component from the baseflow pathway. Another problem is that accurate data on the elevations of the lips of these springs is unknown, but it is clear that they should not be and are not at the same elevations. The fact that Rinker Spring discharges more PCB load is explained by the fact that it is another overflow and the fact that PCB concentrations are often correlated to TSS concentrations and the TSS concentrations should be higher in overflow components because that water may be moving faster especially in storms. Another possibility could be a problem in the tracing data. Rhodamine types dyes were used and they could easily be subject to deaminoalkylation (Käss,1998). This means that one tracer dye can easily look like another. The transformed rhodamine signal may not have been recognized at monitoring locations. This would have been particularly difficult if not almost impossible if the tracing technique used involved charcoal and elutant methods.

Response: The referenced test was a simple visual test conducted by CBS on April 1, 1988. The test was observed by representatives of CBS and EPA. A total of 25 grams of rhodamine WT was injected at Illinois Central Spring at 10:10, and was followed downstream by visual observation. After flowing through a choked railroad culvert, the dye plume front entered the primary ICS swallowhole area at 10:58. The dye was detected at Quarry A at 11:27, and at the Quarry B culvert at 12:00. No dye was observed at Quarry C.

EPA offers additional commentary with respect to the referenced test on Page 7.

"This dye trace established that ICS was not connected directly to Quarry B Spring."

The referenced dye trace was conducted in October 2001. At that time EPA had concerns that PCBs detected at Quarry B were related to direct underflow discharge of groundwater from the Lemon Lane Landfill to the spring. Dyes injected at the landfill had previously been detected at both ICS and Quarry. The ICS discharge entered a swallowhole a short distance downstream from its resurgence, and this swallowhole had also been dye traced to Quarry B. This, the source of the PCBs at Quarry B was unclear. PCBs were always present at Quarry B, even after the ICS Water Treatment Plant began operation and discharge of clean water to the swallowhole. EPA recognized at least two possible explanations for the continued presence of PCBs at Quarry: 1) there is a direct conduit connection between Lemon Lane Landfill and Quarry B existed, or 2) PCBs are being leached from contaminated sediments in the conduit system between the ICS swallowhole and Quarry. The October 2001 dye trace was designed to evaluate whether or not a direct conduit connection existed.

During the October 2001 dye trace the ICS spring water discharge was pumped into the storage tanks and not allowed to enter the primary ICS swallowhole. An additional pump was installed in the surface channel above the swallowholes so the no water entered the ICS swallowholes during the test. Fluorescein dye injected into a shallow monitoring well in the southeast corner of the landfill was appeared at ICS beginning 21 hours after the dye injection. Sampling was conducted at Quarry B for 24 hours after the first dye arrival at ICS. No fluorescein dye was observed above the background level at Quarry B, despite that fact that a massive fluorescein breakthrough curve peaking at over 300 ug/L occurred at ICS. EPA concluded from this test that there was no underflow connection between Lemon Lane Landfill and Quarry B Spring. This is the basis for EPA's comment that ICS is not directly connected to Quarry B Spring.

ICS and Quarry B are both perennial springs, and are both regarded as underflow springs with respect to the cited *vertical hierarchical* nature of flow in karst conduit systems. Quarry B spring appears to receive most of its flow from the ICS swallowholes. Additionally, the spring appears to have a small groundwater drainage basin to the northwest that is independent of ICS groundwater basin.

Comment 35: Page 10. (karst conduit investigation) (The geophysical work done in attempting to identify the location of conduits.) There are several methods that can be used and most are claimed to have marvelous merits. However, there seems to be a lack of understanding that the resolution needed must be at some level and even when this is optimal there may still be noise or uncertainty. It is clear to me that the best initial method in any karst terrain would the Natural Potential method using a base station and a roving electrode. This method allows the resolution of data to be adjusted "on the fly." Following collection of such data other techniques can be used. In my experience the collection of NP or other geophysical data is typically not followed up by enough

drilling. Often only a few test holes are drilled and if these do not result in some obvious feature being seen the NP method is deemed to not work rather than the fact that the drilled hole may have missed the feature possibly by a few centimeters without that being known. What is also problematic is that the geophysicist who did the work is often not consulted sufficiently when the first few holes are drilled to discuss what was observed and where maybe additional holes can be tried. There is a very low probability of drilling to intersect a conduit even if its general location is known. Unfortunately even if conduits can be drilled into the nature of the subsurface often with many interconnected bedding planes down the bore hole above the conduit make sampling for tracers or contaminants subject to complex hydraulic connections that may not result in data that are easy to interpret (Smart, 1999). In addition when tracers are recovered in such conduit wells recovery curves are multimodal and it is very challenging to try and estimate what percentage of the tracer was recovered there. There are also effects that are a result of pumping the well in order to sample the water for the tracers. The same complications can apply to contaminants (Smart, 1999). There are a few examples of collection of geophysical (NP) data followed by drilling and constructing wells with construction of a potentiometric map that shows troughs (and by association conduits) where tracers and contaminants are present.

Response: EPA notes that there has generally been extensive drilling based on the geophysical investigations conducted at Lemon Lane Landfill. Interpretation of conduit locations from potentiometric data has been problematic due to the low hydraulic gradient and the fact that wells used to construct the maps are often completed across multiple dissolution zones. Potentiometric data have consistently shown a low along the east side of the landfill, and some dye tracer tests have indicated that dye moves in that direction. However, as the commenter notes, there is a low probability of intersecting a conduit with a well, and extensive testing of wells in this area has not demonstrated that they are effective in recovering significant quantities of PCBs.

Comment 36: Page 21. Explanation for Figure 10. Somebody please explain "SURFACE WATER SPRING" A spring is the discharge of ground water - which maybe connected to surface water, but is not surface water. So the term "surface water spring" is an oxymoron. It should just be called - spring. Unless there is some chicanery with regards to what type of water the spring is discharging!

Response: EPA recognizes that *karst spring* is perhaps a more appropriate term for the features noted in Figure 10 for a technical audience. EPA developed the Proposed Plan for review by the entire community and *surface water spring* seemed a more appropriate feature description for a non-technical audience. There is no chicanery.

Comment 37: One commenter states that EPA should refrain from describing the Lemon Lane Landfill as a sanitary landfill but was a common dump that became a toxic and hazardous waste dump when Westinghouse dumped thousands of capacitors filled with PCBs at the site from 1958 to 1964.

Response: The Lemon Lane Landfill was operated as a sanitary landfill. Historical records show large amounts of municipal trash were placed in the landfill. The commenter is correct that the landfill became a hazardous waste site when Westinghouse disposed of PCB oil filled capacitors. Other types of hazardous wastes were also disposed of at Lemon Lane. EPA continues to make it clear to the public that hazardous materials have been disposed of in the landfill and that it is on the National Priorities List.

Comment 38: One commenter states that EPA lists the State, City of Bloomington and Monroe County as the governmental parties but continues to hold possible liability over the City for Lemon Lane, therefore forcing the city to agree with everything the EPA wants. The commenter continues that the public has always wanted complete removal but now some city officials are supporting water treatment.

Response: EPA has not held the City of Bloomington hostage as the commenter infers. The City is a co-plaintiff of the United States and the other government parties, and as such, the City been an active player in the discussions to select a remedy that is fully protective of human health and the environment. The City has been a strong supporter of water treatment at the Site because this is the best approach for abating risks posed by PCBs at the Site

Comment 39: One commenter states that after 8 years of global negotiations, EPA and CBS have reached an impasse on EPA's operable units 2 and 3 and water treatment as a final remedy for the PCB superfund NPL list sites.

Response: The commenter is correct that EPA and the other governmental parties have not reached an agreement with CBS on a global settlement but the parties continue to work on resolving our differences. If the parties fail to each an agreement, then a number of enforcement options are available to EPA.

Comment 40: The commenter argues that the proposed ROD Amendment does not comply with the Consent Decree because the Consent Decree called for complete excavation of the Site. Also, the commenter complains that the proposed ROD Amendment does not comply with CERCLA because (1) EPA has considered only cost-effectiveness in selecting the preferred remedial alternative and (2) EPA did not conduct a Remedial Investigation/Feasibility Study.

Response: EPA has put forth remedies that are protective of public health and the environment and has not used only cost effectiveness as the determining factor in decision making. Millions of dollars have been spent addressing the PCB problem in Bloomington. EPA has removed the direct contact threat at the landfill and is addressing risks associated with water and sediment by implementing Alternative 3 and completing a soil/sediment cleanup at the ICS emergence, swallowhole and quarry springs area.

EPA has completed an RI/FS equivalent at the Lemon Lane Landfill. Please see the Lemon Lane Administrative Record. The nature and extent of contamination has been

determined. Further, EPA completed human health and ecological risk assessments and evaluated alternatives to remediate the water and sediment.

Regarding complete excavation, the incinerator was linked in the Consent Decree to complete excavation. EPA reevaluated the site remedy pursuant to the Operating Principles.

Comment 41: One commenter states that EPA tells the public that no alternatives would be considered to hot spot cleanup. In addition, EPA has been arbitrary and capricious by not completing an RI/FS, doing a hot spot excavation as a cleanup and doing water and sediment removal which eliminated the public from the decision making process as if there were no alternatives. The commenter continues with the public feels betrayed by EPA since complete removal was at the heart and soul of the Consent Decree.

Response: The EPA is disappointed that the commenter feels betrayed by the actions of EPA. The Consent Decree did call for complete excavation but also included the construction of an incinerator. EPA has put forth alternative remedies through the EPA's ROD Amendment process and has not been arbitrary and capricious. EPA and CBS have completed an RI/FS equivalent and the Administrative Record clearly shows the large amount of documentation justifying the site remedies. The nature and extent of contamination was determined, both human health and ecological risk assessments were completed and alternatives were evaluated through the use of EPA's nine criteria. The large number of community meetings and the public meeting on the Proposed Plans has not eliminated the public from providing input.

Comment 42: One commenter states that EPA in constructing the 1,000 gpm water treatment plant did not get the plant running prior to the hot spot removal due to leaking storage tanks and did not treat stormwater until August 1, 2001. The commenter continues stating that it is confusing as to who is running and paying for the operation of the ICS plant and why the plant qualified to become a final remedial action after its first three years of operation without a report on it as an act of public accountability.

Response: The commenter is incorrect in stating that the water treatment plant was not operating by the start of the source control remedy. The plant became operational on May 1, 2000. The commenter is correct that the two storage tanks were not operational until after the completion of the source control due to the poor construction of the tanks. The tanks were replaced and were operational by August 1, 2001. Currently, four parties are funding the operation of the ICS water treatment plant and include EPA, State of Indiana, City of Bloomington and CBS. The State is managing the contract but the City of Bloomington is administrating the contract with Environmental Field Services who are running the facility. For historical purposes, the first year of operation was funded by EPA and the next three years were funded by the State of Indiana. If a global settlement is reached with CBS, we would expect CBS to fund the operation and maintenance of the facility. The plant was constructed under EPA's removal authority and a public comment period was not required by the statute. EPA has been open with the public on its operations and will continue to provide the public with monthly progress reports

discussing the operation of the system. The EPA is unsure what the commenter is referring to as to a report on it as an act of public accountability. The plant will be required to meet NPDES substantive requirements and an operation and the maintenance plan will be modified to take into consideration the plant expansion.

Comment 43: One commenter states that water treatment will be the final remedial action for cleanup of the Lemon Lane Landfill by stacking the deck with four alternatives, all concerned with some form of water treatment. In addition, a public hearing has not been held or a report on the performance of the water treatment plant.

Response: EPA has not stacked the deck with the four alternatives. EPA is of the opinion that water treatment is necessary and EPA evaluated a number of different alternatives. EPA did not consider additional source control measures at the landfill due to the large amount of PCBs located up to 70 feet below the top of bedrock over a large area. The difficultly also in trying to pump groundwater at the landfill and the inability to find large pools of PCB oil for pumping leads EPA to focus its efforts on water treatment at ICS. The performance of the water treatment plant is demonstrated in the monthly progress reports submitted by the contractor operating the plant.

Comment 44: One Commenter states that the principal threat wastes were not addressed in operable unit 1 and the definition of principal threat characterizes Monroe County/City of Bloomington and that PCBs in landfills over karst cannot be reliable contained. The commenter would like EPA to consider again complete removal of the PCBs as their scientific consultants recommended 20 years ago.

Response: Principal threat wastes were addressed in the source control remediation. Over 80,000 tons of PCB contaminated material was excavated and the area was verified to a 50 ppm PCB standard on average. EPA is addressing the continuing release of PCBs through water treatment. EPA is not considering complete removal at this time.

Comment 45: One commenter states that Superfund requires long-term remedial actions for NPL sites and PCBs at Lemon Lane should be cleaned up at the source since karst is always evolving and changing.

Response: Long-term monitoring programs will be put in place to address any changes which could occur.

Comment 46: One commenter states that the ICS water treatment plant is an open to the air remedial action. The commenter continues that EPA has ignored the lessons they should have learned during the Lemon Lane excavation and that PCBs are volatile and EPA continues to ignore that fact. In addition, the commenter states the design of the treatment plant is basically deficient with no consideration of the volatility of PCBs under storm conditions.

Response: The commenter has ignored the large amount of air sampling data that was gathered at the ICS water treatment plant. EPA did sample for PCBs in the air at the ICS

plant during a storm event. A risk assessment was completed and showed that the levels were not unacceptable and within the EPA's risk range. The commenter is referred to the Lemon Lane Administrative Record.

Comment 47: One commenter states that EPA continues to TI waiver of the NPDES requirements not be granted for water not treated within the 1,000 gpm system. The commenter continues to state that treating storm events was the principal purpose of the water treatment plant.

Response: The EPA is granting a TI waiver pursuant to Section 121 (d)(4) of CERCLA. As described in the Proposed Plan, EPA will be treating nearly 100% of the water from ICS, (including storm events) but due to the PCB oil being located at depth within the bedrock and the frequent circumstances under which these PCBs are released (namely large infrequent storm events), NPDES discharge criteria will not be given for the storage tank overflow treatment system.

Comment 48: EPA's Decision to Build the ICS Treatment Facility was Not Justified By Any Risk to Human Health or Ecological Receptors

At the time of EPA's 1998 decision to build the ICS Treatment Facility, the most comprehensive analysis of health risks presented by Illinois Central Spring and other springs in the area was contained in the 1996 Health Assessment by the Agency for Toxic Substances and Disease Registry ("ATSDR"). ATSDR considered the potential routes of exposure from the ICS in great detail and concluded "neither children nor adults are likely to engage in activities in the . . . springs and streams that would lead to significant exposures to site-related contaminants."[1] ATSDR also concluded that the PCB levels in fish in Clear Creek were not a health concern because the stream was too small to support fishing for food, and that most of the species close to Lemon Lane Landfill are not considered a human food source.[2]

The ATSDR findings were corroborated by the statements of long time Monroe County fisherman Dan Combs, who was quoted in a 1997 newspaper article, saying that "[n]ot since I was a kid have I seen anyone fishing for food in [Clear Creek]." Mr. Combs further explained: "It just got such a horrid reputation. And what gave it the horrid reputation was the Winston-Thomas raw sewage instead of the PCBs."

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[1] "Public Health Assessment for Bloomington PCB Sites, Bloomington, Monroe County, Indiana and Spencer, Owen County, Indiana" (3 Volumes), prepared by the Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, Department of Health and Human Services, Public Health Service, Atlanta, Georgia, November 15, 1996 (hereinafter "ATSDR Health Assessment"), Vol. I at 4.

[2] ATSDR Health Assessment at Vol. I., p. 5. EPA did not include the ATSDR Health Assessment in the administrative record, even though it is required to be included by the NCP. 40 C.F.R. § 300.810(a)(1).

S. Hinnefeld, "Health Advisories Cover Many Area Fishing Spots," Bloomington Herald-Times (Aug. 10, 1997). Although the Winston-Thomas plant has been closed, the Dilman Road sewage plant is still operating and discharging into the same area.

Despite this evidence, EPA premised its decision to build the ICS Treatment Facility on the presumed risk to hypothetical fishermen eating a substantial amount of fish on a constant basis from the portion of Clear Creek potentially affected by PCBs from Illinois Central Spring. CBS's letter to EPA of November 10, 1998 (attached as Exhibit A and incorporated by reference) explained in considerable detail why these assumptions were not valid, and those comments are incorporated by reference here. Nonetheless, eight years later, EPA is still using unfounded assumptions about food consumption by hypothetical fishermen to justify the continued operation and expansion of the ICS Treatment Facility. As discussed in greater detail below, EPA's assumptions are totally unrealistic and unsupported by evidence.

Response: CBS comments on both the human health and ecological receptors are addressed later in this Responsiveness Summary. ATSDR's evaluation was completed prior to a large amount of data being gathered and is more of a qualitative analysis and not a quantitative risk assessment. The ATSDR report was prior to EPA doing both a human health and ecological risk assessments. EPA basis its decisions on its risk assessment process and has determined the unacceptable risk is present for both human health and the environment.

Comment 49: The ICS Treatment Facility as Constructed Has Been Largely Ineffective and Overly Expensive

EPA originally projected in its 1998 Action Memorandum that the construction of the ICS Treatment Facility would cost $1.8 million. The actual construction cost exceeded $6.2 million. EPA projected that the ICS Treatment Facility would be operational by the summer of 1999, but EPA did not even begin partial operation until the spring of 2000. The storage tanks were not operational until the summer of 2001.

Even when the ICS Treatment Facility was put in operation, EPA's choice of location made the plant ineffective in capturing PCBs from all springs. More importantly, EPA's poor choice of location resulted in *the discharge of treated water to a contaminated area. Thus, water that is being treated by the ICS Treatment Facility is becoming recontaminated immediately after treatment.* Although CBS advised EPA of concerns about its choice of location, EPA ignored these comments until after the plant was built and put in operation.

Only recently has EPA begun to try to account for these flaws. The "Common Elements" of the four Alternatives discussed in the Proposed Plan includes a modification (Modification B) to relocate the discharge of treated water from the ICS Treatment Facility away from a swallowhole where the water is being recontaminated with PCBs.

Although there has been some reduction in PCB levels in fish in areas closest to the ICS Treatment Facility, PCB levels in fish further down in the main stem of Clear Creek have not been reduced to any significant degree. This evidence suggests that the ICS Treatment Facility has had little impact on PCB levels in fish beyond its immediate vicinity. Although CBS believes that the PCB levels in these fish do not represent a true risk to either humans or ecological receptors, it is clear that the ICS Treatment Facility has been largely ineffective in lowering these levels as EPA had intended in 1998.

Since EPA originally decided to build the ICS Treatment Facility, the cost of the plant has ballooned enormously, going from the estimate of $1.8 million to a true construction cost of over $6 million. EPA has now estimated that continued operation of the ICS Treatment Facility (with two modifications) would cost over $6.8 million on a present value basis. If the additional system described in EPA's preferred option, Alternative 3, is built as well, that net present value cost would mushroom to over $9.1 million. EPA is proposing to throw good money after bad: making extensive capital improvements to an overly expensive, largely ineffective and ultimately unnecessary facility.

Response: The goal of the ICS water treatment plant was to begin operation when CBS began to implement the source control operable unit. EPA did meet those goals when the plant became operational in May 2000. EPA is of the opinion that the plant is in the correct location and if it was placed at the location CBS Corporation requested, uncontaminated water, particularly from Quarry B spring, would have been needlessly treated. By implementing Modification A and B as described in the Alternatives Evaluation, EPA is minimizing the amount of water to be retreated. PCB reductions have occurred in fish and EPA is of the opinion that by expanding the water treatment plant as described in the ROD Amendment and implementing the sediment/soil cleanup, PCB levels in fish should decrease over time. It appears that CBS infers from its comment that additional sources of PCBs are releasing to Clear Creek but CBS has not investigated or shown that other sources exist. Finally, regarding the cost of the ICS water treatment plant, CBS did have the opportunity to construct the water treatment plant, but refused.

Comment 50: EPA's proposed alternatives are all based on the continued operation of the ICS Treatment Facility. As CBS noted at the time when EPA decided to construct the system in 1998, that decision was ill-conceived and inconsistent with CERCLA and the NCP. EPA's original decision to build the ICS Treatment Facility violated the procedural requirements of CERCLA and the NCP, and fundamental principles of administrative law. For example, EPA told the U.S. District Court for the Southern District of Indiana on August 21, 1998 that it had decided to build the ICS Treatment Facility. At the time, EPA had not issued a Record of Decision or Action Memorandum explaining its decision. EPA only issued an Action Memorandum on September 30, 1998 – over a month after it made the decision. The administrative record issued in support of that Action Memorandum included several documents which were generated after EPA had made its announcement on August 21, 1998. Therefore, it is clear that the EPA Action Memorandum is not the true decision document, but a post hoc rationalization of a decision already made outside of the administrative processes required by CERCLA and the NCP. Under traditional principles of administrative law, an agency may not use post

hoc rationalizations to support a previously made decision. *Federal Power Comm. v. Texaco*, 417 U.S. 380, 397 (1974); *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168-69 (1962); *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947).

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the Commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, the Commenter's comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses the Commenter's arguments regarding alleged procedural problems below.

First, the Commenter claims that EPA did not comply with the procedural requirements of CERCLA and the NCP, because "EPA told the U.S. District Court for the Southern District of Indiana on August 21, 1998 that it had decided to build the ICS Treatment Facility" and, because "EPA only issued an Action Memorandum on September 30, 1998" one month after expressing its intention to the Court. In support of its conclusion that the "Action Memorandum is not the true decision document, but a post hoc rationalization of a decision already made outside of the administrative processes" the commenter cites the fact that the administrative record issued in support of that Action Memorandum included several documents which were generated after EPA had made its announcement on August 21, 1998." The comment demonstrates a misunderstanding of EPA's formal decision making process by duly delegated officials versus the roles EPA and U.S. Department of Justice staff. The fact that EPA and U.S. DOJ may have made representations to the Court regarding an intention to proceed with a removal action does not constitute an Agency decision, because these individuals do not have the authority to commit the needed funding or to make the decisions memorialized in the Action Memorandum. Here, EPA's Superfund Division Director had the delegated authority to select the removal action and to sign the action memorandum committing federal money to do the work. Thus, EPA did not make its decision regarding construction if the Illinois Central Spring water treatment plant, and did not commit funding to pay for the water treatment plant, until the action memorandum was approved and signed by the Superfund Division Director on September 30, 1998. The fact that documents were generated and placed into the Illinois Central Spring administrative record (the administrative record contains the documents supporting the decision made in the Action Memorandum) before the Action Memorandum was signed (but after the August 21, 1998 meeting with the Court) is fully consistent with EPA's CERCLA decision making process and consistent with general principles of administrative law. Indeed, the facts recited by the Commenter demonstrate that the documents were placed into the record before the deciding official, the Superfund Division Director signed the Action memorandum.

Second, the cases cited by the Commenter stand for the proposition that arguments made in court by counsel to try to explain or justify a prior, formal, agency decision may be post hoc rationalizations that do not serve as support for those prior agency decisions. As

explained in a seminal case cite by the Commenter "a reviewing court, in dealing with a determination or judgment which an administrative agency alone is authorized to make, must judge the propriety of such action solely by the grounds invoked by the agency. If those grounds are inadequate or improper, the court is powerless to affirm the administrative action by substituting what it considers to be a more adequate or proper basis." *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947). Put another way, an agency decision must be able to stand on its own merits, and later explanations, or attempts to supply new support, cannot be considered in support of a previous agency decision. This is not the fact pattern presented here. Instead, during the August 21, 1998 meeting with the Court, EPA and U.S. DOJ staff may have expressed an intention of how they expected matters to proceed, but the actual decision to fund and construct the Illinois Central Spring water treatment plant was not taken until the Action Memorandum was signed by the decision maker with duly delegated authority. Here, the Action Memorandum is not a no post hoc rationalization of a prior decision. Instead, the Action Memorandum is the decision, made by the individual with the duly delegated authority to take that decision.

Comment 51: EPA never requested public comments on its decision to build the ICS Treatment Facility as a removal action. Under 40 C.F.R. §§ 300.415(n), 300.820, EPA is required, prior to undertaking a removal action, to provide the public – including any known potentially responsible parties (PRPs) – with at least 30 days to submit public comments on the proposed decision. Because EPA decided to select the system as a time-critical removal action, no formal comment period was provided. Nonetheless, CBS made a record of the reasons for its opposition to EPA's decision on November 10, 1998. Under section 113(h) of CERCLA, 42 U.S.C. § 9613(h), however, CBS is precluded from challenging the government's selection of this response action in Court until the government sues CBS to recover its costs, which it has not yet done.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, the comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

The Commenter is correct that EPA did not conduct a formal public comment period in connection with its original time-critical removal Action Memorandum. This fact does not establish a procedural defect, however, because under the National Contingency Plan EPA is not required to hold a public comment period before undertaking a time critical removal action and initiating on-site removal activity. Here, based on the facts contained in the administrative record, and based on the determinations contained in the September 30, 1998, Action Memorandum, EPA found it necessary to proceed with the Illinois Central Spring cleanup as a time-critical removal action.

Comment 52: The NCP requires EPA to perform an Engineering Evaluation/Cost Analysis ("EE/CA"), 40 C.F.R. § 300.415(a)(4)(i), if there is a planning period of at least six months, and to submit the EE/CA for public comment. 40 C.F.R. §§ 300.415(n), 300.820. EPA did not prepare an EE/CA.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, the comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

The Commenter is correct that where EPA undertakes a non-time critical removal action, EPA is required to prepare an EE/CA and to conduct public comment on the recommendations contained in the EE/CA. Here, however, EPA did not conduct a non-time critical removal and, therefore, no EE/CA was prepared. Instead, EPA followed its time-critical removal process, which does not require preparation of an EE/CA.

Comment 53: Although EPA attempted to justify its decision not to solicit public comments on the ground that this was a "time-critical" removal action, this justification had no merit because EPA had known about the PCBs in Illinois Central Spring since at least 1985, had known about PCBs in the fish in Clear Creek since the 1980s, and was planning to construct the system over a period of more than six months (actual construction took almost two years).

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses the arguments regarding alleged procedural problems below.

EPA disagrees with the Commenter's conclusion that EPA's decision to proceed with a time-critical removal action was wrong, "because EPA had known about the PCBs in Illinois Central Spring since at least 1985, had known about PCBs in the fish in Clear Creek since the 1980s." The basis for concluding that a time critical removal was necessary are included in the September 30, 1998, time-critical removal Action Memorandum. The fact that EPA may have been aware of some issues regarding the Site for a period of time prior to undertaking the removal action does not take away from the determination that action at the Site became needed on a time-critical basis. Using the Commenter's logic, it would be appropriate to continue to ignore problems the longer those problems are known and the more is understood about those problems. Here, based

on the data developed over time, including storm event data collected starting in 1995, a clearer understanding developed of the nature of the threats posed by the Site, and the time-critical need for action became evident.

Although it may have taken more then six months to complete the design and construction of the removal action after signing the time critical removal Action Memorandum does not take away from the time-critical need to initiate and construct the treatment plant. Instead, this fact is consistent with EPA often conducting time critical removals over a long period of time, depending on the nature of the threats and type of responses required to address the threats.

Comment 54: EPA had no reason to consider its decision to build the ICS Treatment Facility a "removal" action at all. Rather, the construction of this facility was a "stealth" remedial action selected by EPA without regard to the statutory and NCP requirements. CERCLA requires that long term response actions be taken as remedial, not removal measures.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the Commenter of events leading up to EPA's decision toissue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

EPA disagrees with this comment. The reasons why a time critical removal action was needed at the Illinois Central Spring site were spelled out in the September 30, 1998, Action Memorandum. Further, there was nothing "stealthy" about this removal action, and it was not a "stealth" remedial action. Instead, EPA's time critical removal action constituted a response needed to address immediate threats to human health and the environment posed by conditions at the site as determined in the Action Memorandum. The Illinois Central Spring removal action administrative record establishes that CBS was apprised of EPA intentions regarding the Site. Indeed, the September 30, 1998, Action Memo at page 3 even references that "[d]uring a status conference on August 14, 1998, with Magistrate Foster, the parties informed the court that they were deadlocked as to the need for, and the implementation of, an interim water treatment plant at ICS to be put in place pending evaluations concerning a possible permanent water treatment system."

The fact that EPA is now considering making its removal action response measures a part of the final remedial action does not make the original time-critical removal a "stealth" remedial action response. Both CERCLA and the NCP contemplate EPA undertaking removal response actions before undertaking remedial action response activities. Indeed, CERCLA § 104(a)(2) provides that any removal action should, to the extent practicable, contribute to the efficiency of long term remedial action. This is echoed in the NCP at §

300.415(d). The facts presented here are fully consistent with these goals - the Illinois Central Spring water treatment plant, which was built and operated as a time-critical removal action is now considered a central component of the final remedial action response for the Lemon Lane Landfill.

Comment 55: In its 1998 Action Memorandum, EPA obligated over $2 million to be spent over a period of more than one year. In doing so, EPA violated section 104(c)(1) of CERCLA, 42 U.S.C. § 9604(c)(1), which prohibits EPA from obligating more than $2 million or undertaking a removal action for more than one year unless the Agency makes certain specific findings. The Agency did not make the necessary findings, nor could it do so based on the factual record. The statute allows EPA to exceed the $2 million and one year limits if: (1) "response actions are immediately required to prevent, limit or mitigate an emergency," (2) "there is an immediate risk to human health, welfare or the environment," and (3) "such assistance would not otherwise be provided on a timely basis." 42 U.S.C. § 9604(c)(1); *see also* the NCP at 40 C.F.R § 300.415(b)(5).

An additional exception to these limits exists where the removal action is consistent with a selected remedial action. But the Action Memorandum indicates that EPA had not determined to select any remedial action for the ICS at the time.

The EPA Action Memorandum did not support a finding that any of these factors was satisfied. There was no emergency or immediate risk to human health or the environment. Rather, the data at the time did not show any significant exposure. CBS's Letter to EPA of November 10, 1998 (attached as Exhibit A and incorporated by reference) explained that EPA's analysis of risk was erroneous and that there was no emergency which required action. Moreover, CBS's analysis explained that EPA's proposed construction of an ICS Treatment Facility – which required months to years of construction activities – would not be timely.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the Commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant, as well as continued funding of construction and operation of the treatment plant.. Thus, comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

EPA disagrees with these comments. First, EPA's June 22, 1999, "Request for a Ceiling Increase and a CERCLA Removal Action and Consistency Exemption" (along with its March 16, 2000 "addendum" fully complied with providing the facts, explaining why, and determining that a removal action and consistency exemption to the $2 million and 12 month statutory limits were appropriate. The same holds true for the April 5, 2001, "Request for a Ceiling Increase and a CERCLA Removal Action and Consistency Exemptions."

EPA also disagrees with the Commenter's conclusion that although an additional exception to these limits exists where the removal action is consistent with a selected remedial action, EPA's September 30, 1998, Action Memorandum indicates that EPA had not determined to select any remedial action for the ICS. At page 9 of the Action Memorandum, EPA expressly stated that "[c]onsistent with Section 104(b) of CERCLA, 42 U.S.C. § 9604(b), and 40 C.F.R. § 300.415(g), the interim removal activities contemplated in this Action Memorandum shall, to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release." EPA's statement in this regard should put the Commenter's complaint to rest.

Comment 56: EPA has Failed to Consider a "No Further Action" Alternative. The Proposed Plan violates the NCP because EPA has failed to consider a "No Further Action" alternative. The least expensive option, Alternative 1, calls for the continued operation of the ICS Treatment Facility on an indefinite basis at an annual cost of $386,000. Moreover, this option would also required that two modifications to the existing plant for an additional capital cost of $968,000. EPA does not consider the option of shutting down the plant. Also, with respect to the sediment operable unit, EPA only considers the option of removal. It does not consider any alternatives, such as no action. In 40 C.F.R § 300.430(e)(6), the NCP requires that in deciding on remedy, EPA must consider a no action or no further action alternative. EPA has plainly not done that in the Proposed Plan.

Response: Operable Unit 1 (treatment of contaminated groundwater releases to surface water)

The commenter misreads the requirements of the NCP in arguing that EPA had a legal duty to consider the alternative of shutting down the treatment plant. While 40 C.F.R. § 300.430(e)(6) states that EPA shall develop a "no action" alternative, it further states that the "no action" alternative may be "no further action if some removal or remedial action has already occurred at the site." Here, EPA has already constructed a water treatment plant at the site. Thus, contrary to the commenter's suggestion, EPA was under no duty under the NCP to consider the alternative of shutting down the treatment plant.

In any event, EPA did evaluate shutting down the plant, along with many other alternatives, in the document titled "Alternative Evaluation: Screening of Remedial Alternatives" issued in June of 2006 ("AE Report"). In that document, EPA screened out the alternative of decommissioning the water treatment plant, finding that the alternative was not protective of human health and the environment and did not meet ARARs. (AE Report, Appendix D)

Finally, CBS is incorrect that EPA did not consider the alternative of maintaining the treatment plant in its current configuration without implementing modifications A & B. In the AE Report issued in June of 2006, EPA specifically considered the "no further action" alternative where "no changes would be made to the existing physical facility." (AE Report at Section 4.5). EPA also developed a cost analysis for this alternative where

EPA determined the net present value of this alternative to be $5.3 million based upon $0 capital costs and $348,000 in annual O&M costs. (AE Report, Appendix C, Table 1-1 to 1-3). EPA nevertheless determined that all remedial actions selected for further review – including the "no further action" alternative -- should be combined with Modifications A (moving the outfall location from the treatment plant) and Modification B (capturing and treating springs downstream from the treatment plant).

EPA based this determination on the fact that treated water discharged from the plant would become recontaminated when it entered into the swallowhole area downstream from the plant unless Modification A and B were implemented. This recontamination problem is evident from the fact that site investigations show that water entering into the swallowhole area has lower concentrations of PCBs than the water emerging from two downstream springs (Quarry A and Quarry B) that are hydrologically connected to the swallowhole area. The AE Report explained:

> *PCB concentrations in water exiting the [treatment plant] . . .are <0.1 ug/L. Yet all spring water emergent at Quarry A and Quarry B always contain PCBs [ranging from .5 to 1ug/L]. The most probable explanation for this is partitioning of PCBs from contaminated sediments to water moving thought (sic.) karst solution conduits between the swallowholes and the springs. Two clear alternatives exist for preventing this recontamination and isolating PCBs within the karst conduit system:*
>
> 1) *Seal the Principal and Bypass Swallowholes to prevent entry of the [treatment plant] discharge*
> 2) *Bypass the [treatment plant] discharge around the Principal and Overflow Swallowholes*
>
> *Rinker Spring has no known hydrologic connection to the swallowholes, yet is always contaminated with PCBs. Collection and treatment of the Rinker Spring water is recommended to avoid contamination of downstream areas.*

(AE Report at p. 4). Thus, to prevent water discharged by the treatment plant from becoming recontaminated with PCBs, EPA determined that all the remedial alternatives, including the "no further action" alternative, should include Modifications A & B.

In any event, an evaluation of the "no further action" alternative proposed by the commenter (i.e., the alternative of making no physical changes to the water treatment plant and not implementing Modifications A and B) shows that it is not the most appropriate remedy for addressing groundwater releases to surface water.
EPA uses nine criteria to evaluate the remedial alternatives against each other to determine the most appropriate remedy for the site. Each alternative is compared to the other to determine the best balance of the nine criteria. EPA believes that the advantage of the commenter's proposed "no further action" alternative in terms of cost "savings" is far outweighed by advantages afforded by the other remedial alternatives reviewed by

EPA in terms of overall protectiveness, long-term (and short-term) effectiveness, and reduction of toxicity and mobility.

1. Overall Protection of Human Health and the Environment

While the treatment plant has been successful in reducing the mass of PCBs released from Illinois Central Spring, the commenter's proposed "no further action" alternative would be the least protective of human health and the environment in comparison to the other alternatives considered by EPA. Unlike Alternatives 2, 3, and 4, the commenter's proposed "no further action" alternative would not increase the amount of PCB mass that the plant currently removes from Illinois Central Spring. Further, unlike all the other alternatives, the commenter's proposed "no further action alternative" would not prevent recontamination of the discharge from the plant. In short, the commenter's proposed "no further action" alternative would allow more PCB mass to enter into Clear Creek than the other alternatives would allow, and hence, it is the least protective of human health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements

Given the Technical Impracticability waiver of certain ARARs relevant to stormwater discharges that will not be treated by the existing 1,000 gpm treatment plant, the commenter's proposed "no further action" alternative would comply with ARARs set forth in the ROD Amendment. More specifically, the plant would comply with 0.3 ppb effluent limit required by ARARs. However, the utility of the plant meeting this discharge criteria would be significantly undermined by the fact that the water discharged by the plant would become recontaminated before it entered into Clear Creek. While the water discharged from the plant will have a concentration below 0.3 ppb at the outfall, the water will become recontaminated when it flows through the swallowhole area and have a concentration of 0.5 to 1 ppb by the time that it flows into Clear Creek. This concentration is well above the discharge limit of .3 ppb identified by the State of Indiana.

3. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

In comparing the proposed "no further action" alternative to the other alternatives considered by EPA, the "no further action" alternative would be least effective in the long-term because it would allow the greatest amount of mass to flow into Clear Creek over the long-term.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

In comparing the proposed "no further action" alternative to the other alternatives considered by EPA, the "no further action" alternative would be the less effective than alternatives 2, 3, and 4 in terms of treating PCB flow and mass. While it would as effective as alternative 1 in terms of treating PCB flow and mass that flow *into* the plant, it would less effective than alternative 1 in terms of reducing the mass of PCBs released into Clear Creek.

5. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

The proposed "no further action" alternative could be implemented immediately since it requires no changes to the existing plant. That said, the remedy would have an adverse impact on the community to the extent that the remedy would fail to address the recontamination problem and would allow releases from the Quarry Springs and Rinker Spring to flow untreated into Clear Creek.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The commenter's proposed "no further action" alternative is feasible since it requires no changes to the existing plant.

7. Cost

To calculate the cost for each alternative, a 7% discount rate was used along with a 2% inflation rate. Present worth calculations were completed. The commenter's proposed "no further action" alternative would be less expensive than the other alternatives considered by EPA, although the cost savings is not dramatic. The commenter's proposed alternative has a net present value of $5,304,000. (AE Report, Appendix C, Table 5). By adding Modifications A and B (as proposed by EPA in Alternative 1), the net present value would increase by only $1,547,000 to $6,851,000

8. State/Support Agency Acceptance

The State of Indiana would unlikely support a remedial action, such as the commenter's proposed "no further action" alternative, that would allow on-going releases to Clear Creek in excess of the .3 ppb effluent limit established by the State for PCB discharges into State waters that are not part of the Great Lakes System. Likewise, the City of Bloomington and Monroe County are unlikely to support a remedial action that fails to address the recontamination problem.

9. Community Acceptance

The public comments are addressed in this Responsiveness Summary. A few commenters submitted a large volume of comments not supporting Alternative 3 (the preferred alternative identified by EPA) and recommending a complete excavation remedy. Given that Alternative 3 is more protective of human health and the environment than the commenter's proposed "no further action" alternative, it is certainty that these commenters would not support the commenter's proposed "no further action" alternative.

Operable Unit 2 (sediment contamination)

The commenter argues that, in addition to considering sediment removal in the area of the swallowhole, EPA should also consider a "no action" alternative. EPA disagrees. Under 40 C.F.R. § 300.430(f)(1)(i)(A), an remedial alternative must meet threshold requirements to be eligible for selection. Specifically, the remedial alternative must be protective of human health and the environment and must be in compliance with ARARs. A "no action" alternative meets neither of these threshold criteria. First, concentrations at the ICS emergence, swallowhole and Quarry Springs area are heavily contaminated with PCBs, including areas with concentrations greater than 50 ppm. The human health risk assessment calculated unacceptable risk at the Quarry Springs area. Also, as the commenter stated in other comments, the effluent from the water treatment plant does flow through the swallowhole and Quarry Springs area. By remediating these areas will prevent further migration of PCBs downstream.

Comment 57: The risk estimates that are provided in the HHRA contain unnecessarily high levels of precautionary default assumptions and uncertainty and do not reflect the likely potential for exposure to media at the Site. It appears that, in an effort to ensure that risks at the Site are not underestimated, a number of conservative default assumptions, which are not supported by available data or site-specific characteristics, have been made and have resulted in substantially overestimated Site risks.

The key issues that have contributed to this overestimation include the following:

- Risks due to fish consumption are overestimated due to the fact that fish ingestion rates do not reflect realistic use of the resource by the surrounding population. In addition, while risk estimates are provided for high levels of consumption of

benthic fish species, it is highly unlikely that these fish will be consumed and therefore that these exposures will occur.

- Risks due to surface water contact are overestimated due to the use of exposure point concentrations (EPCs) that are based on maximum surface water concentrations of PCBs measured at three of the reaches. Further, the HHRA uses unrealistically high ingestion and dermal contact rates, and an unreasonably high exposure frequency for certain reaches and activities.

- Risks due to sediment contact are also inflated due to unreasonable high sediment ingestion rates, soil adherence factors, exposed dermal surface areas, and frequency of contact.

- Risks due to soil exposure are overestimated due to unreasonably high soil ingestion rates, dermal surface areas, and frequency of contact.

- Aggregate risk estimates, which have also been provided by combining estimated risks for individual exposure pathways, have not been derived in an appropriate manner. As a result, they are not reflective of likely levels of exposure and do not provide useful information to assist risk managers in making decisions about potential remedial actions to be taken to mitigate potential risks associated with the Site.

Finally, in discussing the limitations of some of the exposure parameters that have been used in the HHRA, CBS has recommended alternative values for those parameters, based on what we believe to be the best science and our understanding of site characteristics. These have then been combined into alternative risk estimates for each pathway. These revised risk estimates indicate that potential risks associated with this Site are likely to be substantially lower than have been estimated in the HHRA.

Response: EPA's responses to each of the comments above regarding particular elements of the HHRA are addressed in the response to specific comments below. However, EPA's responses to several points raised by CBS are presented below.

- EPA agrees that the fish tissue ingestion rates used in the HHRA are overly conservative and do not adequately represent site-specific stream conditions. The revised HHRA calculations will be based on reduced fish tissue ingestion rates that conservatively reflect site-specific stream conditions.

- EPA agrees that individual anglers are not likely to ingest large amounts of benthic fish from Clear Creek. The revised HHRA calculations are based on recalculated fish tissue exposure point concentrations (EPC) based on 90 percent: 10 percent (pelagic fish:benthic fish) ratio.

- EPA acknowledges that the Strain Ridge Road reach of Clear Creek is somewhat less accessible than the Country Club and Fluckmill Road reaches. Therefore, exposure frequencies for surface water exposure at Strain Ridge Road and

sediment and soil exposure in and along lower Clear Creek (as represented by the Strain Ridge Road reach) have been reduced (to 30 days/year for surface water and sediment exposures and 38 days/year for soil exposures).

- EPA acknowledges that the approach used in the HHRA to calculate total (or aggregate) risks and hazards included some double- and triple-counting of potential soil and sediment exposures. Therefore, sediment and soil risks and hazards will be revised to eliminate double- and triple-counting of sediment and soil exposures. Specifically, sediment and soil risks and hazards will be reduced to reflect the assumption of equal amounts of sediment and soil exposures at each location. Also, because the available fish tissue biomass in Clear Creek may only support a small number (as low as one) of anglers, the majority of individuals that are exposed in and along the Quarry Springs area and Clear Creek are not likely to also ingest fish from Clear Creek. Therefore, the revised HHRA calculations include two types of total risks and hazards: (1) totals for all relevant exposure pathways including sediment, soil, surface water, and fish tissue ingestion and (2) totals based only on all relevant sediment, soil, and surface water exposures.

Recalculated pathway-specific and total risks and hazards are summarized in Tables 1 and 2 (See Attachment A), respectively. Also, recalculated pathway-specific exposures, risks, and hazards are documented in Tables A1 through A5 in Attachment A. Reach-specific total risks are greater than or equal to 1E-06 (1 in 1,000,000) but less than 1E-04 (1 in 10,000) in all reaches (Country Club Road – 8E-06; Fluckmill Road – 6E-05; Strain Ridge Road – 9E-05; and Quarry Springs – 2E-05) based on inclusion of fish tissue ingestion. On the other hand, reach-specific total risks are greater than or equal to 1E-06 only at Quarry Springs (8E-06) when fish tissue ingestion is excluded. Recalculated total hazards exceed 1 at Fluckmill Road (hazard = 3.4) and Strain Ridge Road (hazard = 5.0) based on inclusion of fish tissue ingestion and are less than 1 at all locations when fish tissue ingestion is excluded.

EPA has the mandate and authority to address any risks greater than 1E-06 and hazards greater than 1 including total risks and hazards inclusive of risks and hazards associated with fish ingestion that are expected to impact only a very small number of persons. It should be noted that direct contact risks (that is, excluding results associated with fish ingestion) exceed 1E-06 at Quarry Springs (8E-06).

Further, PCBs are present in whole pelagic and benthic fish at concentrations greater than the Ambient Water Quality Criteria – derived fish tissue level of 0.025 part per million (ppm) and in pelagic and benthic fish fillets at concentrations greater than the PCB action level of 0.05 ppm used to trigger Indiana's fish consumption advisories. EPA's decision to require remedial action (including, but not limited to, the halting of direct discharge of contaminated groundwater into Quarry Springs and Clear Creek) is consistent with the National Oil and Hazardous Substances Pollutant Contingency Plan (NCP) (EPA 1990) and EPA Policy.

Comment 58: Fish Consumption - The HHRA has provided eight sets of risk estimates for the fish consumption pathway at each of the three Clear Creek reaches evaluated.

This has been done by using four different fish consumption rates and applying them separately to the consumption of pelagic and benthic species. The four fish consumption rates selected are assumed to be representative of reasonable maximum exposure (RME) and central tendency exposure (CTE) for recreational anglers and low income anglers. In addition, it is assumed that 100 percent of the fish consumed by some of the anglers will be benthic species including white sucker and creek chub. Finally, it is assumed that this level and type of behavior occurs every year for a period of 30 years.

The consumption rates used are not realistic estimates of exposure at this Site and it is highly unlikely that individuals will consume benthic species regularly. As a result, the risk estimates that are presented are not likely to be representative of the actual potential for exposure at the Site.

Response: EPA acknowledges that (1) the fish tissue ingestion rates (ranging from RME subsistence angler to CTE recreational angler) and (2) the assumption that the fish consumed by some receptors would be benthic species as used in the HHRA are overly conservative and do not adequately represent potential exposure at the Site. As discussed in greater detail below with regard to specific points, the HHRA was revised to incorporate two fundamental changes.

First, a single representative revised RME fish tissue ingestion rate was identified for each reach of Clear Creek. The reach-specific fish tissue ingestion rate will be based on (1) the expected fish tissue biomass present in each Clear Creek reach, (2) the fish tissue ingestion rates supported in other Bloomington area streams, and (3) fish tissue ingestion rates discussed in the literature.

Second, the HHRA now assumes that the majority of fish consumed by anglers is made up of pelagic fish, with a smaller percentage made up of benthic fish. An assumed ratio of pelagic to benthic fish consumed by anglers was used to calculate weighted fish tissue exposure point concentrations (EPC).

The HHRA will continue to evaluate exposures, risks, and hazards associated with fish tissue ingestion assuming an exposure duration of 30 years.

Comment 59: Fish Ingestion Rate - The HHRA asserts that both recreational and low-income subsistence anglers regularly use three reaches of Clear Creek (Country Club Road, Fluckmill Road, and Strain Ridge Road) as a source of food fish, and has selected default exposure parameters that would only potentially be relevant for much larger and more productive fisheries. While there is some indication that individuals may occasionally fish these reaches, it is highly unlikely, given their characteristics and the availability of superior fisheries nearby, that these reaches will experience the level of fishing and consumption activity that has been assumed. Even if these reaches are fished with some regularity, the fish consumption rates that have been selected are not well supported by either site-specific characteristics or the body of literature on fish consumption habits.

The HHRA uses four separate fish consumption rates to evaluate potential exposures via fish harvested from Clear Creek. The fish consumption rates and the populations which they are assumed to characterize are the following:

- 15 g/day -average consumption by recreational anglers
- 59 g/day -high end consumption by recreational anglers
- 43 g/day -average consumption by low-income minority consumers
- 110 g/day -high end consumption by low-income minority consumers

These fish consumption rates were selected based on data collected by West et al. (1989, 1993) in two surveys that were conducted of Michigan anglers. Participants in these studies were asked to recall how many fish meals they had consumed during the previous one-week period and to identify the source of each of those fish meals. The fish meals consumed during the one-week period were then extrapolated to estimate potential long-term consumption rates. There are a number of reasons why these fish consumption rate estimates are not likely to be representative of actual consumption from Clear Creek.

First, these fish consumption rates are based on short-term survey data and cannot be used to reliably estimate long-term consumption rates, particularly high end consumption rates, as acknowledged by EPA (1997). Use of short-term data to estimate long-term consumption rates is inappropriate. In its *Exposure Factors Handbook,* EPA (1997) states "percentiles of the distribution of average daily intake reflective of long-term consumption patterns can not in general be estimated using short-term (e.g., one week) data" (EPA, 1997, p. 10-14). This is true for the West et al. data due to the fact that only those respondents who had consumed fish during the previous one-week period were included in the analysis, thereby overlooking those individuals who may have been fish consumers but consumed fish with less frequency than one time per week. This results in a substantial overestimation of high-end consumption rates. Because the resulting fish consumption rates are strongly biased toward more frequent consumers, they should not be used as a basis for long-term consumption estimates for the risk assessment.

Second, the West et al. (1989) consumption rates include a combination of sport-caught and commercially obtained fish. Because there is no commercial fishery on Clear Creek, it is inappropriate to select fish consumption rates that, in part, reflect consumption of commercially caught fish. While EPA attempted to correct for this bias in the West et al. study, it was necessary for it to use a number of assumptions to derive estimates of sport-caught fish consumption alone. As a result, these estimates are highly uncertain and are not representative of sport-caught fish consumption from a single small waterbody.

Finally, use of the West et al. data, which also include fish consumed from the highly productive Great Lakes fisheries, undoubtedly overestimates consumption from a single small stream. EPA's *Exposure Factors Handbook* provides estimates for recreational fish

consumers based on four "Key" studies. One of the "Key" studies was that conducted by Ebert et al. (1993) of Maine's recreational anglers, which specifically looked at consumption from specific types of waterbodies (i.e., all waterbodies combined, river/stream fish only, lake/pond fish only). Based on the analysis of fish consumed from rivers and streams, Ebert et al. reported a median consumption rate of 1.0 g/day and a 95th percentile consumption rate of 12 g/day. These rates represent consumption from multiple Maine rivers and streams statewide, many of which are extremely high quality fisheries. Thus, while they are considerably lower than the estimates used in the EPA's current risk assessment, even these rates still likely overestimate consumption from a small, limited-quality fishery like that being evaluated for this Site.

EPA has acknowledged the importance of considering differing characteristics of waterbodies when selecting fish consumption rates. For example, in its Technical Background Document for the National Sludge Rule (EPA, 2003), EPA considered fish ingestion by recreational anglers who catch and eat fish from affected waterbodies. While EPA considered selection of ingestion dab from all four "Key" studies presented in the 1997 *Exposure Factors Handbook,* it concluded that, because three of the studies (West et al., 1989, 1993; Connelly et al., 1996) included large numbers of individuals who fished the Great Lakes, the Maine data collected by Ebert et al. (1993) provide a more relevant and appropriate basis for evaluating the streams, rivers and ponds under consideration in developing the sludge rule. Thus the Ebert et al. (1993) data were used as the basis for that national regulation that was promulgated in 2003.

EPA's *Estimating Exposures to Dioxin-Like Compounds* (2000a; Part 1, Volume 4 of the EPA's draft dioxin reassessment), also recognized that smaller waterbodies are likely to have limited rates of consumption. In that document, EPA suggested that an alternative approach, which estimated the number of meals that might be consumed from a single small waterbody, might be used instead to estimate consumption from that waterbody. In that approach, it was suggested that 3 meals/year might be consumed on average and that a high-end consumer might eat 10 meals/year. Using an estimated meal size of 150 g, EPA (2000a) derived a central estimate consumption rate of 1.2 g/day and a high- end estimate of 4.1 g/day.

Other studies of river anglers who use a single river fishery indicate that consumption rates of this magnitude are appropriate. ChemRisk (1991) conducted a creel survey of the West Branch Penobscot River, which is a destination landlocked salmon fishery in Maine. Despite the desirability of this fishery and the availability of large and numerous fish there, the 50th percentile consumption rate for individuals who consumed fish that they harvested from the river was 0.5 g/day and the 95th percentile consumption rate was 11 g/day (ChemRisk, 1991). It is reasonable to assume that estimates of consumption from this river, which is a large, targeted, sport-fishing destination, would grossly overestimate consumption from a small stream like Clear Creek.

The HHRA also assumes that Clear Creek is being used by low-income anglers for the purpose of subsistence fishing and has selected fish consumption rates from West et al. (1993) for minority anglers in an urban area. There is, however, no reason to believe

that low-income anglers are using the upper reaches of Clear Creek for subsistence purposes. While there is evidence that a low income population lives near portions of the creek, available fish consumption survey data demonstrate that there is little correlation between income levels and fish consumption rates. Finally, Clear Creek is such a limited fishing resource that it is not likely that any individual who needs to obtain fish for food would choose to fish there, particularly when Lake Monroe, which is a substantially higher quality fishery, is close by and provides better access for fishing.

While it is sometimes assumed, as a conservative measure, that low-income individuals will catch fish to provide the primary source of protein in their diets, there is little support for this assumption. In fact, it appears that income is not a good predictor of fish consumption rates because the available consumption literature indicates that there are no significant differences in fish consumption rates among different income groups (Javitz et at., 1980; West et al., 1989; 1991; Connelly et al., 1990; Anderson and Rice, 1993; Ebert et al., 1993). Wendt (1986) studied the fish consumption habits of low- income families living in New York State to determine the levels of freshwater fish they consumed from New York State waters. For those who reported eating fish, the annual fish consumption rates ranged from one to 96 meals, with a median of 8.5 meals and a mean consumption rate of 17.5 meals per year. If it is assumed that a meal size is 227 g, the reported rates equate to a median of 5.3 g/day, a mean of 11 g/day, and a maximum of 60 g/day. These rates are similar to the rates reported in various surveys of recreational anglers (Connelly et al., 1996; Ebert et al., 1993; 1996), and are substantially lower than the rates currently used in the HHRA.

To evaluate the potential issue of subsistence fishing, Ebert et al. conducted an additional analysis of the Maine angler survey data to determine whether there were any defining socioeconomic factors among the top 10 percent of consumers who responded to the Maine angler survey (ChemRisk, 1996). To do this, the authors compared angling behavior, demographic characteristics and advisory awareness for the top ten percent consumers (high consumers) to the remaining 90 percent of consumers. This comparison was conducted for total consumption (all waterbody types combined) and for river/stream fish consumption. While the high consumers took more fishing trips than the remaining consumers and were more avid ice fishermen than the others, there were no substantive differences between the high consuming and remaining consuming groups as related to educational level, ethnicity, or income level. Analysis of respondent knowledge about advisories indicated that the high consumers were actually better informed about advisories than the remaining anglers. Overall, these authors reported little evidence that anglers with consumption rates at or above the 90th percentile were distinguishable from other consumers by factors other than their consumption rates.

Finally, it should be noted that subsistence fishing requires an enormous amount of fishing effort. The HHRA suggests that 110 g/day is an appropriate consumption rate for subsistence fishing in Clear Creek. This equates to four ounces of fish consumed every day throughout the year. If a subsistence individual had a family of four to feed, it would require that one pound of edible fish be obtained from Clear Creek daily. Given that the edible portion of fish is roughly 30 percent of the whole fish mass, this means that 3

pounds of fish would need to be harvested daily (well over one-half ton of whole fish harvested yearly) from Clear Creek. Given the limited size and productivity of this reach, the harvesting of such an enormous amount of fish would require an unreasonable amount of fishing effort. It is not realistic to assume that an individual who needs to harvest this mass of fish yearly would choose to fish a small fishery like Clear Creek. Instead, that individual, if he or she exists, would fish from a much larger, more productive fishery where it would be possible to harvest greater numbers of larger fish within a much shorter amount of time.

Response: EPA acknowledges that the fish tissue ingestion rates used in the draft HHRA are overly conservative, do not adequately reflect site-specific conditions, and may be more representative of highly productive fisheries.

The draft HHRA assumed the potential for subsistence fishing from Clear Creek. Low-income neighborhoods are present along Clear Creek, particularly near Country Club Road. However, as noted by CBS, there is little direct evidence that low-income individuals will catch a larger amount of fish to provide the primary source of protein in their diet compared to higher income individuals. As a result, potential exposures and subsequent risks must be evaluated for the entire population (regardless of income or education level). Although it is possible that some current individuals or that some future receptor may attempt to engage in subsistence fishing, EPA recognizes that the fish biomass in Clear Creek is not sufficient to support subsistence fishing as defined in the draft HHRA (up to 110 grams per day). The HHRA was revised to eliminate the assumption of subsistence fishing, and only recreational fishing is now evaluated.

As noted above (under the "Fish Consumption" header), the HHRA was revised to incorporate representative reach-specific fish tissue ingestion rates. These revised fish tissue ingestion rates (see the response under the header "Selection of a Fish Consumption Rate") was used in conjunction with fish tissue EPCs weighted by an assumed ratio of pelagic to benthic fish consumed by receptors. The basis for the revised fish tissue ingestions rates is set forth below in response to Comment 60.

Comment 60: Selection of a Fish Consumption Rate - EPA's draft *Estimating Exposures to Dioxin-Like Compounds* suggested that rates in the range of 1 to 4 g/day are appropriate for evaluating single small waterbodies (EPA, 2000a). The lower end of this range is identical to the median river/stream consumption rate reported by Ebert et al. (1993) while the upper end of the range is lower than the 95th percentile reported from that study. The higher upper bound consumption rate in the Ebert et at. (1993) study is to be expected, however, because this rate is based on anglers' long-term consumption of fish from multiple rivers/streams in the State of Maine, including many, high quality, destination fisheries. It is therefore appropriate that lower upper bound fish consumption rates would be more suitable for evaluating fish consumption from single, small, and substantially less productive reaches, like those being evaluated on Clear Creek.

CBS does not believe that it is likely that any individuals are obtaining fish from the Country Club Road reach of Clear Creek so that the actual consumption rates are likely to be zero. As a conservative measure, however, CBS has evaluated potential occasional

consumption from this area by selecting a fish consumption rate of 1 g/day, for both the CTE and RME analyses, to account for any individuals who might consume as much as three 4-ounce meals per year from this area.

It is possible that individuals might occasionally fish the Fluckmill Road and Strain Ridge Road reaches of Clear Creek. Thus, to evaluate the CTE exposures in both of these reaches, CBS has selected a fish consumption rate of 1 g/day, based on the median consumption rate from the Ebert et al. (1993) study of Maine's recreational anglers and the low end of EPA's (2000a) consumption rate range for single small waterbodies. There are, however, some differences between the physical characteristics and productivity of the Fluckmill Road and Strain Ridge Road reaches. While Fluckmill Road is still very shallow, has a more pronounced gradient, and is directly downstream of a sewage treatment discharge point, Strain Ridge Road is somewhat deeper and slower, has a muddy substrate, and consequently has a higher percentage of larger and more desirable fish species. Thus it is likely that sport anglers might fish and consume fish from Strain Ridge Road with greater frequency than they would consume fish from the Fluckmill Road reach. Consequently, CBS has selected different RME fish consumption rates for these reaches. For Fluckmill Road, it has selected a fish consumption rate of 4 g/day, based on the upper end of EPA's (2000a) fish consumption range for small waterbodies. This is roughly equivalent to one 4-ounce meal per month. CBS has selected a more conservative rate of 12 g/day, based on the 95th percentile from the Ebert et al. (1993) study to evaluate RME exposures at Strain Ridge Road. CBS believes that these rates should be more than adequately representative and protective of any fishing and consumption activities that may occur in Clear Creek.

While it is often assumed that subsistence fishing may be occurring, it is rarely the case except where there are substantial populations of individuals (e.g., Native Americans, Inuits) who, because of cultural habits and traditions, consume large quantities of fish. Otherwise, there is little indication that true subsistence populations exist. Instead, those individuals who consume fish at higher-than-average rates are largely defined by their avidity, not their income level. To assume that such individuals exist and use a small, low-quality fishery like that presented by Clear Creek is not reasonable.

EPA (1989) guidance states that the risk assessor should "characterize the populations on or near the site with respect to location relative to the site, activity patterns, and the presence of sensitive subgroups." Then to identify subpopulations of potential concern, risk assessors should review site area information to determine if there are any subpopulations that may be at increased risk, using information about the site, local census data, and information from local public health officials (EPA, 1989). Such approaches have been used for other HHRA's conducted by EPA. For example, EPA evaluated consumption by potentially sensitive subpopulations (Native Americans and Hmong) along the Fox River and Green Bay because there were data to indicate that these groups, which live in proximity to the study area, fish from the site and have consumption habits that differ from those of the general recreational angler population (RETEC, 2002). Such an approach is appropriate when it is known that this type of activity is occurring. However, subsistence consumption was not

evaluated for either the Hudson River or the Housatonic River risk assessments, despite the substantial sires of those fisheries, because there was no indication that such populations existed there. Rather than evaluate potential for subsistence behavior in the Hudson River risk assessment, EPA stated in its uncertainty analysis that "[although there are no known, distinct subpopulations that may be highly exposed, there is some degree of uncertainty as to whether these subpopulations have been adequately addressed in this risk assessment" (EPA, 2000b). For the Housatonic River risk assessment, EPA did not evaluate subsistence fishing, stating that "EPA has made efforts to identify populations that engage in subsistence fishing in both the Massachusetts and Connecticut reaches of the Housatonic River (including discussions with appropriate state personnel)and has found no evidence that a subsistence population exists at this time" (EPA, 2005).

There is no indication that such steps have been taken to ascertain the existence of a subsistence population using Clear Creek. Rather, it appears the existence of this hypothetical population has been presumed without any basis. In the absence of evidence to support the existence of such a subpopulation, subsistence fishing should not be evaluated in the HHRA as its inclusion implies that this activity is occurring. If further research indicates that such a population does exist and does use Clear Creek, it is recommended that EPA collect specific information about their consumption habits for use in an updated risk assessment.

Response: As noted above in the previous item, the HHRA was revised to eliminate consideration of subsistence fishing in Clear Creek. The basis for the revised reach-specific fish tissue ingestion rates are presented below.

Country Club Road

CBS states it "does not believe that it is likely that any individuals are obtaining fish from the Country Club Road reach of Clear Creek." However, CBS does not provide any justification or basis for this statement, and CBS has not conducted a population or biomass study on any reaches of Clear Creek. However, biomass studies have been conducted for other Bloomington area streams, including Stout's Creek (Normandeau 2004) and Richland Creek (Normandeau 2006). Based on a qualitative comparison of the size and flow of the two streams, and the size and type of fish observed, retained, and caught at Country Club Road during sampling efforts, EPA anticipates that the productivity of this reach of Clear Creek is similar to the Acuff Road reach of Stout's Creek. EPA is not suggesting that the Country Club Road reach of Clear Creek is identical to the Acuff Road reach of Stout's Creek, but in the absence of any reliable data on fish populations or biomass present in Clear Creek, the comparison with the Acuff Road reach is justified for HHRA purposes.

For the HHRA for Bennett's Dump, it was demonstrated that the Acuff Road (location BD-2) reach of Stout's Creek has sufficient fish biomass to support one angler at a fish tissue ingestion rate of 3 grams per day (Tetra Tech 2006a). This fish tissue ingestion rate is slightly higher than that proposed by CBS for Lemon Lane (1 gram per day); however, it is within the 1- to 4-gram range indicated for single small waterbodies in

EPA's draft "Estimating Exposures to Dioxin-Like Compounds (EPA 2000), and it represents a little less than a single 4-ounce meal per month. Therefore, for the purposes of the revised HHRA, EPA identified a RME fish ingestion rate of 3 grams per day for Country Club Road.

Fluckmill Road

CBS contends that Fluckmill Road supports fewer large, desirable fish species than Strain Ridge Road because Fluckmill Road is "very shallow, has a more pronounced gradient, and is directly downstream of a sewage treatment discharge point" in contrast to Strain Ridge Road, which CBS describes as "somewhat deeper and slower, [with] a muddy substrate." EPA disagrees with CBS's assessment of the likely productivity of Fluckmill Road. The Fluckmill Road reach of Clear Creek has a variety of habitats that include all four of the combinations of slow, fast, shallow, and deep waters, with numerous snags, root tballs, and boulders and frequent backchannels and meanders. The variety of habitats, along with the number and size of the fish observed, retained, and in some cases sampled at Fluckmill Road supports the conclusion that the Fluckmill Road reach of Clear Creek is more productive than assumed by CBS. In addition, CBS's assumption that the site's location downstream from a sewage treatment plant depresses fish productivity is not supported by any data. Effluent from sewage treatment plants may decrease local concentrations of dissolved oxygen, but this effect is not likely to be significant at Fluckmill Road because the many pools and runs in the creek are separated by broad riffle areas that maintain high oxygen levels in Clear Creek. A review of physico-chemical water quality parameters (including temperature and dissolved oxygen concentration) as measured by CBS contractors during sampling events at Fluckmill Road does not support the CBS assertion that water quality in the reach is negatively affected by the sewage treatment plant (Viacom 2005).

Based on the observed variety of habitats throughout the reach and the size, number, and variety of fish observed in the reach, EPA assumes that the Fluckmill Road reach of Clear Creek is at least as productive as assumed by CBS for the Strain Ridge Road reach. Therefore, for the purposes of the revised HHRA, EPA identified a RME fish ingestion rate of 12 grams per day for Fluckmill Road. As noted by CBS, this ingestion rate is equivalent to the 95th percentile rate from the Ebert and Others (1993) study and is slightly less than the average recreational ingestion rate of 15 grams per day assumed in the draft HHRA (Tetra Tech 2005).

Strain Ridge Road

EPA agrees with CBS that based on stream characteristics (including primarily the slower stream flow), the Strain Ridge Road reach of Clear Creek is likely to support a greater biomass than the Fluckmill Road reach. This conclusion is supported by the number and size of fish observed, retained, and caught from the Strain Ridge Road reach. As a result, it is reasonable to assume that recreational anglers could fish and consume a greater amount of fish from Strain Ridge Road compared to Fluckmill Road. Therefore, for the purposes of the revised HHRA, EPA identified a RME fish ingestion rate of 25 grams per day for Strain Ridge Road. This ingestion rate is roughly equivalent to an average of the

total (pelagic plus benthic) fish tissue ingestion rates assumed for the 5.5- (15.3 grams per day) and the 12.7-mile (30.5 grams per day) locations on Richland Creek as part of the Neal's Landfill HHRA (Tetra Tech 2006b). It should also be noted that this ingestion rate is less than one-half of the RME recreational angler fish tissue ingestion rate (59 grams per day which was calculated as the average of the RME ingestion rates presented in West and Others 1989 and 1993).

Comment 61: Inclusion of Benthic Species - EPA has based a substantial portion of its risk analysis on the assumption that individuals will eat large amounts of suckers and other bottom feeders from Clear Creek. A body of fish survey data from all regions of the U.S. demonstrates, however, that while suckers are commonly caught by anglers, they are rarely consumed. These data include, but are not limited to, the following:

- The Maine angler survey conducted by Ebert et al (1993), collected catch and harvest data for a one-year period. An analysis of the raw data from that year-long study of 1,612 anglers, who consumed fish, indicates that a total of 20,046 fish were consumed from rivers and streams in the state. Of those, 100 fish (0.5 percent) were bottom fish, which included suckers, carp and sturgeon. These bottom fish were consumed by a total of 7 individuals (0.4% of the surveyed population).

- The West et al, study (1989), upon which EPA has based its fish consumption rates, indicated that only 0.8 percent of total meals consumed consisted of "bottom feeders and suckers."

- The Alabama Department of Environmental Management study of fish consumption by Alabama anglers (ADEM, 1994) also provided information on the species harvested by anglers during a one-year survey. According to information contained in Table 7 of that report, a total of 2,579 fish were harvested by 1,586 anglers during the study period. These fish totaled 3,117 kg of total fish weight. Only one of these fish, with a total weight of 0.36 kg or 0.01 percent of the fish mass harvested, was a sucker.

- The New York Department of Health conducted an evaluation of the fishing habits of Hudson River anglers. In the survey conducted in 1996, it was reported that only three of the 558 fish harvested from the river (0.5 percent) were suckers (NYDOH, 1999). As there is no species-specific consumption information available in that report, it is not known whether or not any of those fish were consumed by the anglers who harvested them.

- A study of the Savannah River freshwater fishery also indicated that the harvest of suckers by recreational anglers was very low (Turcotte, 1983). It appears that approximately 250 fish were suckers of the 550,282 fish harvested from the freshwater section of the river, based on data provided in Tables 6 and 7 of that report. These represented only 0.045 percent of the total fish harvested from the Savannah River during that survey.

- The Florida Department of Environmental Protection conducted a survey of the fish consumption habits of individuals statewide (Degner et al., 1994). As shown in Table B.1 of that report, none of the 4,675 consumers listed suckers as a species of fish that was consumed.[3]

As is demonstrated with consistency in the above studies, suckers are not typically consumed by the angler population. Thus it is unlikely that the consumptions rates assumed by EPA for suckers would ever be approached.

In light of the preponderance of survey data and information, CBS does not believe that individuals are likely to regularly consume suckers. EPA has acknowledged that "benthic species such as white sucker and creek chub are generally less desirable for consumption compared to game fish" (Tetra Tech, 2005a; p. 41). EPA has stated however, that some anglers may be more opportunistic and thus may ingest a higher proportion of sucker and creek chub if they are readily available. There is no information available in the risk assessment that provides information on the relative availability of pelagic vs. benthic species in Clear Creek. However, while opportunistic anglers may consume a combination of species, their consumption will not be limited to a single species. The description of the reaches, which is provided in the HHRA, indicates that pelagic fish are plentiful in those reaches. If this is the case, it is likely that anglers will target those species and will consume few, if any, suckers and chubs. Thus the consumption rates for suckers and chubs are not reasonable, given site-specific conditions.

Response: EPA recognizes that anglers are unlikely to regularly consume a large percentage of benthic fish from Clear Creek. While anglers are more likely to consume pelagic fish (for example, sunfish and bass), a variety of large (> 200 grams) benthic fish were observed and retained during Clear Creek fish sampling events, especially at the Fluckmill and Strain Ridge Road reaches. Therefore, it is not reasonable for CBS to assume that anglers will not catch or consume benthic fish from Clear Creek.

In the absence of data from a stream-specific population survey, for the purposes of the revised HHRA calculations, EPA has used the 90 percent:10 percent (pelagic:benthic) ratio as proposed by CBS to calculate weighted reach-specific fish tissue EPCs. The revised fish tissue EPCs was be used in conjunction with the revised reach-specific fish tissue ingestion rates to calculate revised fish tissue exposures.

Comment 62: Exposure Duration - EPA has used an exposure duration of 30 years for all locations evaluated on Clear Creek. While it is conceivable that an individual could fish Clear Creek every year for 30 years, it is highly unlikely that this would occur, particularly with the regularity that is assumed in the HHRA. Instead, an individual who regularly fishes from year to year is likely to be an avid sport angler who will visit higher quality fisheries during regular fishing trips. Thus this assumption, when combined with

[3] While 17 individuals indicated that they consumed "other freshwater" fish that were not included in the list of species, a review of Table A.6 of that report indicates that suckers were not one of the species reported by survey participants.

the other upper-bound parameters that are used, is highly conservative and likely overstates actual potential for cancer risk.

Response: EPA's use of a 30-year exposure duration is consistent with long-established residential exposure duration under RME conditions. An individual angler may fish a particular stream or a particular stretch of a stream for a variety of different reasons; in fact, these reasons may change during different periods of that angler's life. For example, an angler may fish in a particular stream (for example, Clear Creek) based on its convenient location. Later in life, that same angler may continue to fish in Clear Creek for nostalgic reasons; they have fished there in the past and may consider fishing in Clear Creek to be relaxing and comforting. EPA has never asserted that anglers fish exclusively in Clear Creek. As suggested in CBS's comment, an avid sports angler may fish in higher quality fisheries in addition to Clear Creek. However, EPA maintains that the assumption that an angler may fish in Clear Creek to the extent necessary to meet the assumed fish tissue ingestion rates over a 30-year exposure duration is consistent with RME conditions.

Comment 63: Evaluation of TEQ - EPA has also provided risk estimates for the fish consumption pathway that have been calculated using dioxin toxicity equivalents (TEQ). However, the data used to estimate the TEQ fish tissue concentrations are so limited that they provide little reliable insight into the potential risks associated with dioxin TEQ. For all reaches, only one sample of pelagic fish was analyzed for TEQ. TEQ analysis for benthic species was also extremely limited with analysis of only one sample from Strain Ridge Road, two samples from Country Club Road, and 3 samples from Fluckmill Road. These results cannot be considered representative or reliable without additional sampling to confirm their representation of site-specific tissue concentrations.

In addition, as discussed in previous comments to EPA on the HHRA for the Neal's Landfill Site (Viacom, 2004), there is considerable uncertainty associated with the use of dioxin TEQ to evaluate PCB congeners, including the uncertainties associated with the application of individual toxic equivalence factors, as well as the uncertainty associated with the selection of a cancer slope factor for dioxin. This uncertainty and the scientific validity of the approach are subjects of considerable debate among members of the scientific community and, consequently, are a primary focus of the review of EPA's draft dioxin reassessment, which is currently underway by the National Academy of Sciences (NAS). Until such time as the approach has been deemed to be scientifically valid, results based on the use of this approach should not be used for making risk management decisions.

In addition, the HHRA has reported the results of an evaluation of the noncarcinogenic hazards posed by the "dioxin-like" PCB congeners, using a reference dose of 1 pg/kg-day, based on the value it states was proposed in EPA's draft dioxin reassessment. It should be noted that the EPA has never published a reference dose for dioxin and the draft Dioxin Reassessment does not recommend or propose a reference dose for dioxin or dioxin-like compounds. Therefore, the HHRA erroneously reports the existence of a reference dose that has neither been proposed by EPA nor has its scientific validity been established.

Response: EPA is aware that there is uncertainty associated with use of dioxin toxicity equivalents (TEQ) to evaluate PCB congeners. However, as stated in the HHRA, EPA recognizes that the use of the TEQ methodology as an official policy is still under internal review, and that dioxin toxicity is being reviewed by the NAS. Nonetheless, use of the TEQ methodology "has a sound science basis and is widely applied in peer reviewed published literature" (EPA 2004c). Much of the current debate centers around the compound-specific toxicity equivalency factors (TEF) that should be applied and the uncertainty associated with these TEFs – not the application of the TEQ methodology in general (EPA 2004b). EPA acknowledges that uncertainty is associated with use of the TEQ methodology, but the presence of this uncertainty does not warrant dropping the TEQ methodology entirely (EPA 2004b).

With regard to the dioxin RfD of 1 pg/kg-day used in the HHRA to evaluate hazards associated with potential exposure to dioxin-like PCBs, EPA strongly disagrees with CBS's assertion that EPA has never published a reference dose for dioxin and that the scientific validity of the reference dose used in the HHRA has never been established. EPA proposed an allowable daily intake (ADI) of 1E-06 μg/kg-day (equivalent to 1 pg/kg-day) as part of the Ambient Water Quality Criteria (AWQC) for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (EPA 1984). The ADI is equivalent to an RfD. In addition, the Agency for Toxic Substances and Disease Registry (ATSDR) derived an oral minimum risk level (MRL) of 1 pg/kg-day in the "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins" (ATSDR 1998). Therefore, the scientific validity of the 1 pg/kg-day value has undergone significant peer review. Finally, it is irrelevant that EPA's Dioxin Reassessment (EPA 2003) does not recommend or propose an RfD for dioxins or dioxin-like compounds. It is EPA policy to use previous toxicological values and policies until toxicity factors (including RfDs) are finalized.

Comment 64: Surface Water Contact - The HHRA's analysis of direct contact with surface water from three reaches of Clear Creek and from Quarry Springs indicates that potential risks are well below EPA's acceptable risk range (10^{-4} to 10^{-6}). However, even these risks are substantially overestimated due to the extremely conservative assumptions that have been made in estimating exposures. These unreasonable assumptions include the use of maximum values from six years of surface water monitoring as estimates of the long-term exposure point concentration (EPC) to which individuals will be exposed in the three reaches of Clear Creek. In addition, the risk estimates for the surface water contact pathway are based on unrealistic surface water ingestion rates and extremely unlikely dermal surface areas in most areas of the Creek.

EPCs for Surface Water

Tetra Tech has based its surface water exposure evaluations on the maximum surface water concentration detected in each reach of Clear Creek over six years of sampling. Use of the maximum 6-year concentration as the EPC is inappropriate because long- term repeated exposure with surface water, as is being evaluated in the HHRA, will result in contact with different concentrations over time so that the most appropriate EPC would be a long-term average concentration. Thus, the use a maximum value as the long-term EPC has undoubtedly resulted in overestimated exposures via this pathway.

Response: **CBS** provided to EPA analytical data associated with surface water samples collected in conjunction with fish tissue samples at the Country Club Road, Fluckmill Road, and Strain Ridge Road reaches of Clear Creek (Viacom 2005g). For the years 2000, 2002, and 2004 only a single analytical result was provided at each location; no analytical results were provided for the years 2001, 2003, and 2005. As noted in the risk assessment, the maximum concentration of PCBs remained fairly consistent at each of these three locations based on the available analytical results. It should be noted that in contrast to CBS's statement that "Tetra Tech has based its surface water exposure evaluations on the maximum surface water concentration detected in each reach of Clear Creek," PCBs were detected at a higher concentration (0.026 microgram per liter [µg/L]) than the concentration (0.024 µg/L) used as the exposure point concentration (EPC) at the Strain Ridge Road location.

Use of the maximum surface water concentration for the most recent year for which analytical data were provided is a conservative and health-protective approach. If surface water-related risks or hazards had been shown to be potentially significant (risks greater than or equal to 1E-06 and hazards greater than 1), alternate surface water EPCs would have been investigated. The risk assessment will be revised to acknowledge the conservative nature of the surface water EPCs used in the risk assessment.

Comment 65: Exposure Frequency - The HHRA uses an extremely high exposure frequency of 68 days/year for the surface water exposure pathways. This frequency is based on the assumption that adult and youth recreationalists will spend 4 days per week for 13 weeks, from June through August, and 4 days per month at the Site during April, May, September, and October. There is no indication that this level of recreational activity is occurring along the Creek or would likely occur in the future.

In the Quarry Springs area, where water flow is very minimal and intermittent, it is not likely that individuals involved in recreational activities would wade in the water, and very infrequent that the water would be deep enough that an individual could submerge and thus ingest water. While HHRA recognizes the limited potential for dermal contact, in that it has used a reduced skin surface area (feet only), it does not acknowledge that because the springs are dry or muddy for much of the year, an exposure frequency of 68 days/year is not feasible. Instead, it would be more realistic to assume that an individual might have contact with surface water in this area no more frequently than 5 or 10 days/year.

While it is conceivable that individuals living near Country Club Road reach might visit or play along the Creek on a more regular basis, the more remote nature of the Fluckmill Road and Strain Ridge Road reaches, and substantially more difficult access to them, make it unlikely that individuals will be present in those reaches on a regular basis. Thus, a lower frequency, in the range of 1 day per week during the warmer months of the year, or 30 days/year, is probably more appropriate for these reaches. This exposure frequency was used by EPA to evaluate potential recreational activities in more remote areas of the Housatonic River in Massachusetts (EPA, 2005). CBS believes that an exposure frequency of no more than 30 days per year would be most appropriate and representative of the potential for exposures in these two reaches of the Creek.

Response: EPA is concerned about potential exposures throughout Clear Creek (including the Quarry Springs area) downstream of the site. It is reasonable to expect that area residents may choose to visit and recreate in and along Clear Creek (including the Quarry Springs area) at a nearby location. While other surface water bodies may have a higher overall attractiveness, Clear Creek is the "local" stream and its proximity and a sense of ownership by nearby residents cannot be overlooked. Also, EPA expects that exposure frequency will increase during the summer months, when the heat will make the stream water more attractive. The HHRA is intended to address a RME scenario. That is, not all individuals may be exposed as frequently as assumed, but EPA believes it is reasonable to assume some individuals may be exposed as often as 68 days/year.

Ultimately, all of the water that comes out of the Illinois Central Spring winds up flowing through the Quarry Springs area. Therefore, it is not unreasonable to assume that it is possible to contact contaminated water throughout the year in this area. This is particularly true in the lower reaches between Quarry B and what is referred to as the Quarry Combined culvert – water ponds in this area. EPA recognizes that in the upper reaches near Quarry Springs A, it is possible to find limited to no flow in the fall (September and October). However, if a receptor is intentionally looking for water to recreate in or along, EPA continues to believe that water can be found, especially below Quarry B. The HHRA calculates potential surface water exposures based on the Quarry Springs-combined location, which is located below Quarry B. Therefore, the HHRA will maintain use of an exposure frequency of 68 days/year for the Quarry Springs area. However, the revised HHRA calculations will include a discussion of the fact that this exposure frequency is likely to be somewhat conservative and may overestimate surface water exposures during the fall.

As noted by CBS, an exposure frequency of 68 days/year is reasonable for Country Club Road; therefore, no changes will be made to the exposure frequency value for this location. EPA disagrees with CBS's claim that the Fluckmill Road reach is sufficiently remote and inaccessible to require a reduction in exposure frequency. As noted in Table 2 in the HHRA, both children and adults have been observed fishing from the bridge and railroad structures in the area. Also, the road itself provides access to much of this reach. Therefore, an exposure frequency of 68 days/year will be retained for the Fluckmill Road reach.

EPA acknowledges that the Strain Ridge Road reach is more remote and less accessible than other reaches of Clear Creek. An exposure frequency of 30 days/year as suggested by CBS is more reasonable for this reach. The HHRA will be revised accordingly.

Comment 66: Exposure Time - EPA has used an exposure time of 2 hours/day to evaluate dermal exposure to surface water. This is a greatly inflated estimate of the amount of time that individuals are likely to wade at the Site, particularly when considered in light of the exposure frequency of 68 days/year that is used in the assessment. It is highly unlikely that an individual would spend this amount of time in the water from April through October. This is particularly true for older youths and adults who are not likely to spend substantial amounts of time in the water, even when visiting the Creek.

Given the size and physical nature of the Creek and its low appeal as a recreational location, it seems more reasonable to assume that an individual spends no more than one hour in contact with the surface water during every exposure event. This is the upper bound estimate of the time spent swimming that is recommended by EPA (1997, Table 15-18). Even this assumption would be likely to overestimate potential for exposure through this exposure pathway.

Response: EPA acknowledges that the assumption that individuals are exposed for 2 hours/day on each day of exposure is conservative. Therefore, EPA has revised its exposure time assumption from 2 to 1 hour/day. Exposures, risks, and hazards associated with dermal exposure to surface water will be revised accordingly.

Comment 67: Water Ingestion Rate - EPA has selected a water ingestion rate of 0.0382 L/day for adults and 0.0765 L/day for youths and young children. They have derived these water ingestion rates by using the incidental ingestion of 0.05 L/hour recommended by EPA (1989) for incidental ingestion during swimming, and then assuming the exposure time of 2 hours to derive a total of

0.1 L/day. For youths and young children, they have assumed that individuals will only ingest water during the summer months (13 weeks or 52 visits if there is a visit four days/week) and thus have adjusted the ingestion rate by a factor of 52/68 so that they can combine this ingestion rate with a frequency of 68 days/year to derive a long-term average daily water ingestion rate. EPA has then assumed that adults will ingest water for approximately half of the time that youth receptors will. This approach is unnecessarily convoluted and does not reflect realistic potential for exposure due to this pathway. In addition, it substantially overestimates the amount of time that is spent swimming (0.5 hours/day for central tendency and 1.0 hours per day for upper bound), as described by EPA (1997, Table 15-18).

Ingestion of surface water is only likely to occur if an individual is swimming or is accidentally submerged in surface water. It would be highly unusual for an individual to ingest any surface water while visiting most of the reaches of the Creek evaluated. The Quarry Springs area is intermittent and not likely to be deep enough at any time for an individual to be completely submerged and thus ingest surface water. The Country Club Road and Fluckmill Road reaches are too shallow to provide a good swimming location. Thus individuals at these reaches would only ingest water if they accidentally fell down and swallowed it when they fell. While the Strain Ridge Road reach is somewhat deeper than the other reaches, it is still very unlikely that individuals will be submerged to the extent that they will ingest surface water, except by accident.

As a result, the only occasion that an individual is likely to have an opportunity to ingest water will be if that individual were to fall into a deeper pool and accidentally swallow some water. While this could conceivably occur in some areas, it is not reasonable to assume that this accidental exposure would happen regularly. Instead, it is possible that this type of accidental exposure might occur one or two times per year and that an individual might ingest 50 mL of water during each of those accidental events.

Response: EPA agrees that the approach used to calculate the rate of potential surface water ingestion rate was overly complex. Further, because the methodology assumed exposure during swimming (an activity that was not assumed to occur), this approach did not adequately reflect site-specific conditions.

However, EPA disagrees with CBS's assumption that "ingestion of surface water is only likely to occur if an individual is swimming or is accidentally submerged in surface water." Individuals recreating in or along Clear Creek and Quarry Springs may ingest surface water by scooping water from the creek to their mouth. One fluid ounce of water is equivalent to 29.6 mL. EPA considers one fluid ounce to be a reasonable amount of water to assume an individual ingests to temporarily alleviate a thirst they may have especially on warmer days. EPA also assumes that children and youths may ingest water in this fashion on 50 percent of the days they are assumed to recreate in or along Clear Creek or Quarry Springs. Adults are assumed to ingest water from the creek half as often as children and youths (about 25 percent of the days they are assumed to recreate in or along Clear Creek or Quarry Springs). Therefore, receptor-specific revised surface water ingestion rates are calculated below.

Children and Youths

(0.030 L/day x 0.5) = 0.015 L/day

Adults

(0.030 L/day x 0.25) = 0.0075 L/day

Comment 68: Dermal Surface Area - EPA has assumed that the feet and legs of young children and the feet and lower legs of youths and adults will be in contact with the water for some of the modeled exposure events (except Quarry Springs Area where it is assumed that only the feet are in contact with surface water). These assumptions are plausible for the areas evaluated, given the water depths in those areas.

However, EPA has gone on to assume that individuals are totally submerged in surface water at Country Club Road, Fluckmill Road, and Strain Ridge Road on a regular basis (26 days/year for young children and youths and 5 days/year for adults). CBS asserts that total submersion will not occur in these reaches, where the surface water is very shallow. While total submersion could conceivably occur in some of the slightly deeper pools, it is highly unlikely that anyone would swim there and that accidental submersion would occur more than two times per year.

CBS recommends that total submersion due to swimming in surface water be eliminated in all reaches. Since submersion in deeper pools along Clear Creek could occur a couple of times per year due to accidental falls, it would be appropriate to calculate dermal surface areas using a frequency of 2 days/year combined with the total body surface area, for submersion due to a fall, along with the age-specific surface areas used in the HHRA for wading for the remaining days of exposure that are assumed. For Country Club Road, this results in surface areas of 4,023 cm^2 for adults, 2,870 cm^2 for youths, and 2,207 cm^2

for young children. For the other two reaches, this assumption results in surface areas of 4,565 cm^2 for adults, 3,263 cm^2 for youths, and 2,374 cm^2 for young children.[4]

Response: EPA acknowledges that swimming is unlikely to occur at the Country Club Road, Fluckmill Road, and Strain Ridge Road locations in Clear Creek. However, full body exposure may occur in deeper pools as the result of play or recreational activities (including floating) and accidental falls into the creek. Revised receptor-specific dermal surface areas based on the age-specific surface areas used for total submersion and wading as presented in the risk assessment and the revised location-specific exposure frequencies are presented below.

Child (1 to 6 years)

At Country Club and Fluckmill Roads it is assumed that children (1 to 6 years) have full-body exposure on 25 percent of the available summer days (this equates to 13 days/year), with wading the remainder of available days. Strain Ridge Road is somewhat less desirable as a play or recreational area; therefore, it is assumed that full-body exposure would occur at this location only as the result of accidental submersion (2 days/year), with wading the remainder of available days. Revised receptor-specific dermal surface areas are calculated below:

Country Club and Fluckmill Roads: (6,560 cm^2 x 13/68 days) + (2,075 cm^2 x 55/68 days) = 2,932 cm^2

Strain Ridge Road: (6,560 cm^2 x 2/30 days) + (2,075 cm^2 x 28/30 days) = 2,374 cm^2

Youth (7 to 18 years)

At Country Club and Fluckmill Roads, it is assumed that youths (7 to 18 years) have full-body exposure on 25 percent of the available summer days (this equates to 13 days/year), with wading the remainder of available days. Strain Ridge Road is somewhat less desirable as a play or recreational area; therefore, it is assumed that full-body exposure would occur at this location only as the result of accidental submersion (2 days/year), with wading the remainder of available days. Revised receptor-specific dermal surface areas are calculated below:

Country Club and Fluckmill Roads: (13,120 cm^2 x 13/68 days) + (2,559 cm^2 x 55/68 days) = 4,578 cm^2

Strain Ridge Road: (13,120 cm^2 x 2/30 days) + (2,559 cm^2 x 28/30 days) = 3,263 cm^2

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[4] For Country Club Road:
Adults = (2 days * 18,150 cm^2 + 66 days * 3,595 cm^2)/68 days = 4,023 cm^2
Youths = (2 days* 13,120 cm^2 + 66 days * 2,559 cm^2)/68 days = 2,870 cm^2
Child = (2 days *6,560 cm^2 + 66 days * 2,075 cm^2)/68 days = 2,207 cm^2

For Fluckmill/Strain Ridge:
Adults = (2 days * 18,150 cm^2 + 28 days * 3,595 cm^2)/30 days = 4,565 cm^2
Youths = (2 days * 13,120 cm^2+ 28 days * 2559 cm^2)/30 days = 3,263 cm^2
Child = (2 days * 6,560 cm^2 +28 days * 2075 cm^2)/30 days = 2,374 cm^2

Adult

At Country Club and Fluckmill Roads, it is assumed that adults have full-body exposure on 10 percent of the available summer days (5 days/year) as the result of play and recreational activities and accidental submersion. At Strain Ridge Road, it is assumed that adults have full-body exposure as the result of accidental exposure (2 days/year). Exposure at all three locations through wading is assumed to occur on the remaining available days. Revised receptor-specific dermal surface areas are calculated below:

Country Club and Fluckmill Roads: (18,150 cm^2 x 5/68 days) + (3,595 cm^2 x 63/68 days) = 4,665 cm^2

Strain Ridge Road: (18,150 cm^2 x 2/30 days) + (3,595 cm^2 x 28/30) = 4,565 cm^2

Comment 69: Sediment Contact - Like the water contact pathways, the sediment contact pathways are not important pathways in terms of their contribution to total risks. However, it is still important to note that these risk estimates have also been substantially overstated. This is because the analysis uses a very high exposure frequency of 68 days/year (as discussed in the preceding comments for the surface water pathways); an inflated sediment ingestion rate that is not supported by the EPA guidance upon which it is purportedly based; and an unreasonably high dermal adherence factor for youths and young children.

Response: Consistent with EPA's response related to surface water exposure frequency, EPA will continue to employ an exposure frequency of 68 days/year to evaluate Quarry Springs and upper Clear Creek (as represented by the Country Club and Fluckmill Road reaches). However, EPA acknowledges that lower Clear Creek (as represented by the Strain Ridge Road reach) is more remote and less accessible than upper Clear Creek. The HHRA calculations will be revised to employ an exposure frequency of 30 days/year for sediment exposures in lower Clear Creek.

Comment 70: Sediment Ingestion Rate - The HHRA uses a sediment ingestion rate of 100 mg/day for adults and 200 mg/day for youths, citing as support the soil ingestion rates provided in EPA's 1997 Exposure Factors Handbook. That guidance does not, however, support the use of these rates for these age groups. In fact, EPA (1997) presents an average rate for adults and older children of 50 mg/day and makes clear that mouthing behaviors, and thus soil ingestion rates, decrease substantially by the age of six, so that the age group of youths (7 to 18 years) is better represented by adult soil ingestion rates. Thus CBS believes that the rates for youth recreationalists should be the same as the rates used for adults.

While EPA (1997) does not provide any information about potential ingestion of sediment, and does not provide an upper bound estimate of adult and older child soil ingestion rates, EPA risk assessments often estimate that the upper bound rate is roughly twice the central tendency rate, as is demonstrated in the recommended soil ingestion rates for young children (EPA, 1997). If this same ratio were applied to the potential rate of sediment ingestion, it would result in an upper bound rate of 100 mg/day. This is the

same as the upper bound sediment ingestion rate that was used in the Housatonic River risk assessment (EPA, 2005).

Response: EPA acknowledges that as a group, the sediment ingestion rate for youths (7 to 18 years) may be better represented by the rates used for adult, rather than the rates for younger children. Therefore, the risk assessment was revised to use a sediment ingestion rate of 100 mg/kg for youths (7 to 18 years).

Comment 71: Sediment Adherence Factor - EPA has used a different soil adherence factor for adults than it has used for youths and young children. The adherence factor of 0.3 mg/cm^2 is based on upper bound exposure for an adult gardener while the value of 3.3 mg/cm^2 used for young children and youths is reportedly based on soil adherence for children playing in loose wet soil. There is, in fact, no reason to believe that sediment adherence for adults will be different from sediment adherence for youths as the sediment will have the same tendency to be washed off of the skin of youths and children as it will for the skin of adults.

The soil adherence value used to estimate skin adherence for children playing in sediment is not appropriate because the majority of sediment that contacts the skin will also be washed off by the water. In addition, children playing in an artificially provided loose, wet soil, which is the basis for the adherence factor of 3.3 mg/cm^2 used for children and youths, is not a reasonable surrogate for individuals who are wading in the creek where sediments and bank soils are more compacted and water will scour the skin as the individual moves around. Rather CBS suggests that the adherence factors reported by EPA (2004) for reed gatherers provides a better estimate of the amount of sediment likely to be adhered to the skin of individuals who are wading in the creek.

The recent risk assessment conducted by EPA for the Housatonic River in Massachusetts evaluated potential dermal contact with sediment for children aged 7 through 18 years and adults. In that assessment, EPA used the soil adherence factor of 0.3 mg/cm^2, based on average contact by reed gatherers. This is the same value that has been used in the HHRA for adults and appears to be reasonable, given that there is no reason to believe that more sediment will adhere to the skin of youths and young children than will adhere to the skin of adults during the same types of activities.

Response: EPA agrees that there is no reason to believe that the amount of sediment adhering to the skin of youths (7 to 18 years) and children (1 to 6 years) will be greater than the amount of sediment that will adhere to the skin of adults. Therefore, the risk assessment was revised to use an adherence factor of 0.3 mg/cm^2 for adults, youths (7 to 18 years), and children (1 to 6 years).

Comment 72: Soil Contact - The risks due to soil contact are also overestimated due, in part, to the extremely conservative exposure frequency and soil ingestion rate estimates that have been used to derive them. Frequency of exposure to soil is assumed to be even higher than potential exposure to surface water and sediment (76 days per year). In addition, as for sediments, the soil ingestion rates for older children have been substantially overestimated. Furthermore, the soil ingestion and dermal contact rates do

not reflect the fact that the total areas contacted during a day of exposure are likely to be a combination of contaminated and non-contaminated areas. Finally, the skin surface area exposed is assumed to be head, hands, forearms and lower legs for all age groups throughout the year.

Exposure Frequency

The HHRA uses an exposure frequency of 76 days for the soil contact pathways. This is based on EPA's professional judgment and assumes that individuals will be in contact with Site-related soils 4 days/week throughout June, July, and August, and 4 days/month for six additional months of the year. Such a high frequency may be reasonable in areas where the Creek runs adjacent to residential areas, such as the Country Club Road area, but is not reasonable for Quarry Springs, which is a less desirable area, or for the Fluckmill Road and Strain Ridge Road areas, which are more remote and to which access is substantially limited.

As discussed for the surface water pathway, it would be more reasonable to assume that individuals are present in these more remote areas 1 day per week on average during the warmer months of the year for a total of 30 days/year. CBS recommends that the risk evaluation be modified to be more site-specific for the individual reaches and use 30 days/year as a soil exposure frequency, except for the Country Club Road area.

Response: The Quarry Springs area is located near a residential area. As a result, receptors (adults, youths, and children) may frequent Quarry Springs based primarily on its convenient location. Therefore, an exposure frequency of 76 days/year will be retained for the Quarry Springs area. EPA disagrees with CBS's claim that the Fluckmill Road reach is sufficiently remote and inaccessible to require a reduction in exposure frequency. As noted in Table 2 in the HHRA, both children and adults have been observed fishing from the bridge and railroad structures in the area. Also, the road itself provides access to much of this reach. Based on this, an exposure frequency of 76 days/year will be retained for the Fluckmill Road reach. Therefore, an exposure frequency of 76 days/year will be retained for upper Clear Creek (as represented by the Country Club and Fluckmill Road reaches).

On the other hand, EPA acknowledges lower Clear Creek (as represented by the Strain Ridge Road reach) is relatively remote and that access to this area is more limited than for upper Clear Creek. Therefore, the risk assessment will be revised to reduce soil exposure frequencies along lower Clear Creek (as represented by the Strain Ridge Road reach) by 50 percent to 38 days/year.

Comment 73: Soil Ingestion Rate - As discussed under the Sediment Exposure pathway, the soil ingestion rates used for youths (200 and 100 mg/day for RME and CTE exposures, respectively) are not supported by the soil ingestion literature. According to that literature and EPA guidance (EPA, 1997), by the time an individual reaches the age of six years, his/her soil ingestion rate is decreased substantially and is more similar to adult rates of ingestion. Thus, for youth recreationalists, it is more appropriate to use the same conservative rates that have been used to evaluate potential adult exposures.

Response: EPA acknowledges that as a group, the soil ingestion rate for youths (7 to 18 years) may be better represented by the rates used for adult, rather than the rates for younger children. Therefore, the risk assessment was revised to use a soil ingestion rate of 100 mg/kg for youths (7 to 18 years).

Comment 74: Fraction Contaminated - The evaluation of exposure due to surface soil, bank soil, and floodplain soil contact assumes that 100 percent of the soil ingested and contacted on a daily basis will be contaminated soil. In fact, soils from the contaminated areas are likely to represent a very small fraction of the total incidental soil ingested daily, which will include a majority of soils from non-contaminated areas (i.e., away from the banks and outside of flood plain areas). As a result, it is not reasonable to assume that 100 percent of the soils contacted on each day of exposure will be contaminated soil. Given the relatively small sizes of the floodplain areas and bank soil areas, it is reasonable to assume that no more than half of the soil contacted daily will be derived from contaminated areas. Thus CBS recommends that an additional factor of 50 percent be used in calculating potential exposures due to soil contact.

Response: EPA acknowledges that it is unlikely that all of the soil contacted by receptors will be from site-contaminated areas. Therefore, all receptor-specific soil exposures was adjusted to incorporate a "fraction contaminated" factor of 50 percent.

Comment 75: Dermal Surface Area - The HHRA assumes that during all potential soil contact events, the hands, forearms, lower legs and head have contact with soils, even when the weather is inclement and individuals would be expected to wear long pants, socks, and long sleeved shirts. The justification for this is the possibility that some soil or dust could penetrate or get inside of clothing. While it is possible that a small amount of soil might work its way under pant or sleeve cuffs, it is highly unlikely that this soil will contact all skin areas assumed and will have the same level of adherence as will occur when skin is bare. Thus, CBS believes that it is necessary to adjust the dermal surface areas for soil contact to reflect lower contact rates when skin is covered by long sleeved shirts, long pants, and socks. In the HHRA for the Housatonic River in Massachusetts (2005), EPA made such an adjustment. For adult recreationalists, they adjusted skin surface areas for the colder months and derived a seasonally-weighted skin surface area of 4,446 cm^2. Similarly they derived seasonally-weighted skin surface area of 3,464 for 7 to 18-year old youths and 2,195 cm^2 for young children. It is recommended that these reduced skin surface areas be used to evaluate the soil contact pathway and provide more realistic estimates of exposure and risk.

Response: EPA acknowledges that the dermal surface area assumed to contact soil may be reduced during periods of colder weather when receptors are more likely to wear long-sleeved shirts, long pants, and socks. As noted in EPA's RAGS Part E, Supplemental Guidance for Dermal Risk Assessment (EPA 2004a) and in CBS's comment, weighting of dermal surface area may be appropriate for colder climates. However, noted in EPA (2004a) and again in CBS's comment, some studies have shown that dermal contact with soil can occur under clothing. Because of this, EPA does not consider the recommended dermal surface areas (as used in the HHRA) "to be overly conservative." Also, the receptor-specific dermal surface areas used in the HHRA range between 8 and 28 percent

higher than those proposed by CBS; these differences are relatively small and are unlikely to significantly impact risk and hazard results. Therefore, the receptor-specific dermal surface areas used in the risk assessment will not be revised.

Comment 76: Aggregate Exposures - Tables 8 and 9 of the HHRA provide summaries of aggregate risks and hazard indices, respectively. To calculate these, EPA has summed exposures from fish consumption, with contact with surface water, sediment, bank soil and floodplain soil to derive total risk estimates for RME low income, RME recreational, average low income and average recreational fish consumers at all four reaches. There are a number of problems with this approach that result in unrepresentative risk estimates and provide inaccurate information that can be extremely misleading for decision-making by risk managers.

First, these aggregate risk estimates assume that all individuals who have some contact with water, soil, or sediment are also fish consumers. In all cases, the risks associated with the fish consumption pathways have been combined with the risks associated with other direct contact pathways. It is not unreasonable to assume that individuals who fish from Clear Creek may have some contact with surface water or with soil/sediment in the area at which they fish. However, it is likely that the vast majority of individuals who may have contact with sediment or soil do not also consume fish from the Creek.

The HHRA states, in its defense of the evaluation of the fish consumption scenarios that are evaluated, that "it as [sic] assumed that at least one individual consuming fish at each of the considered fish tissue ingestion rates can be supported by the fish population at each location. Uncertainty remains regarding whether more than one individual can be supported by fish populations at each location. This uncertainty is expected to be moderate." Given this acknowledgement, it is possible that only one individual consumes fish from each reach of the Creek, particularly at the fish consumption rates used by EPA to estimate potential exposure. Thus, the aggregate risk estimates that are provided in Tables 8 and 9 may only be relevant for a single individual at each reach and are not likely to be representative of the recreational population as a whole. Risk managers may be misled by these aggregate risk estimates into assuming that the risks to individuals who use the Creek for recreational activities apply to a substantially larger population than is actually the case.

In addition, EPA has specifically developed aggregate risk estimates for the Quarry Springs area by combining the direct contact risk estimates with fish consumption risks based on the consumption of fish from Country Club Road, despite the admission that no fish consumption will occur from the Quarry Springs area. This is extremely misleading because it implies that risks associated with media concentrations at Quarry Springs are substantially greater than they actually are, since the vast majority of the estimated risks are based on the consumption of fish that are not even present in the Quarry Springs Area. This risk estimate could lead risk managers to make remedial decisions for the Quarry Springs area based on activities that will not occur there. As a result, if those risk estimates are used as the basis for remedial activities at Quarry Springs, the result will be no change in the ultimate risk estimates because remedial actions taken at Quarry Springs will not affect the

potential risks due to the consumption of fish from Country Club Road. Instead, any remedial decisions that are made for Quarry Springs should be based only on activities that could potentially occur in the Quarry Springs area. As acknowledged in the HHRA, these activities do not include the consumption of fish.

Finally, EPA's approach for aggregating potential risks and hazards double-counts (for Quarry Springs) and triple-counts actual direct contact exposures for the other reaches of Clear Creek that were evaluated. In evaluating the potential risks associated with sediments, bank soils, surface soils, and floodplain soils along different reaches of Clear Creek, EPA has considered each exposure pathway as a discrete exposure. Thus, for each evaluation, total daily soil ingestion rates and dermal contact rates have been combined with media-specific EPCs to estimate potential risks. While this is a conservative approach when considering a single medium, it is completely inappropriate to sum the estimated risks and hazards associated with multiple media because to do so, yields risk results that are completely unrepresentative of potential exposures in those areas.

For example, the HHRA has used an upper bound soil ingestion rate for adults of 100 mg/day, which is assumed to be a total daily soil ingestion rate. However, for Country Club Road, Fluckmill Road, and Strain Ridge Road, EPA has evaluated potential exposure due to the ingestion of sediment, bank soil, and floodplain soil separately, each using 100 mg/day as an ingestion rate, and then has summed these pathways to get an aggregate risk estimate. Thus, these aggregate risk estimates assume that individuals ingest 100 mg of sediment, 100 mg of bank soil, and 100 mg of floodplain soil on each day of exposure, for a total of 300 mg/day. This is not appropriate or characteristic of recreational exposures. Instead, if individuals have contact with sediment, floodplain soil, and bank soil on a given day of recreational activity, then using EPA's conservative rate of soil ingestion, these individuals will still only ingest a total of 100 mg/day but that total will be comprised of a combination of sediment, floodplain soil, and bank soil. In order to aggregate exposures for these pathways combined, the HHRA should either apportion the total soil ingestion rate among the different exposure pathways or should conduct a separate calculation that uses an EPC that is based on a combination of sampling data for all three media, weighted as is deemed appropriate. The same is true for the dermal pathway.

The same approach was used for the Quarry Springs area although only two duplicative media were evaluated (sediment and surface soil). However, the same approach as is described above should have been used to aggregate risks so that the ingestion and dermal exposure risks are not double-counted, as they currently are.

Response: EPA acknowledges that not all individuals who have contact with soil, sediment, and surface water will also consume fish from Clear Creek. The total (or aggregate) risks and hazards are intended to represent RME conditions. It is not unreasonable to assume individuals who have contact with soil, sediment, and surface water will also consume fish from Clear Creek. However, because the fish biomass at each receptor location may support only a small number (as low as one) of anglers at the assumed rate for each location, it is likely that the majority of receptors exposed in and

along Clear Creek do not consume fish at the assumed ingestion rates. Therefore, for the purpose of the revised HHRA calculations, two types of total risks and hazards were calculated: (1) all potential location-specific exposure pathways including fish ingestion and (2) all location-specific soil and sediment exposure pathways (excluding fish tissue ingestion). This revised approach provides risk managers with more accurate and clear information upon which to base their decisions.

EPA disagrees with CBS's comments regarding the decision to calculate total exposures, risks, and hazards for the Quarry Springs area by including results associated with potential ingestion of fish from Country Club Road. Clearly no fish ingestion takes place from the Quarry Springs area. However, it is not unreasonable to assume that individuals who are exposed to sediment and soil in the Quarry Springs area may also ingest fish from Clear Creek. Country Club Road represents the closest fish sampling location to the Quarry Springs area and for this reason was selected as the location at which individuals exposed to sediment and soil at the Quarry Springs area may reasonably be assumed to also be exposed through ingestion of fish. In light of the decision to calculate two types of total risks and hazards, any confusion regarding this approach should be minimized. The presentation of total risks and exposures based only on sediment and soil exposures at the Quarry Springs area will allow risk managers to make decisions based on this information alone if they choose to do so.

EPA recognizes that the approach used to calculate total receptor-specific exposures (or aggregate exposures) is conservative because it includes some double- or even triple-counting of potential exposure (such as assuming receptors ingest 100 mg/day of sediment, 100 mg/day of floodplain soil, and 100 mg/day of bank soil for a total of 300 mg/day). Therefore, for the purposes of the revised HHRA calculations, EPA calculated medium-specific exposures using the full medium-specific ingestion rate. This approach allowed medium-specific exposures to be evaluated on their own at each location. However, for the purposes of calculating total (or aggregate) exposures at the Quarry Springs area, EPA will assume that one-half of direct contact exposures (incidental ingestion and direct contact) is to soil and one-half is to sediment. Similarly, for the purposes of calculating total (or aggregate) exposures at Country Club Road, Fluckmill Road, and Strain Ridge Road, EPA assumed one-third of direct contact exposures is to floodplain soil, one-third is to bank soil, and one-third is to sediment.

Comment 77: Revised Risk Estimates - In an effort to demonstrate the degree of overestimation of the risk estimates provided in the HHRA, CBS has recalculated potential risks to these receptors using the recommended assumptions outlined and discussed above. The parameters and assumptions which were used to derive the revised risk estimates are briefly summarized below. These revised calculations are provided in detail in Attachment A and are summarized in Tables 1and 2.

Response: Because EPA does not agree with many of CBS's proposed parameter value revisions, review and comment on AMEC's revised risk estimates is not warranted. Also, for the purposes of this response, CBS's recalculated pathway-specific and aggregate risks and hazards as discussed in the preceding paragraph have not been repeated. However, EPA has recalculated potential risks to adult, youth, and child

receptors using the revised assumptions and parameter values discussed above in EPA's responses.

EPA's revised pathway-specific and total risk and hazard estimates are summarized in Tables 1 and 2 (See Attachment A), respectively, and are documented in Tables A1 through A5 in Attachment A. Specifically, Table A1 presents revised general and chemical-specific exposure parameter values, Table A2 presents medium-specific EPCs, Table A3 presents revised fish tissue risks and hazards, Table A4 presents revised surface water exposures, risks, and hazards, and Table A5 presents revised sediment and soil exposures, risks, and hazards.

Comment 78: Fish Consumption - CBS has recalculated the potential risks and hazards associated with the fish ingestion pathways, making the following changes:

- The analysis of consumption for subsistence consumers has been eliminated as there is no evidence that this type of behavior is occurring along Clear Creek.

- A fish ingestion rate of 1 g/day has been used to represent CTE exposures at all three reaches of Clear Creek. To evaluate RME exposures, rates of 1, 4, and 12 g/day have been used to evaluate the potential for fish consumption at Country Club Road, Fluckmill Road, and Strain Ridge Road, respectively. The rates of 1 and 4 g/day are based on the EPA (2000a) range for consumption from single, small waterbodies, and the rate of 12g/day is based on the 95th percentile rate reported by Ebert et al. (1993) for recreational anglers who consumed fish from rivers and streams.

- A new set of EPCs has been developed to represent potential exposure to a mixture of pelagic and benthic species (Combination fish). Given the low desirability of benthic fish for consumption and the reported high incidence of pelagic fish in Clear Creek, it has been assumed that 90 percent of the fish consumed from each reach are pelagic fish and that 10 percent of the fish consumed are benthic species. A weighted average fish tissue concentration has then been derived using the concentrations in pelagic and benthic fish that were reported in the HHRA for each reach.

- No TEQ risks have been calculated due to the lack of adequate data on TEQ in fish tissue and the uncertainties associated with the application of the approach.

Surface Water Exposure

CBS has revised the surface water exposure pathways to reflect more realistic potential for exposure at each reach, including the following changes:

- All of the reaches of Clear Creek that have been evaluated in the HHRA are too shallow for swimming so it has been assumed that swimming does not occur in any of those reaches. Instead, it is assumed that individuals could fall into the Country Club Road, Fluckmill Road, and Strain Ridge Road reaches of the creek

by accident, 2 times/year and ingest a limited amount of surface water during those events. Surface water ingestion is not evaluated for the Quarry Springs Area. No ingestion is expected to occur in the Quarry Springs area.

- During accidental falls, it is assumed the entire body surface area of each receptor is in contact with surface water.

- The exposure frequency for dermal contact in the Fluckmill Road and Strain Ridge Road reaches is assumed to be no more than 30 days/year due to their more remote locations and the lack of ready access.

- Dermal surface areas have been calculated for Fluckmill Road and Strain Ridge Road by assuming that the total body surface area is in contact with the surface water on 2 days/year and that wading occurs on the remaining 28 days of activity each year.

- For Quarry Springs it is assumed that exposure may occur 5 days/year but that only the feet will be in contact with surface water during those days.

- While the exposure frequency at Country Club Road is conservatively assumed to be 68 days/year, as presented in the HHRA, the dermal surface areas are calculated by assuming that there is full body contact with surface water during accidental falls on 2 days/year but that individuals only wade during the remaining 66 days.

- An exposure time of 1hour/day, to represent the time spent swimming. This factor is used to calculate the total surface water ingested during swimming as well as the factor "DA" for the dermal contact pathways. This exposure time is consistent with the exposure time associated with swimming events, as presented in EPA guidance (EPA, 1997).

Sediment Exposures

Sediment exposures have been recalculated using the same revised exposure frequencies as were used for surface water, due to the fact that sediments will be contacted at the same time that surface water is. Thus, the following revisions have been made:

- Exposure frequency of 68 days/year for Country Club Road but exposure frequencies of 30 days/year for Fluckmill and Strain Ridge Roads, and 5 days/year for Quarry Springs.

- A sediment adherence rate of 0.3 mg/cm^2 has been used for young children and youths to match the sediment adherence rate used for adults (based on reed gatherers) and reflect the different potential for adherence of sediment and soil.

- Upper bound sediment ingestion rate of 100 mg/day for adults and older children, based on EPA's (1997) discussion about soil ingestion by children over the age of 6 years.

Exposure to Soils

Many of the same changes have been made to the soil contact pathways. These changes have been applied to all of the soil contact calculations (floodplain soil, bank soil, surface soil) and include the following:

- A revised soil ingestion rate of 100 mg/day for youths has also been used.

- While the exposure frequency for Country Club Road is unchanged, due to the proximity of residences in the area, the exposure frequency for Fluckmill Road and Strain Ridge Road has been changed to 30 days/year and the exposure frequency for Quarry Springs has been reduced to 5 days/year to be consistent with the other scenarios and reflect site-specific characteristics.

- Revised skin surface areas have been calculated to reflect that fact that individuals will wear long sleeves, long pants, and socks on days in the early spring and late fall when the weather is cool.

In addition, CBS had added a factor for the fraction of soil contacted daily that is contaminated. That factor has been conservatively assumed to be 50 percent to reflect the fact that individuals will also spend at least half of their days in areas that are not contaminated.

Total Risks

Total aggregate risks have also been recalculated and are presented in Tables 1and 2. To calculate these risks, the following changes have been made:

- Aggregate risks for the Quarry Springs area have been revised to exclude the fish consumption pathway.

- Aggregate risks for Country Club Road, Fluckmill Road, and Strain Ridge Road include all of the exposure pathways but assume that 1/3 of the soil contacted is bank soil, 1/3 is floodplain soil, and 1/3 is sediment on every day of exposure.

- Aggregate risks for Quarry Springs include all of the direct contact pathways but assume that ½ of the soil contacted is surface soil and 1/2i s sediment on each day of exposure.

Results

Using these revised assumptions and parameters, CBS has recalculated pathway-specific and aggregate risks. As shown in Table 1 (See Attachment A), all cancer risks fall within or below EPA's acceptable risk range. As in the HHRA, these risk estimates are

completely dominated by the fish consumption pathways. For those individuals who recreate along Clear Creek but do not consume fish from the creek, risk levels are below levels of concern at Country Club Road, Fluckmill Road, and Strain Ridge Road, as demonstrated in Table 1. At Quarry Springs, the direct contact risks are slightly higher but are near the more stringent end of EPA's acceptable risk range.

Hazard indices have also been recalculated. Results of that analysis are presented in Table 2. As for the cancer risk estimates, the fish ingestion pathway yields the highest hazards, with hazard indices ranging from 0.15 to 2.4 for the RME fish consumer. Hazards to the CTE fish consumer are well below the benchmark hazard index of 1. Aggregate hazard indices exceed 1for the RME scenario that includes the consumption of fish at Fluckmill Road and Strain Ridge Road. However, for those individuals who recreate along Clear Creek but do not consume fish from it, hazard indices are well below levels of concern.

Response: Please see Response to Comment 77.

Comment 79: Risks to Ecological Receptors Do Not Justify any of the Alternatives

Similarly, none of the alternatives are required to protect ecological resources. As in the Bennett's Dump Proposed Plan, EPA uses toxicity reference values that the latest scientific studies show to be overly conservative for the kingfisher and mink, its two indicator species. This results in an overstatement of the risk. In the Proposed Plan, EPA calculates hazardous quotients for mink and kingfishers that are just slightly above the 1.0 threshold level recognized by the Agency. *See* Proposed Plan at pp. 19-20. However, as discussed in detail in CBS's Lemon Lane Ecological Risk Assessment Comments (attached as Exhibit C and incorporated by reference), EPA has calculated these hazard quotients using overstated toxicity reference values (TRVs). If more reasonable TRVs are used, then the hazard quotients would be much lower and would not justify any further action. The proper calculation of the TRVs is explained in detail in Exhibit C.

Moreover, as also detailed in Exhibit C, although the existing ICS Treatment Facility has been in operation for six years, it has had no significant impact on EPA calculated ecological risk levels within the main stem of Clear Creek. There is no reason to suppose that Alternative 3, or any other options considered in the Proposed Plan, will measurably improve the situation in the main stem.

Response: See the responses to Comments 80 through 84.

Comment 80: The assessment for Clear Creek includes only one line of evidence, the generation of conservative hazard quotients. CBS agrees with Fairbrother (Fairbrother 2003) that this conservative line of evidence based on theoretical hazard quotients can only be used to rebut the presumption of risk, not to conclude that significant risk actually exists. The EPA has not performed any field studies that would be required to determine if these theoretical risks have actually manifested in any real population effects.

Response: The Lemon Lane Focused Ecological Risk Assessment (FERA) is consistent with Superfund guidance and practice.

Comment 81: Since the assessment uses the same TRVs that EPA has used in the other Bloomington area ERAs, CBS has the same comments made previously with respect to those TRVs. Specifically:

First bullet:

The methods used to derive some of the TRVs for both mink and birds are novel and their utility and accuracy have not been established. In particular, CBS has a number of concerns about the TRVs and the methods that were applied in deriving them that were presented in the document entitled "Toxicity Reference Values (TRVs) for Mammals and Birds Based on Selected Aroclors", from USEPA Region V, dated March 6, 2003 (which is included as a part of USEPA 2005, Focused Ecological Risk Assessment, PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek, August 10). For example, the combination of data from various studies and then the extrapolation of NOAELs and LOAELs from the combined data sets have several obvious limitations, including the comparability of methods between studies. To our knowledge, these approaches have not been externally peer reviewed and are in contrast to the typical EPA method of deriving TRVs from relevant single high value studies.

Second bullet:

The TRVs for mink have been adjusted to account for two breeding seasons. It is not clear that this is a generally accepted or scientifically valid procedure. In their TRV memo, USEPA evaluated the Brunstrom et al., (2001) study and concluded that "the low effect TRV for exposure over 2 breeding seasons (1.3 ppm PCB) is 42% of the corresponding TRV for 1 season exposure (3.1 ppm), and the 2-season no effect TRV (1.1 ppm) is 47% of the 1-season value (2.4 ppm)." These TRVs are clearly artifacts of the interpolation method used by USEPA since only two doses were evaluated by Brunstrom et al., (2001) and yet USEPA derived four different TRVs from this study. Furthermore, USEPA's TRVs are based on a narrow definition that considers only a single endpoint rather than deriving a TRV based on the most sensitive, ecologically relevant endpoint(s), as is commonly done with setting a TRV. Clearly, the results of Brunstrom et al., (2001) demonstrate the toxicity of the European Clophen technical mixture. If one focuses on reduced birth weight of kits as an endpoint, then it is clear from this study that the LOAEL TRV (0.3 mg Clophen A50/mink/d or 2 mg/kg in diet) is the same for both the 6-month and 18-month exposures (compare Tables 3 and 5 in Brunstrom *et al.*, 2001). However, the more sensitive endpoints from this study were the numbers of 2-week old kits per mated female and weights of kits at 2 and 5 weeks of age. Using these more sensitive endpoints, the LOAEL is 0.1 mg Clophen A50/mink/d (or 0.67 mg/kg in feed) at the 18-month exposure. However, since the authors did not present data on these endpoints for the 6-month exposure, there is no way to directly compare TRVs for 6 and 18-month exposures for these endpoints. Thus, this study does not support the derivation of a 1-season to 2-season uncertainty factor. Similarly, USEPA's

analysis of the Restum et al., (1998) study does not support a 1-season to 2-season uncertainty factor. Again, the TRVs derived from this study by USEPA are artifacts of the interpolation method used by USEPA and the narrow definition of a TRV that utilized a single endpoint rather than deriving a TRV based on the most sensitive, ecologically relevant endpoints. As before, the lowest dose tested for both seasons determined a LOAEL and therefore, the uncertainty associated with estimating a NOAEL from this study would be relative great. For example, based on the most sensitive, ecologically relevant endpoint from this study, reduced body weight of 6-week old male kits, it is clear that the LOAEL TRV (0.25 mg PCBs/kg in diet) is the same for both the 6-month and 18-month exposures (compare Tables 8 and 9 of Restum et al., 1998). Thus, this study and the other study cited by USEPA (Brunstrom et al., 2001) do not support the derivation of a 1-season to 2-season uncertainty factor. The most recent high quality studies (for example the Housatonic River fish feeding studies detailed in Bursian et al 2003) have not involved multiple breeding seasons. Similarly the USFWS is planning a similar mink feeding study with Hudson River Fish and this is also proposed as a single season study (Hudson Ever Natural Resource Trustees 2006). This is an indication that multiple breeding seasons are not judged to be a significant factor in TRV development for mink by much of the scientific community including EPA or FWS at other high profile PCB sites. If this factor was omitted, the resulting Hazard Quotients would drop by about a factor of 2.

Third bullet:

Relative to assessment of potential effects thresholds in mink, the study conducted by Michigan State University under contract with the USEPA (Bursian et al., 2003) where fish from the Housatonic River were fed to mink is the highest quality, most relevant study from which TRVs can be determined. EPA disregards this study because the original technical grade of PCBs released at the Housatonic River was Aroclor 1260. While the original PCB technical mixture released to the Housatonic River may have been different from those released at this site, it has been established that TEQs are the most accurate predictor of toxicity to mink. A variety of weathering and bioaccumulation processes have altered both the PCBs released in Bloomington streams and those released to the Housatonic. Upon review of the residue data from both the Housatonic mink feeding study and Clear Creek fish, the relative potency of the dioxin-like activity, in the units of mg TEQs/kg PCBs, were found to be lower for the Clear Creek fish than for the Bursian study fish (Table 1). Additionally, for both sites congener 126 was found to be the main contributor of TEQs. Thus, selection of this study as the basis for TRV's is relevant and likely conservative for this site. USEPA has used Aroclor 1260 field derived TRVs at sites contaminated with Aroclor 1242 in other high profile risk assessments. For example, in the Hudson River ERA (USEPA 2000), USEPA used a NOAEL TRV for great blue heron that was based on a Halbrook (Halbrook et al. 1999) field study where Aroclor 1260 was the contaminant. The main contaminant released at the Hudson River site is also Aroclor 1242, the same as at Lemon Lane Landfill.

Fourth bullet:

The TRVs used to assess toxicity for kingfishers are all from other bird species. Gallinaceous birds, such as chickens and pheasants are among the most sensitive birds with respect to exposures to PCBs and other dioxin-like chemicals. The assessment fails to evaluate recent scientific evidence that kingfishers may be much less sensitive than any of these birds. This evidence is found in the Housatonic field studies (Henning and Brooks, 2003). At the Housatonic site, where PCB levels in fish are one to two orders of magnitude greater than they are at this site, there was no noticeable impact to breeding success of native kingfishers near the site. While the original PCBs disposed of at the Housatonic site may be different from those disposed of at Clear Creek, it has been established that the TEQs are the most accurate predictor of toxicity to fish eating birds. The TEQs of the Housatonic fish when evaluated as mg TEQs/kg PCBs are similar, but higher, than those found at the Clear Creek site. This large discrepancy between predicted risk to reproduction and actual field measured reproduction shows how relying on a single line of evidence such as theoretical hazard quotients can lead to improper conclusions.

Fifth bullet:

There is a growing body of evidence that suggests that it is inappropriate to apply chicken based TRVs to piscivorous birds for TEQs. For example, studies over the last several years by a number of researchers indicate that predatory birds, such as bald eagles, ospreys, and kingfishers are much more resistant to the effects of dioxins and related chemicals (Woodford et. al., 1998; Kennedy et. al. 2003; Henning and Brooks, 2003). Elliott and Harris (2002) noted the following based on their extensive review of data for piscivorous birds:

> • *In summary, the results of this study are consistent with the emerging data from both field and laboratory studies which indicate that predatory birds are not particularly sensitive to some of the effects of TCDD. Assessments based on field studies on eagles (Elliott et al., 1996) and ospreys (Woodford et al., 1998) and the comparative egg injection work with kestrels, indicate that raptors are rather insensitive to some of the toxic and biochemical effects of TCDD and PCBs. Elliot et al., (1996) suggested a no effect level (based on hepatic CYP1A in hatchlings) of 100pg/g TEQs and a lowest effect level of 303 pg/g.*

Sixth bullet:

In summary, the raptor TEQ egg LOAEL ranges conservatively from 210 pg/g to 303 pg/g based on enzyme induction, which is not typically an endpoint chosen for an ERA since it is not an ecologically relevant endpoint and occurs at much lower concentrations than effects on reproduction and development. Furthermore, since these values are based on the induction of enzymes, it is likely that effect levels in predatory birds for ecologically relevant endpoints, such as reproductive and developmental endpoints, are

much greater. If these TRVs were used in the USEPA's ERA, then the predicted risks to piscivorous birds, such as kingfishers, would be substantially less, and if other TRVs were available for such raptors, based on endpoints such as reproductive/developmental endpoints, the predicted risk would again be much less.

Seventh bullet:

CBS has previously provided EPA TRVs for the Great Blue Heron (Viacom 2004). Since the Great Blue Heron is also a predatory piscivore, the TRVs derived for the Great Blue Heron are likely more representative for the Kingfisher. CBS therefore recommends that the TRVs in Viacom 2004 for the Great Blue Heron be used for the kingfisher rather than those the EPA has derived based on Gallinaceous birds. If this substitution were made, the calculated hazard quotients would drop to about those shown for the "LOAEL" kingfisher case in EPA's risk assessment. Those hazard quotients approximate 1 based on the 2004 data set and show little risk to avian piscivores.

Response: First bullet:

Eight sets of TRVs are used in the FERA, the comments pertain to 2 of these 8 sets. The TRVs in question are based on meta-analysis of multiple toxicity studies, a procedure used to derive mink dietary no effect (500 μg total PCB/kg diet) and low effect (600 μg/kg) TRVs, and kingbird ingestion dose no effect (400 μg total PCB/kg_{BW}-d) and low effect (500 $\mu g/kg_{BW}$-d) TRVs. The remaining 6 sets of TRVs in the FERA are derived through other approaches, including a second set of kingbird PCB ingestion TRVs used to bracket uncertainty over kingbird sensitivity to PCBs.

The methods used for the meta-analysis are not novel. The approach is based on Leonards, et al. (1995), who used meta-analysis to interpolate mink tissue-based PCB TRVs on a dioxin-equivalent (TEQ) basis. The method used in the FERA for normalizing data from multiple studies to combine them into a single meta-analysis is the same as used by Leonards, et al. (1995). Other examples of the same normalization approach for meta-analysis of ecotoxicological studies include Isnard, et al. (2001), Tanaka and Nakanishi (2001), and Calabrese (2005). The main differences between the methods in the FERA and Leonard, et al. (1995) are minor ones made for site-specific objectives. The FERA meta-analysis TRVs are derived for PCBs on an individual Aroclor basis, instead of TEQs; exposure to mink is quantified on a dietary basis, instead of tissue accumulation; a different regression method is used (adapted from USEPA guidance on effluent toxicity testing); and, consistent with Superfund practice, TRVs are based on the range between no adverse effects and the onset of adverse effects, while the Leonards, et al. (1995) TRVs are based on a high incidence of adverse effects (affecting 50 % of exposed mink).

CBS incorrectly states that the TRVs are extrapolated, but the meta-analytical method in the FERA is restricted solely to interpolation within the combined data sets, and extrapolation beyond the bounds of the empirical data is not allowed.

Incompatibilities between studies because of differences in study design or other factors are potentially important limitations of meta-analysis and, therefore, are evaluated as part of the meta-analysis performed for the FERA. Significant incompatibilities between studies are revealed by inconsistencies in the exposure-response plots of the combined data sets. There are no inconsistencies among the 3 studies performed by two sets of investigators combined in the meta-analysis of PCB effects on hatchability, to the contrary, the results of the various studies are remarkably consistent with each other (Figure 1). The mink PCB TRVs are based on 4 studies performed by three sets of investigators (two separate experiments reported in Aulerich and Ringer 1977 are included in Figure 2). The results are internally consistent except for an inconsistency between studies at 1 mg/kg PCB dietary concentration (Figure 2). For the FERA, the two data points are averaged before calculating the TRVs, but, if the data point showing greater toxicity at 1 mg/kg PCB is excluded (Aulerich and Ringer 1977), and the TRVs are calculated with only the Wren, et al. (1987) data point to represent the response at 1 mg/kg PCB (showing less toxicity), the TRVs increase by no more than 15 %. Therefore, the difference between studies at this dietary concentration has only a minor influence on the calculated TRVs. Mink reproduction is consistently suppressed in treatments at or above 2 mg/kg dietary concentrations.

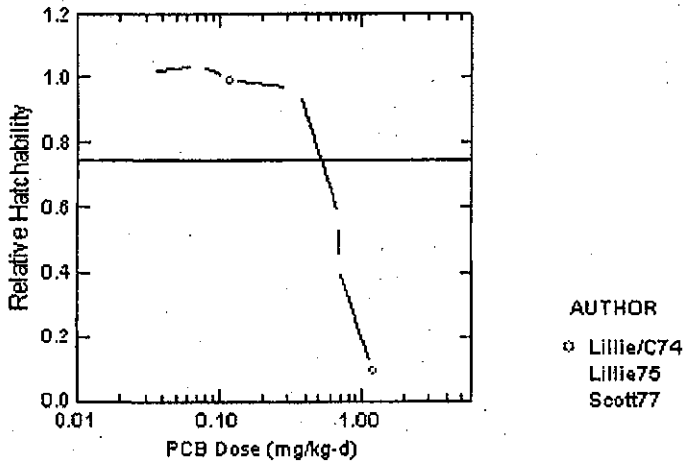

Figure 1. Hatchability, Aroclor 1248 Dose to Chicken Hens
(Lillie/C74 - Lillie, et al. 1974 and Cecil, et al. 1974 (reporting the same study); Lillie75 - Lillie, et al. 1975; Scott77 - Scott 1977)

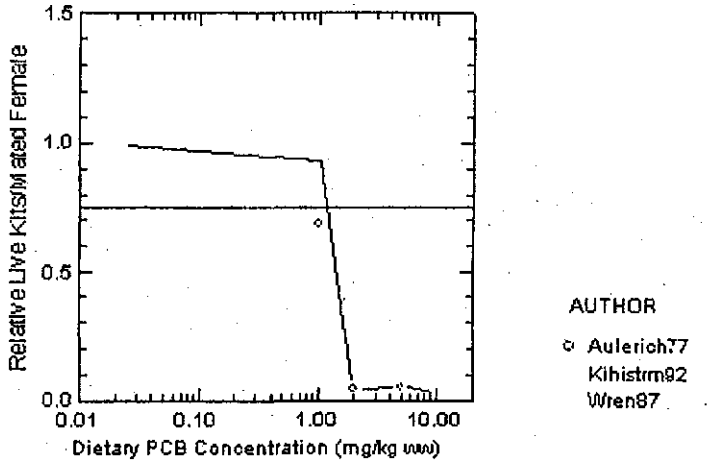

Figure 2. Live Kits per Mated Female Mink Exposed to Aroclor 1254 for 1 Breeding Season (Aulerich77 - Aulerich and Ringer 1977; Kihistrm92 - Kihiström, et al. 1992; Wren87 - Wren, et al. 1987)

Following a suggestion of CBS (then Viacom), an uncertainty analysis has been performed for the two sets of meta-analysis TRVs. The procedure, recommended by Dr. John Giesy, ENTRIX, consultant to CBS, is to remove data points individually from the combined data set to assess the effect of incompatibilities between studies and treatments on the TRV interpolation. The results show that the TRVs for PCB dietary exposure to mink, and PCB ingestion dose to birds, are robust to data variability in the upper range of exposures, but not in the lower range of exposures. In other words, the "actual" TRVs are unlikely to be higher than the values used in the FERA–the analysis recommended by CBS resulted in no more than a 20 % increase in the calculated TRVs, and mostly less than 10 % changes related to variability in the upper range of exposures, but the "actual" TRVs might be lower than derived for the FERA–the procedure resulted in 35 to 90 % decreases in calculated TRVs related to variability in the lower range of exposures. This implies that risk calculations based on these TRVs are unlikely to overestimate risk, but the possibility that risk might be underestimated cannot be ruled out.

TRVs derived from what CBS characterizes as "relevant single high value studies" are presented in Appendix E of the FERA, and comparisons with the TRVs used in the FERA are discussed in FERA Sections 4.1 and 4.2. The FERA meta-analysis TRVs are consistent with, or *less* conservative than the peer-reviewed mink PCB TRVs used for the Fox River Superfund Site, the Hudson River Superfund Site, or the Great Lakes Initiative (used to establish water quality criteria for the Great Lakes). The discussion is expanded below:

Two high-profile applications of mink total PCB TRVs in USEPA Region 5 have been for the Great Lakes Initiative (GLI) and the Fox River Superfund site in Wisconsin. The TRVs were based on "relevant single high value studies", and were externally peer

reviewed in both cases. Converted to a dietary basis, the Fox River mink LOAEC (0.5 to 0.7 mg PCB/kg diet) is highly consistent with the LOAEC of 0.6 mg PCB/kg diet in the FERA. The NOAEC for the Fox River (0.25 mg PCB/kg diet), is lower (more conservative) than the FERA NOAEC of 0.5 mg PCB/kg diet. The LOAEC for the GLI (2.0 mg PCB/kg diet) is higher than the FERA LOAEC, but is based on complete reproductive suppression in mink, which is inadequately protective for regulatory purposes (the GLI water quality criteria are based solely on no effect levels, and the LOAEC served only as a starting point for estimating a NOAEC). Again, the GLI NOAEC (0.2 mg PCB/kg diet) is more conservative than the FERA NOAEC. The low NOAEC values chosen for the Fox River and GLI are the result of wide dose spacing in individual experiments that missed the actual dose at which adverse effects begin to be observed. By combining multiple studies, the meta-analysis in the FERA provides a more detailed characterization of the relationship between exposure and reproductive effects compared to single-study approaches.

Outside of USEPA Region 5, the externally peer-reviewed mink TRVs for the Hudson River are much more conservative (LOAEC – 0.25 and NOAEC – 0.025 mg PCB/kg diet) than the mink TRVs in the FERA. A site-specific mink feeding study was performed for the Housatonic River Superfund site (Bursian, et al. 2006). The dietary concentration of the treatment resulting in decreased kit survival (3.7 mg PCB/kg diet) is higher than the LOAEC TRVs used at other Superfund sites, but resulted in high kit mortality (54 %). The investigators performed probit regression analysis to calculate the dietary concentrations lethal to 20 % and 10 % of kits (LC_{20} and LC_{10}, respectively) and the associated 95 % confidence intervals (CI). The LC_{20} is 1 mg PCB/kg diet (CI: 0.5 – 1.9 mg/kg), and the LC_{10} is 0.2 mg PCB/kg diet (CI: 0.03 – 0.5 mg/kg) (Bursian, et al. 2006). The Bursian, et al. (2006) LC_{20} differs from the FERA LOAEC by less than a factor of 2, reasonably consistent with the observed difference in toxicity between PCB exposure over 1 breeding season versus exposure over 2 breeding seasons. In contrast, the Bursian, et al. (2006) LC_{10} is lower (more conservative) than the FERA NOAEC. However, the 95 % confidence intervals for the Bursian, et al. (2006) LC_{20} and LC_{10} include the values of the LOAEC (0.6 mg PCB/kg diet) and NOAEC (0.5 mg/kg) TRVs, respectively, used in the FERA.

Overall, the FERA mink PCB NOAEC is less conservative than the NOAECs based on "relevant single high value studies" at other sites. The estimated risk to mink would be much higher if the FERA NOAEC TRV were replaced with the externally peer-reviewed NOAEC TRVs for the Fox River Superfund site, the Hudson River Superfund site, or the Great Lakes Initiative, or with the LC_{10} of the Housatonic River study.

Overall, the FERA mink PCB LOAEC is a median value among the LOAECs based on "relevant single high value studies" at other sites. The estimated risk to mink would increase more than 2-fold if the FERA LOAEC TRV were replaced with the externally peer-reviewed LOAEC TRV from the Hudson River site, the risk estimate would not change if the externally peer-reviewed Fox River LOAEC TRV were used, and about 40 % less risk would be estimated based on the LC_{20} of the Housatonic River study with no adjustment for exposure duration.

Two high-profile applications of avian total PCB TRVs in USEPA Region 5 have been for the Great Lakes Initiative (GLI) and the Fox River Superfund site in Wisconsin. The TRVs were externally peer reviewed in both cases. The GLI LOAEL (0.6 mg PCB/kg_{BW}-d), based on a study with pheasant, is similar to the FERA LOAEL (0.5 mg/kg_{BW}-d), but the GLI NOAEL (0.2 mg/kg_{BW}-d) is lower (more conservative) than the FERA NOAEL (0.4 mg/kg_{BW}-d). The Fox River LOAEL (1.12 mg/kg_{BW}-d), based on effects in doves, is higher than the FERA LOAEL, but the Fox River NOAEL (0.11 mg/kg_{BW}-d) is much lower than the FERA NOAEL. The Fox River avian TRVs are incorporated into the FERA in addition to the meta-analysis TRVs to provide a range of risk estimates for kingfisher to account for unknown sensitivity to PCBs.

The TRVs for kingfisher at the Hudson River Superfund site (LOAEL – 7.1 and NOAEL – 1.8 mg PCB/kg_{BW}-d) are much higher than the TRVs for the FERA, Fox River, or GLI. The Hudson River TRVs are based on the same pheasant study used by the GLI, but a different and less sensitive endpoint was used for the Hudson River (egg production) than for the GLI (egg hatchability). Use of egg production for setting PCB TRVs is questionable for two reasons: first, egg production in chicken, a sensitive species to PCBs, shows no coherent relationship with PCB exposure (Figure 3), and second, there is "very little evidence" that egg production limits clutch size in the field (Mineau 2005). The GLI use of egg hatchability, not egg production, is a more ecologically relevant basis for deriving TRVs.

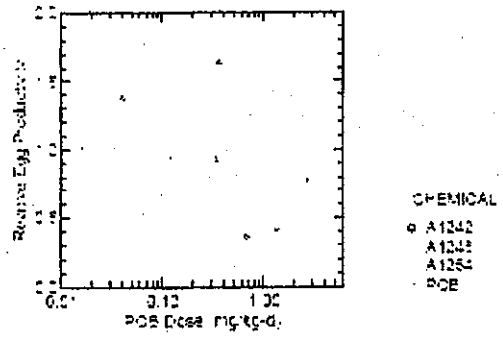

Figure 3. Egg Productivity, PCB Dose to Chicken Hens
(Sources: Britton and Huston 1973; Cecil, et al. 1974; Lillie, et al. 1974; Platanow and Reinhart 1973; Scott 1977; and Summer, et al. 1996a,b)

Second bullet:

The mink PCB TRVs in the FERA are based on mink feeding studies performed over a single breeding season (longer duration Aroclor feeding studies with mink were not located). Prolonged mink feeding studies with field-contaminated fish (Restum, et al. 1998) or with a European PCB product (Brunström, et al. 2001) have shown increased toxicity after continuous exposure through 2 breeding seasons or to 2 generations of mink. The TRVs based on single-breeding season exposure to Aroclor 1254 are accordingly adjusted to reflect the increased toxicity with longer exposure as seen in

other mink studies. The findings of increased PCB toxicity with prolonged exposure over more than one breeding season or generation in two mink feeding studies are supported by similar findings in PCB studies with other mammals:

McCoy, et al. (1995) reported the PCB body burden in oldfield mice (*Peromyscus polionotus*) approximately doubled between generations at a constant exposure concentration, and was associated with increasingly adverse effects.

> "These observations indicate that, even at this low level, chronic exposure to PCBs has pronounced reproductive effects on mammals and that these effects are amplified through multigeneration exposure. ... It is apparent that continued exposure at a low level results in amplified body burdens over three generations. For wild populations that remain in the same area for many generations, cumulative effects may have serious consequences. ... In studies of wild populations, it is evident that the roles of maternal exposure and increasing body burdens must be considered in assessing the long term effects of PCB exposure."

Linzey (1988) reported for white-footed mice (*Peromyscus leucopus*) that

> "Reproductive success of second generation PCBs-treated white-footed mice was reduced in comparison with performance of the parental generation reported by Linzey (1987). ... These results confirm the expectation that effects of chronic exposure to PCBs are cumulative through generations, probably due to length of exposure as well as to exposure during critical periods of growth and development."

The PCB studies are consistent with an increase in the reproductive toxicity of dioxin (TCDD) associated with exposure to multiple generations of rats compared to exposure to a single generation (f_0 is the initial generation tested, f_1 is the offspring from f_0, and f_2 is the offspring from f_1) (Murray, et al. 1979).

> "At the intermediate dose of 0.01 μg TCDD/kg/day, many adverse effects seen in the f_1 and f_2 adults and their litters were not evident in the f_0 adults or their offspring. The most obvious difference is that the f_0 rats were given TCDD beginning at about 7 weeks of age whereas subsequent generations were exposed to TCDD, at least theoretically, from the time of conception. This suggests that some of the effects observed were initiated, perhaps, during the neonatal period."

CBS's comments on the Brunström, et al. (2001) study are inaccurate. Brunström, et al. (2001) evaluated three doses (control, A50 low, and A50 high), not two doses as asserted by CBS. Brunström, et al. (2001) also reported multiple endpoints including percent mated females whelping, total litter size, live litter size, kit birth weight, and kit organ weight for both 6- and 18-month exposure durations for all three doses. This means that potentially 20 different TRVs could be derived from the study (5 endpoints * 2 PCB exposure durations * 2 TRV categories [NOAEC or LOAEC]). CBS correctly points out that 2-week survival of kits per mated female is only reported for 18-month exposure,

and therefore cannot be compared to 2-week kit survival for 6-month exposure; however, the difference between the toxicity of PCB exposure over 6 versus 18 months is not based on 2-week kit survival. Instead, it is based on live kits at birth per mated female, which is readily calculated from the data presented in Tables 3 (6-month) and 5 (18-month) of Brunström, et al. (2001) [live kits per mated female = % mated females whelping * live litter size]. The number of live kits per mated female in the A50 high treatment dropped from 3.4 live kits/mated female with 6-months PCB exposure to only 0.8 live kits/mated female with 18-months exposure.

CBS's comments on the Restum, et al. (1998) study conflates the methodology for statistically deriving TRVs with the methodology for interpolation of TRVs from dose-response curves. Statistically significant differences are not prerequisites for including treatments in dose-response plots – to the contrary, *all* treatment results should be included in dose-response plots to understand how toxicity changes with exposure. Figure 4 illustrates the dramatic effect of exposure duration on live kits per mated female mink in the Restum, et al. (1998) study.

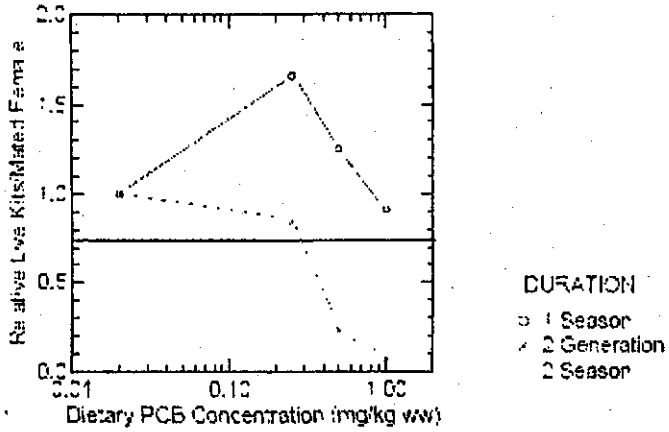

Figure 4. Live Kits per Mated Female Mink Exposed to Field-contaminated Fish for Single and Multiple Breeding Seasons or Generations (Restum, et al. 1998)

The increasingly adverse effects of PCB exposure over 2 breeding seasons or 2 generations compared to exposure over a single breeding season in the Restum, et al. (1998) study are not "artifacts of the interpolation method", but are supported by the statistical analyses presented in the study. The LOAEC for kit survivability with only a single breeding season exposure is 1 ppm PCB, whether assessed at birth, 3 weeks, or 6 weeks after birth. In contrast, with continuous exposure over 2 breeding seasons, the LOAEC for kit survivability is 0.5 ppm at 3 and 6 weeks after birth. Similarly, with continuous expose over 2 generations of mink, the LOAEC for kit survivability is 0.5 ppm at birth, 3 weeks, or 6 weeks after birth (Table 7 in Restum, et al. 1998). In other words, there is a 2-fold decrease in the LOAEC for kit survivability when PCB exposure is increased from a single breeding season to 2 breeding seasons or 2 generations.

Third bullet:

The mink feeding study performed for the Housatonic River Superfund site is a high quality single-breeding season exposure study, but the applicability to the Lemon Lane Landfill site is uncertain because of the differences in the major Aroclors released at each site. The predominant Aroclor released to the Housatonic River was Aroclor 1260 (USACE/USEPA 2004), reflected in both Housatonic River aquatic biota (Yanik, et al. 2003) and tree swallows (Custer and Read 2006).

Aroclor 1260 differs in composition and toxicity from Aroclor 1242, the predominant Aroclor disposed in Bennett's Dump. The dioxin-like toxicity of Aroclor 1260 is less than one-half of that of Aroclor 1242, as shown by bioassays that provide an integrated measure of total dioxin-like activity (Tillitt, et al. 1992). Aroclor 1260 differs in having a larger polychlorinated dibenzofuran (PCDF) co-contaminant component compared to other Aroclors—12 times as much as Aroclor 1242 (Wakimoto, et al. 1988). Most of the TEQ of Aroclor 1260 is due to PCDFs (70 %), not PCB coplanar congeners (29 %), in contrast to Aroclors 1248 and 1254 in which most of the TEQs are due to PCB coplanar congeners (at least 90 %) with only small PCDF contributions (less than 10 %) (Yamashita, et al. 2000). The predominant role of PCDFs in causing toxicity at the Housatonic River site is supported by a field study of tree swallows:

> "The hypothesis that the dioxin and furan congeners are contributing to reduced hatching success *more so* than the PCB congeners is further supported by the two-variable model results. In these models, TEQs associated with PCBs become nonsignificant in both analyses, while the WHO TEQs for dioxin/furans remained as a significant variable ..." (Custer, et al. 2003) [emphasis added].

PCDFs also bioaccumulate less overall compared to PCB coplanar congeners. The reported biota-sediment accumulations factors (BSAFs) in field studies are lower for PCDFs than for PCBs (Niimi 1996; van der Oost, et al. 1996; Marvin, et al. 2002; Naito, et al. 2003; Burkhard, et al. 2004). Similarly, diet-to-egg biomagnification factors (BMFs) for birds are lower overall for PCDFs compared to PCB coplanar congeners (Hoffman, et al. 1996; Henny, et al. 2003; Murata, et al. 2003).

Despite the differences in composition and bioaccumulation between the predominant Aroclors released at the sites, the ratios of TEQ to total PCBs in fish samples appear to be similar for fish from the Housatonic River and Clear Creek. However, total PCBs are measured differently at the two locations: sum of PCB congeners for Housatonic River fish and total Aroclor for Clear Creek fish. Aroclor analysis may overestimate or underestimate total PCBs compared to the sum of congeners (Sather, et al. 2003; Connor, et al. 2005). For Clear Creek fish, the magnitude of the difference between Aroclor-based and congener-based analysis of total PCBs is uncertain, so there is significant uncertainty over the comparison with the data on Housatonic River fish. TEQ is also measured differently at the two sites, for Clear Creek samples it includes only dioxin-like PCB congeners, but for the Housatonic River samples, TEQ also includes the contributions of dioxins and chlorinated dibenzofurans.

Fourth bullet:

Chicken are known to be sensitive to PCBs, and chicken PCB toxicity data are used to derive one set of TRVs to represent higher sensitivity to PCBs, but a second set of TRVs based on doves is also used in the FERA to represent middle sensitivity to PCBs, which brackets uncertainty over the sensitivity of kingfisher to PCBs. It would be inappropriate to solely assess potential risk to kingfisher based only on TRVs for insensitive species when the sensitivity of kingfisher is uncertain.

Data from a dioxin study with pheasant is used for dose-based TEQ TRVs. Although pheasant are also a gallinaceous species, pheasant is less sensitive to dioxin than chicken. One of CBS's consultants described pheasant as "one of the more tolerant species" to dioxin-like effects (Giesy, et al. 1995; see also Bowerman, et al. 1995).

The kingfisher field study performed at the Housatonic River site is limited by several shortcomings in design, including an insufficiently broad exposure gradient, lack of a control or reference population, and a method of evaluation that is subject to confounding because the results of the field study are compared to that of a single study from the literature for a different location. According to the Housatonic River ERA (USACE/USEPA 2003 §8.5.4):

> "The belted kingfisher field study results do not definitively support the conclusions of low risk because the data are limited. There are several conclusions drawn by the authors that are not strongly supported by the information presented in the report. The conclusion that the kingfisher population is consistent with the quality of habitat present is speculative. ... It is inappropriate to conclude that the Housatonic River kingfishers fall within the range reported for other kingfisher populations when only one study is referenced."
>
> "... EPA was not provided with an opportunity to review these protocols prior to receiving the study. There were several shortcomings of the approach used. For example, there was no reference site, no information was provided regarding nest search intensity, the researchers were unable to determine clutch size, and there were too few visits to the nests during the reproductive cycle. These shortcomings limit the ability to draw rigorous conclusions."
>
> "The approach used to estimate dose in the belted kingfisher study had a number of shortcomings. ... As a result, the dose gradient achieved by this approach is likely too narrow to detect a significant dose-response relationship."
>
> "The sample sizes were very small (i.e., n=6) for the statistics used ..."

For these reasons, the Housatonic kingfisher field study is not considered an adequate study for reducing uncertainty over the relative sensitivity of kingfisher to PCBs.

Fifth bullet:

With the exception of the Housatonic kingfisher field study (addressed in the previous comment), the examples in the comment are based on dioxin-like effects in raptors. Assuming kingfisher sensitivity to PCBs is similar to that of raptors is as uncertain as assuming it is similar to that of chicken because kingfisher is not a close relative of either chicken or raptors. The FERA assesses risk to kingfisher based on a range of sensitivities to address this uncertainty.

In a review of avian studies of dioxin-like toxicity performed by USEPA, chicken was not shown to be unusually sensitive:

> "A conclusion of these analyses is that the domestic chicken is, as is generally recognized, the most sensitive tested species, but it is not aberrantly sensitive. Given the wide range of sensitivities within birds and within mammals to dioxin-like chemicals, test data for chickens should be used." (USEPA 2003).

The review also compared TRVs derived through the species sensitivity distribution (SSD) approach for laboratory versus field studies. The egg TEQ TRVs are lower (showing greater toxicity) based on field studies compared to TRVs based on laboratory studies, even when chicken are included in the laboratory SSD (USEPA 2003). This indicates that the results of chicken studies are not necessarily overprotective for wild birds, and may even be underprotective in some situations.

Sixth bullet:

The particular values of the egg TEQ TRVs used in the FERA are based on enzyme induction, but the TRVs were chosen because they represent a middle range between the values reported in multiple field studies of piscivorous birds that resulted in reproductive impacts, which are ecologically relevant endpoints.

Seventh bullet:

CBS (then Viacom) was offered the opportunity to perform ecological risk assessments for the Bloomington sites but declined. The selection of kingfisher as an assessment endpoint is based on sightings of kingfisher along Bloomington streams, and because their territorial behavior means they are potentially highly exposed receptors.

Comment 82: EPA has assumed that the PCBs in Clear Creek fish, even those at the most distant two stations (Fluckmill and Strainridge Roads), are directly related to and largely driven by PCBs which bypass the treatment system at Illinois Central Spring. While it is true the PCBs which bypass the treatment plant do eventually enter Clear Creek, the assumption that those PCBs are largely responsible for most of the PCBs in the fish of the main stem of Clear Creek (at stations 2,3 and 4) is un-proven and most of the evidence suggests it is unlikely. For example:

First bullet:

Refer to Figure 1. This Figure shows the calculated hazard quotients for mink at each of the 4 stations for all sampling events since 1996 using EPA's methods (EPA NOEAL TRV and CTE PCB levels). There were two sets of fish data taken prior to construction of the ICS treatment plant in 2000. The data clearly shows that while the 1996 hazard quotients are higher than post 2000 levels, the 1999 hazard quotients for fish at stations 2, 3 and 4 are essentially the same as those after completion of the treatment plant. This would indicate that the PCBs in the fish of the main stem of Clear Creek have not changed substantially from the 1999 levels. Since the ICS treatment plant, in its current configuration captures the vast majority of PCBs issuing from ICS this indicates that most of the PCBs in the fish of the main stem of Clear Creek are not driven by PCBs which issue from ICS or currently bypass treatment. Put another way, the source control measures at Lemon Lane Landfill and the treatment of water at ICS have had no significant impact on risk levels in the main stem of Clear Creek when compared to 1999 levels.

Second bullet:

Additionally, note that the calculated hazard quotients do not change much as you get farther from the assumed source at ICS. In fact the calculated hazard quotients for station 4 (20 miles downstream from ICS) are higher than for stations 2 and 3 (station 2 is only a few miles from ICS) and essentially equal to station 1 (which is within 2 miles from the ICS). EPA has noted this apparent discrepancy and explained it by looking at the difference between sizes and types of fish sampled at the various locations (USEPA 2006). However, the effective dilution between station 1 and station 4 is huge. For example, see Table 2. This table shows the flow estimates at various points along the creek. The flow was estimated at about 100 gpm near station 1. While upstream of station 4 (at Ketcham Rd on the table) the flow was almost 9000 gpm. Since there are other significant tributaries which enter Clear Creek between Ketcham Rd and Strainridge Rd (station 4), the flow at station 4 surely is greater than 9000 gpm. This implies an effective dilution ratio of more than 90 to 1 (and likely closer to 100 to 1) between station 1 and 4. This implies that PCBs which currently bypass treatment at ICS would be substantially diluted prior to reaching station 4 and only a minor source to fish at station 4. This dilution effect is seen in other stream systems around Bloomington. For example, PCB levels in the main stem of Richland Creek fish drop off dramatically as you get more than a few miles from Neal's Landfill (the only known source of PCBs to Richland Creek) due to dilution even though the fish at further downstream locations are in some cases larger than those sampled much closer to the site (see USEPA 2001) and the same effect is seen in Stout's Creek near Bennett's Dump. In most creek systems, PCB levels in fish will drop as you get farther downstream from a source due to dilution effects. The fact that this does not happen in Clear Creek indicates that the PCBs which bypass treatment at ICS are not a controlling source to fish more than a few miles downstream.
Third bullet:

A more likely scenario, based on the evidence and the nature of Clear Creek, is that the PCBs in fish of the small branch which directly receives the ICS discharge (represented by the Allen St location) are directly related to discharges from Illinois Central Spring. But as the water from this branch enters the main stem of Clear Creek, significant dilution occurs and the loading to fish from the ICS source is significantly diminished. The farther down Clear Creek you travel, the additional dilution will further diminish the impact of the ICS source on fish. This is especially true beyond several major tributaries such as Jackson Creek, the Dillman Road treatment plant and the Shirley/Leonard Springs Branches. The PCBs in fish downstream of these major tributaries are more likely a result of other potential sources. The ICS PCBs would be less of a factor at these locations for several reasons. First, they are significantly diluted. But secondly, and most importantly, the ICS PCBs which bypass treatment occur in very short burst during very large storm events. These are relatively rare and very short lived events. These PCBs are released for short time periods during major storm flows when flows throughout Clear Creek are high, which yields large dilution and little opportunity for settling.

Response: First bullet:

The analysis and figure presented in CBS's comments are not appropriate approaches for assessing temporal trends in PCB exposures to mink feeding on Clear Creek fish because of inconsistencies in the species composition of the fish samples used to model mink dietary exposures between sampling events. For example, the mink risk estimates at Station 4 are based on a mix of green sunfish and hog suckers in 1996; longear sunfish, stonerollers, rock bass, bluegill, and hog suckers in 1999; longear sunfish, hog suckers, and redhorse in 2000; longear sunfish and rock bass in 2002; and longear sunfish and redhorse in 2004. Different species of fish accumulate PCBs differently depending on species-specific diet (trophic status), metabolism (elimination of PCBs), foraging behavior (amount of sediment contact), movement (duration of exposure where collected), and lipid content (higher lipid content is normally associated with higher whole-body PCB concentration). The temporal trends in modeled mink dietary PCB exposure are confounded by the shifts in fish species sampled between years, by changes in fish lipid contents among species and between sample years, and by apparent movement of small numbers of fish between sample locations shortly before collection (data outliers).

Temporal changes in fish PCB uptake should be assessed on a species-specific basis. For the Clear Creek whole-fish samples collected between 1996 and 2004, species-specific data are available for multiple years at the same location for creek chubs, green sunfish, and longear sunfish (Table 1). To minimize the influence of changes in lipid content between samples, the whole-fish PCB concentrations of each individual sample are lipid-normalized (lipid-normalized PCB = whole fish PCB / (% fish lipid content / 100)). Samples with no reported lipid data are excluded from the analysis because lipid-normalized PCB concentration cannot be calculated. To minimize the influence of possible data outliers, the geometric mean lipid-normalized PCB is calculated instead of an arithmetic mean (geometric means are less influenced by extreme values compared to arithmetic means).

All of the species-location examples with 1996 data show decreased lipid-normalized PCB accumulation in fish in 2004 compared to 1996 (creek chub in Stations 1 or 2, and green sunfish in Stations 2 or 3). Most of the examples with 1999 data also show decreased lipid-normalized PCB accumulation in fish in 2004 compared to 1999 (creek chub in Station 3, and longear sunfish in Station 4). An exception is creek chub in Station 2, which show higher lipid-normalized PCB accumulation in 2004 compared to 1999 (but much lower accumulation compared to 1996). Overall, these data do not support CBS's claim that the water treatment plant has had no effect on the main stem of Clear Creek.

Table 1. Temporal Trends in Geometric Mean PCB Concentration and Arithmetic Mean Lipid Content by Species and Sampling Station, Whole-fish Samples Collected from Clear Creek Downstream of Lemon Lane Landfill, Bloomington, IN.

Station	Species	Date	N	Whole-body PCB Conc.	Lipid Content	Lipid-normalized PCB Conc.
				mg/kg	%	mg/kg lipid
1	creek chub	11/96	9	17.6	2.2	835
		11/02	11	6.7	0.7	1093
		11/04	7	1.6	1.6	104
2	creek chub	11/96	8	1.8	1.2	151
		11/99	4	0.6	1.4	49
		11/00	4	1.5	1.5	115
		11/02	6	0.7	0.7	111
		11/04	6	1.0	1.1	88
2	green sunfish	11/96	9	3.2	3.3	100
		11/02	5	1.3	1.3	165
		11/04	6	1.8	2.7	66
3	creek chub	11/99	2	1.0	0.9	112
		11/00	3	0.4	1.5	30
		11/02	5	0.5	0.5	105
		11/04	7	1.0	1.5	68
3	green sunfish	11/96	8	1.0	1.0	110
		11/02	6	1.2	1.2	108
		11/04	6	1.6	2.7	68
4	green sunfish	11/96	8	4.0	3.4	131
	longear sunfish	11/99	4	2.8	2.4	117
		11/00	5	1.4	3.8	40
		11/02	6	1.8	1.3	165
		11/04	6	1.7	4.4	41

Fish Sample Stations: 1 – Allen St, 2 – Country Club Rd, 3 – Fluckmill Rd, 4 – Strainridge Rd

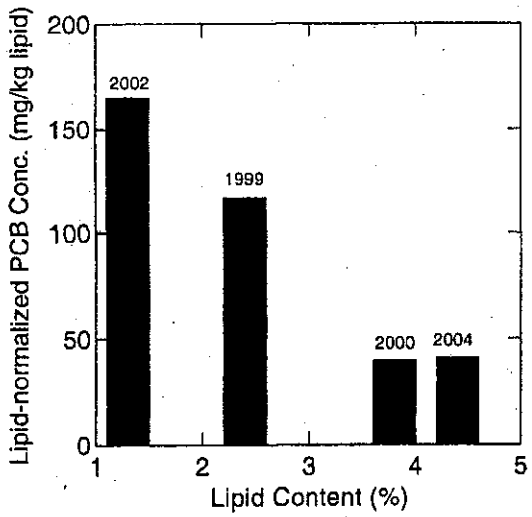

Figure 5. Arithmetic Mean Lipid Content and Geometric Mean Lipid-normalized PCB Concentration in Longear Sunfish Collected in November from Sample Station 4 (Strainridge Road), Clear Creek, Lemon Lane Landfill Site, Bloomington, IN.

An unusual pattern in the data is an inverse relation between mean lipid content and lipid-normalized PCB concentration in the same species at a single location but collected in different years. This pattern is most apparent in the lower reaches of Clear Creek, for example, longear sunfish in Station 4 (Figure 5) and green sunfish or creek chub in Station 3 (Table 1). A possible explanation for this pattern is redistribution of accumulated PCBs to dwindling lipid reserves in stressed fish, as has been reported in fasting animals (Lydersen, et al. 2002; Debier, et al. 2006; Fuglei, et al. 2006). Sampling for the Neal's Landfill site shows markedly deceased fish lipid contents in November compared to May or August. If a similar seasonal pattern holds for Clear Creek fish, in years in which fish use large portions of their lipid reserves late in the season, the November lipid-normalized PCB concentrations would be elevated compared to less stressful years in which the fish maintain higher lipid reserves and therefore do not internally redistribute previously absorbed PCBs.

Regardless of the explanation, the inverse lipid content – lipid-normalized PCB concentration relationship further complicates evaluation of temporal trends in fish PCBs in Clear Creek. One way to minimize this effect is to compare lipid-normalized PCB concentrations when the mean lipid contents are similar between sample dates. Two of three comparisons indicate decreased PCB exposure. Decreases in lipid-normalized PCB concentrations at similar lipid contents occur in Station 2 creek chub (1996 – 2004) and

Station 4 sunfish (1996 green sunfish – 2000 longear sunfish), but not in Station 3 green sunfish (1996 – 2002) (Table 1).

Second bullet:

For the same reasons discussed in the previous response, spatial trends in PCBs should be assessed on a species-specific basis. The available data are summarized in Table 2. Green and longear sunfish are closely related, so close they are known to hybridize, therefore their data are combined in two cases to expand the available comparisons. Five of the eight comparisons show decreasing lipid-normalized PCB concentrations in fish with distance from Lemon Lane Landfill (creek chub in 1996, 2000, 2002, and 2004; and green sunfish/longear sunfish in 2004). Three of the eight comparisons do not show decreasing trends (green sunfish in 1996; creek chub in 1999; and green sunfish/longear sunfish in 2002) (Table 2).

The increase in modeled risk to mink at Station 4 compared to upstream stations is a result of differences in the species of fish collected at different stations and differences in fish lipid contents between stations. The evidence that the increase in risk at Station 4 is not due to an addition PCB source is shown by the relationship between lipid content and total PCBs in fish samples of the same or closely related species (Figures 6 – 8). For the most recent sampling events, 2002 and 2004, data for green sunfish in Station 3 are compared to longear sunfish in Station 4. In 2002, the Station 4 longear sunfish show the same relationship between lipid content and total PCB as Station 3 green sunfish, with a single outlier that probably represents a fish that recently moved from a more highly exposed upstream reach of Clear Creek (Figure 7). There is a strong linear relationship between lipid content and total PCB concentration for the combined data from both stations in 2002, excluding the single longear sunfish outlier ($N = 11$, adjusted $r^2 = 0.83$, $p < 0.001$). The similarity of the lipid content – total PCB relationship in Stations 3 and 4 is not an artifact of comparing related species, because green sunfish in Station 3, Station 4, and an intermediate Ketchum Road station in 1996 also exhibit a strong linear relationship between lipid content and total PCB concentration (Figure 8) ($N = 21$, adjusted $r^2 = 0.74$, $p < 0.001$) (the statistical results are the same when the additional longear sunfish data are included). In 2004, Station 4 longear sunfish exhibit much *less* PCB accumulation for the range of lipid contents compared to Station 3 green sunfish (Figure 6). These analyses demonstrate that the increase in modeled risk to mink at Station 4 is not a result of a significant additional downstream point source of PCBs.

PCB levels in fish do not decrease as rapidly in Clear Creek with distance as, for example, in Richland Creek, but this does not necessarily mean that there are additional downstream external sources of PCBs to Clear Creek It may also result from slower natural attenuation processes in Clear Creek compared to Richland or Stout's Creeks, or greater potential for remobilization of sediment PCBs compared to other the other creeks.

Table 2. Spatial Trends in Geometric Mean PCB Concentration and Arithmetic Mean Lipid Content by Species and Sampling Station, Whole-fish Samples Collected from Clear Creek Downstream of Lemon Lane Landfill, Bloomington, IN.

Date	Species	Station	N	Whole-body PCB Conc.	Lipid Content	Lipid-normalized PCB Conc.
				mg/kg	%	mg/kg lipid
11/96	creek chub	1	9	17.6	2.2	835
		2	8	1.8	1.2	151
		K	2	0.5	1.0	55
11/96	green sunfish	2	9	3.2	3.3	100
		3	8	1.0	1.0	110
		K	5	2.1	2.4	93
		4	8	4.0	3.4	131
11/99	creek chub	2	4	0.6	1.4	49
		3	2	1.0	0.9	112
11/00	creek chub	2	4	1.5	1.5	115
		3	3	0.4	1.5	30
11/02	creek chub	1	11	6.7	0.7	1093
		2	6	0.7	0.7	111
		3	5	0.5	0.5	105
11/02	green sunfish	2	5	1.3	1.3	165
		3	6	1.2	1.2	108
	longear sunfish	4	6	1.8	1.3	165
11/04	creek chub	1	7	1.6	1.6	104
		2	6	1.0	1.1	88
		3	7	1.0	1.5	68
11/04	green sunfish	2	6	1.8	2.7	66
		3	6	1.6	2.7	68
	longear sunfish	4	6	1.7	4.4	41

Fish Sample Stations: 1 – Allen St, 2 – Country Club Rd, 3 – Fluckmill Rd, K – Ketchum Rd, 4 – Strainridge Rd

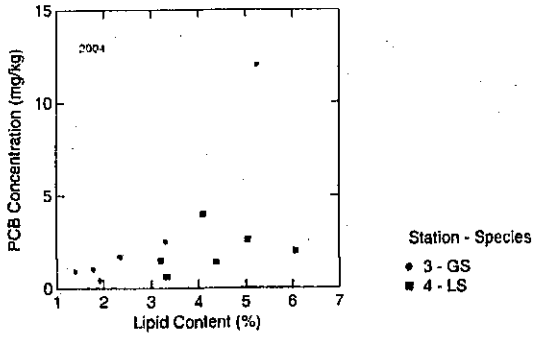

Figure 6. Total PCBs and Lipids (whole-fish wet weight) in Green and Longear Sunfish, Fluckmill (3) and Strainridge (4) Roads, Clear Creek, Bloomington, IN, November 2004.

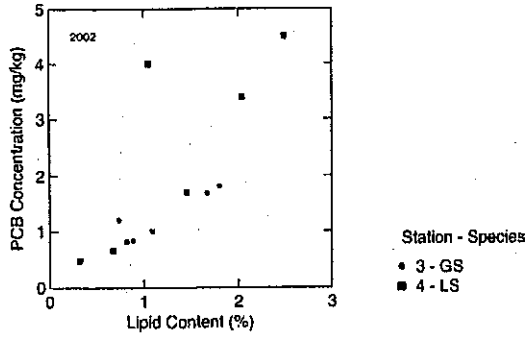

Figure 7. Total PCBs and Lipids (whole-fish wet weight) in Green and Longear Sunfish, Fluckmill (3) and Strainridge (4) Roads, Clear Creek, Bloomington, IN, November 2002.

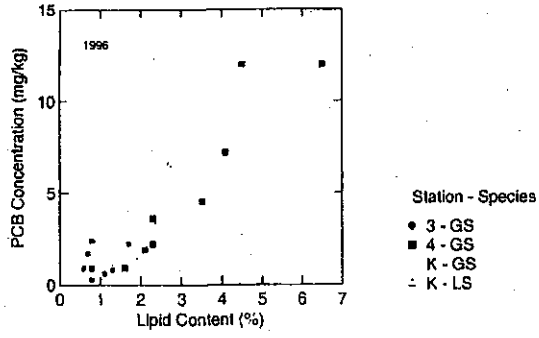

Figure 8. Total PCBs and Lipids (whole-fish wet weight) in Green (GS) and Longear (LS) Sunfish, Fluckmill (3), Ketchum (K), and Strainridge (4) Roads, Clear Creek, Bloomington, IN, November 1996.

Third bullet:

Uncontrolled releases of large amounts of PCBs from the Lemon Lane Landfill occur during storm events that greatly exceed Ambient Water Quality Criteria. Controlling these releases is a necessary component in allowing Clear Creek to recover over time.

Comment 83: The World Health Organization (WHO) has recently re-issued its recommended mammalian TEFs for PCBs (WHO 2005). While some of the revised TEFs went up and some went down, when you apply the revised TEFs for the Clear Creek fish significantly less TEQs are calculated (see Table 1). The new TEFs should be used for the assessment of risk in the Lemon Lane risk assessment.

Response: Risk estimates *increase* in the two Clear Creek sample locations closest to the Lemon Lane Landfill when the mammalian WHO_{1998} TEFs used in the FERA are replaced with the revised WHO_{2005} TEFs. Application of the WHO_{2005} TEFs to the 2004 Clear Creek fish congener data results in lower fish TEQs, decreased by 41 % compared to TEQ based on WHO_{1998} TEFs (range of -28 to -60 % per sample), with correspondingly decreased mink dietary exposures (-40 %, range -30 to -60 %), but the overall effect on risk also depends on recalculation of the TEQ TRVs with the revised TEFs. The mink TEQ TRVs used in the FERA are based on the geometric mean of the TRVs in two long-term mink studies (Restum, et al. 1998; Brunström, et al 2001). The congener data for the Restum, et al. (1998) study are reported in Tillitt, et al. (1996). The WHO_{2005} TEQs of the three exposure treatments in Restum, et al. (1998) are 24 % lower than the WHO_{1998} TEQs (range -23 to -24 %), and the WHO_{2005} TEQs of the two exposure treatments in Brunström, et al. (2001) are 53 % lower than the WHO_{1998} TEQs (range -52 to -53 %). The revised mink dietary WHO_{2005} TEQ NOAEC is 2.8 pg/g (compared to 4.6 pg/g WHO_{1998} TEQ), and the LOAEC is 11. pg/g (compared to 18 pg/g WHO_{1998} TEQ). The revised exposure and risk estimates are shown in Table 3.

Table 3. Mean WHO_{2005} TEQ Concentration in Fish and in Mink Diet, and the Associated Mink Risk Estimates, Compared with WHO_{1998} TEQ Risk Estimates, November 2004 Fish Data, Lemon Lane Landfill, Bloomington, IN

Station	WHO_{2005} TEQ		HQ NOAEC (WHO_{2005})	HQ LOAEC (WHO_{2005})	HQ NOAEC (WHO_{1998})	HQ LOAEC (WHO_{1998})
	Fish	Mink Diet				
	pg/g	pg/g	ratio	ratio	ratio	ratio
1	77.7	61.4	21.9	5.6	19.0	4.9
2	18.3	14.5	5.2	1.3	4.5	1.2
3	12.8	10.1	3.6	0.9	3.5	0.9
4	10.0	7.9	2.8	0.7	4.3	1.1

WHO_{2005} TEQ TRVs: NOAEC – 2.8 pg/g; LOAEC – 11 pg/g (Restum, et al. 1998; Brunström, et al 2001)
HQ (WHO_{1998}) as reported in FERA Table E-4
WHO_{1998} TEQ TRVs: NOAEC – 4.6 pg/g; LOAEC – 18 pg/g (Restum, et al. 1998; Brunström, et al 2001)

The estimated risks to mink are higher in Clear Creek sampling stations 1 and 2 (Allen Street and Country Club Road) based on WHO_{2005} TEQs as compared to risks based on WHO_{1998} TEQs. The risks are similar in Station 3 (Fluckmill Road) on either basis. Risks are lower in Station 4 (Strainridge Road) based on WHO_{2005} TEQs compared to

risks based on WHO_{1998} TEQs. Interestingly, the apparent downstream increase in mink risk based on WHO_{1998} TEQs does not occur with the revised WHO_{2005} TEQs.

Comment 84: Clear Creek at the most upstream station, represented by Allen Street, is a very shallow stream in a highly urbanized area. Since kingfishers are dive feeding birds and the water is so shallow, it is unlikely that kingfishers would use this stream reach extensively. A more appropriate avian receptor for this shallow habitat is a great blue heron. Additionally, there is some direct toxicity data for great blue herons and PCB (see Viacom 2004). Therefore use of this receptor at this location would reduce the uncertainty in the avian risk estimate. CBS has shown a representative risk assessment for great blue herons at the NLF site and thus has developed appropriate factors (feeding range, ingestion rates, body weight, TRVs etc in Viacom 2004).

Response: See response to Comment 81.

Comment 85: Summary: The EPA risk assessment uses very conservative TRVs, based in some cases on unproven principals [*sic*], and consistently makes the more conservative assumption concerning types of receptors. This combination likely overestimates the theoretical risk along Clear Creek. EPA has performed no actual field study to assess if actual effects are occurring in the field. When this conservatism is combined with a lack of understanding about the relationship between PCBs which bypass treatment at ICS and PCB levels in the main stem of Clear Creek fish, use of this risk assessment to justify further action at ICS is unwarranted.

Response: See responses to Comments 80 through 84.

Comment 86: The alternatives analysis is based on a model of the existing spring water treatment system performance at Illinois Central Spring (ICS). The modeled analysis of the existing ICS system can be improved in two ways. a. Re-contamination of the existing plant discharge is acknowledged, but the impact of re-contamination is not quantitatively evaluated. To remedy this, the following are recommended:

- The model should acknowledge recontamination and account for it.
- The existing PCB data (at Quarry Springs combined), which documents the recontamination, should be evaluated to determine if the re-contamination is naturally decaying.
- The point of comparison for the modeled plant performance should be shifted to the "Quarry Springs Combined" location. In other words, the model should be used to reflect how much PCB is discharged to the stream system at the Quarry Springs Combined location. This will more accurately reflect the impact of any alternative on the receiving stream.

Response: EPA disagrees with the commenter. EPA uses its model to calculate the mass of PCBs discharged from the Illinois Central Spring treatment plant. It is true that this water, after being discharged from the plant, enters into a swallowhole where it collects additional PCB contamination from contaminated sediment. Further, it is true

that EPA calculation of the total mass released from Illinois Central Spring have been understated in the past because EPA's model does not take into account the effect of this recontamination. Nevertheless, EPA does not agree with CBS's proposal that the model should be revised to reflect the re-contamination caused by the swallowhole. To revise the model, we would need to study the site to develop the following baseline data for the two springs (Rinker and Quarry Springs) that are the discharge points for water entering into the Swallow hole:

1. Base and storm related flow rates independent of the ICS contribution.
2. PCB contributions other than resident effects.
3. PCB concentrations for a given flow rate (i.e. base flow, storm flow)

The best way (if not the only way) to collect this data would be to divert water from the treatment plant around the Swallowhole. Once the diversion was completed, the discharges from Rinker and Quarry springs could be studied in isolation, and the resulting data added to EPA's model. Such an investigation, however, would delay the implementation of the remedy by at least one year. EPA does not believe that this is a reasonable approach, particularly given the fact that the mass of PCBs added by the swallowhole area is likely to be small in comparison to the total mass released from Illinois Central Spring. Instead, EPA believes that the most prudent course of action is to construct a permanent diversion of wastewater around the swallowhole area. A permanent diversion would not be much more expensive than a temporary diversion, and it would obviate the need to delay the remedy as the parties engaged in additional groundwater investigations. Further, such an approach greatly simplifies the environmental problem posed by the site, leaving only Illinois Central Spring as the known source of PCBs from the site. As already noted, EPA's computer model is adequate for determining the mass of PCBs released from Illinois Central Spring.

Comment 87: On page 24 of the proposed plan, in the paragraph describing alternative 3, the EPA states that "During large storm events, water currently overflows the storage tanks and is directly discharged to Clear Creek without treatment". While it is true that tank overflow occurs, it is not true that this occurs "without treatment". It has been proven by both tank overflow sampling during such large storms and tank bottom sediment sampling that there is substantial settlement of PCB contaminated suspended solids in the storage tanks. Thus, it can be said that there is currently treatment of all ICS flows during even the largest events. EPA acknowledges this at other places in the proposed plan and has adjusted their predicted performance of the existing system to account for this. However, EPA has evaluated two very disparate settling efficiencies for the existing storage tanks (0 and 80%). Judgment should be applied to make this information more useful in a quantitative analysis of alternatives. It has been shown that significant PCBs are settling in the tank at least during the largest events (which generate by far the largest fraction of the predicted bypass). Therefore the analysis can be improved by dropping the discredited zero settling case. If EPA is uncomfortable with the 80% settling case, then a more conservative assumption such as 50% settling could be used.

Response: The statement of "without treatment" is a matter of definition and semantics. The U.S. Environmental Protection Agency (EPA) agrees that the storage tanks do retain and provide short-term storage for PCB laden sediments. This is accomplished by settling but no pure form of treatment is performed whereas the PCBs can be removed and handled for disposal. The treatment process within the ICS treatment facility does process the PCB laden water whereas the process does remove PCB in a form that can be handled and disposed of and the waters released without any measurable PCB.

The testing to date suggests that there is a significant amount of PCB retention during larger events but the data is somewhat scattered with respect to the smaller storm events. Though a hypothesis has been developed as to why such variances exist they have not been proven as of this date. The "zero percent" retained is the most conservative use of the data and does provide a measure of what benefits may be derived when comparing operating modes.

Except as an academic exercise, the use of a 50% settling rate has no basis within the current data base and its use would be considered arbitrary.

Comment 88: The combined impact of the above recommendations can be easily evaluated using the existing model and the historic data set for Quarry Springs Combined. For example, refer to Figure 1. This Figure shows the PCB sample results for the Quarry Springs Combined location. From this Figure, two things are evident. First, during the period for which the EPA model is applied (August 2001 through February 2004), the average PCB content of the water at Quarry Springs Combined was about 1 ppb. Second, it appears that the PCB content of the water at this location has declined over time. In fact, if a linear regression of log PCBs vs time is made, time is found to be a highly significant factor ($p<.0003$) with a constant decline rate of about 10% per year. So the clean discharge from the plant is being re-contaminated. But this re-contamination is declining at 10% per year. To apply this information to an evaluation of the PCBs discharged to the Quarry Springs Combined location during the evaluation period (August 2001 through February 2004) simply multiply the total amount of water estimated to have been treated during that time period by the average PCB content for that period (1 ppb). This, combined with how much PCBs are estimated to bypass treatment would provide a better estimate of PCB loading to the Clear Creek system. If we assume 50% settling in the existing tanks, then the PCBs estimated to be reaching the Clear Creek system at Quarry Springs Combined during the period of evaluation is 4.1 kilograms. This would yield an overall treatment efficiency of about 80% for the system during that time period. importantly, the overall system efficiency is improving every year since the re-contamination is decaying. Such an analysis leads to an obvious additional alternative for evaluation which is to maintain the existing system without implementing modifications A and B. Such a scenario would show continual improvement over time up to an overall efficiency of 87% which would represent insignificant re-contamination and bypass of 50% of the PCBs EPA has estimated in their zero settling case. The cost of such a scenario is known with a high confidence level and such a case can then be used as a baseline metric for a cost benefit analysis.

Response: EPA notes that Figure 1 is based on non-storm data collected at the Quarry Springs Combined location. Although EPA does not dispute the findings of the linear regression analysis indicating a 10 percent decline in PCB concentration per year, it is not clear that such an analysis of low flow sampling data could be directly applied to high flow data. EPA does not dispute that the total estimated PCB release through the Quarry Springs Combined location would be about 4.1 Kg for the modeled period if 50 percent PCB removal by the storage tanks is assumed. While the overall system efficiency may improve slightly from year to year due to the declining recontamination, EPA notes that roughly 2.6 Kg of the 4.1 Kg estimated release is direct ICS overflow discharge. No decrease in the PCB concentrations at ICS has been demonstrated. In fact, the peak PCB concentration from the August 30, 2005 storm event at ICS was 1,600 ug/L and is one of the highest concentrations ever recorded at the spring. The fact remains that the spring discharge remains consistently above the 0.3 ppb substantive National Pollution Discharge Elimination System (NPDES) proposed limit.

EPA also notes that without the implementation of Modifications A and B of the Proposed Plan, additional recontamination may be expected from the Quarry A discharge. The commenter's flow data from the August 2005 suggests that the quarry A discharge would be even a higher volume of water to treat than Quarry B if Modifications A and B are not implemented.

Other than noted above, the EPA does not, in general, dispute the numbers presented by the commenter. However, EPA deems it imperative to remove the 4.1 Kg PCB loading that has been projected for a 30 month period and continue to remove such loadings until such time that the PCB concentrations meet the substantive NPDES limits.

Comment 89: EPA has in the proposed plan that all the alternatives it evaluated are protective, including what it has defined as alternative 1, the "no change in the current treatment plant capacity alternative (see page 29). CBS agrees that all the EPA defined alternatives are protective since CBS sees little risk in the status quo, but the implication of all the alternatives being protective is that cost effectiveness should be an important criterion in choosing among the alternatives. It appears that EPA selected alternative 3 based mainly on a criterion associated with the amount of additional PCB mass removed. While this is a consideration, a cost benefit type analysis would balance PCB removal effectiveness with cost.

Response: The selection of Alternative 3 was based upon a number of criterions that are specifically depicted in the screening document titled "Alternative Evaluation" prepared in June 2006. This multidimensional document systemically assessed 198 different operational alternatives with the four most viable alternatives selected for further consideration. The evaluation process provides for the review of the following parameters for each alternative that was considered:

a. Overall Protection of the Human Health and the Environment.
b. Compliances with ARARs
c. Long term Effectiveness & Permanence
d. Reduction of Toxicity, Mobility, and Volume through Treatment

e. Short Term Effectiveness
f. Implementability
g. Cost
h. State Acceptance
i. Community Acceptance

In more than one respect the evaluation of costs has been considered in relationship to the benefits that are afforded. Accordingly the evaluation provided that Alternative 3 provides the greatest overall benefit for the cost that is to be incurred. Further discussion of the selection of Alternative 3 may be found in the ROD Amendment.

Comment 90: Additional alternatives should be evaluated. This would include:
A no action alternative and a status quo alternative. This would involve only running the current plant with no new capital expenditures. EPA has evaluated the cost of this alternative in their alternatives study. A system which would inject powdered activated carbon (PAC) and other settling aids into the current storage tanks combined with storage tank modifications to improve the settling characteristics of the tanks. CBS has performed an initial evaluation of such as system which is shown schematically in Figures 2 through 4. A cost estimate for such a system is shown in Tables 1 and 2.

Response: EPA did provide for the evaluation of a "No Further Action" alternative and a "Status Quo" alternative in its assessment. Please see Response to Comment 56. The current PCB levels within the ICS are greater than the substantive NPDES limits therefore the "No Further Action" was not considered viable. The Maintenance of the Existing Operations (Status Quo) alternative was considered for further evaluation with both the bypass of the "swallow-hole area" and the placement of downstream collection system required due to the PCB levels of the Combined Quarry Springs emergences exceeding the substantive NPDES limits.

EPA evaluated the addition of flocculants and coagulants as part of the Alterative Evaluation. No further assessment of this alternative was considered for the following reasons:

a. Substantial variances in the chemical and physical characteristics of the spring influent.
b. Operator assessment of chemical feed requirements and timing not reliable and time consuming.
c. Ability to uniformly feed coagulants and flocculants
d. Substantial increase in the potential to foul filters
e. Increase in waste and hazardous waste produced.
f. Need to over-feed the system due to variances.
g. Cost of procuring, storing, handling, and purchasing coagulant, flocculants, and carbon.
h. Reduction in storage and/or treatment capacity due to operating tanks in series or the increases in cost for additional storage capacity.
i. Difficulty of assessing short term storm event flows and anticipated volumes.
j. Increase in labor costs and requirement for extended operational times

k. Need for bench studies and identification of flocculants and coagulants for varying conditions and the capability of operators to assess such needs.

For the limited detail provided, EPA has provided a cursory review of the PAC system information provided by the Commenter. EPA is of the opinion that such a system will not be reliable and will be difficult to operate and maintain. In addition to the reasoning afforded above, the system as currently proposed would need to address the following additional cost and operational concerns.

a. The system as currently sized does not address flow rates above 2,600 gpm or the volume of water generated over the course of large single, multiple, or quick return type events.
b. No evaluation or representation has been provided to efficiencies of such a system or its capability to work with extended flows
c. Evaluation of term system efficiencies have not been assessed or evaluated.
d. Assuming that PCB flocked particulates have settled and were retained in the tanks no allowances have been made for the processing, handling, and disposal of the flocked material.

Comment 91: The rational for the design specifications for the preferred alternative, alternative three are not clear and those design criteria may be unnecessarily severe. For example, it is not clear why EPA chose an overflow treatment standard of 95% or a design capacity of 5000 gpm. This appears to be significantly more than that required. Consider the following:

- With a current plant capacity of 1000 gpm, this implies the overall treatment system would have a capacity 6000 gpm. The ICS system has been monitored for flow almost continuously since 1994. There has been no credible flow measured that approaches 6000 gpm. See Table 3 for a summary of peak flows measured since 1995 at the spring. The highest value on Table 2 is for the May 1995 event and this flow was estimated based on correlations with rain (the measurement weir was overtopped during this event rendering the measured data unusable). The highest credible ICS flow rate measured was a spring flow of about 4500 which would require an overflow treatment system of 3500 gpm. Therefore it appears that a capacity of 5000 gpm for an overflow treatment system is a significant over design based on historical records. While larger events than those measured during the last 11 years will undoubtedly occur, those events will be extremely rare and importantly would still be largely treated by a system with less capacity.

- For example, an overflow treatment system sized for 2600 gpm can be evaluated using the EPA model. During the evaluation period of 2.5 years, only one storm event would have had any significant PCB bypass with a 2600 gpm system (see Figure 5). Even though there

would be some PCBs that bypass treatment during that one event (January 2004), the actual amount of bypass would be very small and is easily calculated using the EPA model. If you assume that the overflow treatment system treats all waters overflowing the tanks during that event up to 2600 gpm, and you assume an overflow treatment efficiency of 95% (as the EPA has in its analysis), then the amount of PCBs bypassing overflow treatment during the 2.5 year period would be 167.7 grams assuming no settling in the existing tanks. This would yield an overall capture efficiency of 98% percent (assuming no settling in the tanks). If you assume 80% settling in the tanks, the overall treatment efficiency is well over 99% for the 2600 gpm capacity system during this 2.5 year period.

- EPA may have chosen 95% removal efficiency as a standard for overflow treatment based on the testing done to date on overflows. However, this testing was very limited and likely would not show the continued performance of such a system over a period of several days of overflow. Over a more extended time period, solids loading to carbon vessels can cause performance issues such as excessive head loss, channeling, solids migration through the bed and carbon blinding. The latter three effects can cause degradation in removal efficiencies. CBS believes that the 95% standard is overly restrictive and may not be achievable even with carbon without proper pre-filtration.

Response: Bullet No. 1

EPA notes that the estimated peak flow of 5,385-gpm for the May 18, 1995 event is consistent with Earth Tech's model 25-year, 6-hour storm event which predicts a peak flow rate of 5,403 gpm. EPA's opinion is that such flow rates are likely to occur again. A simple probability plot of maximum annual discharge for the 11 year period of record in the commenter's Table 3 suggests that the 25-year recurrence peak would be between 5,500 and 6,000 gpm. This is in good agreement with the design storm.

The commenter further suggests that the May 1995 flow rate data that they present is not credible and unusable. No evidence is provided for this opinion. To the contrary, EPA estimates that the flow rate may have been greater than estimated. As indicated below, the flow rate at the time was reduced by restriction in the culvert under the RR tracks that led to upstream storage of storm water. Currently, no such restrictions exist and the same storm event that occurred in May 1995 may actually produce flow rates in excess of 5,385 gpm. Even if the May 18, 1995 value is not considered credible, as the commenter suggests, a probability plot still suggests a 25-year recurrence peak flow above 5,000 gpm. Use of short term historical flow rates for the purpose of defining design values is a valuable tool but it is not appropriate to use these absolute values for defining the design capacities as suggested by the commenter.

EPA contends that the design capacity of 1000-gpm primary treatment and 5000 gallon secondary treatment capacity is appropriate given observed flow rates, predicted future flow rates, and EPA's desire to minimize to the extent reasonably possible (without expenditure of maximum cost) the release of PCBs to clear creek.

The treatment and storage components are part of the overall system that provides related but different functions for the ICS. The evaluation and assessment of the combined treatment and storage capacity is based on engineering parameters, empirical relationships, costs, experience, regulations, and the evaluation of data. Accordingly various combinations were evaluated to determine the most effective combination of the two components.

The treatment system must be able provide the following functions:

1. Process PCB laden water to meet specific discharge criteria.
2. Process water over a range of flows whereas the system is capable of treating within discharge limits the base, low, and high flows without damage to the operating systems.
3. Process stored water whereas the storage capacity is regained prior to the next event. Accepted practice is restore 100% of the design storage capacity within seven (7) days of the single storm type event.
4. Remove the constituent of concern (COC) and provide a means to handle and properly dispose of the material.

The storage systems must be able to provide the following functions:

1. Store water in sufficient quantity to allow the treatment system to properly operate within its given range.
2. Allow for bypass of waters that exceed the storage capacity.
3. Store and retain the COC within the limits of storage.
4. Prevent short circuiting of the system.
5. Return the stored waters, sediments and COC at a rate that can be properly treated prior to release.
6. Operate within a defined range for the given hazard.

The system and its various components were designed from storm data collected by the commenter. With the use of SCS standardized hydrographs an empirical model was developed to determine the design flow and sump capacities. A 25 yr-6 hr ICS storm event was selected to design the facility. The 25yr-6hr (4% chance of occurrence for any given year) design event was selected because of its common regulatory use with projects involving hazardous materials.

The ICS karst system is a complex network of solution paths, cavities, crevices, and caves that can provide a full array of hydraulic anomalies depending on the stage of groundwater passing through the system for any given flow rate. Because the flows cannot be calculated using conventional hydraulic models, the EPA elected to use a

comparative analysis using the short term historical rainfall and flow data collected by the commenter. The use of actual data would account for changes in flow conditions (gravity, pressure conduits, pools, submerged entrance and outfall, etc.) whereas the hydraulics could be calculated and applied to a standard SCS unit hydrograph. Once the application was made the hydrograph was linearly expanded to determine the design flows and volumes that could be expected. For the ICS the 25yr-6hr storm event was developed from the unit hydrograph with peak flow rate of 5,400 gpm. Given the relative low flows (1300 gpm +/-) used in the analysis to calculate the peak flow with the variables and unknowns associated with the karst system, a ten (10%) percent increase in the peak flow was applied (5, 830 gpm).

The peak flow of 5,830 gpm is for a single event storm that mirrors the peak and volume of water for an equivalent SCS Type II storm event. Because the karst system is unique and may not compare well to the basic parameters of a SCS unit hydrograph with its various soil conditions, pools, areas of deposition and other related parameters, the design flow rate was rounded to 6000 gpm. Other related storm parameters that were acknowledged but not considered at the time of design were multiple storm events where the karst system had not drained from previous events, quick return storm events, and changes in the surface features whereas sink holes, swallow-holes, land use and other related causes may influence the hydraulic profile.

Since the ICS Treatment Facility was brought on-line in May 2000 the facility has bypassed approximately 10,000 gallons of "raw" spring water through the Spring Receiving Sump (SRS) emergency overflow. This bypass was due to a programming error and not an equipment failure or capacity issue. Measured flows by the commenter prior to ICS Facility commissioning have exceeded 5300 gpm and since commissioning of the facility single storm event flow rates have been as high as 4,500 gpm.

The commenter has a limited understanding of the use of the treatment and storage components of the existing ICS facility. The nominal treatment capacity is 1000 gpm and the nominal storage capacity is approximately 1.2 million gallons. The storage component can be fed at a rate 5000 gpm and can overflow at a rate of 5000 gpm but this system is not capable of treating or storing such an event without modification.

The primary treatment system is an active system that can treat an average of 1000 gpm but its capacity to continually treat waters diminishes with time for a given event depending on the skill of the operator, the system's condition at the outset, and the quality of constituents in the effluent. With extended run times the granular activated carbon (GAC) filters within the treatment component develop a backpressure and will typically need to be backwashed one time over the course an event. During this time the treatment system is not operable and all flow is through the storage tanks.

The storage tanks currently receive 2,500 gpm or 5,000 gpm per cycle. Accordingly, any treatment units receiving the overflow from the storage tanks would need to match the overflow potential of the storage tanks. The SRS Tank overflows could occur during the following events:

1. Inflow to the SRS is greater 1000 gpm and the storage capacity is used.
2. The primary treatment system is off line and he storage capacity has been expended.
    a. equipment failure
    b. backwashing cycles
    c. control failure
    d. certain alarm condition

Bullet No. 2

EPA believes it is appropriate to design for an overflow rate based on an anticipated 25-year recurrence interval. As the commenter suggests, for small storms the storage tanks may be expected to buffer the overflow rate to some value below the peak spring discharge. That is, the peak spring discharge occurs at a time when the tanks are filling, and the maximum overflow rate occurs at a time after the peak. For larger storms this is not the case. The commenter is referred to Appendix A, Figure 14 of the June 2006 Alternative Evaluation Report. For the January 6, 2005 storm event illustrated in the figure, the peak discharge of 4,300 gpm occurred when the tank system was completely full. The overflow rate, accounting for a 1,000 gpm plant treatment rate was therefore 3,300 gpm. This storm appears to have been only a 4 or 5 year recurrence interval storm based on the historic spring flow record.

Bullet No. 3

The GAC filters proposed for the SRS Tank overflow have a capacity of 1,000 gpm per vessel or a total capacity equal to 8,000 gpm. EPA recognizes that solids could potentially create a back pressure on the units reducing there flow capacity. The use of the individual GAC units provides a level of redundancy whereas the filters can be brought on line or off line as the flows change allowing the filters to be backwashed as required without loosing the capacity to treat the overflow. The use of the multiple filters allows them to remain in service longer with the capacity to renew the filters before they would become fouled. Based on the 25yr-6hr design event with an average overflow of approximately 4400 gpm, seven units would be needed to maintain a flow capacity of 650 gpm or more until a backwash cycle (½ hr.) was complete. This is well within the operating range of the GAC units.

As part of the design the GAC train is part of a filtering system that provides a 15 micron Average Opening Size (AOS) filter. This filter will retain solids with courser particles introduced at the beginning of a storm event when the flows are higher. As the storm peaks the solids loading will decrease with the flow rate and the size of particles will continue to decrease with the overflow. This natural progression will allow the GAC units to continue to filter finer particles than the 15 micron AOS allowing a greater retention of PCB laden sediments. It is EPA's opinion that the 95 percent removal standard is appropriate and achievable whether applied as an average across a year or to individual storm events.

The modeling used in Alternative 3 was specifically designed to observe the potential for blinding the surface of the GAC filter. Over the course of the test, no measured head loss was observed through the media and the filter did not show a propensity to foul or blind over during the course of the testing. A layer of fine particles was observed throughout the filter with notable discoloration in the upper ½ inch of the model.

Comment 92: The estimated cost for Alternative 3 in the proposed plan is likely underestimated. First, the estimate assumes no filtration is required in front of the carbon vessels. This is an unproven assumption that if wrong would have significant implications on the cost of this alternative. CBS has contacted a carbon filtration system company and a feed stream with 9 to 74 ppm of suspended solids (EPA data from 1/5/2005 testing) is a concern for carbon system removal efficiency. Until proven otherwise via pilot testing, it is more reasonable to assume that both pre-filtration and backwash capability will be necessary to consistently achieve the desired removal efficiency. CBS has otherwise evaluated the cost estimate prepared for alternative 3 and feels the following modifications are warranted (these cost adders are summarized in Table 4, Table 5 is a cost estimate for a 2600 gpm overflow treatment system with carbon vessels):

a. Filtration in front of the carbon vessels should be included until proven unnecessary. For planning purposes at this time, the cost for an inclined plate settler is added.

b. The influent pipe from the storage tank and the effluent pipe will be a minimum of 18" diameter to convey the 4,500 gpm. The price for this pipe should be closer to $1 OO/LF versus the $25 listed.

c. Variable frequency drives for the GAC feed pumps are not listed.

d. The valves and piping required to connect the GAC units are not listed.

e. The cost for the flow meters appears to be low. For the size of piping required (12" & 18") the cost could be significantly higher.

f. The GAC adsorber tank cost appears to be too low. Based on discussions with Calgon, the capital cost for five model 12 systems is $950,000 including installation and first load of GAC. This will add about $325,000 to the estimate.

g. The bypass pipe is shown at $25/LF. This should be at least $1 OO/LF for this size pipe.

h. The line item for valves is listed as $12,500. This will buy about four valves. This should be at least doubled to account for the 5 GAC systems.
i. The electrical costs appear low. These costs should be closer to $40,000 to $50,000.

j. The startup costs are listed at $10,000 which may be too low. Since it will be started and operated during rain events, use approximately $25,000 for the startup cost.

Response: In the Alternatives Evaluation report, EPA presented estimated capital costs for the Alternative 3 conceptual design. The capital costs were estimated in Table 3-1 to be $1,255,000. In Exhibit D, CBS indicated that a number of line items in Table 3-1 were underestimated. Based on these comments, EPA evaluated comments and agrees that EPA's costs may be between 15% and 20% low but with within the range for a conceptual design as described in the Alternatives Evaluation Report.

However, we disagree that it is appropriate to assume that suspended solids removal is required prior to GAC filtration. It is EPA's opinion that such clarification will not be required considering that Alternative 3 includes backwashing capability. In any event, the clarifier proposed by CBS in Table 4 as a necessary element of the Alternative 3 remedy will not be of any benefit since Earth Tech's studies consistently show through Imhoff cone testing that all settleable solids are removed in the storage tanks.

Comment 93: Rinker Spring has no proven relationship to the Lemon Lane site. CBS may choose to include collection of this spring water but reserves the right to maintain that it is not connected to Lemon Lane Landfill discharges.

Response: It is currently the intention of the EPA to construct Modification B, as presented in the AE Report, to collect the flow from Rinker Spring and pump it to the ICS treatment system.

Comment 94: Pumping back Rinker and Quarry Springs is only warranted during non-storage tank overflow conditions. This is because the PCB content of these springs is a fraction of that issuing from ICS. The option to not collect Rinker or Quarry Spring waters during periods when the storage tanks are overflowing should be left open pending further evaluation. The option to not collect these waters at all should also be considered after the impact of cleaning the sediments around the swallow hole and moving the plant discharge.

Response: As of this date, insufficient data has been provided to assess the PCB contribution of Rinker and Quarry Springs (Quarry Combined) during storm flow. The EPA is willing to consider the direct discharge to stream if it can be shown that the Quarry Combined springs contribute a consistently lower PCB loading than the discharge from the treated SRS tank overflow. The EPA is willing to consider the decommissioning of the Quarry Combined spring collection and pumping system if the Substantive NPDES requirements are maintained below the established limits as prescribed by the EPA.

Comment 95: A cost benefit analysis should be performed since maintenance of the status quo appears to be protective of human health and the environment. The costs have

been reasonably well determined. But some additional discussion is required to identify the net benefits which should be attributed to each alternative. While one benefit could be described in terms of total PCB mass captured by each alternative, it is not clear how to attribute the incremental environmental benefit for PCB mass captured. A sample cost benefit analysis in terms of mass of PCB captured is shown in Tables 6 and 7. As can be seen from these Tables, most of the mass of PCBs is currently being captured by the existing system. Therefore any additional modifications to capture the remaining relatively small mass which bypasses the current system will have a very high incremental cost per additional pound of PCB captured. CBS questions whether it is reasonable to invest in additional systems that would yield an incremental cost of approximately $83,000 per pound of PCBs.

Response: EPA does consider nine criteria during the process of evaluating alternatives. Accordingly cost is one of the parameters that is evaluated and is used with the remaining criterion when considering recommendations for a final remedial action. Accordingly, EPA has found Alternative 3 best meets the overall objectives including the cost to implement this action for this site. The commenter may need to reevaluate the cost per pound of PCB removed but more importantly review the other considerations that comprise a cost to benefit study.

Comment 96: The EPA has projected cost for 30 years for each alternative. While this is a standard method for comparing alternatives, it ignores the reality that the ICS will likely continue with levels of PCBs which the EPA would deem requires treatment for a substantially longer time. The only conceivable way to prevent this is to continue evaluating source removal or control in the bedrock at the landfill. CBS has been and is committed to continuing this approach with its conduit investigation. CBS has made substantial progress over the years locating bedrock deposits of PCB DNAPL which is surely the source of the PCBs which emerge at ICS. While EPA acknowledges this in the proposed plan, this approach is not recognized or evaluated as a viable alternative. It is more reasonable to put additional moneys into this approach over the next few years than spend millions of additional dollars on expensive end of the pipe treatment that will have a very high incremental cost per pound of PCB captured, may have little effect on the PCB content of fish in the main stem of Clear Creek and will not resolve the restore the contaminated groundwater in any reasonable time period.

Response: The commenter is encouraged to continue its studies and develop its hypothesis but in the mean time the PCB emerging from the ICS area needs to removed from the environment. The commenter acknowledges in the preamble of his comment that PCB's will likely continue for a period of time longer than 30 years, accordingly, the commenter would possibly benefit from any means or technology that could be used to control or remove the PCB within the next 30 years. Unfortunately, the PCB contamination is deeply rooted into the bedrock and along various karst features whereas the source is no longer just the Lemon Lane Landfill but the entire karst system extending from the Lemon Lane Landfill to below the ICS. Given the depth of contamination, the vast extent of the spatial area (karst and surface) that contains elevated PCB levels, the constant and continued release of PCBs into the environs, and the fact that a source type

solution has been sought for the last seven years and the problem known for over 20 years with no imminent solution proposed or available, and with the lack any other viable alternative being implemented; the EPA will not allow the PCB releases to continue to adversely effect the human and environmental resources. EPA is of the opinion that it is time to move forward with a final remedy. In the event that the commenter's efforts do provide a definitive solution to the release of PCBs from the ICS and the Quarry Combined springs, then EPA is committed to reopen the water remedy.

Comment 97: National Pollution Discharge Elimination System (NPDES) program requirements of the Clean Water Act (CWA) are neither applicable, nor relevant and appropriate, requirements for the Illinois Central Spring on-site water treatment plant. First, the Commenter states that it agrees with EPA that NPDES permit requirements are not applicable. Next, the Commenter states that the substantive NPDES requirements are not relevant and appropriate for the water treatment plant, because the NPDES requirements regulate the "discharge of pollutants" (defined as the addition of pollutants to navigable waters) from a "point source." In this case there is no NPDES-regulated "discharge of pollutants," because the proposed plant would not add pollutants to those already occurring as a result of existing groundwater and surface water flows. In short, "NPDES requirements are very ill-suited to the Lemon Lane Landfill Superfund Site, which is very different from the situation in which they would normally apply. The NPDES requirements are intended to apply to the "discharge of pollutants," which is a defined term with a specific meaning under that statute. 33 U.S.C. §§ 1311, 1362(12). The term "discharge of a pollutant" is defined to mean "any addition of any pollutant to navigable waters from any point source." 33 U.S.C. § 1362(12). This definition does not apply to the ICS Treatment Facility because no "addition" of a pollutant is involved.

Response: EPA disagrees with the comment. The NPDES program requirements of the CWA are relevant and appropriate requirements for an on-site water treatment plant at Lemon Lane Landfill's Illinois Central Spring water treatment plant.

As the lead agency for the site, EPA is charged by 40 C.F.R. § 300.400(g) with identifying applicable or relevant and appropriate requirements to the release or remedial action contemplated for the site. As the commenter correctly notes, EPA determined that the NPDES program requirements of the CWA were not "applicable" to the Illinois Central Spring water treatment plant. This is because Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), specifically exempts on-site removal and remedial actions, such as the water treatment plant, from the permit requirement imposed by the NPDES program. Nevertheless, EPA determined that the substantive requirements of the CWA were "relevant and appropriate" to the plant (and its proposed expansion as part of the final remedial action). Specifically, EPA determined that 327 IAC 5-2-11.1, which sets forth the procedure for establishing a water-quality based effluent limits (WQBEL) for various pollutants including PCBs, was "relevant and appropriate" to establishing the effluent limit for PCBs discharged by Lemon Lane Landfill's Illinois Central Spring water treatment plant.

The Commenter argues that substantive requirements of the NPDES Program are not "relevant and appropriate" because the proposed water treatment plant will not be subject to the CWA. The Commenter's argument confuses the difference between requirements that are "applicable" and those that are merely "relevant and appropriate." Even if a requirement is not "applicable," EPA is nevertheless required to determine whether a regulation may be relevant and appropriate to the circumstances of the release. 40 C.F.R. § 300.400(g)(2). A "relevant and appropriate" requirement means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5 (emphasis added). EPA believes that the substantive requirements of the NPDES program are "well-suited" to the cleanup at Lemon Lane Landfill's Illinois Central Spring and the water treatment plant, because the NPDES Program, similar to the proposed CERCLA action, is concerned with abating the harmful effects of pollutants discharged into the nation's waterways.

Under 40 C.F.R. § 300.400(g)(2), EPA is required to examine eight factors, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated. Id. An examination of these factors (below) shows that EPA reasonably determined that the substantive requirements of the NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1 (the reference to 327 IAC 5-2-11.2 appears to be a typographical error repeated throughout), were "relevant and appropriate" to the proposed waste water treatment plant.

Factor 1: The purpose of the requirement and the purpose of the CERCLA action: The objective of 327 IAC 5-2-11.1 is to establish water quality based effluent limits for pollutants discharged into waters other than those within the Great Lakes system. The State of Indiana has established water quality criteria to restore and maintain the chemical, physical and biological integrity of the waters of the state. Pertinent to the present case, the State has determined that the concentrations of PCBs in Indiana waterways shall not exceed .79 parts per trillion ("ppt"). Based upon this water quality criteria, the State has also determined, in accordance with the guidelines set forth at 327 IAC 5-2-11.1, that dischargers of PCBs cannot discharge PCBs at a concentration greater than .3 parts per billion (ppb).

The problem addressed by 327 IAC 5-2-11.1 is similar to the circumstances of the remedial action proposed by EPA for Lemon Lane Landfill's Illinois Central Spring and the water treatment plant. Here, PCBs from the site were being released into Clear Creek, thus requiring the treatment plant, and continue to be released from the plant during certain storm events, thus necessitating this Lemon Lane Landfill water treatment operable unit. To protect human health and the environment from these releases, EPA has proposed, among other things, expanding the treatment capabilities of the water treatment plant to capture and treat the PCB-contaminated water (which now bypasses the plant during large storms) before it is discharged into Clear Creek. A critical question

in implementing this remedial action concerns the amount of PCB reduction that is necessary. That is, EPA must determine what concentration of PCBs can be discharged into Clear Creek without threatening human health and the environment. The procedure set forth at 327 IAC 5-2-11.1 is directly relevant to answering this question, and it is therefore appropriate for EPA to use 327 IAC 5-2-11.1 in selecting the proposed final remedy for both the treatment plant discharge criteria and the discharge criteria for treated spring water that currently bypasses the treatment plant.

Factor 2: The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1, is concerned with protecting the waters of the State from the harmful effects of pollutants, such as PCBs. Similarly, the proposed remedial action is concerned with protecting Clear Creek - one of the State's waterways - from the harmful effects of PCBs. This factor, therefore, supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 3: The substances regulated by the requirement and substances found at the Site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1, regulates the discharge of "pollutants," which includes PCBs. PCBs are also the contaminant of concern with respect to the proposed remedial action. Therefore, this factors also supports EPA's determination that the State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 4: The actions or activities regulated by the requirement and the remedial action contemplated at the CECRLA site:

Like all NPDES program, the State of Indiana's NPDES Program regulates the "discharge" of pollutants into the State's waters. Section 503(12) of the CWA, 33 U.S.C. § 1362(12), defines the "discharge of a pollutant" in relevant part to mean "any addition of any pollutant to navigable waters from any point source." Here, the Lemon Lane Landfill's Illinois Central Spring and its water treatment plant are similar to a "point source" if it is not, in fact, a point source. EPA believes, therefore, that these circumstances at the site are similar enough to the activities regulated by the State NPDES program that the substantive requirements of that program are "relevant and appropriate" to the proposed remedial action.

Section 503(14) of the CWA, 33 U.S.C. § 1362(d), defines the term "point source" to mean "any discernible, confined and discrete conveyance . . . from which pollutants are or may be discharged." Cases brought under the CWA establish that the term "point source" is to be broadly construed. Dague v. City of Burlington, 935 F.2d 1343, 1354-55 (2d Cir. 1991); Albahary v. City and Town of Bristol, Connecticut, 963 F.Supp. 150, 152-53 (D. Conn. 1997). The term not only includes pipes or ditches, but also large land areas, such as strip mining pits and mine tailing ponds. In Washington Wilderness

Coalition v. Hecla Mining Company, 870 F.Supp. 983 (E.D. Wa. 1994), the Court held that two dirt-filled mine tailing ponds and a third, active, unlined mine tailing pond from which contaminants were leaching could be point sources. Similarly, in Sierra Club v. Abston Construction, 620 F.2d 41, 45 (5th Cir. 1980), the Court held that a strip mine was a point source where "the miner at least initially collected or channeled the water and other materials" that eventually resulted in a discharge into a navigable body of water. See also Beartooth Alliance v. Crown Butte Mines, 904 F.Supp. 1168, 1174 (D. Mont. 1995)("This Court finds that Glengarry Adit, McLaren Pit, and Como Pit are 'discernable, confined and discrete' conveyances constituting point sources.").

All of these cases support the conclusion that the Lemon Lane Landfill, Illinois Central Spring, and its water treatment plant, are point sources. The Lemon Lane Landfill occupies a sinkhole filled with garbage and commercial and industrial waste including capacitors and PCB-containing dielectric fluids. The addition of these materials and wastes changed the surface and subsurface of the land and directed the flow of water or otherwise impeded its progress. As result of these activities, PCBs are now discharged from the Illinois Central Spring site into Clear Creek, and hence, the site is a "point source." Further "point sources" are the culvert under the Illinois Central Spring railroad railbed, which channels water emerging from the Illinois Central Spring before it goes to the Illinois Central Spring water treatment plant. This culvert is not the original culvert that the spring water flowed through, because that culvert needed to be replaced as part of the removal action. The fact, is however, that even before the removal action the water was channeled as a result of human actions through a railroad culvert qualifying as a point source. Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990). Finally, the Illinois Central Spring water treatment plant itself is a point source.

A second argument made by the commenter is that discharges from the water treatment plant are not "discharges" under the CWA. Specifically, the commenter argues that the purpose of plant, and its proposed expansion is to *reduce* the concentration of PCBs entering into Clear Creek. Since the plant is not *adding* pollutants to Clear Creek, the commenter maintains that the effluent discharged by the plant does not qualify as a "discharge" for the purposes of the CWA.

This argument overlooks the fact that the site, not the plant, is adding pollutants to Clear Creek. If the commenter's argument were correct, then a publicly owned treatment works (POTW) would not need to obtain an NPDES permit because a POTW does not add pollutants to the waste stream that flows through the plant. Rather, a POTW merely removes pollutants from the wastestream. Numerous courts, however, held that POTWs are subject to the NPDES program.

Factor 5: Any variances, waivers, or exemption of the requirement and their availability for the circumstances at the CERCLA site

Under 327 IAC 2-1-8.8. the State may grant a variance from a water quality standard used to derive a WQBEL for a specific substance. In making this determination, the State must balance the increased risk to human health and the environment if the variance

is granted against the hardship or burden upon the applicant if the variance is not granted. This determination is similar to the one that EPA made in selecting the proposed remedial alternative. Specifically, EPA found that the proposed remedial action was the best choice taking into account a number of factors, including cost. For the same reasons set forth in the proposed plan as to why Alternative 3 is the best choice among remedial alternatives, EPA believes that the variance under 327 IAC 2-1-8.8 should not be granted in the present case. Likewise, EPA believes that various exemptions available under its own regulations should not be granted here.

Factor 6: The type of place regulated and the type of place affected by the release or CERLA action:

As already noted, the State NPDES Program regulates dischargers of pollutants into the States' waterways. Similarly, under the proposed remedial action, EPA seeks to clean up a site that is discharging pollutants into a State waterway. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 7: The type and size of structure or facility regulated and the type of size of structure or facility affected by the release or contemplated by the CERCLA action:

As already noted, the State NPDES Program regulates "point source" of pollutants discharged into the State's waterways. Lemon Lane Landfill; the Illinois Central Spring railroad culvert, and the Illinois Central Spring water treatment plant are all consistent with the sizes and types of point sources regulated under the Clean Water Act. The conclusion that the Lemon Lane Landfill, as well as the railroad culvert are themselves each point source is directly supported by Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990)(holding city landfill was a point source). Likewise, the proposed water treatment plant is consistent with the size and type of facilities that are routinely subject to the requirements of the NPDES Program. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 8: Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

The requirements of 327 IAC 5-2-11.1 apply to all waterways in the State that are not part of the Great Lakes System, regardless of the use or potential use of the waterway. Accordingly, this factor supports EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Comment 98: EPA and the State of Indiana have failed to identify specific effluent limitations for specific hazardous substances, pollutants, and contaminants and, instead, has identified only broad programmatic requirements. Thus, EPA and the State have failed to properly identify CWA requirements as ARARs.

Response: The commenter is incorrect. EPA refers the commenter to EPA's response to Comment 99 below. Further, there are sample results reflecting the presence of a hazardous substances or pollutants or contaminants other than PCBs in the water emerging from the Lemon Lane Landfill's Illinois Central Spring. Specifically, the sample results show low levels of volatile organic chemicals at the Illinois Central Spring. The State, however, has not yet identified any additional substantive NPDES requirements for those constituents.

Next, the State has identified its NPDES permit modification regulation (327 IAC 5-2-16(c)(2) and 5-2-16(d)(2)) as an ARAR and as a basis for being able to impose an effluent limit or other requirement for any such hazardous substance or pollutant or contaminant that is later identified (as well as a basis to identify newer methods for quantifying PCB concentrations). EPA agrees that while this may be the way the State handles discovery of additional contaminants (or newer quantification methodologies) at an NPDES-permitted facility, under Superfund EPA handles the discovery of additional contaminants, newer quantification methodologies, the inadequacy of existing treatment technologies, and other matters that may establish that a remedy is not protective, through amendments or other changes to its selected remedy using its remedy amendment process. The discovery of additional contaminants, newer quantification methodologies, or the inadequacy of existing treatment technologies may be raised to U.S. EPA at any time, and U.S. EPA's five year review process is one forum in which such matters may be formally raised and addressed. Thus, if additional hazardous substances or pollutants or contaminants are found to be in the water emerging at the Lemon Lane Landfill's Illinois Central Spring (or new PCB-quantitation methodologies are identified), and if these facts are raised to U.S. EPA, then it may be necessary to modify the selected ground water remedy to establish effluent limits or other additional requirements using EPA's processes for amending or otherwise altering a remedy selected in a record of decision.

Comment 99: Regarding PCBs, EPA and the State have not identified a legally enforceable effluent limitation that qualifies as an ARAR. Instead, EPA and the State rely on 327 IAC 5-2-11 and 327 IAC 5-2-11.1 as the vehicle to set an effluent limit of 0.3 parts per billion (ppb), because that is the limit of quantitiation (a level which can be reliably confirmed using existing measurement technology) using existing technology. The 0.3 ppb effluent limitation for PCBs does not qualify as an ARAR, because it has not been "promulgated" by the State as a regulatory standard.

Response: Indiana properly identified 327 IAC 5-2-11 and 327 IAC 5-2-11.1 as ARARs and used 327 IAC 5-2-11.1 as the promulgated standard, requirement, criteria, or limitation to set an effluent limit of 0.3 ppb for PCBs. With respect to State ARARs, 42 U.S.C. § 9621(d)(2)(A)(ii) provides that

> "any promulgated standard, requirements, criteria, or limitation under a State environmental . . . law that is more stringent than any Federal standard, requirement, criteria, or limitation . . . is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant

and appropriate under the circumstances of the release of such hazardous substance or pollutant or contaminant, the remedial action selected . . . shall require, at the completion of the remedial action a level or standard of control for such hazardous substance or pollutant or contaminant which at least attains such legally applicable or relevant and appropriate standard, requirement, criteria, or limitation."

This provision does not require that a State's "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" take the form of a specific, promulgated numeric effluent limit. Rather, it simply requires that the "standard, requirements, criteria, or limitation" identified as an ARAR be promulgated. Here, 327 IAC 5-2-11.1 is the relevant and appropriate standard, requirement, criteria, or limitation promulgated by Indiana. 327 IAC 5-2-11.1(f) in pertinent part provides:

(f) When the WQBEL for any substance is less than the limit of quantitation normally achievable and determined by the commissioner to be appropriate for that substance in the effluent, the permit shall contain the following provisions:
(1) The permittee shall be required to use an approved analytical methodology for the substance in the effluent to produce the LOD and LOQ achievable in the effluent. The analytical method, and the LOD and LOQ associated with this method, shall be specified in the permit in addition to the following requirements:
(A) The permit shall include conditions that state that effluent concentrations less than the limit of quantitation are in compliance with the effluent limitations.
(B) In addition, the permit shall require the permittee to implement one (1) or more of the following requirements:
(i) Develop a more sensitive analytical procedure.
(ii) Use an existing, more sensitive, analytical procedure that has not been approved by EPA.
(iii) Conduct studies to determine the bioaccumulative or bioconcentrative properties of the substance in aquatic species through caged-biota studies or fish tissue analyses of resident species.
(iv) Conduct effluent bioconcentration evaluations.
(v) Conduct whole effluent toxicity testing.
(vi) Other requirements, as appropriate, such as engineering assessments or sediment analyses.
For substances defined as BCCs, at a minimum, either item (iii) or (iv) shall be included in the permit.
(2) If the measured effluent concentrations for a substance are above the WQBELs and above the LOD specified by the permit in any three (3) consecutive analyses or any five (5) out of nine (9) analyses, or if any of the additional analyses required under subdivision (1)(B) indicate that the substance is present in the effluent at concentrations exceeding the

WQBELs, the permit shall contain provisions that require the discharger to:

(A) determine the source of this substance through evaluation of sampling techniques, analytical/laboratory procedures, and industrial processes and wastestreams; and

(B) increase the frequency of sampling and testing for the substance.

(3) The permit shall contain provisions allowing the permit to be reopened, in accordance with section 16 of this rule, to include additional requirements or limitations if the information gathered under subdivisions (1) and (2) indicates that such additional requirements or limitations are necessary.

Here, the WQBEL for PCBs is 0.001 part per billion, which is below the limit of quantitation and limit of detection normally achievable and determined by the commissioner to be appropriate for PCBs. As a result, in accordance with the promulgated requirements of the NPDES program, the State set the effluent limit for PCBs at 0.3 ppb, which is the level at which concentrations of PCBs can be reliably quantified.

In identifying 327 IAC 5-2-11.1 as an ARAR, Indiana properly and timely identified a "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" and through application of that standard, requirements, criteria, or limitation derived the 0.3 ppb PCB effluent limitation.

EPA also notes that in its footnote 12 (Comment Letter at 17), CBS identifies a 3 pbb effluent limit taken from EPA Toxic Substances Control Act Spill Policy regulations (40 C.F.R. § 761.79(b)(1)(ii) as a higher (less stringent) limit than the "unpromulgated" limit of 0.3 pbb identified by the State. EPA concludes that the Stale limit of 0.3 pbb derived from application of Indiana's promulgated standard, requirements, criteria, or limitation at 327 IAC 5-2-11.1 is more stringent than the Federal requirement and, therefore, will be used.

Comment 100: PCB effluent limits that could be calculated pursuant to 327 IAC 5-2-11 and 327 IAC 5-2-11.2 (the reference to 327 IAC 5-2-11.2 appears to be a typographical error repeated throughout) also are not ARARs, because those levels are not verifiable using existing technology, and where numerical limits are infeasible, EPA can instead establish conditions to reduce pollutants to an acceptable level by, for example, using best management practices to control or abate the discharge of pollutants.

Response: The commenter appears to be suggesting that PCB effluent limits other than the 0.3 ppb effluent limit could be calculated pursuant to 327 IAC 5-2-11 and 327 IAC 5-2-11.1. Whether or not this is true is immaterial. Based upon consultations with the State, EPA has determined that the proposed remedy will comply with ARARs under the State's NPDES program if, among other things, the proposed treatment plant meets or exceeds a discharge limit of 0.3 ppb. This discharge limit is verifiable using existing technology.

Comment 101: EPA should use "best management practices," consistent with 40 C.F.R. § 122.44(k)(2), to control or abate the discharge of pollutants, because numeric effluent limits are infeasible here. Further, the 0.3 ppb PCB effluent limit, if it is an ARAR, should be waived under 42 U.S.C. § 9621(d)(4)(C) on the basis that it is technically impracticable to meet this limit from an engineering perspective.

Response: First, numeric effluent limits are feasible here, and have been identified. Therefore, it is not appropriate for EPA to rely on "best management practices," consistent with 40 C.F.R. § 122.44(k)(2), alone to control or abate the discharge of pollutants instead of the numeric limit. EPA agrees that adoption of some best management practices is appropriate here.

Second, EPA declines to consider a technical impracticability waiver for 327 IAC 5-2-11.1 and the effluent limit of 0.3 ppb PCBs. Given the water flows and volumes at the Site, designing, constructing, and operating a water treatment plant that captures and removes PCBs to an effluent of 0.3 ppb is practicable from an engineering perspective. Indeed, the water treatment plant designed and constructed by EPA at the Illinois Central Spring Site consistently treats PCBs to this level.

EPA agrees, however, that a technical impracticability waiver is appropriate for criteria that would otherwise apply to PCB-contaminated storm water flows that currently bypasses the 1,000 gpm treatment plant. Thus, the PCB-contaminated storm water flows that are treated by the additional remedial components identified in alternative 3 do not have to achieve the States NPDES criteria.

Comment 102: The 0.3 ppb PCB effluent limit should also be waived under 42 U.S.C. § 9621(d)(4)(E). This provision "authorizes EPA to waive State ARARs when they are not consistently applied by the State."

Response: There is no basis for providing this type of waiver here. The State timely identified 327 IAC 5-2-11.1 and the 0.3 ppb PCB effluent limit (which is based on current testing methodology reliability limitations). Indiana has demonstrated an intention to consistently apply 327 IAC 5-2-11.1, and EPA is unaware of examples of the State of Indiana being inconsistent in its application 327 IAC 5-2-11.1. Accordingly, EPA is unaware of a basis for waiving 327 IAC 5-2-11.1 and a 0.3 ppb PCB effluent under 42 U.S.C. § 9621(d)(4)(E).

Comment 103: In addition to Table 1 in 327 IAC 2-1-6, the other Indiana NPDES provisions identified in the Proposed Plan are not ARARs for the following reasons:

IAC Code Provision	Requirement	Reason(s) why not an ARAR
327 IAC 5-2-8(3)	Permittee shall take all reasonable steps to minimize or correct	(1) There is no permit; and (2) this is no "standard, requirement, criteria, or

	noncompliance with the permit	limitation" under 42 U.S.C. § 9621(d)(2).
327 IAC 5-2-8(5)	Allows IDEM to institute proceedings to modify permit if more stringent limits are determined for toxic pollutants	(1) There is no permit to modify; (2) this is not a substantive requirement in a permit, but a procedural provision relating to IDEM's administration of the program; and (3) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs are fixed at the time of remedy selection.
327 IAC 5-2-8(6)	Permit does not convey a property right of any sort	(1) There is no permit; and (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-2-8(7)	Permittee shall provide a right of access to IDEM and its contractors	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); and (3) CBS does not own or lease the property in question.
327 IAC 5-2-8(8)	Permittee shall maintain the facility in good order	(1) There is no permit; and (2) this is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-2-8(9)	Permittee's tampering with monitoring device is subject to criminal sanction	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2); and (3) enforcement provisions are not ARARs.
327 IAC 5-2-8(10)	Establishes reporting requirements	Reporting requirements for CERCLA remedies are set forth in consent decrees or other enforcement documents
327 IAC 5-2-8(11)	Requirements for bypass	EPA has already indicated that it intends to invoke

		CERCLA's technical impracticability waiver to supersede these requirements.
327 IAC 5-2-8(12)	Requirements for upset	EPA has already indicated that it intends to invoke CERCLA's technical impracticability waiver to supersede these requirements.
327 IAC 5-2-8(13)	It shall not be a defense in an enforcement action for a permitee to argue that it would have to halt operations to maintain compliance with a permit	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); (3) enforcement provisions are not ARARs; and (4) this provision makes no sense in this context, because the only "operations" involved are those to implement the remedy.
327 IAC 5-2-8(14)	Provisions relating to signing of reports and criminal sanctions for false reports	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); (3) procedural and enforcement provisions are not ARARs; and (4) these issues are generally addressed separately in a consent decree or other enforcement document.
327 IAC 5-2-11(a)(1)-(4)	Definitions of "Average Monthly Discharge," "Average Weekly Discharge," "Continuous Discharge," and "Daily Discharge," used in calculating effluent limitations.	Definitions are not in and of themselves "standard[s] requirement[s], criteria, or limitation[s]" under 42 U.S.C. § 9621(d)(2), and therefore not ARARs.
327 IAC 5-2-11(a)(5)(C)	Method of calculation for daily discharges	This methodology is not in and of itself a "standard, requirement, criteri[on], or limitation" under 42 U.S.C.

		§ 9621(d)(2), and therefore not an ARAR.
327 IAC 5-2-11(c)(2)	Provision relating to waste load allocation based on production capacity	This provision has no relevance to this treatment system: *there is no production going on.* It is neither applicable nor relevant and appropriate.
327 IAC 5-2-11(d), (e), (f), (g) and (h)	Provisions relating to the calculation of effluent limitations	These provisions relate to the calculation of effluent limitations. Even if the effluent limitation is an ARAR, the means by which it is calculated are not themselves ARARs. The term ARAR in 42 U.S.C. § 9621(d)(2)(A) refers to the specific "standard, requirement, criteri[on], or limitation" itself, not the means by which it was determined.
327 IAC 5-9-2(a), (c), (d), (e)	Refers to best management practice programs for "ancillary manufacturing operations"	There are no "ancillary manufacturing operations" in this situation. This provision is not an ARAR, because it is not applicable or relevant and appropriate under CERCLA. It is ill-suited for this situation.
327 IAC 5-9-2(b)	Defines "manufacture" to mean the production of an intermediate or final product	(1) There is no production of an intermediate or final product in this situation; this provision is not an ARAR because it is not applicable or relevant and appropriate under CERCLA; and (2) a definition is not a "standard, requirement, criteri[on], or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-9-2(f)	Discusses requirements for a best management practices program in a permit application	(1) There is no permit and no permit application; and (2) this is not a "standard, requirement, criteri[on], or limitation" under 42 U.S.C.

		§ 9621(d)(2)(A).
327 IAC 5-9-2(g)	Procedural requirement for modifying best management practices plan	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.
327 IAC 5-9-2(h)	Discharger will maintain a copy of a best management practices plan at the facility and make it available to IDEM on request	This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program.
327 IAC 5-9-2(i)	Discharger will amend the best management practices when there is a change to the system that affects the discharge	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.
327 IAC 5-9-2(j)	Provision relating to the amendment of best management practices plan if it proves ineffective	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.

327 IAC 5-2-13(a), (c), (d), (e), (f)	Monitoring provisions	These provisions are not ARARs in and of themselves.
327 IAC 5-2-16(c)(2)	This provision relates to the modification of a permit due to the promulgation of more stringent effluent limitations	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection; and (3) there is no permit.
327 IAC 5-2-16(d)(2)	This provision relates to the modification of a permit	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A) (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection; and (3) there is no permit.

Response: U.S. EPA agrees that the following sections of the Indiana Administrative Code are not ARARs for the Site, the Illinois Central Spring water treatment plant, or its expansion as described in Alternative 3: 327 IAC 5-2-8(5), (6), and (13); 327 IAC 5-2-11(c)(2); 327 IAC 5-9-2(b), (g), and (h); 327 IAC 5-2-16(c)(2) and (d)(2).

EPA disagrees with the comment that the other cited Sections are not ARARs. The Commenter's observation that many of the sections cited in its title are neither applicable, nor relevant and appropriate, because no NPDES permit is associated with the Site is rejected. Although no NPDES permit is required for the Site, the requirements cited are still relevant and appropriate, because, as will be discussed more fully below, they provide "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently*

similar to those encountered at the CERCLA site that their use is well suited to the particular site." 40 C.F.R. § 300.5.

327 IAC 2-1-6 identifies the minimum surface water quality standard and establishes surface water quality criteria for specific substances, including PCBs. This provision is relevant and appropriate in determining cleanup and discharge criteria, and is directly tied to determining the discharge criteria for PCBs under 327 IAC 5-2-11.1.

327 IAC 5-2-8(7), (8), (9), (10), (11), (12), and (14) all establish standards of control and other substantive requirements and criteria relevant and appropriate to determining the operation of the Illinois Central Spring water treatment plant, as well as the system for treatment of storm water that currently bypasses the water treatment plant. 327 IAC 5-2-8(7) establishes the substantive requirement of IDEM access to the plant, and is relevant and appropriate to ensuring EPA's and IDEM's ability to provide oversight of plant operations. 327 IAC 5-2-8(8) establishes the substantive requirement that the water treatment plant and its equipment be kept in good working order and operated efficiently and is relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. 327 IAC 5-2-8(9) and (10) establishes the substantive requirement that the operation of the water treatment plant and its equipment be monitored and identifies reporting requirements and sanctions for false reporting and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring EPA's and IDEM's ability to conduct oversight. 327 IAC 5-2-8(11) and (12) establish the substantive requirements for handling circumstances where "bypass" or "upset" occur at the water treatment plant, and are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. 327 IAC 5-2-8(14) establishes substantive reporting requirements and sanctions for false reporting and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring EPA's and IDEM's ability to conduct oversight.

327 IAC 5-2-11(a)(1)-(4) and (5)(c); 327 IAC 5-2-11(d),(e),(f) (g), and (h) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for calculating, establishing, and specifying effluent limits and their use is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

327 IAC 5-9-2(a), (c), (d), (e), (f), (i), and (j) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for determining, establishing, and specifying best management practices applicable to the Illinois Central Spring water treatment plant and the plan for treating water that currently bypasses the plant as described in Alternative 3 effluent limits and is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

327 IAC 5-2-13(a), (c), (d), (e), (e), and (f) establish substantive monitoring requirements and are relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring EPA's and IDEM's ability to conduct oversight.

Comment 104: CBS has stated that air emission provisions identified by IDEM are not ARARs. In the Fact Sheet, EPA notes that the State has identified as ARARs three requirements relating to major sources of hazardous air pollutants (HAPs). These requirements are plainly inapplicable and not relevant and appropriate. One requirement, 326 IAC 2-4.1, applies to major sources of HAPs. But, based on the description of the remedial alternatives in the Fact Sheet, there is no proposal to construct a major source of a HAP. The second requirement, 326 IAC 2-5.1-3(a)(1)(D), applies to sources of HAPs which have the potential to emit ten (10) tons or more of a HAP in a year, and the third requirement, 326 IAC 2-5.1-2(a)(1)(A), applies to sources of HAPs which also have the potential to emit five tons or more of particulate matter. Again, no such source is contemplated. Accordingly, these requirements should not have been designated as ARARs. These requirements are not only wrongly identified as ARARs, but by identifying them, EPA has created the false impression that air emissions from the proposed remedies are more extensive than contemplated.

Response: The identified ARARS above could, under some circumstances, be relevant and appropriate for Alternative 3. Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A Source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

Finally, under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. EPA does not anticipate that any of the proposed remedies will meet this threshold.

Comment 105: Commenter requests an additional public meeting before EPA makes its final decision so more technical dialogue is on the record.

Response: EPA sees no need to schedule another public meeting. The public comment period was extended 30-days to allow for additional public comments and EPA has held a number of Community Information Committee meetings to foster technical dialogue..

Comment 106: EPA's proposed list of alternatives is not essentially the full list of alternatives. The better alternative involves complete removal of PCBs at the Lemon Lane site. It's the initial proposal selected by EPA that became part of the Consent Decree and later abandoned by EPA, Westinghouse/CBS, the state, and the city without public involvement after the incineration remedy was abandoned.

Response: EPA evaluated complete excavation in the 2000 Proposed Plan. The commenter is correct that complete excavation was part of the original remedy in the Consent Decree but it also included the construction of an incinerator which was rejected. The public has been involved through numerous public meetings and the use of a Technical Assistance Grant. The commenter is referred to the Responsiveness Summary for the source control operable unit for further discussion on why complete removal of the entire landfill was rejected in 2000.

Comment 107: The water treatment alone is not supported by science and the absence of that additional removal of the existing PCBs....unfortunately, this new action is going to capture and treat some of the PCBs, but it's not going to stop releases to a level that is protective of public health. LaMoreaux 1984 and Powell 1984 offer opinions that essentially there is no way to control PCB releases from karst systems such as Lemon Lane without complete excavation of the PCBs. We believe there is only one alternative to effectively work and that is complete excavation and removal to the extent feasible without regard to cost to the polluter, CBS.

Response: EPA will be treating nearly 100% of the water from ICS and treating PCBs from both Rinker and Quarry Springs to levels that are protective. A large amount of information has been gathered since 1984. The investigation has shown that the southeast portion of the landfill is producing the PCBs that are released at ICS. Monitoring within the landfill has not shown that water is moving into the landfill waste under the cap. CBS did remove PCBs down to rock, and in some areas excavated rock in the southeast portion of the landfill. The depth of the PCBs in the rock along with the difficulty excavating over a large area, including under railroad tracks and within a cemetery has forced EPA to focus its efforts on water treatment.

Comment 108: Karst is inherently unpredictable and groundwater flow may be flowing in a different direction and a different volume next year with PCB releases that are not being treated by the plan being proposed by EPA.

Response: A monitoring program will be developed to ensure that the remedy remains protective of public health and the environment. In addition, EPA evaluates the protectiveness of the site remedy every 5 years.

Comment 109: EPA states one of the goals is to reduce the amount of PCBs, which is a kind of nebulous goal. The question is, how much should PCB releases be reduced and how much can they be reduced. We cannot afford any exposure that is preventable and should be prevented. Reduction is not enough. Reduction to the maximum extent feasible and this proposal does not do that.

Response: EPA disagrees with the commenter. EPA's selected alternative will treat nearly 100% of the PCB contaminated water at ICS and removing over 99% of the PCB mass. The additional removal of contaminated sediment at the ICS emergence, swallowhole and quarry springs area should also help to reduce PCB concentrations in fish over time.

Comment 110: Although EPA may once again assert that it has done an analogous RI/FS, at a minimum we would have to see a comparison in writing of the feasibility and the pros and cons and risks of complete excavation of the remaining PCBs, which might involve in situ treatment of residual PCBs that cannot be excavated, compared to your water treatment alternatives. Without providing any detailed scientific analysis comparing complete removal to EPA's preferred alternative proposed here, EPA cannot legitimately say that what they are doing is anywhere close to the RI/FS equivalent.

Response: EPA did complete an RI/FS equivalent and the large amount of investigation and analysis completed is documented in the Administrative Record. As described in the source control operable unit, even removing all the landfill would still require large scale water treatment. The commenter fails to recognize the results of the conduit study which clearly shows PCBs deep in rock in the southeast portion of the site are producing the PCBs during low and storm events. The difficultly in excavating rock, including excavating under railroad tracks and in a cemetery along with the difficulty in finding technology to treat PCBs in-situ has focused EPA's efforts on water treatment. Complete excavation and in-situ treatment will not be evaluated further. CBS does plan to investigate the southeast portion of the landfill further to see if operation and maintenance costs of the water treatment plant may be reduced over time. If additional remedial measures are implemented, a new ROD Amendment would be required.

Comment 111: We disagree with Dr. Clark's position that PCB air releases from the Bloomington sites and from a water treatment process creates a negligible risk. We believe the risk is substantial not just because of inhalation but also uptake in plants from PCB vapors and deposited in the food chain and eventually being consumed by humans. We also believe EPA is not allowed by law to ignore impacts on human health beyond the Bloomington community from the PCB releases through air to the extent that Bloomington is contributing to the current high level exposure to humans nationwide or worldwide for PCBs and related compounds.

Response: EPA believes it is impractical to conduct a theoretical modeling exercise on the amount of PCBs previously released to the air from area landfills or from the Lemon Lane water treatment plant. Such an analysis is subject to great uncertainty and it is extremely difficult to translate such evaluations into levels present on local vegetation.

Similarly it is also very difficult to predict with any reasonable certainty what health impacts, if any, might occur beyond the Bloomington community, due air releases from the Bloomington sites or water treatment plant.

Historical air releases of PCBs, a small fraction of that released to the water, would have occurred but it improbable that amounts deposited from the air onto local vegetation and into the food chain would give rise to exposure levels measurably higher than those already occurring due to background air deposition resulting from global PCB use and dispersion. It should be recognized that the removal of thousands of tons of PCB wastes from the Bloomington area will reduce PCB releases to the air and address risk pathways which are more important to protect public health and wildlife. Removing these PCBs will also reduce the any contributions to national and global exposures which might result from the Bloomington sites.

PCB contamination of local vegetation and resultant risks of human exposure are orders of magnitude of less concern than are exposures which may occur from (1) fish consumption (2) direct ingestion of soils contaminated by capacitors, sludges and other wastes or (3) growing of garden vegetables in soils contaminated by wastes. EPA has made clear that the highest risks come from the consumption of fish and as a result has taken action to reduce PCB levels in wastewater discharges. Tests on drinking waters show no PCBs. The commenter is referred to PCB air monitoring data in the Administrative Record for the results of the air sampling at the ICS water treatment plant the calculation of risks associated with those concentrations.

Comment 112: EPA probably knows this well, but the public may not, current infants born today that are breast fed receives about 60 to 93 picograms per kilogram per day of PCBs and dioxin-like compounds in terms of dioxin toxic equivalents. This is based on EPA documentation. This is for an average infant. EPA reference doses for dioxin-like compounds is 1 picogram per kilogram per day. A breast-fed infant is now getting on average 60 to 93 times that reference for a virtually safe dose.

Response: U.S. EPA and HHS are fully aware that breast fed infants receive dioxin and PCB doses, as TEQ, greater than the current EPA reference dose. However, the reference dose is based from seven years to a lifetime of exposure and does consider exposures during early life stages. Therefore, it probably is not appropriate to compare exposures during the first year or two of life to the reference dose. It should also be noted that exposure levels have been declining.

Comment 113: We ask EPA to collect PCB data on air releases at the ICS emergence point and at the release point of other springs, and that the data be combined with data on PCB releases from the treatment process and that more data be collected if necessary. Also EPA should collect air data on PCB releases from Clear Creek and the water bodies that receive PCB releases, and that a total calculation be conducted for how much PCBs have been released in the air in the past and are being released on an ongoing basis.

Response: EPA has no plans to collect additional PCB air data at the ICS emergence or within the Clear Creek. EPA did complete a large amount of sampling at the ICS water treatment plant both outside and inside the building. The commenter is referred to the Administrative Record for the complete results and a calculation of risk. Doing additional air sampling at the ICS emergence considering that the water flows directly into a culvert and then into the ICS sump would not produce meaningful results. The sampling outside the sump and directly above the sump in the enclosed building provides a much better understanding of the air risk by PCB volatilization.

Comment 114: EPA violated their own action level for PCB air standards during the cleanup in October 2000, in some cases for inhalation risk of 20 to 30 times with concentrations at 2,000 to 3,000 nanograms per cubic meter. This wouldn't have happened if PCBs weren't capable of being released in the air readily. The presence of moisture exacerbates that risk.

Response: EPA acknowledges that PCBs did volatize and implemented many measures to address the volatilization during the excavation at Lemon Lane. EPA did a risk assessment based upon those air levels and did air modeling to determine depositional areas. The very large PCB concentrations in the waste material as high as 30,000 parts per million do not compare with levels in water. EPA has seen levels as high as 1.6 parts per million PCBs in water during a peak in a storm event but most of the time water concentrations are under 100 parts per billion.

Comment 115: EPA's risk assessment did not include a breast-fed infant scenario, as the breast-fed infant and developing fetus are the most sensitive population and most exposed. If EPA wants to really be conservative, it needs to address these populations in the risk assessment.

Response: It is difficult to develop a quantitative breast-fed infant scenario which has sufficient certainty for risk assessment purposes. U.S. EPA acknowledged that children do receive higher doses and provided hazard indices which were two or three times those of adults.

Comment 116: We recommend EPA makes sure that, before it makes its final decision, that its risk assessments are fully informed by the Westinghouse worker study and by EPA's new dioxin reassessment work.

Response: U.S. EPA has been actively tracking these studies and will consider them in final decision making.

Comment 117: EPA references in the proposed plan to waiving what EPA considers to be ARARs for the NPDES for PCBs. If this is not true for Option 3, please inform me. We certainly recommend that EPA not waive one of the federal law protections that we have against PCB discharges to water.

Response: EPA is waiving the substantive requirements for the storage tank overflow treatment system. The commenter is referred to the ROD Amendment for a discussion on the TI Waiver and the reason for waiving the NPDES substantive requirements.

Comment 118: We're not sure EPA has the authority to waive the Clean Water Act requirements from this state because I believe the ARARs concept only applies to on-site actions. The point of discharge for most of this water is not within the boundaries of the Lemon Lane National Priorities site. Therefore, EPA may not be able to waive that requirement.

Response: The commenter is incorrect. EPA considers the Lemon Lane water treatment plant as an on-site action and only the substantive requirements of the permitting process are required. The water treatment plant is in close proximity as described in the National Contingency Plan and the contamination is contiguous from the landfill to the spring, therefore it is considered an on-site action.

Comment 119: EPA's proposed PCB reduction of 99 percent might reassure people, but if you do capture that amount and the system is as effective as EPA states, that still leaves about one percent of PCB releases into the environment. What is the expected risk and harm from leaving about a one percent release of PCBs into the environment? If you update the assessment with EPA's EDO 1s levels for non-cancer effects, you're still going to get an unacceptable risk for non-cancer effects by using EPA's own calculations. By EPA's chosen method in its current proposal, it's not protective of human health and the environment.

Response: EPA cannot clarify the risk of the 1% since it would only be speculative. The commenter provides no basis for the statement that the non-cancer effects would be unacceptable. EPA is of the opinion that the water treatment plant by treating nearly 100% of the water and removing 99% of the PCB mass is protective of human health and the environment.

Comment 120: We know from Fish and Wildlife Service that there are high levels of PCBs in the fish in the Bloomington area. Apparently EPA does not consider sediment to be a significant reservoir of PCBs, not enough to remediate it. That means the PCBs in fish are coming from ongoing releases from the site, not from historical reservoirs of PCBs in sediment. That means the only way to stop the fish from being so contaminated is to eliminate those ongoing releases.

Response: EPA is addressing these releases through the addition of the stormwater storage treatment system and the treatment of both Rinker and Quarry springs.

Comment 121: Westinghouse/CBS/Viacom has been looking for the magical groundwater conduit for about eight years now without success. We'd like EPA to answer how much money did CBS spend looking for that magic conduit, and how much would it have cost for CBS to have funded a full RI/FS over the past eight years?

Response: EPA does not have an estimate of the cost of the conduit study but the results of this investigation has helped to justify the need for water treatment and has demonstrated that PCBs are as much as 70 feet below the top of rock in the southeast portion of the site. EPA has completed an RI/FS equivalent.

Comment 122: What is happening with this contaminated sediment that is collected on these filters used during the water treatment process? EPA noted they are being tested. What is the testing to be done, what is the trigger for being treated at a toxic facility or a hazardous waste facility, and where else might these contaminated sediments be going?

Response: The solids that are being generated from the water treatment plant will be handled as described in the operations and maintenance plan. They are tested using the toxicity characteristic leaching potential test and PCBs are also tested in the sludge. Depending on the results determines the type of landfill disposal. The stormwater storage treatment system solids will also be handled in the manner. If the concentration is greater than 50 ppm PCBs, then a chemical waste landfill is used. If less than 50 ppm PCBs, then the sludge is disposed of a landfill permitted to accept PCBs less than 50 ppm PCBs. In addition, under Superfund, material disposed of in any off-site landfill must be in compliance with all State Local and Federal regulations.

Comment 123: How effective has the water treatment process been in the past for removing PCBs? EPA would be more accurate in determining the removal efficiency of the treatment process....I'm trying to determine how much of the PCBs that are released from the spring at the point of emergence actually gets captured? How much of the PCB in the water that gets treated still escapes the treatment process? Also, how much of the PCBs that didn't make it into the treatment process because they volatilized before the water entered the treatment process? We have not seen EPA calculations answering this question and would like to see this data as you can't determine how much of the PCBs that escape the landfill are being treated without having that data.

Response: EPA has sampled the air both in the building and outside of the building and determined that the PCB levels during low flow and storm events were not producing an unacceptable risk. The water treatment plant will meet the NPDES substantive requirements. EPA has no plans to complete a theoretical exercise since the plant is not producing unacceptable air risks and will meet the substantive NPDES requirements.

Comment 124: We recommend that the proposed remedy be changed to a complete removal of PCBs to the maximum extent feasible. First PCBs should be removed from soil. Then test the epikarst and see how much PCBs can be removed, pumped out, or treated in place. Then the first step might be to remove some stone, if necessary, to access the remaining reservoir. We do not believe there is any alternative to this admittedly difficult and admittedly expensive proposition.

Response: EPA disagrees with the commenter. The commenter has failed to understand the PCB deep within the rock in the southeast portion of the site are source of the PCBs at ICS. The comment that the first step might be to remove some stone does not take into

consideration the results of the CBS conduit study. In addition, CBS spent 7 years trying to figure out a way to pump at the landfill without success. The remedies implemented will be protective of human health and the environment.

References – Human Health

ADEM. 1994. *Estimation of Daily per Capita Freshwater Fish Consumption by Alabama Anglers*. Prepared by Fishery Information Management Systems, Inc. and Department of Fisheries and Allied Aquacultures for Alabama Department of Environmental Management (ADEM). Montgomery.

Anderson, A.C. and J.C. Rice. 1993. Survey of fish and shellfish consumption by residents of the greater New Orleans area. Bulletin of Environmental Contamination and Toxicology. 51:508-514.

ChemRisk. 1991. Penobscot River Creel Survey. McLaren/Hart-ChemRisk, Portland, ME. November.

ChemRisk. 1996. Letter from R. Keenan and N.W. Harrington to Kevin Garrahan, U.S. EPA re: Results of Additional Maine Angler Survey Analysis. March 1.

Connelly, N.A., *T.L.* Brown, and B.A. Knuth. 1990. New York Statewide Angler Survey 1988. New York State Department of Environmental Conservation, Division of Fish and Wildlife, Albany, NY. April.

Connelly, N.A., B.A. Knuth, T.L. Brown. 1996. Sportfish consumption patterns of Lake Ontario anglers and the relationship to health advisories. *North American Journal of Fisheries Management.* 16:90-101.

Degner, R.L., C.M. Adams, S.D. Moss, S. K. Mack. 1994. *Per Capita Fish and Shellfish Consumption in Florida.* Prepared by the Florida Agricultural market Research Center for the Florida Department of Environmental Protection. Industry Report 94-2. August.

Ebert, E., N. Harrington, K. Boyle, J. Knight, and R. Keenan. 1993. Estimating consumption of freshwater fish among Maine anglers. *North American Journal of Fisheries Management.* 13:737-745.

Ebert, E.S., S.H. Su, T.J. Barry, M.N. Gray, and N.W. Harrington. 1996. Estimated rates of fish consumption by anglers participating in the Connecticut Housatonic River creel survey. *N. Am. J. Fish. Mngt..* 16:81-89.

EPA. 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A).* U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC. EPA154011-891002. December.

EPA. 1997. *Exposure Factors Handbook.* U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/600/(-951002Fa-c). August.

EPA. 2000a. *Estimating exposures to dioxin-like substances: Review Draft.* EPA/600/6-88/005Cc. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC.

EPA. 2000b. Phase 2 Report, Further Site Characterization and Analysis. Volume 2F -Revised Human Health Risk Assessment, Hudson River PCBs Reassessment RI/FS. Prepared by TAMS Consultants, Inc. for U.S. Environmental Protection Agency Region 2 and U.S. Army Corps of Engineers. November.

EPA. 2003. *Exposure Analysis for Dioxins, Dibenzofurans, and Coplanar Polychlorinated Biphenyls in Sewage Sludge; Technical Background Document.* U.S. Environmental Protection Agency, Washington, DC. October 17.

EPA. 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington, DC. EPA/540/R/99/005. July.

EPA. 2005. *Human Health Risk Assessment GE/Housatonic River site, Rest of River.* Prepared by Weston Solutions, Inc. Contract no. DACW33-00-D-0006. February 11.

Javitr, H. 1980. *Seafood consumption data analysis* . SRI International. Final Report prepared for EPA Office of Water Regulations and Standards. EPA contract 68-01-3887.

NYDOH. 1999. *Health Consultation:* 1996 *Survey of Hudson River Anglers, Hudson Falls to Tappan Zee Bridge at Tarrytown, New York.* New York State Department of Health (NYSDOH), Center for Environmental Health. February.

RETEC. 2002. Final Baseline Human Health and Ecological Risk Assessment, Lower Fox River and Green Bay, Wisconsin, Remedial Investigation and Feasibility Study. Prepared by The RETEC Group Inc. December.

Tetra Tech. 2005a. *Human Health Risk Assessment Lemon Lane Landfill, Bloomington, Monroe County, Indiana.* Prepared by Tetra Tech EM Inc., Chicago, IL. Contract Number 68-W6-0037. December 23.

Tetra Tech. 2005b. *Final Technical Memorandum Regarding Stream conditions and Fish Sampling Activities in Clear Creek Lemon Lane Landfill Site, Bloomington, Monroe County, Indiana.* Memorandum from J. Lifka to T. Alcamo, EPA Region 5. April 8.

Turcotte, M.-D.S. 1983. *Georgia Fishery Study: implications for Dose Calculations.* DuPont de Nemours and Co. Report to US. Department of Energy, DE86-008041. Washington, D.C.

Viacom. 2004. Comments of Viacom, Inc. on the U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill. February 4.

Wendt, M.E. 1986. *Low Income Families' Consumption of Freshwater Fish Caught from New York State Waters.* Masters Thesis. Cornell University. August.

West, P.C., M.J. Fly, R. Marans, F. Larkin. 1989. Michigan Sport Anglers fish Consumption Survey. A Report to the Michigan Toxic Substance Control Commission. Michigan Department of Management and Budget, Contract no. 87-20141.

West, P.C., J.M. Fly, F. Larkin, and R. Marans. 1991. Minority anglers and toxic fish consumption: Evidence from a state-wide survey of Michigan. In: *Proceedings of the Michigan Conference on Race and the incidence of Environmental Hazards* (Bryan and Mohai, eds.).

West, P.C., J.M. Fly, R. Marans, F. Larkin, and D. Rosenblatt. 1993. Michigan sport anglers fish consumption study. Prepared by the University of Michigan, School of Natural Resources for the Michigan Department of Natural Resources, Ann Arbor, MI. Technical Report No. 6. May.

EPA REFERENCES

Agency for Toxic Substance and Disease Registry (ATSDR). 1998. "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins." Public Health Service. U.S. Department of Health Services. December. On-Line Address:

http://www.atsdr.cdc.gov/toxprofiles/tp104-p.pdf

Normandeau Associates, Inc. (Normandeau). 2004. Letter Report Regarding Fish and Crayfish Tissue Sampling for Aroclor and Lipid Analysis at Stout's Creek near Bennett's Dump. Normandeau Project No. 20103.000. From George M. Christian, Project Biologist. To Russ Cepko, CBS Corporation. September 2.

Normandeau. 2006. Letter Report Regarding Fish Tissue Sampling for Aroclor and Lipid Analysis at Conard's Branch and Richland Creek near Neal's Landfill: Fall 2005. From George M. Christian, Project Biologist. To Russ Cepko, Viacom, Inc. (Viacom). February 22.

Tetra Tech EM Inc. (Tetra Tech). 2005. "Human Health Risk Assessment, Lemon Lane Landfill, Bloomington, Monroe County, Indiana. December 23.

Tetra Tech. 2006a. "Human Health Risk Assessment, Bennett's Dump Site, Bloomington, Monroe County, Indiana. January 27.

Tetra Tech. 2006b. "Human Health Risk Assessment, Neal's Landfill Site, Bloomington, Monroe County, Indiana." April 28.

U.S. Environmental Protection Agency (EPA). 1984. "Ambient Water Quality Criteria for 2,3,7,8-Tetrachloro-dibenzo-p-dioxin." Office of Water Regulations and Standards. EPA 440/5-84-007. February. On-Line Address: http://www.epa.gov/waterscience/library/wqcriteria/dioxincriteria.pdf

EPA. 1990. "National Oil and Hazardous Substances Pollutant Contingency Plan (NCP)." *Federal Register*. Volume 55, Number 46. April 9.

EPA. 2000. "Estimating Exposures to Dioxin-like Substances: Review Draft." Office of Research and Development. EPA/600/6-88/005Cc. September.

EPA. 2003. "Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds, National Academy of Science Review Draft." December. On-Line Address: http://www.epa.gov/ncea/pdf/doxin/nas-review/#part1

EPA. 2004a. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)." Final. Office of Superfund Remediation and Technology Innovation. EPA/540/R/99/005. July.

EPA. 2004b. Technical Memorandum Regarding Review of "Comments by Viacom, Inc. on U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill." From Dr. Rick Herzberg, Superfund Technical Support Center (STSC). To Patricia Daunt, Administrator, STSC, August 20. Forwarded to Dr. Milt Clark, Health and Science Advisor, Region 5, with cover sheet dated August 23, 2004.

EPA. 2004c. Memorandum Regarding Responses to February 26, 2004 document "Comments of Viacom, Inc. on the U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill. From Milton Clark, Ph.D., Health and Science Advisor. To Thomas Alcamo, Remedial Project Manager. September 8.

Viacom, Inc. (Viacom). 2005. Excel Spreadsheet (Clear Creek Water Data 1999-2004.xls) Summary of Analytical Results for Surface Water Samples Collected from Clear Creek at Country Club Road, Fluckmill Road, and Strain Ridge Road from 1999 through 2004. Received by Tetra Tech and U.S. Environmental Protection Agency from Viacom via Electronic Mail. October 11.

West, P.C. and Others. 1989. "Michigan Sport Anglers Fish Consumption Survey, a Report to the Michigan Toxic Substance Control Commission." Natural Resource Sociology Research Laboratory Technical Report #1. May.

West, P.C. and Others. 1993. "1991-92 Michigan Sport Anglers Fish Consumption Study." Prepared by University of Michigan, School of Natural Resources, for Michigan Department of Natural Resources, Ann Arbor, Michigan. Technical Report No. 6.

References – Ecological Risk Assessment

Brunstrom, B., B Lund, A. Bergman, L. Asplund, I. Athanassiadis, M. Athanasiadou, S. Jensen and J. Orberg. 2001. Reproductive toxicity in mink (Mustela vison) chronically exposed to environmentally relevant polychlorinated biphenyls (PCBs). Environ Toxicol Chem 20:23 18-2327

Bursian, S.J., R.J. Aulerich. B. Yamini. and D.E. Tiilitt. 2003. Dietary Exposure of Mink To Fish From The Housatonic River: Effects On Reproduction And Survival. Revised Final Report to USEPA, June 10, 2003. Available at the following URL http://www.epa.gov/region1/thesite/restofriver/reports/final_era/SupportingInformation

Elliott, J.E., and M.L. Harris. 2002. An ecotoxicological assessment of chlorinated hydrocarbon effects on bald eagle populations. *Rev. Toxicol.* 4: 1-60.

Elliott, J.E., R.J. Norstrom, A. Lorenzen, L.E. Hart, and H. Philbert. 1996, Biological effects of polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls in bald eagle (*Haliaeetus leucococephalus*) chicks. *Environ. Toxicol*

Elliott, J.E., R.J. Norstrom, A. Lorenzen, L.E. Hart, and H. Philbert. 1996. Biological

effects of polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls in bald eagle (*Haliaeetus leucocephalus*) chicks. *Environ. Toxicol. Chem.* 15:782-793.

Fairbrother, A. 2003. Lines of evidence in wildlife risk assessments. *Human Ecol. Risk Assessment.* 9(6): 1475- 1491.

Halbrook, R.S., Brewer, R.L. Jr., and D.A. Buehler. 1999. Ecological Risk Assessment in a Large River-Reservoir: 7. Environmental Contaminant Accumulation and Effects in Great Blue Heron. *Environ. Toxicol. Chem.* 18:641-648Viacom 2004, Viacom's Response to USEPA's Ecological Risk Assessment, Letter from Dorothy M. Alke to Thomas Alcamo dated August 23,2004.

Henning, M., and R.P. Brooks. 2003. Productivity and Density of Belted Kingfishers on the Housatonic River. Available at the following URL:

Hudson River Natural Resource Trustees. 2006. Study Plan for Mink Injury Investigations for the Hudson River. Available on the web at: www.fws.gov/contaminants/restorationplans/hudsonriver/studyplanmink.pdf

Kennedy, S.W., S.P. Jones, and J.E. Elliott. 2003. Sensitivity of Bald Eagle (*Haliaeetus leucocephalus*) Hepatocyte Cultures to Induction of Cytochrome P4501A by 2,3,7,8-Tetrachlorodibenzo-p-dioxin. *Ecotoxicol.* 12:163-170.

Restum, J., S. Bursian, J. Giesy, J. Render, W. Helferich, E. Shipp, D. Verbrugge, and R. Aulerich. 1998. Multigenerational study of the effects of consumption of PCB contaminated carp from Saginaw Bay, Lake Huron, on mink: 1. Effects on mink reproduction, kit growth, and survival and selected biological parameters. J. Toxicol Environ Health Part A 54:343-375

USEPA 2001, Final Report Neal's Landfill Fish Assessment, ERTC report from Mark Sprenger, Mark Huston, and Jennifer Royce.

USEPA 2003. Toxicity Reference Values (TRVs) for Mammals and Birds on Selected Aroclors. USEPA Region V Memo from James Chapman to Shari Kolak dated March 6, 2003

USEPA 2005, Focused Ecological Risk Assessment, PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek, August 10, 2003

USEPA 2006, Spatial Trends in PCB Accumulation in Clear Creek Fish in 2002 and 2004, Lemon Lane Landfill Superfund Site, Bloomington, Indiana. EPA memo from James Chapman to Tom Alcamo dated April 11, 2006.

USEPA. 2000. Revised baseline ecological risk assessment. Hudson River PCBs Reassessment. Phase 2 Report. November 2000.

WHO 2005. The 2005 World Health Organization Re-Evaluation of Human and Mammalian Toxicity Equivalency Factors for Dioxins and Dioxin-like Compounds, available on the web at:
http://www.who.int/ipcs/assessment/tef_update/en/index.html

Woodford, J.E., Karasov, W.H., Meyer, M.W., Chambers, L. 1998. Impact of 2,3,7,8-TCDD exposure on survival, growth, and behavior of ospreys breeding in Wisconsin, USA. *Environ. Toxicol. Chem.* 17: 1323-1 33 1.

Woodford, J.E., Karasov, W.H., Meyer, M.W., Chambers, L. 1998. Impact of 2,3,7,8-TCDD exposure on survival, growth, and behavior of ospreys breeding in Wisconsin, USA. *Environ. Toxicol. Chem. 17:* 1323-1 33 1.

EPA REFERENCES

Aulerich, R. and R. Ringer. 1977. Current status of PCB toxicity to mink, and effect on their reproduction. Arch Environ Contam Toxicol 6: 279-292.

Bowerman, W., J. Giesy, D. Best, and V. Kramer. 1995. A review of factors affecting productivity of bald eagles in the Great Lakes region: Implications for recovery. Environ Health Perspect 103: 51-59.

Britton, W. and T. Huston. 1973. Influence of polychlorinated biphenyls in the laying hen. Poultry Sci 52: 1620-1624.

Brunström, B., B. Lund, A. Bergman, L. Asplund, I. Athanassiadis, M. Athanasiadou, S. Jensen, and J. Örberg. 2001. Reproductive toxicity in mink (*Mustela vison*) chronically exposed to environmentally relevant polychlorinated biphenyl concentrations. Environ Toxicol Chem 20: 2318-2327.

Burkhard, L., P. Cook, and M. Lukasewycz. 2004. Biota-sediment accumulation factors for polychlorinated biphenyls, dibenzo-p-dioxins, and dibenzofurans in southern Lake Michigan lake trout (*Salvelinus namaycush*). Environ Sci Technol 38: 5297-5305.

Bursian, S., C. Sharma, R. Aulerich, B. Yamini, R. Mitchell, C. Orazio, D. Moore, S. Siversky, and D. Tillitt. 2006. Dietary exposure of mink (*Mustela vison*) to fish from the Housatonic River, Berkshire County, Massachusetts, USA: effects on reproduction, kit growth, and survival. Environ Toxicol Chem 25: 1533-1540.

Calabrese, E. 2005. Paradigm lost, paradigm found: the re-emergence of hormesis as a fundamental dose response model in the toxicological sciences. Environ Pollut 138: 379-412.

Cecil, H., J. Bitman, R. Lillie, G. Fries, and J. Verrett. 1974. Embryotoxic and teratogenic effects in unhatched fertile eggs from hens fed polychlorinated biphenyls (PCBs). Bull Environ Contam Toxicol 11: 489-495.

Connor, K., M. Eversen, S. Su, and B. Finley. 2005. Quantitation of polychlorinated biphenyls in fish for human cancer risk assessment: a comparative case study. Environ Toxicol Chem 24: 17-24.

Custer, C. and L. Read. 2006. Polychlorinated biphenyl congener patterns in tree swallows (*Tachycineta bicolor*) nesting along the Housatonic River watershed, western Massachusetts, USA, using a novel statistical approach. Environ Pollut 142: 235-245.

Custer, C., T. Custer, P. Dummer, and K. Munney. 2003. Exposure and effects of chemical contaminants on tree swallows nesting along the Housatonic River, Berkshire County, Massachusetts, USA, 1998-2000. Environ Toxicol Chem 22: 1605-1621.

Debier, C., C. Chalon, B. Le Bœuf, T. de Tillesse, Y. Larondelle, and J. Thomé. 2006. Mobilization of PCBs from blubber to blood in northern elephant seals (*Mirounga angustirostris*) during the post-weaning fast. Aquat Toxicol *In press* doi:10.1016/j.aquatox.2006.08.002

Fuglei, E., J. Bustnes, H. Hop, T. Mørk, H. Björnfoth, and B. van Bavel. 2006. Environmental contaminants in artic foxes (*Alopex lagopus*) in Svalbard: relationships with feeding ecology and body condition. Environ Pollut *In press* doi:10.1016/j.envpol.2006.06.036.

Giesy, J., W. Bowerman, M. Mora, D. Verbrugge, R. Othoudt, J. Newsted, C. Summer, R. Aulerich, S. Bursian, J. Ludwig, G. Dawson, T. Kubiak, D. Best, and D. Tillitt. 1995. Contaminants in fishes from Great Lakes-influenced section above dams of three Michigan rivers. III: Implications for health of bald eagles. Arch Environ Contam Toxicol 29: 309-321.

Henny, C., J. Kaiser, R. Grove, V. Bentley, and J. Elliott. 2003. Biomagnification factors (fish to osprey eggs from Willamette River, Oregon, U.S.A.) for PCDDs, PCDFs, PCBs, and OC pesticides. Environ Monit Assess 84: 275-315.

Hoffman, D., C. Rice and T. Kubiak. 1996. PCBs and dioxins in birds. *In* Environmental Contaminants in Wildlife, Interpreting Tissue Concentrations. (W. Beyer, G. Heinz and A. Redmon-Norwood, eds.). Lewis, Boca Raton. pp. 165-207.

Isnard, P., P. Flammarion, G. Roman, M. Babut, P. Bastien, S. Bintein, L. Esserméant, J. Férard, S. Gallotti-Schmitt, E. Saouter, M. Saroli, H. Thiébaud, R. Tomassone, and E. Vindimian. 2001. Statistical analysis of regulatory ecotoxicity tests. Chemosphere 45: 659-669.

Kihiström, J., M. Olsson, S. Jensen, Å. Johansson, J. Ahlbom, and A. Bergman. 1992. Effect of PCB and different fractions of PCB on the reproduction of the mink (*Mustela vison*). Ambio 21: 563-601.

Leonards, P., T. de Vries, W. Minnaard, S. Stuijfzand, P. de Voogt, W. Cofino, N. van Straalen and B. van Hattum. 1995. Assessment of experimental data on PCB-induced reproduction inhibition in mink, based on an isomer- and congener-specific approach using 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxic equivalency. Environ Toxicol Chem 14: 639-652.

Lillie, R., H. Cecil, J. Bitman, and G. Fries. 1974. Differences in response of caged white leghorn layers to various polychlorinated biphenyls (PCBs) in the diet. Poultry Sci 53: 726-732.

Lillie, R., H. Cecil, J. Bitman, G. Fries, and J. Verrett. 1975. Toxicity of certain polychlorinated and polybrominated biphenyls on reproductive efficiency of caged chickens. Poultry Sci 54: 1550-1555.

Linzey, A. 1987. Effects of chronic polychlorinated biphenyls exposure on reproductive success of white-footed mice (*Peromyscus leucopus*). Arch Environ Contam Toxicol 16: 455-460.

Linzey, A. 1988. Effects of chronic polychlorinated biphenyls exposure on growth and reproduction of second generation white-footed mice (*Peromyscus leucopus*). Arch Environ Contam Toxicol 17: 39-45.

Lyderson, C., H. Wolkers, T. Severinsen, L. Kleivane, E. Nordøy, and J. Utne Skaare. 2002. Blood is a poor substrate for monitoring pollution burdens in phocid seals. Sci Total Environ 292: 193-203.

Marvin, C., E. Howell, T. Kolic, and E. Reiner. 2002. Polychlorinated dibenzo-*p*-dioxins and dibenzofurans and dioxinlike polychlorinated biphenyls in sediments and mussels at three sites in the lower Great Lakes, North America. Environ Toxicol Chem 21: 1908-1921.

McCoy, G., M. Finlay, A. Rhone, K. James, and G. Cobb. 1995. Chronic polychlorinated biphenyls exposure on three generations of oldfield mice (*Peromyscus polionotus*): effects on reproduction, growth, and body residues. Arch Environ Contam Toxicol 28: 431-435.

Mineau, P. 2005. A review and analysis of study endpoints relevant to the assessment of "long term" pesticide toxicity in avian and mammalian wildlife. Ecotoxicol 14: 775-799.

Murata, M., S. Masunaga, and J. Nakanishi. 2003. Population-level ecological risk assessment of planar polychlorinated aromatic hydrocarbons in great cormorant (*Phalacrocorax carbo*) around Tokyo Bay, Japan. Environ Toxicol Chem 22: 2508-2518.

Murray, F., F. Smith, K. Nitschke, C. Humiston, R. Kociba, and B. Schwetz. 1979. Three-generation reproduction study of rats given 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in the diet. Toxicol Appl Pharmacol 50: 241-252.

Naito, W., J. Jin, Y. Kang, M. Yamamuro, S. Masunaga, and J. Nakanishi. 2003. Dynamics of PCDDs/DFs and coplanar-PCBs in an aquatic food chain of Tokyo Bay. Chemosphere 53: 347-362.

Niimi, A. 1996. Evaluation of PCBs and PCDD/Fs retention by aquatic organisms. Sci Total Environ 192: 123-150.

Platonow, N. and B. Reinhart. 1973. The effects of polychlorinated biphenyls Aroclor 1254 on chicken egg production fertility and hatchability. Can J Comp Med 37: 341-346.

Restum, J., S. Bursian, J. Giesy, J. Render, W. Helferich, E. Shipp, D. Verbrugge, and R. Aulerich. 1998. Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink: 1. Effects on mink reproduction, kit growth, and survival, and selected biological parameters. J Toxicol Environ Health Part A 54: 343-375.

Sather, P., J. Newman, and M. Ikonomou. 2003. Congener-based Aroclor quantification and speciation techniques: a comparison of the strengths, weaknesses, and proper use of two alterative approaches. Environ Sci Technol 37: 5678-5686.

Scott, M. 1977. Effects of PCBs, DDT and mercury compounds in chickens and Japanese quail. Fed Proceed 36: 1888-1893.

Summer, C., J. Giesy, S. Bursian, J. Render, T. Kubiak, P. Jones, D. Verbrugge, and R. Aulerich. 1996a. Effects induced by feeding organochlorine-contaminated carp from Saginaw Bay, Lake Huron, to laying white leghorn hens. I. Effects on health of adult hens, egg production, and fertility. J Toxicol Environ Health 49: 389-407.

Summer, C., J. Giesy, S. Bursian, J. Render, T. Kubiak, P. Jones, D. Verbrugge, and R. Aulerich. 1996b. Effects induced by feeding organochlorine-contaminated carp from Saginaw Bay, Lake Huron, to laying white leghorn hens. II. Embryotoxic and teratogenic effects. J Toxicol Environ Health 49: 409-438.

Tanaka, Y. and J. Nakanishi. 2001. Model selection and parameterization of the concentration-response functions for population-level effects. Environ Toxicol Chem 20: 1857-1865.

Tillitt, D., G. Ankley, J. Giesy, J. Ludwig, H. Kurita-Matsuba, D. Weseloh, P. Ross, C. Bishop, L. Sileo, K. Stromborg, J. Larson, and T. Kubiak. 1992. Polychlorinated biphenyl residues and egg mortality in double-crested cormorants from the Great Lakes. Environ Toxicol Chem 11: 1281-1288.

Tillitt, D., R. Gale, J. Meadows, J. Zajicek, P. Peterman, S. Heaton, P. Jones, S. Bursian, T. Kubiak, J. Giesy, and R. Aulerich. 1996. Dietary exposure of mink to carp from Saginaw Bay. 3. Characterization of dietary exposure to planar halogenated

hydrocarbons, dioxin equivalents, and biomagnification. Environ Sci Technol 30: 283-291.

USACE/USEPA. 2004. Ecological Risk Assessment for General Electric (GE)/Housatonic River Site Rest of River. Prepared by Weston Solutions, Inc. for U.S. Army Corps of Engineers and U.S. Environmental Protection Agency. http://www.epa.gov/region1/ge/thesite/restofriver-reports.html

USEPA. 2003. Analyses of Laboratory and Field Studies of Reproductive Toxicity in Birds Exposed to Dioxin-like Compounds for Use in Ecological Risk Assessment. National Center for Environmental Assessment, Office of Research and Development, Cincinnati. EPA/600/R-03/114F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=56937

Van den Berg, M., L. Birnbaum, A. Bosveld, B. Brunström, P. Cook, M. Feeley, J. Giesy, A. Hanberg, R. Hasegawa, S. Kennedy, T. Kubiak, J. Larsen, F. van Leeuwen, A. Liem, C. Nolt, R. Peterson, L. Poellinger, S. Safe, D. Schrenk, D. Tillitt, M. Tysklind, M. Younes, F. Wærn, and T. Zacharewski. 1998. Toxic equivalency factors (TEFs) for PCBs, PCDFs, PCDFs for humans and wildlife. Environ Health Perspect 106: 775-792.

Van den Berg, M., L. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, and R. Peterson. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicol Sci *Advanced Access* www.who.int/ipcs/assessment/tef_update/en/index.html

van der Oost, R., A. Opperhuizen, K. Satumalya, H. Heida, and N. Vermeulen. 1996. Biomonitoring aquatic pollution with feral eel (Anguilla anguilla) I. Bioaccumulation: biota-sediment ratios of PCBs, OCPs, PCDDs and PCDFs. Aquatic Toxicol 35: 21-46.

Wakimoto, T., N. Kannan, M. Ono, R. Tatsukawa, and Y. Masuda. 1988. Isomer-specific determination of polychlorinated dibenzofurans in Japanese and American polychlorinated biphenyls. Chemosphere 17: 743-750.

Wren, C., D. Hunter, J. Leatherland, and P. Stokes. 1987. The effects of polychlorinated biphenyls and methylmercury, singly and in combination on mink. I. uptake and toxic responses. Arch Environ Contam Toxicol 16: 441-447; and II. reproduction and kit development. Arch Environ Contam Toxicol 16: 449-454.

Yamashita, N., K. Kannan, T. Imagawa, A. Miyazaki, and J. Giesy. 2000. Concentrations and profiles of polychlorinated naphthalene congeners in eighteen technical polychlorinated biphenyl preparations. Environ Sci Technol 34: 4236-4241.

Yanik, P., T. O'Donnell, S. Macko, Y. Qian, and M. Kennicut II. 2003. Source apportionment of polychlorinated biphenyls using compound specific isotope analysis. Organic Geochem 34: 239-251.

References – Hydrogeology

References Cited

Käss, W., 1998, Tracing Technique in Geohydrology, Balkema, Rotterdam, p. 34.

Smart, C.C., 1999, Subsidiary conduit systems: a hiatus in aquifer monitoring and modeling, in Palmer, A.N., Palmer, M.V., and Sasowski, I.D., (eds) Karst Modeling, Karst Waters Institute Special Publication No. 5, p. 146 -157.

Worthington, S.R.H., Davies, G. J., and Ford, D. C., 1999, Quantification of matrix, fracture and channel contributions to storage and flow in a Paleozoic Carbonate aquifer. Chapter in: Approaches to Understanding Groundwater Flow at Contaminant Transport in Carbonate Aquifers, Balkema, Rotterdam, p. 113 - 128.

ATTACHMENT A

EPA'S REVISED EXPOSURES, RISKS, AND HAZARDS HUMAN HEALTH RISK ASSESSMENT LEMON LANE LANDFILL BLOOMINGTON, MONROE COUNTY, INDIANA

TABLE 1

REVISED RISK SUMMARY[a]
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Pathway	Location[b]			
	Country Club Road	Fluckmill Road	Strain Ridge Road	Quarry Springs
Fish Ingestion[c]	8.3E-06	5.7E-05	8.5E-05	8.3E-06
Surface Water - Incidental Ingestion	4.5E-10	6.2E-10	1.8E-10	2.0E-08
Surface Water - Dermal Contact	7.8E-10	1.1E-09	3.1E-10	9.1E-09
Sediment - Incidental Ingestion	8.2E-08	8.2E-08	1.4E-07	6.7E-06 [d]
Sediment - Dermal Contact	7.3E-08	7.3E-08	1.2E-07	6.0E-06 [d]
Surface Soil - Incidental Ingestion	NA	NA	NA	2.5E-06 [e]
Surface Soil - Dermal Contact	NA	NA	NA	1.4E-06 [e]
Bank Soil - Incidental Ingestion	7.8E-08	7.8E-08	1.0E-07	NA
Bank Soil - Dermal Contact	4.3E-08	4.3E-08	5.7E-08	NA
Floodplain Soil - Incidental Ingestion	2.7E-07	2.7E-07	2.7E-07 [f]	NA
Floodplain Soil - Dermal Contact	1.5E-07	1.5E-07	1.5E-07 [f]	NA
Totals[g] - All	8E-06 (97.3)[h]	6E-05 (99.6)[h]	9E-05 (99.7)[h]	2E-05 (49.8)[h]
Totals[g] - No Fish	2E-07	2E-07	3E-07	8E-06

Notes:

NA = Not Applicable
RMI = Reasonable maximum exposure

[a] See Appendix B of the draft HHRA for detailed receptor and exposure pathway-specific calculations (Tetra Tech 2005). All risk values presented are for adult receptors.

[b] See Figures 2 and 4 of the draft HHRA for locations of Quarry Springs and of Country Club Road, Fluckmill Road, Strain Ridge Road, upper Clear Creek, and lower Clear Creek, respectively (Tetra Tech 2005).

[c] Risks presented represent polychlorinated biphenyl (PCB) risks based on consumption of 90 percent pelagic and 10 percent benthic fish.

[d] This result is for Quarry Springs A and represents the highest result in the Quarry Springs area. The risk results for Quarry Springs B and C are less then 1E-06.

[e] This result is for Quarry Springs, Combined.

[f] This result is for upper Clear Creek; floodplain soil results are not available for lower Clear Creek.

[g] For Country Club Road, Fluckmill Road, and Strain Ridge Road, totals represent the sum of receptor-specific fish ingestion risk plus all surface water, sediment, bank soil, and floodplain soil risks. For Quarry Springs, totals represent the sum of receptor-specific fish ingestion for Country Club Road and surface water, sediment, and surface soil risks at Quarry Springs. The location-specific totals are detailed below:

Country Club Road -- fish ingestion risk (Country Club Road), surface water risks (Country Club Road), and bank soil, floodplain soil, and sediment risks (upper Clear Creek). Note: bank soil, floodplain soil, and sediment risks are each divided by a factor of 3 prior to summing to eliminate over estimation introduced by allowing 100 milligrams per day of each medium when considering each medium on its own.

Fluckmill Road -- fish ingestion risk (Fluckmill Road), surface water risks (Fluckmill Road), and bank soil, floodplain soil, and sediment risks (upper Clear Creek). Note: Repeat same as for Country Club Road.

Strain Ridge Road -- fish ingestion risk (Strain Ridge Road), surface water risk (Strain Ridge Road), sediment and bank soil (lower Clear Creek), and floodplain soil (upper Clear Creek- floodplain soil results are not available for lower Clear Creek). Note: repeat same as for Country Club Road.

Quarry Springs -- fish ingestion risk (Country Club Road), surface water risks (Quarry Springs, combined), sediment risks (Quarry Springs A), surface soil risks (Quarry Springs, combined). Note: sediment and surface soil risks are each divided by a factor of 2 prior to summing to eliminate over estimation by allowing 100 milligrams per day of each medium when considering each medium on its own.

[h] Parenthetical values represent the percent of the total risk represented by the fish ingestion.

TABLE 2

REVISED HAZARD SUMMARY[a]
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Pathway	Location[b]			
	Country Club Road	Fluckmill Road	Strain Ridge Road	Quarry Springs
Fish Ingestion[c]	4.8E-01	3.4E+00	5.0E+00	4.8E-01
Surface Water - Incidental Ingestion	2.6E-05	3.6E-05	1.1E-05	1.2E-03
Surface Water - Dermal Contact	4.6E-05	6.4E-05	1.8E-05	5.3E-04
Sediment - Incidental Ingestion	4.8E-03	4.8E-03	8.0E-03	3.9E-01 [d]
Sediment - Dermal Contact	4.3E-03	4.3E-03	7.2E-03	3.5E-01 [d]
Surface Soil - Incidental Ingestion	NA	NA	NA	1.5E-01 [e]
Surface Soil - Dermal Contact	NA	NA	NA	8.1E-02 [e]
Bank Soil - Incidental Ingestion	4.5E-03	4.5E-03	6.0E-03	NA
Bank Soil - Dermal Contact	2.5E-03	2.5E-03	3.3E-03	NA
Floodplain Soil - Incidental Ingestion	1.6E-02	1.6E-02	1.6E-02 [f]	NA
Floodplain Soil - Dermal Contact	8.7E-03	8.7E-03	8.7E-03 [f]	NA
Totals[g] - All	4.9E-01 (97.3)[h]	3.4E+00 (99.6)[h]	5.0E+00 (99.7)[h]	9.7E-01 (49.8)[h]
Totals[g] - No Fish	1.4E-02	1.4E-02	1.6E-02	4.8E-01

Notes:

NA = Not Applicable
RME = Reasonable maximum exposure

[a] See Appendix B of the draft HHRAfor detailed receptor and exposure pathway-specific calculations (Tetra Tech 2005). All risk values presented are for adult receptors.

[b] See Figures 2 and 4 of the draft HHRA for locations of Quarry Springs and of Country Club Road, Fluckmill Road, Strain Ridge Road, upper Clear Creek, and lower Clear Creek, respectively (Tetra Tech 2005).

[c] Risks presented represent polychlorinated biphenyl (PCB) risks based on consumption of 90 percent pelagic and 10 percent benthic fish.

[d] This result is for Quarry Springs A and represents the highest result in the Quarry Springs area. The risk results for Quarry Springs B and C are less then 1E-06.

[e] This result is for Quarry Springs, Combined.

[f] This result is for upper Clear Creek; floodplain soil results are not available for lower Clear Creek

[g] For Country Club Road, Fluckmill Road, and Strain Ridge Road, totals represent the sum of receptor-specific fish ingestion risk plus all surface water, sediment, bank soil, and floodplain soil risks. For Quarry Springs, totals represent the sum of receptor-specific fish ingestion for Country Club Road and surface water, sediment, and surface soil risks at Quarry Springs. The location-specific totals are detailed below:

Country Club Road -- Fish ingestion risk (Country Club Road), surface water risks (Country Club Road), and bank soil, floodplain soil, and sediment risks (upper Clear Creek). Note: bank soil, floodplain soil, and sediment risks are each divided by a factor of 3 prior to summing to eliminate over estimation introduced by allowing 100 milligrams per day of each medium when considering each medium on its own.

Fluckmill Road -- fish ingestion risk (Fluckmill Road), surface water risks (Fluckmill Road), and bank soil, floodplain soil, and sediment risks (upper Clear Creek). Note: Repeat same as for Country Club Road.

Strain Ridge Road -- fish ingestion risk (Strain Ridge Road), surface water risk (Strain Ridge Road), sediment and bank soil (lower Clear Creek), and floodplain soil (upper Clear Creek- floodplain soil results are not available for lower Clear Creek). Note: repeat same as for Country Club Road.

Quarry Springs -- fish ingestion risk (Country Club Road), surface water risks (Quarry Springs, combined), sediment risks (Quarry Springs A), surface soil risks (Quarry Springs, combined). Note: sediment and surface soil risks are each divided by a factor of 2 prior to summing to eliminate over estimation by allowing 100 milligrams per day of each medium when considering each medium on its own.

[h] Parenthetical values represent the percent of the total risk represented by the fish ingestion

TABLE A1

REVISED GENERAL AND CHEMICAL-SPECIFIC EXPOSURE PARAMETER VALUES
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Parameter	Acronym	Units	Values		
			Adult (18+)	Youth (7 to 18)	Child (1 to 6)
Exposure Point Concentrations	EPC	varies	See Table A2	See Table A2	See Table A2
Exposure Frequency (surface water and sediment_QS. CC. FM. UCC)	EF_{sw} and EF_{sed}	days/year	68	68	68
Exposure Frequency (surface. bank and floodplain soil_QS&UCC)	EF_{bkf} and EF_{fs}	days/year	76	76	76
Exposure Frequency (aquatic life)	EF_{al}	days/year	365	365	365
Exposure Frequency (surface water and sediment_SR&LCC)	EF_{SW-SR} and EF_{sed-SR}	days/year	30	30	30
Exposure Frequency (surface, bank. and floodplain soil_LCC)	EF_{bkf}. EF_S and EF_{fs}	days/year	38	38	38
Exposure Duration	ED	years	30	12	6
Fraction Contaminated_soil	FC_s	unitless	0.5	0.5	0.5
Body Weight	BW	kg	70	47	15
Ingestion Rate (aquatic life)	IR_{al}	kg/day	see below	NA	NA
Ingestion Rate (sediment and soil)	IR_{sed} and IR_{soil}	mg/day	100	100	200
Ingestion Rate (surface water)	IR_{sw}	L/day	7.50E-03	1.50E-02	1.50E-02
Cooking Reaction Factor	CRF	unitless	0.5	0.5	0.5
Skin Surface Area (sediment)	SA_{sed}	cm^2	2129	1640	809
Skin Surface Area (soil)	SA_{soil}	cm^2	5700	4373	2378
Skin Surface Area (surface water)	SA_{sw}	cm^2	see below		
Adherence Factor (sediment)	AF_{sed}	mg/cm^2	0.3	0.3	0.3
Adherence Factor (soil)	AF_{soil}	mg/cm^2	0.07	0.2	0.2
Dermal Absorption	ABS	unitless	Chemical Specific- see below		
Absorbed Dose per Event	DA_{event}	mg/cm^2-event	Chemical Specific- see below		
Exposure Time	ET	hr/day	1	1	1
Event Frequency	EV	event/day	1	1	1
Conversion Factor 1	CF1	mg/ng	1.00E-06	1.00E-06	1.00E-06
Conversion Factor 2	CF2	mg/µg	1.00E-03	1.00E-03	1.00E-03
Conversion Factor 3	CF3	kg/mg	1.00E-06	1.00E-06	1.00E-06
Averaging Time (carcinogens)	AT_c	days	25550	25550	25550
Averaging Time (noncarcinogens)	AT_{nc}	days	10950	4380	2190
Gastrointestinal Absorption	GI	unitless	Chemical Specific- see below		
Chronic Oral Exposure Reference Dose	RfD	mg/kg-day	Chemical Specific- see below		
Oral Slope Factor	SF	$(mg/kg-day)^{-1}$	Chemical Specific- see below		

Note: See footnotes to Table 3 from the draft HHRA (Tetra Tech 2005) and individual EPA responses.

TABLE A1

REVISED GENERAL AND CHEMICAL-SPECIFIC EXPOSURE PARAMETER VALUES
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Ingestion Rate of Aquatic Life				
		Values		
Rate	units	Adult (18+)	Youth (7 to 18)	Child (1 to 6)
County Club Rd	kg/day	0.003	--	--
Fluckmill Rd	kg/day	0.012	--	--
Strain Ridge Rd	kg/day	0.025	--	--

Skin Surface Area (surface water) Location Specific Values				
		Values		
Location	units	Adult (18+)	Youth (7 to 18)	Child (1 to 6)
Quarry Springs, Combined	cm^2	1225	949	451
Country Club Road	cm^2	4665	4578	2932
Fluckmill Road	cm^2	4665	4578	2932
Strain Ridge Road	cm^2	4565	3263	2374

Chemical Specific Values									
	Exposure Factors[a]							Toxicity Factors[b]	
Chemical	ABS	FA	K_p	C_w	τ_{event}	t_{event}	GI	RfD	SF
PCB	0.14	0.5	4.30E-01	see note	11.29	2	0.8 to .96	2.00E-05	2
TEQ	--	--	--	--	--	--	0.5 to 0.83	1.00E-09	1.50E+05
$TEQ_{EPA\ alternate}$	--	--	--	--	--	--	--	--	1.00E+06

Notes:

-- = Not applicable

ABS = Dermal absorption factor (unitless)

C_w = Chemical concentration in water - this concentration is equivalent to the location -specific surface water exposure point concentration (EPC) (see Table 4) in units of milligrams per cubic centimeter (mg/cm^3).

FA = Fraction absorbed water (unitless)

GI = Gastrointestinal absorption (unitless)

K_p = Dermal permeability coefficient in water (centimeter per hour [cm/hr])

PCB = Polychlorinated biphenyl

RfD = Oral reference dose (milligram per kilogram - day [mg/kg-day])

SF = Oral slope factor $(mg/kg\text{-}day)^{-1}$

τ_{event} = Lag time per event (hour per event [hr/event])

t_{event} = Event duration (hr/event)

TEQ = Toxicity equivalent

[a] PCB-specific exposure factors were obtained from EPA (2004a).

[b] PCB-specific toxicity factors were identified as discussed in Sections 4.2.2 and 4.3.2 of the draft HHRA (Tetra Tech 2005).

TABLE A2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATIONS
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

	Values								
Chemical	$EPC_{ni(90:10)}$	$EPC_{ni(pelagic)}$	$EPC_{ni(benthic)}$	EPC_{sw}	DA_{event}	EPC_{sed}	EPC_{bs}	EPC_{fs}	EPC_{ss}
	(ug/kg-PCB/ ng/kg-TEQ)			(mg/L)	(mg/cm^2-event)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Country Club Road									
PCB	448.9	416	744.5	2.60E-05	7.34E-11	--	--	--	--
TEQ	9.65	9.6	10.1	--	--	--	--	--	--
Fluckmill Road									
PCB	781.5	768.8	895.8	3.65E-05	1.03E-10	--	--	--	--
TEQ	9.3	9.5	7.1	--	--	--	--	--	--
Strain Ridge Road									
PCB	557.2	480.9	1243.8	2.40E-05	6.78E-11	--	--	--	--
TEQ	9.9	9.3	15.5	--	--	--	--	--	--
Upper Clear Creek[c]									
PCB	--	--	--	--	--	0.36	0.61	2.09	--
Lower Clear Creek[d]									
PCB	--	--	--	--	--	1.37	1.6	--	--
Quarry Springs A									
PCB	--	--	--	--	--	29.3	--	--	--
Quarry Springs B									
PCB	--	--	--	--	--	3.5	--	--	--
Quarry Springs C									
PCB	--	--	--	--	--	0.6	--	--	--
Quarry Springs Combined									
PCB	--	--	--	1.15E-03	3.25E-09	--	--	--	19.6

Notes:

-- = Not applicable
µg/kg = Microgram per kilogram
mg/kg = Milligram per kilogram
mg/L = Milligram per liter
ng/kg = Nanogram per kilogram
PCB = Polychlorinated biphenyl
TEQ = Toxicity equivalent

[a] Medium-specific EPC calculations are discussed in Section 3.3.1 and presented in Appendix A of the draft HHRA (Tetra Tech 2005).

[b] See Figures 1, 2, and 4.

[c] Upper Clear Creek extends from Gordon Pike Road about 5 miles downstream of the Lemon Lane Landfill to just upstream of Ketcham Road about 16 miles downstream of the Lemon Lane Landfill. For the purposes of calculating sediment exposure point concentrations (EPC), sediment samples collected from Country Club and Fluckmill Roads are considered to be representative of conditions in upper Clear Creek.

[d] Lower Clear Creek extends from just upstream of Ketcham Road about 16 miles downstream of the Lemon Lane Landfill to the confluence of Clear and Salt Creeks about 22 miles downstream of the Lemon Lane Landfill. For the purposes of calculating sediment EPCs, sediment samples collected from Strain Ridge Road are considered representative of conditions in lower Clear Creek.

TABLE A-3

REVISED FISH INGESTION RISKS AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

	PCB		TEQ		
Location	**Hazard**	**Risk**	**Hazard**	**Risk**	**$Risk_{EPA\ Alt}$**
Country Club Road	4.81E-01	8.25E-06	2.07E-01	1.33E-05	8.86E-05
Fluckmill Road	3.35E+00	5.74E-05	7.97E-01	5.12E-05	3.42E-04
Strain Ridge Road	4.98E+00	8.53E-05	1.77E+00	1.14E-04	7.58E-04

Notes:

RME = Reasonable maximum exposure
PCB = Polychlorinated biphenyl
TEQ = Toxicity equivalent
$Risk_{EPA\ Alt}$ = U.S. Environmental Protection Agency's alternative TCDD slope factor (see Section 4.2.2).

TABLE A4

REVISED SURFACE WATER RISKS AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

	Ingestion				Dermal Contact			
Chemical	ADD	Hazard	LADD	Risk	ADD	Hazard	LADD	Risk
Adult (18+ years)								
Country Club Road								
PCB	5.19E-10	2.59E-05	2.22E-10	4.45E-10	9.12E-10	4.56E-05	3.91E-10	7.81E-10
Fluckmill Road								
PCB	7.29E-10	3.64E-05	3.12E-10	6.24E-10	1.28E-09	6.40E-05	5.48E-10	1.10E-09
Strain Ridge Road								
PCB	2.11E-10	1.06E-05	9.06E-11	1.81E-10	3.63E-10	1.82E-05	1.56E-10	3.11E-10
Quarry Springs, Combined								
PCB	2.30E-08	1.15E-03	9.84E-09	1.97E-08	1.06E-08	5.29E-04	4.54E-09	9.07E-09
Youth (7 to 18 years)								
Country Club Road								
PCB	1.55E-09	7.73E-05	2.65E-10	5.30E-10	1.33E-09	6.66E-05	2.28E-10	4.57E-10
Fluckmill Road								
PCB	2.17E-09	1.09E-04	3.72E-10	7.44E-10	1.87E-09	9.35E-05	3.21E-10	6.41E-10
Strain Ridge Road								
PCB	6.30E-10	3.15E-05	1.08E-10	2.16E-10	3.87E-10	1.93E-05	6.63E-11	1.33E-10
Quarry Springs, Combined								
PCB	6.84E-08	3.42E-03	1.17E-08	2.34E-08	1.22E-08	6.11E-04	2.09E-09	4.19E-09
Child (1 to 6 years)								
Country Club Road								
PCB	4.84E-09	2.42E-04	4.15E-10	8.30E-10	2.67E-09	1.34E-04	2.29E-10	4.58E-10
Fluckmill Road								
PCB	6.80E-09	3.40E-04	5.83E-10	1.17E-09	3.75E-09	1.88E-04	3.22E-10	6.43E-10
Strain Ridge Road								
PCB	1.97E-09	9.86E-05	1.69E-10	3.38E-10	8.82E-10	4.41E-05	7.56E-11	1.51E-10
Quarry Springs, Combined								
PCB	2.14E-07	1.07E-02	1.84E-08	3.67E-08	1.82E-08	9.09E-04	1.56E-09	3.12E-09

Notes:

ADD = Average daily dose (mg/kg-day)
LADD = Lifetime average daily dose (mg/kg-day)
PCB = Polychlorinated biphenyl

REVISED SEDIMENT AND SOIL EXPOSURES, RISKS, AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
LEMON LANE LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

	Ingestion				Dermal Contact			
Chemical	ADD	Hazard	LADD	Risk	ADD	Hazard	LADD	Risk
Adult (18+ years)								
Upper Clear Creek - Sediment								
PCB	9.58E-08	4.79E-03	4.11E-08	8.21E-08	8.57E-08	4.28E-03	3.67E-08	7.34E-08
Upper Clear Creek - Bank Soil								
PCB	9.07E-08	4.54E-03	3.89E-08	7.78E-08	5.07E-08	2.53E-03	2.17E-08	4.34E-08
Upper Clear Creek - Floodplain Soil								
PCB	3.11E-07	1.55E-02	1.33E-07	2.66E-07	1.74E-07	8.68E-03	7.44E-08	1.49E-07
Lower Clear Creek - Sediment								
PCB	1.61E-07	8.04E-03	6.89E-08	1.38E-07	1.44E-07	7.19E-03	6.16E-08	1.23E-07
Lower Clear Creek - Bank Soil								
PCB	1.19E-07	5.95E-03	5.10E-08	1.02E-07	6.65E-08	3.32E-03	2.85E-08	5.70E-08
Quarry Springs A - Sediment								
PCB	7.80E-06	3.90E-01	3.34E-06	6.68E-06	6.97E-06	3.49E-01	2.99E-06	5.98E-06
Quarry Springs B - Sediment								
PCB	9.32E-07	4.66E-02	3.99E-07	7.98E-07	8.33E-07	4.16E-02	3.57E-07	7.14E-07
Quarry Springs C - Sediment								
PCB	1.60E-07	7.98E-03	6.84E-08	1.37E-07	1.43E-07	7.14E-03	6.12E-08	1.22E-07
Quarry Springs, Combined - Surface Soil								
PCB	2.92E-06	1.46E-01	1.25E-06	2.50E-06	1.63E-06	8.14E-02	6.98E-07	1.40E-06
Youth (7 to 18 years)								
Upper Clear Creek - Sediment								
PCB	1.43E-07	7.13E-07	2.45E-08	4.89E-08	9.83E-08	4.91E-03	1.68E-08	3.37E-08
Upper Clear Creek - Bank Soil								
PCB	1.35E-07	6.76E-03	2.32E-08	4.63E-08	1.65E-07	8.27E-03	2.84E-08	5.67E-08
Upper Clear Creek - Floodplain Soil								
PCB	4.63E-07	2.31E-02	7.94E-08	1.59E-07	5.67E-07	2.83E-02	9.72E-08	1.94E-07
Lower Clear Creek - Sediment								
PCB	2.40E-07	1.20E-02	4.11E-08	8.21E-08	1.65E-07	8.25E-03	2.83E-08	5.66E-08
Lower Clear Creek - Bank Soil								
PCB	1.77E-07	8.86E-03	6.08E-08	1.22E-07	2.17E-07	1.08E-02	3.72E-08	7.44E-08
Quarry Springs A - Sediment								
PCB	1.16E-05	5.81E-01	1.99E-06	3.98E-06	8.00E-06	4.00E-01	1.37E-06	2.74E-06
Quarry Springs B - Sediment								
PCB	1.39E-06	6.94E-02	2.38E-07	4.76E-07	9.56E-07	4.78E-02	1.64E-07	3.28E-07
Quarry Springs C - Sediment								
PCB	2.38E-07	1.19E-02	4.08E-08	8.15E-08	1.64E-07	8.19E-03	2.81E-08	5.62E-06
Quarry Springs, Combined - Surface Soil								
PCB	4.34E-06	2.17E-01	1.49E-06	2.98E-06	5.32E-06	2.66E-01	9.11E-07	1.82E-06
Child (1 to 6 years)								
Upper Clear Creek - Sediment								
PCB	8.94E-07	4.47E-02	7.66E-08	1.53E-07	1.52E-07	7.60E-03	1.30E-08	2.60E-08
Upper Clear Creek - Bank Soil								
PCB	8.47E-07	4.23E-02	7.26E-08	1.45E-07	2.82E-07	1.41E-02	2.42E-08	4.83E-08
Upper Clear Creek - Floodplain Soil								
PCB	2.90E-06	1.45E-01	2.49E-07	4.97E-07	9.66E-07	4.83E-02	8.28E-08	1.66E-07
Lower Clear Creek - Sediment								
PCB	1.50E-06	7.51E-02	1.29E-07	2.57E-07	2.55E-07	1.28E-02	2.19E-08	4.37E-08
Lower Clear Creek - Bank Soil								
PCB	1.11E-06	5.55E-02	9.52E-08	1.90E-07	3.70E-07	1.85E-02	3.17E-08	6.34E-08
Quarry Springs A - Sediment								
PCB	7.28E-05	3.64E+00	6.24E-06	1.25E-05	1.24E-05	6.18E-01	1.06E-06	2.12E-06
Quarry Springs B - Sediment								
PCB	8.69E-06	4.35E-01	7.45E-07	1.49E-06	1.48E-06	7.39E-02	1.27E-07	2.53E-07
Quarry Springs C - Sediment								
PCB	1.49E-06	7.45E-02	1.28E-07	2.55E-07	2.53E-07	1.27E-02	2.17E-08	4.34E-08
Quarry Springs, Combined - Surface Soil								
PCB	2.72E-05	1.36E+00	2.33E-06	4.66E-06	9.06E-06	4.53E-01	7.76E-07	1.55E-06

Notes:

ADD = Average daily dose (mg/kg-day)
LADD = Lifetime average daily dose (mg/kg-day)
PCB = Polychlorinated biphenyl

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
LEMON LANE LANDFILL SITE
BLOOMINGTON, MONROE COUNTY, INDIANA

UPDATE #4
SEPTEMBER 28, 2006

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
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2	07/13/06	Griffith, T., & C. Fisher, Fisher Reporting, Inc.	U.S. EPA	Public Meeting Transcript re: U.S. EPA's Proposed Plan for the Lemon Lane Landfill Site w/Transmittal Sheet	84
3	07/30/06	Frey, S. & M. Harrison, Protect Our Woods, Inc.	U.S. EPA	Appraisal of U.S. EPA's Proposed Plan for the ROD Amendment, Operable Units Two and Three, Lemon Lane Landfill Site w/Attached References	16
4	08/11/06	Hird, D., Weil, Gotshal & Manges LLP	Alcamo, T., U.S. EPA	Electronic Transmittal re: CBS Corporation's Comments to the Proposed Plan for the ROD Amendment, Operable Units Two and Three, Lemon Lane Landfill Site w/Attached Exhibits A-D	119
5	08/12/06	Baker, M., COPA	Alcamo, T., U.S. EPA	Electronic Transmittal re: COLA Comments on U.S. EPA's Proposed Plan for the Lemon Lane Landfill Site	3
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8	08/24/06	Lifka, J., Tetra Tech EM, Inc.	Alcamo, T., U.S. EPA	Letter re: Surface Water Sample Analytical Results for the Lemon Lane Landfill Site w/Attached Laboratory Report	35
8	00/00/00	U.S. EPA	Public	ROD Amendment, Operable Units Two and Three, Lemon Lane Landfill Site **(PENDING)**	
9	00/00/00	City of Bloomington	U.S. EPA	Concurrence Letter re: ROD Amendment, Operable Units Two and Three, Lemon Lane Landfill Site **(PENDING)**	
10	00/00/00	IDEM	U.S. EPA	Concurrence Letter re: ROD Amendment, Operable Units Two and Three, Lemon Lane Landfill Site **(PENDING)**	
11	00/00/00	Monroe County	U.S. EPA	Concurrence Letter re: ROD Amendment, Operable Units Two and Three, Lemon Lane Landfill Site **(PENDING)**	

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
LEMON LANE LANDFILL SITE
BLOOMINGTON, MONROE COUNTY, INDIANA

UPDATE #3
JUNE 13, 2006

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311	05/26/05	Viacom	Distribution List	Clear Creek November 2004 Sediment Sample PCB Validation for the Lemon Lane Landfill Site w/Cover Letter	42
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313	06/20/05	Lifka, J. Tetra Tech EM Inc.	Alcamo, T. U.S. EPA	Field Oversight Summary May 17-25, 2005 Clear Creek Sediment Investigation for Lemon Lane Landfill Site w/ Cover Letter	57
314	06/23/05	Alke, D., Viacom	Distribution List	Memorandum re: Quarterly Inspection and Maintenance Report for Second Quarter 2005 for the Lemon Lane Landfill Site	6
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316	06/30/05	Viacom	Distribution List	Surface Water, Flow and Water Level Monitoring Third Quarter 2004 for the Lemon Lane Landfill Site w/ Cover Letter	81
317	07/01/05	Lifka, J. Tetra Tech EM Inc.	Alcamo, T. U.S. EPA	Letter re: Clear Creek Sediment and Bank Soil Split Sample Analytical Results for Lemon Lane Landfill Site w/ Enclosure	5

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319	07/08/05	Lifka, J. Tetra Tech EM Inc.	Alcamo, T. U.S. EPA	Letter re: Surface Water Sample Analytical Results for the Lemon Landfill Site w/ Enclosure	4
320	07/28/05	Viacom	Alcamo, T. U.S. EPA	Upper Clear Creek Flood Plain Sampling and Analysis Plan for the Lemon Lane Landfill Site w/ Cover Letter	49
321	08/02/05	McCandless, R. PSARA	Rinker, L., Bloomington, IN	Letter: Results of Spring Water Sampling by Viacom and U.S. EPA for the Lemon Lane Landfill Site w/ Attachment	2
322	08/05/05	Viacom	Distribution List	Upper Clear Creek Sediment and Soil Sampling and Analysis Report for the Lemon Lane Landfill Site w/ Cover Letter	43
323	08/19/05	Lifka, J. Tetra Tech EM Inc.	Alcamo, T. U.S. EPA	Letter: Upper Clear Creek Sediment and Soil Sampling and Analysis Report for the Lemon Lane Landfill Site	2
324	08/22/05	Alke, D. Viacom	Alcamo, T. U.S. EPA	Letter re: Addendum to Upper Clear Creek Flood Plain and Analysis Plan for the Lemon Lane Landfill Site w/ Enclosures	6
325	09/02/05	Viacom	Alcamo, T. U.S. EPA	Lower Clear Creek Sediment Sample and Analysis Plan for the Lemon Lane Landfill Site: QAPjP Volume XLV w/ Cover Letter	40
326	09/08/05	CBS	U.S. EPA	Data: Rinker Spring Flow June 10 - September 7, 2005	47
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330	10/05/05	Alke, D., Viacom	Distribution List	Letter re: Surface Water, Flow and Water Level Monitoring Fourth Quarter 2004 for the Lemon Lane Landfill Site	100
331	10/20/05	Alcamo, T., U.S. EPA; et al.	File	Report: Illinois Central Spring FIELDS Analysis	14
332	10/20/05	Alke, D., Viacom	Alcamo, T., U.S. EPA	E-Mail Transmission re: New Fluckmill Road PCB Data	1
333	10/21/05	Lifka, J., Tetra Tech EM Inc.	Alcamo, T., U.S. EPA	Letter re: Field Oversight Summary for September 19-28, 2005 for the Clear Creek Sediment Investigation	42
334	10/21/05	Lifka, J. Tetra Tech EM Inc	Alcamo, T. U.S. EPA	Upper Clear Creek Flood Plain Soil Split Sample Analytical Results for the Lemon Lane Landfill Site w/ Cover Letter	5
335	10/31/05	Lifka, J. Tetra Tech EM Inc.	Alcamo, T. U.S. EPA	Field Oversight Summary September 19-28, 2005 Clear Creek Sediment Investigation for the Lemon Lane Landfill Site w/ Cover Letter	42
336	11/01/05	Viacom	U.S. EPA	Upper Clear Creek Flood Plain Soil Sampling and Analysis Report	522
337	11/09/05	Lifka, J. Tetra Tech EM Inc.	Alcamo, T. U.S. EPA	Clear Creek Sediment and Bank Soil Split Sample Analytical Results for the Lemon Lane Landfill Site w/ Cover Letter	5
338	12/00/05	Environmental Field Services, Inc.	File	Field Sampling Plan for SRS Tanks at the Illinois Central Spring Plant	9

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339	12/16/05	Lifka, J., Tetra Tech EM Inc.	Alcamo, T., U.S. EPA	Upper Clear Creek Flood Plain Soil Sampling and Analysis Report for the Lemon Lane Landfill Site	4
340	12/16/05	Tetra Tech EM Inc.	U.S. EPA	Focused Ecological Risk Assessment for the Lemon Lane Landfill Site	180
341	12/20/05	Alke, D., Viacom	Distribution List	Letter re: Quarterly In-section and Maintenance Report Fourth Quarter 2005 for the Lemon Lane Landfill Site	5
342	12/21/05	Alke, D., Viacom	Distribution List	Letter re: Sediment and Soil Sampling and Analysis Report for Lower Clear Creek	267
343	12/23/05	Tetra Tech EM Inc.	U.S. EPA	Human Health Risk Assess-ment for the Lemon Lane Landfill Site	108
344	01/11/06	Alke, D., CBS	Distribution List	Memorandum re: Surface Water, Flow and Water Level Monitoring First Quarter 2005 for the Lemon Lane Landfill Site	100
345	03/02/06	CBS	Government Parties	Summary of Lemon Lane Conduit Investigation from 2002-2005	16
346	03/07/06	Walston, L., et al., U.S. EPA/FIELDS	Alcamo, T., U.S. EPA	Technical Memorandum: FIELDS Report on Clear Creek PCB Contamination Characterization at Bloomington, IN	24
347	03/08/06	Alke, D., CBS	Alcamo, T., U.S. EPA	E-Mail Transmission re: Cost Estimate for IC/QS Sediment Removal	2
348	03/08/06	Burck, T., IDEM	Alcamo, T., U.S. EPA	Letter re: Sludge Sampling Results for the Illinois Central Springs Treatment Facility	8
349	03/17/06	Burck, T., IDEM	Alcamo, T., U.S. EPA	Letter re: ARARS for the Lemon Lane Landfill Site	3
350	03/17/06	Lifka, J., Tetra Tech EM Inc.	Alcamo, T., U.S. EPA	Letter re: Lower Clear Creek Sediment and Soil Sampling and Analysis Report for the Lemon Lane Landfill Site	4

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352	03/24/06	Alke, D., CBS	Distribution List	Letter re: Quarterly Inspection and Maintenance Report First Quarter 2006 for the Lemon Lane Landfill Site	7
353	04/07/06	Lifka, J., Tetra Tech EM Inc.	Alcamo, T., U.S. EPA	Letter re: Surface Water Sample Analytical Results for the Lemon Lane Landfill Site	28
354	04/11/06	Chapman, J., U.S. EPA	Alcamo, T., U.S. EPA	Memorandum re: Spatial Trends in PCB Accumulation in Clear Creek Fish in 2002 and 2004 for the Lemon Lane Landfill Site	34
355	04/13/06	Fliss, J., IDEM	Alcamo, T., U.S. EPA	Letter: Discharge Criteria for Remedial Alternatives Proposed for Lemon Lane Landfill	2
356	04/19/06	McCann, M., CBS	U.S. EPA	Report: Confirmation of PCB Contamination in the Bedrock Strata of the Southeast Corner of Lemon Lane Landfill	32
357	06/00/06	Earth Tech, Inc.	U.S. EPA	Alternative Evaluation: Screening of Remedial Alternatives for the Illinois Central Spring Water Facility	153
358	06/12/06	U.S. EPA	Public	Proposed Plan for the ROD Amendment for the Lemon Lane Landfill Site Operable Units 1 & 2	32

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
LEMON LANE LANDFILL SITE
BLOOMINGTON, MONROE COUNTY, INDIANA

EPA Region 5 Records Ctr.
237452

UPDATE #2
OCTOBER 28, 2005

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	08/00/90	U.S. EPA/ OERR	U.S. EPA	Guidance: Guidance on Remedial Actions for Superfund Sites with PCB Contamination (EPA 540-G-90/007)	
2	02/00/91	U.S. EPA/ OERR	U.S. EPA	Guidance: Conducting Remedial Investigations/ Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/540/P-91/001)	
3	11/15/96	Agency for Toxic Substances and Disease Registry	U.S. EPA	Public Health Assessment for the Bloomington PCB Sites Volume 1 of 3 (Revision to April 1994 Report)	
4	11/15/96	Agency for Toxic Substances and Disease Registry	U.S. EPA	Public Health Assessment for the Bloomington PCB Sites Volume 2 of 3 (Revision to April 1994 Report)	
5	11/15/96	Agency for Toxic Substances and Disease Registry	U.S. EPA	Public Health Assessment for the Bloomington PCB Sites Volume 3 of 3 (Revision to April 1994 Report)	

EPA Region 5 Records Ctr.
224316

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
LEMON LANE LANDFILL
BLOOMINGTON, INDIANA

UPDATE #1
MAY 12, 2000

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	04/27/98	Fernandez, J., City of Bloomington	Wilson, L. Clean Land, Air & Water	E-Mail Memorandum re: Proposed Cleanup at the Lemon Lane Landfill Site	2
2	01/19/99	Alke, D., CBS Corporation	Distribution List	Memorandum re: Conduit Investigation Progress Report for the Lemon Lane Landfill Site w/ Attachments 1-5	217
3	01/20/99	Alke, D., CBS Corporation	Distribution List	Memorandum re: Conduit Investigation Data Distribution for 1999 w/ Attachments 1-13	432
4	12/09/99	Harrison, M., et al.; Attorneys	Addressees	Notice of Intent to Sue on Behalf of Ms. S. Frey and Protect Our Woods, Inc. re: Bloomington Sites	477
5	12/16/99	McCann, M., CBS Corporation	Alcamo, T., U.S. EPA	Memorandum re: Exploratory Borings at the Lemon Lane Landfill Site	4
6	01/19/00	Fisher, C., Fisher Reporting, Inc.	U.S. EPA	Transcript: January 19, 2000 Proposed Plan Public Meeting for the Lemon Lane Landfill Site	33
7	01/22/00	Pace, J. & G. Hegeman; League of Women Voters/ Bloomington-Monroe County	Kimbrough, D., U.S. EPA/ OPA	Letter re: LWV's Comments on the Proposed Revised Source Control Remedy for the Lemon Lane Landfill Site	3
8	02/00/00	Concerned Citizens	U.S. EPA	Sixteen Public Comment Sheets re: the Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site (Received February 2-March 8, 2000)	16

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9	02/02/00	Anaya, W., *Johnson & Bell, Ltd.*	Kimbrough, D., U.S. EPA/	Letter re: Loewen Group's Comments on the Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site	3
10	02/29/00	Anaya, W., *Johnson & Bell, Ltd.*	Kimbrough, D., U.S. EPA/ OPA	Letter re: Loewen Group's Additional Comments on the Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site	3
11	03/01/00	Alke, D., CBS Corporation	Alcamo, T., U.S. EPA	Letter re: CBS' Comments on the Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site	9
12	03/03/00	Baker, M., Coalition Opposed to PCB Ash in Monroe County, Inc.	Kimbrough, D., U.S. EPA/ OPA	Letter re: COPA's Comments on the Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site	7
13	03/04/00	Frey, S. & Protect Our Woods, Inc.	Kimbrough, D., U.S. EPA/ OPA	Notice of Intent to Sue Supplement 1: S. Frey/ POW's Comments on U.S. EPA's Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site	31
14	03/04/00	Cartmell, J.	Alcamo, T. & D. Kimbrough; U.S. EPA	E-Mail Memorandum re: Comments on the Proposed Plan for the Source Control Operable Unit at the Lemon Lane Landfill Site	35
15	05/12/00	U.S. EPA	Public	Record of Decision Amendment w/Responsiveness Summary and Attachments for the Source Control Operable Unit at the Lemon Lane Landfill Site	748

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U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

EPA Region 5 Records Ctr.
224134

ADMINISTRATIVE RECORD
FOR
LEMON LANE LANDFILL SITE
BLOOMINGTON, MONROE COUNTY, INDIANA

ORIGINAL
DECEMBER 28, 1999

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	00/00/00	U.S. EPA	File	Hazardous Waste Site Ranking Model Summary w/Attached Model Work-sheets for the Lemon Lane Landfill Site	~~23~~ 26
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3	00/00/00	Metcalf & Eddy	U.S. EPA	Charts/Drawing: Proposed Well Locations for the Lemon Lane Landfill Site	4
4	00/00/00	Metcalf & Eddy; et al.	U.S. EPA	Charts/Notes re: Boring Well Data for the Lemon Lane Landfill Site	28
5	00/00/00	Metcalf & Eddy	U.S. EPA	Charts/Graphs re: Seismic Data for the Lemon Lane Landfill Site	80
6	00/00/00	O'Brien & Gere; et al.	U.S. EPA	Charts/Graphs/Notes re: Well Data for the Lemon Lane Landfill Site	95
7	00/00/00	U.S. EPA	File	Groundwater Investigation Plan for the Lemon Lane Landfill Site w/Attach-ments	24
8	00/00/00	Krothe, N., Indiana University	File	Paper: Fracture Trace Analysis for the Lemon Lane Refuse Area	8
9	1981-1984	U.S. EPA	File	Maps/Tables re: Water and Soil Quality at the Lemon Lane Landfill Site	18
10	06/00/81	City of Bloomington/ Utilities Lab	File	Testing Samples from the Lemon Lane Landfill Site	1
11	06/26/81	Poe, S., Indiana State Board of Health	File	Letter re: PCB's at the Lemon Lane Dump Site	1

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12	07/15/81	Lillich, R., U.S. EPA	Miner, W., U.S. EPA	Letter re: June 30 and July 1, 1981 Inspection at the Lemon Lane Landfill Site (DRAFT)	6
13	07/16/81	Gray, H., IDNR	Davoli, D., U.S. EPA	Letter re: IDNR File Data on Five Sites Including Lemon Lane Landfill	6
14	07/29/81	Lillich, R., U.S. EPA	Miner, W., U.S. EPA	Memorandum re: June 30 and July 1, 1981 Inspection at the Lemon Lane Landfill Site	7
15	08/26/81	DeFouw, T. & S. McCone: U.S. EPA/ Region 5/ Technical Assistance Team	Vanderlaan, G., U.S. EPA	Memorandum re: August 25, 1981 Inspection at the Lemon Lane Landfill Site	2
16	09/09/81	Lillich, R., U.S. EPA	Miner, W., U.S. EPA	Memorandum re: Data Results from Lemon Lane Landfill	61
17	11/23/81	Bieze, C.F., Ecology and Environment, Inc.	File	Memorandum re: Insepction of the Westinghouse PCB Disposal Sites w/Attached (1) Site Inspection Report, (2)HRS Scoring Package and (3) Preliminary Assessment	36
18	12/21/81	Lillich, R., U.S. EPA	Miner, W., U.S. EPA	Memorandum re: Sampling at Lemon Lane Landfill	38
19	1982-1983	O'Brien & Gere; et al.	U.S. EPA	Charts/Graphs/Notes re: Well Data for the Lemon Lane Landfill Site	100
20	03/10/82	Peoples, R., City of Bloomington	Magel, B., U.S. EPA	Letter re: PCB Analysis at the Lemon Lane Landfill Site	2
21	03/25/82	U.S. EPA	File	Lemon Lane Landfill Study Area/Background Study	9
22	06/09/82	Schmall, D., U.S. DOJ	Kelly, D., *Jones, Day, Reavis & Pogue*	Letter re: Implementation of a Remedial Action Plan for the Bloomington Sites w/Attached Sampling Results	10

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23	06/28/82	U.S. EPA	File	Documentation Records for Hazardous Ranking System for the Lemon Lemon Lane Landfill Site	13
24	08/00/82	Alt & Witzig Engineering, Inc.	U.S. EPA	Record of Subsurface Exploration for the Period July 7-August 5, 1982 at the Lemon Lane Landfill Site	14
25	11/00/82	Ecology and Environment, Inc.	U.S. EPA	Interim Report for the Lemon Lane Landfill Site	26
26	11/24/82	Lee, G. O'Brien & Gere Engineers, Inc.	McKay, E., Jones, et al.	Letter re: Monitoring Well and Piezometer Installation at the Lemon Lane Landfill Site w/ Attachments	10
27	12/07/82	Blasland, W., O'Brien & Gere Engineers, Inc.	Highland, J. Environ	Letter Transmitting the Groundwater Sampling and Analysis Program Document for the Lemon Lane Landfill Site w/Attachments	17 18
28	12/08/82	Geosciences Research Associates, Inc.	U.S. EPA	Report: Geology and Hydrology of Lemon Lane Landfill **(DRAFT)**	41
29	01/28/83	Blasland, W., O'Brien & Gere Engineers, Inc.	Highland, J., Princeton, NJ	Letter Forwarding Groundwater Analytical Results and Topographic Map for the Lemon Lane Landfill Site	14
30	02/04/83	Blasland, W., O'Brien & Gere Engineers, Inc.	Highland, J., Princeton, NJ	Letter re: Hydrogeologic Information for the Lemon Lane Landfill Site w/ Attachments	91
31	04/29/83	Smith, P.	File	Memorandum re: April 25, 1983 Site Visit to the Lemon Lane Landfill Site **(DRAFT)**	2
32	05/00/83	Blasland & Bouck Engineers, P.C.	U.S. EPA	Airphoto Analysis Report **(DRAFT)** for the Monroe County Landfill Site "C" Investigation	16

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34	05/06/83	Lillich, R., U.S. EPA	U.S. EPA	On-Scene Coordinator's Report for the Lemon Lane Landfill Site	152
35	06/06/83	CH2M Hill	U.S. EPA	Remedial Action Master Plan for the Lemon Lane Landfill Site **(DRAFT)**	126
36	06/09/83	Sanders, W., U.S. EPA	Adamkus, V., U.S. EPA	Memorandum re: Immediate Removal Request for the Lemon Lane Landfill Site	9
37	12/11/83	Bieze, C., Ecology and Environment, Inc.	File	Memorandum re: Summary of Data Generated from E&E's Work at the Lemon Lane Landfill Site	18
38	00/00/84	U.S. EPA	File	Summary of Remedial Alternative Selection for the Lemon Lane Landfill Site **(ENFORCEMENT CONFIDENTIAL)**	28
39	00/00/84	Blasland & Bouck Engineers, P.C.	File	Subsurface Log for the Lemon Lane Landfill Site for the Period March 24 - May 11, 1984 (Holes B.1 through B.8)	9
40	03/19/84	Lee, G., Blasland & Bouck Engineers, P.C.	Reich, K., U.S. DOJ	Letter re: Proposed Draft Investigation Protocol for the Lemon Lane Landfill Cover Thickness Testing Program	4
41	04/30/84	Goldman, R., Blasland & Bouck Engineers, P.C.	Levin, G., Westinghouse Electric Corporation	Letter re: Laboratory Analysis of Lemon Lane Refuse Samples	2
42	08/03/84	Thomas, L., U.S. EPA	U.S. EPA	Enforcement Decision Document: Remedial Alternative Selection for the Westinghouse Sites (Including the Lemon Lane Landfill Site)	195

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43	08/20/84	Strecker, J. Indiana State Board of Health	Goldman, R., Blasland & Bouck Engineers, P.C.	Letter Transmitting Groundwater Survey Results for the Lemon Lane Land-Site w/Attachments	149
44	03/00/85	Niedergang, N., U.S. EPA	Strecker, J., Indiana State Board of Health	Letter re: Four Test Results for Soil and Water Samples Taken at Sargents' Pond During October 1984	3
45	05/14/85	U.S. EPA	File	Provisional Final Report of Exposure Assessment/ Health Effects Study for Three Waste Sites in Bloomington, IN	57
46	12/00/85	Indiana University/ School of Public and Environmental Affairs	Westinghouse Electric Corporation	Report: Well Water User Survey Around Four PCB Contaminated Sites	146
47	03/04/86	Kozlowski, S., Ecology and Environment, Inc.	Bieze, C., Ecology and Environment, Inc.	Sampling Data Report for 26 Low Soil Dioxins and Furans for the Period November-December 1985 for the Lemon Lane Land-fill Site w/Attachments	15
48	04/14/86	Bieze, C., Ecology and Environment, Inc.	File	Memorandum re: Dioxin Sampling at the Lemon Lane and Neal's Landfill Sites	11
49	04/15/86	Bieze, C., Ecology and Environment, Inc.	File	Final Report on Dioxin Sampling at Neal's Landfill and Lemon Lane Landfill	44
50	07/10/86	Lybarger, J., USDHHS/USPHS/ ATSDR	Fabinski, L., U.S. EPA	Memorandum re: ATSDR's Review of (1) Dioxin and Furan Levels in Soils and (2) the Project Safety Plan for the Bloomington Sites	9
51	02/00/87	Blasland & Bouck Engineers, P.C.	U.S. EPA	Report: Interim Removal and Remedial Measures for the Lemon Lane Land-fill Site	68
52	02/09/87	Dastgheyb, S., United States Testing Company, Inc.	Environ Corporation	Letter re: Difficulties with Sampling Analysis w/attached Dioxin Furan Sampling Results for the Lemon Lane Landfill Site	26

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53	03/20/87	Pearce, M., U.S. EPA	Anderson, C., Westinghouse Electric Corporation	Letter Transmitting Partial Analytical Data for the Lemon Lane Landfill Site	82
54	04/00/87	Blasland & Bouck Engineers, P.C.	U.S. EPA	Report: References Cited Supplemental Hydrogeologic Investigation Plan for the Lemon Lane Landfill Site	310
55	04/20/87	Adamkus, V., U.S. EPA	Anderson, C., Westinghouse Electric Corporation	Letter re: Inception of Interim Remedial Measures at Lemon Lane Landfill w/Attachments	39
56	06/00/87	Blasland & Bouck Engineers, P.C.	U.S. EPA	Report: Supplemental Hydrogeologic Investigation Plan for the Lemon Lane Landfill Site	123
57	06/05/87	Powell, R., Geoscience Research Associates, Inc.	Pearce, M., U.S. EPA	Letter re: Pelfree Property Lines at the Lemon Lane Landfill Site w/Attachments	11
58	06/20/87	Westinghouse Electric Corporation	File	Westinghouse Project Air Monitoring Survey Data Sheets for the Lemon Lane Site	43
59	07/13/87	Schneider, R., Monroe County Health Department	Adamkus, V., U.S. EPA	Letter re: MCHD's Request for U.S. EPA's Permission to Post Warning Signs at the Lemon Lane Landfill Site	1
60	07/27/87	Switalski, D., Westinghouse Electric Corporation	U.S. EPA	Letter re: Geomembrane Cover Material Change at the Lemon Lane Landfill Site	5
61	07/30/87	Covington, F., U.S. EPA	Schneider, R., Monroe County Health Department	Letter re: U.S. EPA's Response to MCHD's Request to Post Warning Signs at the Lemon Lane Landfill Site	1
62	08/03/87	Pearce, M., U.S. EPA	Anderson, C., Westinghouse Electric Corporation	Letter re: U.S. EPA's Approval for Westinghouse to Substitute CSPE for CPE as the Cover Material to be Used at the Lemon Lane Landfill Site	2

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63	11/24/87	Matz, S. & S. Springer; Roy F. Weston, Inc.	Faryan, S., U.S. EPA	Letter re: Sampling and Emergency Action Plan for the Lemon Lane Landfill Site	20
64	02/01/88	Jenkins, J.L., Blasland & Bouck Engineers and Hydroscience Associates, Inc.	File	Memorandum re: Low Flow Tracer Test for the Lemon Lane Landfill Site	24
65	02/09/88	Anderson, C., Westinghouse Electric Corporation	Pearce, M., U.S. EPA	Letter Forwarding Attached Air Monitoring Summaries and Final Drawings (As-Builts) for the Lemon Lane Landfill Site	116
66	09/00/89	Westinghouse Environmental and Geotechnical Services, Inc.	Westinghouse Electric Corporation	Report: High Flow Tracer Test for the Lemon Lane Landfill Site	97
67	11/00/89	Blasland & Bouck Engineers, P.C.	File	Phase 1 Report: Supplemental Hydrogeologic Investigation for the Lemon Lane Landfill Site (Volume 2 of 2: Appendices LL1 - LL10)	395
68	01/02/91	Hopkins, D., U.S. EPA	Committee Member	Letter re: Analtytical Results of Dye Sampling from Residential Wells 82, 86 and 212 at the Lemon Lane Landfill Site	8
69	03/00/91	Westinghouse Electric Corporation	U.S. EPA	1990 Lemon Lane High Flow Tracer Test Report	73
70	08/14/91	Mead, J., Tetra Tech, Inc.	Hopkins, D., U.S. EPA	Letter Transmitting the June 17, 1991 Lemon Lane Springs Sampling Analyses for the Westinghouse Sites	62
71	00/00/93	Fitch, J.	Indiana University Department of Geosciences	A Karst Groundwater Study to Delineate the Quarry Spring Basin Groundwaters Near the Lemon Lane Landfill	83

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72	03/00/94	Metcalf & Eddy, Inc.	U.S. EPA	Remedial Investigation Report--Appendix E: Drawings for the Lemon Lane Landfill Site (2 Volumes) [DRAWINGS HAVE NOT BEEN COPIED FOR PHYSICAL INCLUSION INTO THE AR: MAY BE VIEWED AT U.S. EPA REGION 5]	1
73	06/28/94	DiVincenzo, R., Westinghouse Electric Corporation	Distribution List	Memorandum re: PCB Data Sets to be Considered for the Lemon Lane Landfill Risk Assessment	28
74	12/14/94	Westinghouse Electric Corporation	U.S. EPA	Field Sampling Plan for the Lemon Lane Groundwater Monitoring Investigation (QAPjP Volume II, Part A) [AGENCY REVIEW DRAFT]	64
75	12/16/94	Westinghouse Electric Corporation	U.S. EPA	Quality Assurance Project Plan for the Bloomington Sites: Volume 1, Appendix A (Laboratory Procedures) [AGENCY REVIEW DRAFT]	119
76	12/16/94	Westinghouse Electric Corporation	U.S. EPA	Quality Assurance Project Plan for the Bloomington Sites: Volume 1, Appendix B (Field Procedures) [AGENCY REVIEW DRAFT]	148
77	00/00/95	U.S. EPA	File	First Quarter Results for Spring Surface Water Samples w/Attached Semi-volatile Organics Analysis Data Sheet Tentatively Identified Compounds for the Lemon Lane Landfill Site	53
78	02/05/95	Hopkins, D., U.S. EPA	Distribution List	Letter Forwarding (1) First Quarter Sampling Results at Springs and Streams Identified in the FSP for the Lemon Lane Groundwater Investigation; (2) June 1995 Electro-magnetic Survey Results for the Lemon Lane Landfill Site; and (3)Boring Location Maps for the Lemon Lane Landfill Site	77

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79	03/00/95	EARTH TECH	U.S. EPA	Mini Quality Assurance Project Plan for Field Oversight of Site Investigation and Remedy Development Activities at the Lemon Lane Landfill Site	32
80	03/00/95	Vendl, M., U.S. EPA	U.S. EPA	Technical Memorandum: Lemon Lane Landfill Borehole Radar Survey August 17-18, 1994	53
81	03/15/95	Westinghouse Electric Corporation	U.S. EPA	Quality Assurance Project Plan (Volume I: Text, Tables and Figures) for the Bloomington Sites	64
82	04/11/95	Flores, R., EARTH TECH	Hopkins, D., U.S. EPA	Memorandum re: Conceptual Sampling Plan for the Lemon Lane Site	13
83	06/01/95	Ramsey, R., Indiana Department of Environmental Management	Hopkins, D., U.S. EPA	Letter re: Results of IDEM's March 22, 1995 Groundwater Sampling from the Lemon Lane Landfill Site and Groundwater/ Sediment Sampling from Illinois Gulf Central Spring w/Attachments	26
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85	06/21/95	Westinghouse Bloomington Project	U.S. EPA	Field Sampling Plan for Lemon Lane Groundwater Monitoring Investigation (Revision of the March 15, 1995 FSP)	68
86	06/23/95	Cepko, R.	Ramsey, R., IDEM, et al.	Letter re: Modified Fence Line and Additional Sample Results for the Lemon Lane Landfill Site	7
87	09/00/95	U.S. EPA	File	1995 Lemon Lane Landfill Residential Water Well User Survey w/Map, Residential Well Sampling and Residential Water Supply Inventory Sheets	114

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88	09/28/95	Alke, D., Westinghouse Electric Corporation	Distribution List	Memorandum re: Sampling Data for Sediment and Water Sampling of Nine Peripheral Springs at the Lemon Lane Landfill Site w/Attachment	133
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90	11/21/95	Alke, D., Westinghouse Electric Corporation	Distribution List	Letter re: Lemon Lane 1st Quarter Residential Well Sample Results and Data Validation Summary	5
91	11/22/95	Aten, R., EARTH TECH	Hopkins, D., U.S. EPA	Letter Transmitting Summary Tables of the Results for the First Quarter Sampling of Residential Wells Around the Lemon Lane Landfill Site	94
92	12/00/95	U.S. EPA/ ERT	U.S. EPA	Quality Assurance Work Plan for the Lemon Lane Landfill Site **(DRAFT)**	209
93	01/02/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Memorandum re: Data Transmittal of 8 Weeks of Non-Storm Sampling at 6 Springs Affected by the Lemon Lane Landfill Site	3
94	02/16/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Memorandum re: Field Sampling Plan Data through December 1995 w/attached Enclosures 1-4	166
95	03/00/96	Aten, R., EARTH TECH	Hopkins, D., U.S. EPA	First Quarter Results for Lemon Lane Monitoring Wells: December 1995 Samples for the Lemon Lane Landfill Site	158
96	03/00/96	Aten, R., EARTH TECH	Hopkins, D., U.S. EPA	Second Quarter Results for Residential Well Sampling: December 1995 Samples for the Lemon Lane Landfill Site	287
97	06/00/96	Aten, R., Earth Tech	Hopkins, D., U.S. EPA	Third Quarter Results for Residential Well Sampling: March 1996 Samples for the Lemon Lane Landfill Site	240

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98	07/16/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Lemon Lane Data Distribution Memorandum: (1) Connected Springs Samples for March and April 1996; (2) Monitoring Well Samples for March 1996; and (3) Continuous Monitoring Data for May 1996	3
99	07/08/96	Ramsey, R., Indiana Department of Environmental Management	Alke, D., Westinghouse Electric Corporation	IDEM Office of Water Management Biological Studies Fish Tissue Contamination Results w/Enclosures	277
100	08/21/96	U.S. EPA	File	Pre and Post Consent Decree Activities at the Lemon Lane Landfill Site w/ Attached Analytical Data	27
101	08/26/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Lemon Lane Data Distribution Memorandum: (1) Connected Springs Samples for May 1996; (2) Monitoring Well Samples for April-June, 1996; and (3) Continuous Monitoring Data for June 1996	2
102	08/26/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Lemon Lane Data Distribution Memorandum: June 1996 Residential Wells Sampling (Fourth of Four Quarterly Samplings)	2
103	08/29/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Memorandum re: Request to Amend the Westinghouse Quality Assurance Project Plan for the Bloomington Sites (QAPP dated June 21, 1995) to add the Field Sampling Plan for the Fill at the Lemon Lane Landfill Site w/Attachments	50
104	09/23/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Letter re: Surface Water Control Test for MW-7 Area of Lemon Lane Landfill	7
105	10/04/96	EARTH TECH	File	Tables: Results of Dioxin/ Furan Analysis Sediment Samples and Environmental Levels of Dioxin in Sediments (ppt) for the Lemon Lane Landfill Site	5

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107	10/23/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Memorandum re: May 1996 Storm Event Sampling at Illinois Central Spring	18
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109	10/30/96	PSARA Technologies, Inc.	Westinghouse Electrical Corporation	Site-Specific Health and Safety Plan for the Lemon Lane Landfill Site (Revision 1)	57
110	11/00/96	U.S. EPA	File	Table: Summary of Results for Waste and Soil Analyses for the Lemon Lane Landfill Site	2
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113	12/12/96	Alke, D., Westinghouse Electric Corporation	Distribution List	Lemon Lane Data Distribution Memorandum: (1) Monitoring Well Samples for September 1996; (2) Continuous Monitoring Data for September 1996; and (3) Residential Well Sampling for March 1996	113

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115	02/00/97	EARTH TECH	U.S. EPA	Report: Summary of Lemon Lane Landfill Analytical Results for Split Samples Collected by Earth Tech	62
116	02/19/97	DiVincenzo, R., Westinghouse Electric Corporation	Distribution List	Memorandum re: Preliminary Data Report for the November 1996 Ecological Sampling Associated with the Lemon Lane Landfill Site	8
117	03/07/97	PSARA Technologies, Inc.	Westinghouse Electric Corporation	Report: Delineation and Characterization Sampling & Analysis for the Lemon Lane Landfill Site (Volume 1: Text and Attachments A-C) [FINAL DRAFT]	81
118	03/07/97	PSARA Technologies, Inc.	Westinghouse Electric Corporation	Report: Delineation and Characterization Sampling & Analysis for the Lemon Lane Landfill Site (Volume 2: Attachment D)	484
119	03/12/97	Aten, R.,	Ramsey, R., & J. Langley	Memorandum Transmitting Boring Logs and CAD Files for the Lemon Lane Landfill Site	13
120	05/19/97	Alke, D., Westinghouse Electric Corporation	Distribution List	Final Data Transmittal Memorandum for Ecological/ Human Risk Assessment Samples Taken in November 1996 Under the October 1996 FSP to the Ecological Risk Assessment of the Lemon Lane Lanefill-IC/QS Site	9
121	05/30/97	Alke, D., Westinghouse Electric Corporation	Distribution List	Memorandum re: Sampling Plan for Illinois Central Spring for 1997	17
122	07/23/97	Alke, D., Westinghouse Electric Corporation	Distribution List	Letter Transmitting Revised Ecological Sampling Data for the Westinghouse-Bloomington Lemon Lane Landfill Risk Assessment: November 1996 Ecological Sampling Program	8

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124	03/16/98	Clark, J., U.S. EPA	Alcamo, T., U.S. EPA	Memorandum re: Evaluation of Bloomington Fish Data w/Attachments	62
125	11/30/99	Alcamo, T., U.S. EPA	File	Memorandum re: Cost Estimate for the Lemon Lane Landfill Source Control Alternatives	6
126	12/20/99	Clark, J., U.S. EPA	Alcamo, T., U.S. EPA	Memorandum re: PCB Cleanup Levels for Lemon Lane Landfill w/Attachments	14
127	12/20/99	Alke, D., CBS Corporation	Alcamo, T., U.S. EPA	Letter Transmitting Information Related to the Calculation of Waste Volumes at the Lemon Lane Landfill Site	5
128	12/29/99	Alcamo, T., U.S. EPA	File	Memorandum re: Applicable or Relevant and Appropriate Requirements (ARARs) for the Four Alternatives at the Lemon Lane Landfill Site	5
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LEMON LANE LANDFILL ADMINISTRATIVE RECORD

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Appendix G

STATEMENT OF WORK
FOR REMEDIAL DESIGN AND REMEDIAL ACTION
OF OPERABLE UNITS TWO AND THREE
AT
LEMON LANE LANDFILL
BLOOMINGTON, INDIANA

I. PURPOSE

The purpose of the Statement of Work ("SOW") is to set forth requirements for implementation of the Remedial Action selected by the U.S. Environmental Protection Agency ("U.S. EPA") to address polychlorinated biphenyl ("PCB")contamination in the groundwater, surface water and sediment at Lemon Lane Landfill (the "Site"). This Remedial Action was selected by U.S. EPA in the Lemon Lane Landfill Record of Decision ("ROD") Amendment for Operable Units 2 and 3 ("LL RODA OU2/3"), which was signed by the Superfund Division Director of U.S. EPA Region V on September 29, 2006. CBS Corporation shall perform the Work in the LL RODA OU2/3, this SOW, and in all plans and schedules reviewed and approved by U.S. EPA in accordance with this SOW after reasonable opportunity to review and comment by other Governmental Parties -- all of which are part of the Amendment to the Consent Decree signed by CBS Corporation ("CBS"), and by U.S. EPA, the State of Indiana (including the Indiana Department of Environmental Management ("IDEM")), the City of Bloomington (including City of Bloomington Utilities), ("City") and Monroe County ("County") (collectively, "the Parties"). For purposes of this SOW, U.S. EPA, the State of Indiana (including the Indiana Department of Environmental Management ("IDEM")), the City of Bloomington (including City of Bloomington Utilities), and Monroe County are referred to as the "Governmental Parties." In performing this Work, CBS shall refer to U.S. EPA Guidance in preparing all deliverables for designing and implementing the remedial action to address PCB contamination in groundwater, surface water, and sediment.

II. DESCRIPTION OF THE REMEDIAL ACTION/PERFORMANCE STANDARDS

CBS shall design and implement the Remedial Action and Operation and Maintenance ("O&M") activities to meet the Performance Standards and specifications set forth in the LL RODA OU2/3, this SOW, and all plans developed by CBS and approved by U.S. EPA under this SOW. Performance Standards shall include cleanup standards, standards of control, quality criteria, and other substantive requirements, criteria or limitations as described in the LL RODA OU2/3, this SOW, and in all plans developed by CBS and approved by U.S. EPA under this SOW. These shall include Applicable or Relevant and Appropriate Requirements ("ARARs") identified in the LL RODA OU2/3, except to the extent that such ARARs were subject to the Technical Impracticability Waiver issued by U.S. EPA on September 29, 2006. Notwithstanding the designation of 327 IAC 2-1-6, Table 1 and IAC 5-2-11.1(h) as ARARs in the LL RODA OU2/3, the only limitation that

will apply to the discharge of pollutants from any water treatment plant operated pursuant to this SOW will be 0.3 parts per billion ("ppb') for PCBs.

The Remedial Action selected by U.S. EPA in the LL RODA OU2/3 is intended to protect human health and the environment from unacceptably high risks posed by PCB-contamination in groundwater, surface water, and sediment at the Site. The Remedial Action for the Source Control Operable Unit 1 was completed in 2000 and addressed the principal threat waste through the excavation and off-site disposal and off-site incineration of high concentrations of PCB waste, including PCB oil filled capacitors.

A. Definitions

Whenever terms listed below are used in this SOW or in plans and reports submitted in accordance with this SOW, the following definitions shall apply.

1) The term "Illinois Central Spring creek channel" or "ICS channel" shall mean the dry creek channel between the railroad culvert, which previously conveyed water from Illinois Central Spring under the railroad tracks, and the Swallowhole. The location of the former creek channel is shown on Figure 1.

2) The term "Illinois Central Spring" or "ICS" shall refer to the groundwater spring that emerges to surface water at the location marked on Figure 1.

3) The term "ICS emergence" shall refer to the fenced area surrounding the location where ICS emerges to surface water.

4) The term ICS Treatment Plant shall refer to the Illinois Central Spring Water Treatment Plant, which is shown on Figure 1. The term "existing ICS Treatment Plant shall refer to the storage and treatment systems existing at the ICSWTP prior to the modifications to the plant required under the LL RODA OU2/3 and this SOW.

5) The term "Quarry A Spring" shall refer to the groundwater spring that emerges to surface water at the location marked on Figure 1.

6) The term "Quarry B Spring" shall refer to the groundwater spring that emerges to surface water at the location marked on Figure 1.

7) The terms "Quarry Springs" or "Quarry Spring System" or "Quarry Spring area" shall refer to the combination of Quarry A Spring and Quarry B Spring.

8) The term "Third Street Culvert" shall refer to the culvert that begins below

Quarry B Spring, travels under Third Street, and ends at the West Branch of Clear Creek, as shown on Figure 1.

9) The term "Rinker Spring" shall refer to the groundwater spring that emerges to surface water at the location marked on Figure 1.

10) The term "Site' shall refer to the area with the geographic boundary shown on the map at Appendix B to the Amendment to the Consent Decree.

11) The term "Swallowhole" or "Swallowhole area" shall refer to area marked on Figure 1 where surface water sinks into the ground.

B. Performance Standards

CBS shall meet the following Performance Standards with respect to the remedial components selected in the LL RODA OU2/3:

Remedial Component	**Performance Standard**
Capture, store, and treat releases from Illinois Central Spring using the existing ICS Treatment Plant	1) Store up to 1.2 million gallons of untreated water released from Illinois Central Spring in two storage tanks. 2) Treat up to 1,000 gallons per minute ("gpm") of water released from Illinois Central Spring. 3) Operate the existing 1,000 gpm treatment system to reduce the volume of water in the storage tanks as expeditiously as possible. 4) Do not discharge effluent from the ICS Treatment Plant with a daily maximum concentration of PCBs in excess 0.3 ppb. Measurement of concentration of PCBs in effluent shall be taken at the point prior to the effluent mixing with clean stormwater from the ICS emergence area or water from the stormwater storage tank treatment system. Notwithstanding the designation of 327 IAC 2-1-6, Table 1 as an ARAR, only the discharge limit of 0.3 ppb for PCBs is designated as a Performance Standard.

Remedial Component	Performance Standard
	5) Comply with the approved Operation and Maintenance Plan, Volumes I through IX, dated June 2000 and revised February 2002, for the existing ICS Treatment Plant and all approved modifications of this plan, including (but not limited to) the modification incorporating the substantive requirements identified by the Indiana Department of the Environmental Management in accordance with paragraph II.E.6 of this SOW, subject to CBS's right to dispute such substantive requirements before the Court as arbitrary and capricious or otherwise not in accordance with law, as specified in Section II.E.6, below 6) Comply with Shut-off criteria set forth at Paragraph III.D.6 below.
Design, build, and operate stormwater storage tank treatment system to treat water that bypasses the existing ICS Treatment Plant	1) When untreated water from ICS exceeds the treatment and storage capacity of the existing ICS Treatment Plant, CBS shall convey overflow from the storage tanks to the new storage tank overflow treatment system. 2) The new storage tank overflow treatment system shall treat up to 5,000 gpm of overflow from the existing ICS Treatment Plant. 3) Treat bypass water with eight (8) Calgon Model 12 or equivalent carbon adsorption vessels each with 20,000 pounds of granular activated carbon and capable of being backwashed within a two (2) week period after end of storm bypasses.
Design and install an effluent line to transport water to the Third Street Culvert from the ICS Treatment Plant, stormwater storage tank treatment system, and currently collected stormwater from the area surrounding the ICS emergence	Effluent line shall capture and transport the combined flow of 1,000 gpm from the primary treatment system at the ICS Treatment Plant, 5,000 gpm from the stormwater storage tank treatment system, and all stormwater from the area surrounding the ICS emergence where stormwater was collected prior to the Effective Date of the Amendment to the Consent Decree.

Remedial Component	Performance Standard
Cleanup of PCB-contaminated soil and sediment at the ICS emergence, former ICS channel, Swallowhole area and Quarry Springs/Rinker Spring area	1) Remediate areas located in final drainage ways to achieve an average PCB concentration of 1 ppm or less with a not-to exceed PCB concentration of 5 ppm. 2) Remediate areas in final non-drainage ways to achieve an average PCB concentration of 5 ppm or less with a not-to exceed PCB concentration of 10 ppm.
Design, build, and operate a collection system that will capture spring water from the Quarry Spring System and Rinker Spring and pump water to the ICSWTP for treatment	Comply with Performance Standards determined by U.S. EPA for collection and treatment of contaminated spring water. U.S. EPA shall make such a determination taking into account the final flow from the springs and the mass of PCBs released to surface water after CBS installs the new effluent line and removes contaminated soil and sediment from the ICS emergence, former ICS Channel, Swallowhole area, and Quarry Springs/Rinker Spring area.

Compliance with the above Performance Standards is deemed equivalent to treating 99.9% of the mass of PCBs released from ICS and CBS shall not be required to make any other demonstration that 99.9% of the PCB mass has been removed.

C. Major Remedial Action Components

The present remedial action addresses PCBs that have migrated and are migrating from the Site through groundwater conduits that are hydraulically connected to nearby springs. CBS shall implement the Remedial Action selected by performing the following:

1) CBS shall capture groundwater emerging from Illinois Central Spring (ICS) and store and treat this water at the existing Illinois Central Spring Water Treatment Plant ("ICS Treatment Plant"), which includes the existing 1,000 gpm water treatment plant and the existing 1.2 million gallons of stormwater storage. The daily maximum concentration of PCBs in the effluent from the existing ICS Treatment Plant shall not exceed 0.3 ppb. When flows exceed the 1,000 gpm treatment capacity of the existing ICS Treatment Plant, CBS shall convey the water to the existing stormwater storage tanks with a maximum storage capacity of 1.2 million gallons. CBS shall operate the existing 1,000 gpm treatment system to reduce the volume of water in the storage tanks as expeditiously as possible. CBS shall assume operation of the ICS Treatment Plant no later than 20 days after entry of the Amendment to the Consent Decree. After assuming operation of the ICS Treatment Plant, CBS shall comply with all requirements of the approved Operation and Maintenance Plan of the existing ICS Treatment Plant, Volumes I through IX, dated June 2000 and revised February 2002. Subject to

Paragraph II.E.6, CBS shall modify this plan to incorporate substantive requirements identified by the State of Indiana after entry of the Amendment to the Consent Decree.

2) CBS shall expand the existing ICS Treatment Plant by designing, constructing, and operating a storage tank overflow water treatment system, which shall treat PCB-contaminated water that overflows the existing stormwater storage tanks during large storm events when the storage tanks reach their 1.2 million gallon capacity. This storage tank overflow water treatment system, which shall supplement the existing 1,000 gpm treatment system, shall consist of eight Calgon Model 12 (or the equivalent) carbon adsorption vessels each with 20,000 pounds of granular activated carbon and capable of being backwashed within a two week timeframe. During the design phase, CBS may petition U.S. EPA to approve a different storage tank overflow water treatment system based upon a demonstration that the proposed system is equivalent to, or better than, the eight carbon adsorption vessel system in terms of reducing the mass of PCBs released from Illinois Central Spring.

3) CBS shall install a new effluent line to handle all water discharged from the combined treatment systems at ICS Treatment Plant, as well as all the currently collected stormwater from the area surrounding the ICS emergence. The new effluent line is to discharge directly to the existing Third Street Culvert, thereby bypassing the Swallowhole area. CBS shall also complete an investigation of the effects of the effluent line change on flow and PCB concentrations in Rinker Spring and Quarry Springs.

4) CBS shall capture releases of spring water from the Quarry Spring System and Rinker Spring and treat this water at the ICS Treatment Plant if the PCB concentrations from the springs are greater than 0.3 part per billion ("ppb") PCBs. It has been estimated that Quarry B spring currently flows on average at 5 gpm with a maximum flow of 500 gpm. Rinker Spring has been estimated to flow currently at 2 gpm on average with a maximum flow of 100 gpm. It is likely that the new effluent line will reduce the flow conditions during both low and high flow conditions. As a result, based upon the investigation conducted by CBS as set forth in subparagraph 3 above, U.S. EPA shall determine the final treatment requirements for each spring, taking into account the final flow from the springs and the mass of PCBs released to surface water, subject to CBS's right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law.

5) CBS shall implement a soil/sediment cleanup at the ICS emergence, Swallowhole area, and Quarry Springs/Rinker Spring area. The cleanup criteria are 1 part per million ("ppm") PCBs on average with a not-to-exceed concentration of 5 ppm PCBs in drainage ways and 5 ppm PCBs on average with a not-to-exceed concentration of 10 ppm in non-drainage ways. Final volumes will be determined by U.S. EPA based upon pre-design sampling. If the plant malfunctions and

untreated water potentially re-contaminates the ICS Channel or surrounding areas, CBS shall sample the areas that came into contact with the untreated water. In the event that the sample results show PCB contamination in excess of the cleanup criteria set forth in this paragraph, U.S. EPA shall determine whether a cleanup is necessary to achieve the cleanup criteria. In the event that U.S. EPA makes such a determination, CBS shall implement the cleanup, subject to CBS's right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law. CBS shall not raise the Covenant Not to Sue in the Amendment to the Consent Decree as a defense to EPA's determination that CBS shall conduct a removal of sediment at the ICS emergence, Swallowhole area, and Quarry Springs/Rinker Spring Area to meet the cleanup criteria in this paragraph.

6) CBS shall perform long-term groundwater monitoring, including a survey of domestic wells within a 5,000-foot radius of the Site and within the hydrogeological zone of influence of the Site. Based upon this well survey, U.S. EPA may determine that wells identified in the survey shall be sampled and tested for PCBs, and in the event that U.S. EPA makes such a determination, CBS shall implement this sampling and testing in accordance with an U.S. EPA-approved plan and schedule. As part of its 5-year review of the Remedial Action, U.S. EPA may determine that CBS shall update the well survey and conduct further sampling and testing of wells within a 5,000-foot radius of the Site and within the hydrogeological zone of influence. In the event that U.S. EPA makes such a determination, CBS shall implement the well survey and conduct the sampling and testing, subject to CBS's right to challenge U.S. EPA's determination under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law. In the event that domestic wells within the 5,000-foot radius of the Site and within the hydrogeological zone of influence contain detectable concentrations of PCBs, CBS shall provide an alternative potable water supply by either hooking up the well user to municipal waterlines or by providing a water treatment system for PCBs.

7) CBS shall prepare a revised Operations and Maintenance Plan for the ICSWTP to cover the new remedial components required under this SOW.

8) CBS shall use best efforts to put into place appropriate deed restrictions upon properties owned by persons other than the City that are within the boundaries of the Site or may impact the Site.

9) CBS shall maintain fencing around the ICSWTP, the Swallowhole, and the ICS emergence until CBS demonstrates to U.S. EPA that cleanup standards have been achieved in these areas.

10) CBS shall use best efforts to put into place agreements with property owners to ensure long-term access to the Site for itself and its contractors.

D. Remedial Action Phases

As described more fully in Section III below, CBS shall implement the Remedial Action set forth in the Lemon Lane ROD Amendment for Operable Units 2 and 3. The Remedial Action will take place in three phases, which are as follows:

1. Phase 1

a) CBS shall implement a plan approved by U.S. EPA to investigate PCB-contaminated soils and sediment at the ICS emergence, Swallowhole, Rinker Spring, and Quarry Spring areas for the purpose of delineating the areas of contamination.

b) CBS shall implement a plan approved by U.S. EPA to investigate surface water drainage near the Swallowhole, Quarry Springs area, and Rinker Spring to identify and evaluate surface water drainage in these areas.

2. Phase 2

a) CBS shall design and execute a plan approved by U.S. EPA to remove PCB-contaminated soil and sediment at the ICS Emergence, Swallowhole, and Quarry Springs/Rinker Spring areas.

b) CBS shall design and implement a plan approved by U.S. EPA to extend the effluent line from the water treatment plant to the culvert near Third Street.

c) CBS shall design, subject to U.S. EPA review and approval, the stormwater overflow treatment system at ICS Treatment Plant.

d) CBS shall implement a plan approved by U.S. EPA to investigate the effects of the new effluent line and soil/sediment cleanup on flow and PCB concentrations at Rinker and Quarry Springs.

3. Phase 3

a) CBS shall construct the U.S. EPA-approved stormwater overflow treatment system.

b) CBS shall capture releases of PCB-contaminated spring

water from the Quarry Spring System and Rinker Spring and treat this water at the ICS Treatment Plant if the PCB concentrations from the springs are greater than 0.3 part per billion (ppb) PCBs. It is likely that the new effluent line will reduce the flow during low and high flow conditions. Consequently, based upon the investigation conducted by CBS in Phase 2 with respect to the impact of the new effluent line and soil/sediment cleanup on Rinker Spring and the Quarry Spring System, U.S. EPA shall determine the final collection and treatment requirements for each spring taking into account the final flow from the springs and the mass of PCBs released to surface water, subject to CBS's right to challenge U.S. EPA's determination under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that the determination is arbitrary and capricious or otherwise not in accordance with law.

E. Remedy Components

1. Site Security

CBS shall maintain the current site security around the ICSWTP to prevent access and vandalism to the plant. CBS may seek approval from U.S. EPA to remove the fence surrounding the Swallowhole area prior to the termination of this Consent Decree. U.S. EPA shall grant permission to remove the fence if CBS demonstrates to U.S. EPA that the cleanup standards have been met and will continue to be met in the long term. CBS may also seek approval from U.S. EPA to reduce the size of the fence surrounding the ICS emergence area. U.S. EPA shall grant approval to reduce the size of this fence where CBS demonstrates to U.S. EPA that PCB sampling shows concentrations less than 1 ppm on average, with a not-to-exceed PCB concentration of 5 ppm for areas outside the proposed fence line. CBS may challenge U.S. EPA's denial of a petition under this paragraph pursuant to Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that the denial is arbitrary and capricious or otherwise not in accordance with law.

2. Site Access

To the extent that the Site or any other property to which access is required for the implementation of the Lemon Lane Landfill ROD Amendments and this SOW is owned or controlled by persons other than CBS or the City, and to the extent that access to such property has not yet been secured through agreements with the property owners, CBS shall use its best efforts to secure from such persons access for CBS, as well as for the Governmental Parties and their representatives, including, but not limited to, their contractors, as necessary to effectuate the ROD Amendments, and this SOW. If any access required to complete the Remedial Action is not obtained within 30 days after the date U.S. EPA notifies CBS in writing that additional access beyond that previously secured is necessary, then CBS shall promptly notify the United States in writing, and shall include in that notification a summary of the steps CBS has taken to attempt to

obtain access. The Parties all remain subject to the requirements of Paragraph 88 of the Original Consent Decree, provided that nothing herein or in the Original Consent Decree shall require the United States to violate the Anti-Deficiency Act, 31. U.S.C. 1341 *et seq.*

3. Institutional Controls

a) Pursuant to the schedule in Section VI, CBS and the City of Bloomington shall submit an Institutional Controls ("ICs") Work Plan for review and approval. The City of Bloomington shall be responsible for implementing the institutional controls for property it owns and CBS shall be responsible for all other properties requiring institutional controls. The IC Work Plan shall include the following:

i) A map that identifies the boundaries of the restricted areas, boundaries of the Site, property ownership, streets, easements, encumbrances, assessor's parcel number, or other recorded plat or survey information.

ii) A legal description of each restricted area prepared according to current ALTA Survey guidelines.

iii) Draft restrictive covenants and easements for the restricted areas that are enforceable under the laws of the State of Indiana and are substantially in the form set forth in Attachment A.

iv) A current title insurance commitment in the form of ALTA Commitment form -1982 (as amended) from a title company, which shows title to the restricted areas to be free and clear of all prior liens and encumbrances.

v) Copies of encumbrances referenced in the Title commitment. Identification of encumbrances that negatively impact the restricted areas. Copies of requests for subrogation agreements for such encumbrances. Identification of the encumbrances on paper and maps that depict parcel numbers and the area impacted by the encumbrance.

b) The institutional controls shall set forth the following, unless the parties mutually agree otherwise:

i) The area within the existing fence at Lemon Lane Landfill which also includes the Pelfree portion of the landfill property shall not be disturbed by development.

ii) Groundwater usage shall be restricted at the Lemon Lane Landfill and at the Illinois Central Spring property.

iii) Development shall be prohibited or restricted at the Illinois Central Spring area, the Swallowhole area and Quarry Springs area based upon the final cleanup levels and protection of remedial components. Future land use that is not consistent with the final cleanup levels or components of the remedy at these areas shall be prohibited.

iv) Give access rights to U.S. EPA, IDEM, CBS, the City, the County and their successors.

v) Give rights to U.S. EPA, IDEM and CBS to enforce land use restrictions and access rights.

c) Pursuant to the schedule in Section VI, CBS shall arrange for the execution of such restrictive covenants and recording of such executed restrictive covenants with the Monroe County recorder. CBS shall use best efforts to secure the execution of the restrictive covenants from such owners. The United States and the State of Indiana may consider, in their unreviewable discretion, using their enforcement authorities (including condemnation) to assist CBS in obtaining implementation of restrictive covenants in appropriate circumstances. In the event that any such use of enforcement authorities (including condemnation) results in an obligation to pay just compensation, CBS shall reimburse the United States or the State of Indiana, as applicable, for just compensation. Such payment shall be made in accordance with the procedures provided to CBS by the United States or the State of Indiana, as applicable. If both the United States and the State of Indiana decide not to use their enforcement authorities (including condemnation) to obtain a restrictive covenant from a property owner, and CBS has not been able to reach agreement with the property owner to obtain the restrictive covenant after exerting its best efforts, CBS shall not be required to take any further action to obtain the restrictive covenant.

4. Interim Groundwater Monitoring Program for Remedial Design and Remedial Action

CBS shall continue to monitor surface water, flow, and groundwater in accordance with the 2003 Long-term Groundwater Monitoring Plan for the Lemon Lane Landfill from the Entry of the Amendment to the Consent Decree until approval of the Long-term Groundwater Monitoring Plan. CBS may choose to remove the Quarry Springs and Rinker Spring from the monitoring program until the Rinker Spring/Quarry Spring and Surface Water Drainage Investigation is implemented in accordance with this SOW. In addition, CBS may request additional modifications to the interim monitoring program.

5. Long-term Groundwater Monitoring Plan

In accordance with the schedule set forth in Section VI, CBS shall develop and submit to

U.S. EPA for review and approval a revised and updated version of the 2003 Long-term Groundwater Monitoring Plan, supplementing the existing requirements for the source control operable unit with new requirements for the groundwater operable unit and sediment operable unit. As part of this plan, CBS shall conduct a well-water user survey as described below. Upon approval by U.S. EPA, CBS shall implement the approved Long-term Groundwater Monitoring Plan.

In the well-water survey, CBS will identify well water users within a 5,000-foot radius of the Site and within the hydrogeological zone of influence of the Site. The survey shall identify the name of the property owner, the address of the property, and the primary use of the well. Once the survey is complete, the U.S. EPA may make a determination that identified wells require sampling and testing for PCBs. If U.S. EPA makes such a determination, CBS shall conduct the sampling and testing in accordance with an U.S. EPA-approved plan and schedule. As part of its 5-year review of the Remedial Action, U.S. EPA may determine that CBS shall update the well survey and conduct further sampling and testing of wells within a 5,000-foot radius of the Site and within the hydrogeological zone of influence. In the event that U.S. EPA makes such a determination, CBS shall implement the well survey and conduct the sampling and testing, subject to CBS's right to challenge U.S. EPA's determination under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law. In the event that domestic wells within the 5,000-foot radius of the Site and within the hydrogeological zone of influence contain detectable concentrations of PCBs, CBS shall provide an alternative potable water supply by either hooking up the well user to municipal water supplies or by providing a water treatment system for PCBs.

6. National Pollution Discharge Elimination System Substantive Requirements

Based upon correspondence from IDEM at the time of the LL RODA OU2/3, the effluent limit for PCBs discharged by the water treatment plant is set at a daily maximum concentration of 0.3 ppb, and discharge criteria for other constituents are not required. After IDEM develops other substantive National Pollutant Discharge Elimination System ("NPDES") requirements pursuant to the ARARs described in the LL RODA OU2/3, CBS shall modify the Operational & Maintenance Plan to include the new requirements identified by IDEM, except that CBS may challenge IDEM's determination under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that new substantive requirements are arbitrary and capricious or otherwise not in accordance with law.

III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION

CBS shall implement the Remedial Design and Remedial Action ("RD/RA") for the groundwater and sediment operable units in accordance with plans approved by U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties, and the schedules set forth in Section VI.

A. RD/RA Work Plan

In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a RD/RA Work Plan for the groundwater and sediment operable units describing in detail the implementation of the phased RD/RA required by this SOW. The Draft RD/RA Work Plan shall describe the general construction approach to complete the three phases, site environmental controls, additional data collection, cleanup confirmation methods, and proposed schedule of activities. After receipt of U.S. EPA's comments, CBS shall submit to U.S. EPA for review and approval a Final RD/RA Work Plan in accordance with the schedule set forth in Section VI. Following approval, CBS shall implement the Final RD/RA Work plan in accordance with the approved schedules.

B. Remediation Phases

1. Phase 1 Activities

a. Sampling and Analysis to Delineate PCB Contamination in Soils and Sediment

i. In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a Draft Sampling and Analysis Plan ("SAP") for the delineation of PCB contaminated soils and sediment at the ICS emergence, the Swallowhole, the Quarry Springs area, and the former ICS Channel. The SAP shall describe the sampling methodology to ensure that the areas of contamination identified by CBS during the pre-ROD Amendment investigation have been fully delineated. The SAP shall require both surface sampling and borings.

ii. After receipt of U.S. EPA's comments on the draft SAP, CBS shall submit a final SAP to U.S. EPA for review and approval in accordance with the schedule set forth in Section VI.

iii. Upon receipt of U.S. EPA's approval of the final SAP, CBS shall implement the approved SAP. In accordance with the schedule

set forth in Section VI, CBS shall submit to U.S. EPA for review and approval a final report presenting details on the sampling event and the validated sampling results.

b. Investigation Plan for Rinker/Quarry Springs and Surface Water Drainage.

i. In accordance with the Schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and approval a Rinker Spring/Quarry Springs and Surface Water Drainage Investigation Plan to continuously monitor flow at Rinker Spring/Quarry Springs. This plan shall require CBS to conduct sampling for PCBs to ensure that Rinker Spring, Quarry Spring System and the surface water drainage in the vicinity of the Swallowhole have been properly characterized. In addition, the plan shall require CBS to sample PCBs and measure flow from Rinker Springs and Quarry Springs during storm events. Part of this investigation shall include a surface water drainage study to determine how to minimize the effects of surface water drainage on the site remedy components.

ii. Upon approval by U.S. EPA of the investigation plan, CBS shall implement the plan in accordance with approved schedules. After CBS installs the new effluent line in Phase 2, CBS shall continue to investigate Rinker Spring and the Quarry Spring area to determine if water from these springs will require treatment. The results of the investigation shall be documented in a report to be developed by CBS pursuant to the schedule in Section VI.

2. Phase 2 Activities

a. Excavation and Disposal of Contaminated Soil and Sediment

i) In accordance with the schedule set forth in Section VI, CBS shall prepare and submit to U.S. EPA for review and comment a Draft Excavation Plan for Soils and Sediments at the ICS emergence, Swallowhole, Quarry Springs/Rinker Springs area, and former ICS Channel. The plan shall require CBS to remove PCB-contaminated soil and sediment in those areas delineated in SAP investigation in Phase I and shall require CBS to achieve a cleanup standard of 1 ppm PCBs on average with a not-to-exceed standard of 5 ppm PCBs in final drainage areas and a standard of 5 ppm PCBs on average with a not-to-exceed PCB concentration of 10 ppm in final non-drainage areas. For the purpose of this SOW, a drainage areas is defined as a natural or constructed soil or rock-lined channel designed to convey storm water or ICS Treatment Plant effluent.

ii) Upon receipt of U.S. EPA's comments on the Draft Excavation Plan, CBS shall submit to U.S. EPA for review and approval a final Excavation Plan in accordance with the schedule in Section VI. The plan shall require that, pursuant to the Toxic Substances Control Act ("TSCA") - 40 CFR § 761.60 and CERCLA off-site policy 40 CFR § 300.440, all excavated soils and sediments containing concentrations greater than or equal to 50 ppb PCBs shall be disposed of by CBS off-site in a licensed, chemical waste landfill selected by CBS and compliant with the CERCLA off-site policy (40 CFR § 300.440). Further, the plan shall require that, pursuant to TSCA – 40 CFR § 761.60, all excavated soils and sediments contaminated with less than 50 ppm PCBs shall be disposed of by CBS off-site in a licensed, special waste landfill selected by CBS and compliant with the CERCLA off-site policy (40 CFR § 300.440). At its option, CBS may propose to dispose of all soils and sediments contaminated with PCBs, regardless of concentration, at a chemical waste landfill, approved and compliant with 40 CFR § 761.75.

iii) Upon approval of the final Excavation Plan, CBS shall implement the plan in accordance with the schedule set forth in Section VI and present verification sampling results to U.S. EPA.

b. Extension of Effluent Line

i) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and comment a preliminary design plan (50% design completion) for a new effluent line to the Third Street culvert, which shall carry all treated water from the ICS Treatment Plant, including water from the stormwater treatment system, and all water from any surface water drainage from the ICS emergence that was collected prior to the entry of this Amendment to the Consent Decree. The purpose of the new effluent line is to prevent treated water and surface water drainage from entering the Swallowhole area, which affects the flow of the Quarry Springs. CBS may propose to seal the Swallowhole area.

ii) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and approval a final design for the new effluent line.

iii) Upon U.S. EPA approval of the final design for the effluent line, CBS shall construct the new effluent line in accordance with the approved final design and the schedule set forth in Section VI.

c. Design of Storage Tank Overflow Water Treatment System

i) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and comment a preliminary design (50% design completion) of the storage tank overflow water treatment system described in Paragraph II.C.2 of this SOW.

ii) After receipt of U.S. EPA's comments, CBS shall submit to U.S. EPA for review and approval a final design of the Storage Tank Overflow Water Treatment System described in Paragraph II.C.2 of this SOW in accordance with the schedule set forth in Section VI.

3. Phase 3 Activities

a. Construction and Operation of Storage Tank Overflow Water Treatment System

i) Upon U.S. EPA approval of the final design for the overflow water treatment system, CBS shall construct the approved system in accordance with the approved final design and the schedule set forth in Section VI. After construction is completed for the stormwater overflow treatment system, CBS shall operate and test the stormwater overflow treatment system to ensure that it meets the approved design parameters.

b. Design and Construction of the Collection System for Rinker Spring and Quarry Springs

i) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and comment a preliminary design of a water collection system for Rinker Spring and Quarry Springs. The proposed system shall be based upon the Rinker Spring/Quarry Springs investigation, including the investigation of the impact of the installation of the new effluent line and the soil/sediment cleanup.

ii) In accordance with the schedule set forth in Section VI, CBS shall submit for review and approval by U.S. EPA a final design for the water collection system.

iii) Upon U.S. EPA approval of the final design, CBS shall proceed to construct the collection system in accordance with the approved final design and the schedule set forth in Section VI.

C. Submittal of Preliminary and Final Designs

As required under Subparagraph B (Remediation Phases), CBS shall submit a Preliminary Design (50% complete) and a Final Design (100% complete) documents for (1) the installation of the new effluent line, (2) construction of the storage tank overflow treatment system, and (3) the Rinker Spring and Quarry Springs collection system and ICSWTP plant modifications to handle the additional flow.

The Preliminary Design shall include the following:

- Preliminary drawings and sketches
- Design assumptions and parameters, including design restrictions
- Design calculations
- Results of additional field sampling or tests
- Compliance with ARARs
- Technical Specifications
- Proposed siting/locations of processes/construction activities
- Real estate, easement and substantive permit requirements

CBS shall resolve with U.S. EPA, after reasonable opportunity for review and comment by other Governmental Parties, all comments on the Preliminary Design for the three design submittals described above. The Final Design shall include construction details, project schedules, and bid specifications, and shall be subject to the approval process set forth in Section V.

D. Remedial Action

1. Remedial Action Construction

Upon approval of the final designs for the installation of the new effluent line, construction of the storage tank overflow treatment system, and the Rinker Spring and Quarry Springs collection system and ICS Treatment Plant modifications, CBS shall implement the construction activities in accordance with the approved final designs and the schedule in Section VI. During the construction activities, weekly construction meetings shall be held to discuss the construction progress, future activities, and proposed changes. CBS may modify the frequency of these meetings with agreement of the

Governmental Parties. Telephone calls may be substituted for a meeting if agreed upon between CBS and U.S. EPA.

2. Final Construction Inspection

After completion of the new effluent line, storage tank overflow treatment system, and the Rinker/Quarry Springs collection and modifications of the ICS Treatment Plant, CBS shall notify U.S. EPA for the purpose of conducting a final construction inspection. The purpose of the inspection is to determine if the construction is complete and consistent with the approved design and plans, this SOW, and the ROD Amendment. A final inspection report submitted to U.S. EPA for approval will document any items of noncompliance, and actions required to resolve them, along with a schedule to complete the work.

3. Completion of Remedial Action Report

Within 90 days after CBS concludes that the Remedial Action has been fully performed and the Performance Standards have been attained, CBS shall schedule and conduct a pre-certification inspection to be attended by CBS, U.S. EPA, the City, the County and State of Indiana. If, after the pre-certification inspection, CBS still believes that the Remedial Action has been fully performed and the Performance Standards have been attained, it shall, within 30 days of the inspection, submit to U.S. EPA for approval (with a copy to the State of Indiana) a written report requesting certification. In the report, a registered professional engineer and CBS shall state that the Remedial Action has been completed in full satisfaction of the requirements of the Amendment to the Consent Decree and this SOW. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of CBS or CBS's project Coordinator:

> "To the best of my knowledge after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after completion of the pre-certification inspection and receipt and review of the written report, U.S. EPA after reasonable opportunity to review and comment by other Governmental Parties, determines that the Remedial Action or any portion thereof has not been completed in accordance with the Amendment to the Consent Decree or this SOW, or that the Performance Standards have not been achieved, U.S. EPA will notify CBS in writing of the activities that must be undertaken by CBS to complete the Remedial Action and achieve the Performance Standards, provided, however, that U.S. EPA may only require CBS to perform such activities consistent with this SOW, the LL RODA OU2/3

and the Amendment to the Consent Decree. The U.S. EPA will set forth in the notice a schedule for performance of such activities consistent with the Amendment to the Consent Decree, the LL RODA OU2/3 and SOW or require CBS to submit a schedule to U.S. EPA for approval. CBS shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge the activities described in the notice. CBS shall bear the burden of demonstrating that its position or actions complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

If U.S. EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by the Governmental Parties, that the Remedial Action has been performed in accordance with the Amendment to the Consent Decree and SOW and that the Performance Standards have been achieved, U.S. EPA will so certify in writing to CBS. Certification of Completion of the Remedial Action shall not affect CBS's uncompleted obligations under previously-approved design documents and work plans.

4. Operation and Maintenance Plan

After assuming operation of the ICS Treatment, CBS shall comply with the Operating & Maintenance ("O&M") Plan, Volumes I through IX, approved by U.S. EPA on June 2000 and revised February 2002 for the existing ICS Treatment Plant. This plan, and all subsequent modifications of the O&M Plan approved by U.S. EPA, shall be enforceable under the Consent Decree. In accordance with paragraph II.E. 6, CBS shall modify the O&M Plan to include substantive requirements identified by IDEM after entry of the Amendment to the Consent Decree.

CBS shall submit a revised O&M Plan for the ICS Treatment Plant addressing the requirements of the groundwater operable unit. The format shall be similar to the approved O & M Plan and will be expanded to include the State of Indiana NPDES substantive requirements. The revised O&M plan will be submitted in accordance with the schedule in Section VI for review and approval by the U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties. Upon approval by U.S. EPA, CBS shall implement the approved revised O & M Plan for the ICS Treatment Plant in accordance with the schedules therein addressing the requirements of the groundwater operable unit.

The O&M Plan shall also provide for maintaining the soil and sediment cleanup levels after the cleanup levels have been achieved, if the ICS Treatment Plant malfunctions and untreated water contaminates the drainage way or surrounding areas. In such an event, the O&M Plan shall require CBS to sample the areas that came into contact with the untreated water. In the event that the sample results show PCB contamination in excess

of the cleanup criteria set forth in this SOW, U.S. EPA shall determine whether a cleanup is necessary to achieve the cleanup criteria. In the event that U.S. EPA makes such a determination, CBS shall implement the cleanup, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law.

After CBS completes construction of the Collection System for Rinker Spring and Quarry Springs, CBS shall submit an update to the O&M Plan setting forth the operational and maintenance requirements with respect to the collection system. The updated O&M plan will be submitted in accordance with the schedule in Section VI for review and approval by the U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties. Upon approval by U.S. EPA, CBS shall implement the approved updated O & M Plan in accordance with the schedules therein.

6. ICS Treatment Plant Shut-Off Criteria

CBS shall operate the ICS Treatment Plant until the PCBs in water from the ICS is equal to or less than 0.3 ppb PCBs for a 12-month period. CBS may propose an alternative shut-off criteria and, if U.S. EPA determines that the alternative shut-off criteria provides a standard that is protective of human health and the environment, U.S. EPA shall propose to amend the LL RODA OU2/3 consistent with the substantive and procedural requirements of CERCLA and the National Contingency Plan. In the event that U.S. EPA amends the LL RODA OU2/3 to include the new shut-off criteria, the parties shall petition the Court to modify the Consent Decree to include the new shut-off criteria. CBS may propose to decommission certain ICS Treatment Plant remedy components based upon spring flow and PCB concentrations in the future.

Regardless of whether the shut-off criteria in this Paragraph III.D.6 remains the unchanged or whether it is superseded by an alternative shut-off criteria, any dispute about whether the shut-off criteria has been achieved will be resolved in accordance with Section XXIV (Dispute Resolution) of the Original Consent Decree. CBS shall bear the burden of demonstrating that its position complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

7. Completion of the Work

Within 90 days after CBS concludes that all phases of the Work (including O & M) have been fully performed, CBS shall schedule and conduct a pre-certification inspection to be attended by CBS, U.S. EPA, the City, the County and the State of Indiana. For the purposes of this Paragraph III.D.7, the term "Work" shall include all Work relating to Lemon Lane Landfill, including Work relating to the Source Control Operable Unit required under Paragraph IV.B.1 of the Amendment to the Consent Decree.

If, after the pre-certification inspection, CBS still believes that the Work has been fully performed, CBS shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of the Consent Decree and this SOW. The report shall contain the following statement, signed by a responsible corporate official of CBS or CBS's Project Coordinator:

> "To the best of my knowledge after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after review of the written report, U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties, determines that any portion of the Work has not been completed in accordance with the Amendment to the Consent Decree , the LL RODA OU2/3, this SOW and documents incorporated by reference under Paragraph IV.B.1 of the Amendment to the Consent Decree, U.S. EPA will notify CBS in writing of the activities that must be undertaken by CBS pursuant to this Consent Decree to complete the Work, provided, however, that U.S. EPA may only require CBS to perform such activities consistent with the Amendment to the Consent Decree, the LL RODA OU2/3, this SOW, and documents incorporated by reference under Paragraph IV.B.1 of the Amendment to the Consent Decree. U.S. EPA will set forth in the notice a schedule for performance of such activities consistent with the Amendment to the Consent Decree, the LL RODA OU2/3, this SOW and documents incorporated by reference under Paragraph IV.B.1 of the Amendment to the Consent Decree or require CBS to submit a schedule to U.S. EPA for approval. CBS shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge the activities described in the notice. CBS shall bear the burden of demonstrating that its position or actions complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

If U.S. EPA concludes, based on the initial or any subsequent request for Certification of Completion by CBS, and after a reasonable opportunity for review and comment by the other Governmental Parties, that the Work has been performed in accordance with the Consent Decree, U.S. EPA will so notify CBS in writing.

8. Closure Plan

No later than 30 days after receipt of U.S. EPA's certification of completion of Work, CBS shall submit to U.S. EPA for review and approval a plan for the closure of the Portions of the Site relating to Operable Units 2 and 3. The closure plan shall detail

closure activities, post-closure activities, and schedules of implementation. Upon approval of the closure plan, CBS shall implement the plan in accordance with the approved schedule.

IV. CONTENT OF SUPPORTING PLANS

In accordance with the schedules in Section VI, CBS shall develop and submit to U.S. EPA for review and comment, after reasonable opportunity for review and comment by the other Governmental Parties, a Health and Safety Plan. At the same time that it submits a Health and Safety Plan for review and comment, CBS shall submit to U.S. EPA for review and approval, after a reasonable opportunity for review and comment by the other Governmental Parties, a Quality Assurance Project Plan. The following section describes the required contents of each of these supporting plans. During all Work performed pursuant to this SOW, CBS shall implement and comply with the approved Health and Safety Plan and Quality Assurance Project Plan.

A. Health and Safety Plan

CBS shall develop a Health and Safety Plan which is designed to protect on-site personnel and area residents from physical, chemical, and all other hazards posed by this remedial action. The Health and Safety Plan shall develop the performance levels and criteria necessary to address the following areas:

- Facility Description
- Personnel
- Levels of Protection
- Safe work practices and safeguards
- Medical surveillance
- Personal and environmental air monitoring
- Personal protective equipment
- Personal hygiene
- Decontamination
- Site work zones

- Contaminant control
- Contingency and emergency planning
- Logs, reports, and record keeping

B. Quality Assurance Project Plan

In accordance with the schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and approval a revised Quality Assurance Project Plan ("QAPP") to address sampling and analysis, along with data handling, for samples collected in all phases of future Site work. CBS shall follow the latest U.S. EPA guidance on the development of QAPPs (Instructions on the preparation of a Superfund Division Quality Assurance Project Plan, revision 0, June 2000).

V. APPROVAL OF DELIVERABLES

CBS shall provide to the other Governmental Parties a copy of any plan, report, or other item that CBS is required to submit to U.S. EPA for approval or comment pursuant to this SOW. After review of any plan, report, or other item that is required to be submitted for approval pursuant to this SOW, U.S. EPA, after reasonable opportunity for review and comment by the other Governmental Parties, shall, in writing: (i) approve the submission; (ii) approve the submission upon specified conditions; (iii) approve part of the submission and disapprove the remainder; or (iv) disapprove the submission.

If the submission is approved, then CBS shall take all actions required by the plan, report, or other document, in accordance with the schedules and requirements of the plan, report, or other document, as approved. If the submission is conditionally approved, then CBS shall, upon written direction of U.S. EPA, take all actions required by the approved plan, report or other item, subject to CBS's right to dispute under Section XXIV (Dispute Resolution) of the Original Decree the conditions upon which U.S. EPA based its approval. If the submission is approved only in part, then CBS shall, upon written direction of U.S. EPA, take all actions required by the approved plan, report, or other item that U.S. EPA determines are technically severable from any disapproved portions, subject to CBS's right to dispute under Section XXIV (Dispute Resolution) of the Original Consent Decree U.S. EPA's determination as to the severability of the approved submission. CBS may dispute before the Court U.S. EPA's disapproval of part or all of any submission as arbitrary and capricious or otherwise not in accordance with law.

Within 45 days of U.S. EPA's disapproval of any submission (or such longer time as the parties may agree to in writing), CBS shall correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval, unless CBS has timely invoked dispute resolution under Section XXIV (Dispute Resolution) of the Original

Consent Decree. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole or in part, U.S. EPA may again require CBS to correct any deficiencies, in accordance with the preceding paragraphs, or may itself correct any deficiencies, subject to CBS's right to dispute U.S. EPA's decision under Section XXIV (Dispute Resolution) of the Original Consent Decree as arbitrary and capricious or otherwise not in accordance with law.

VI. SUMMARY OF MAJOR DELIVERABLES AND SCHEDULE

The following schedule shall be followed unless the parties mutually agree otherwise:

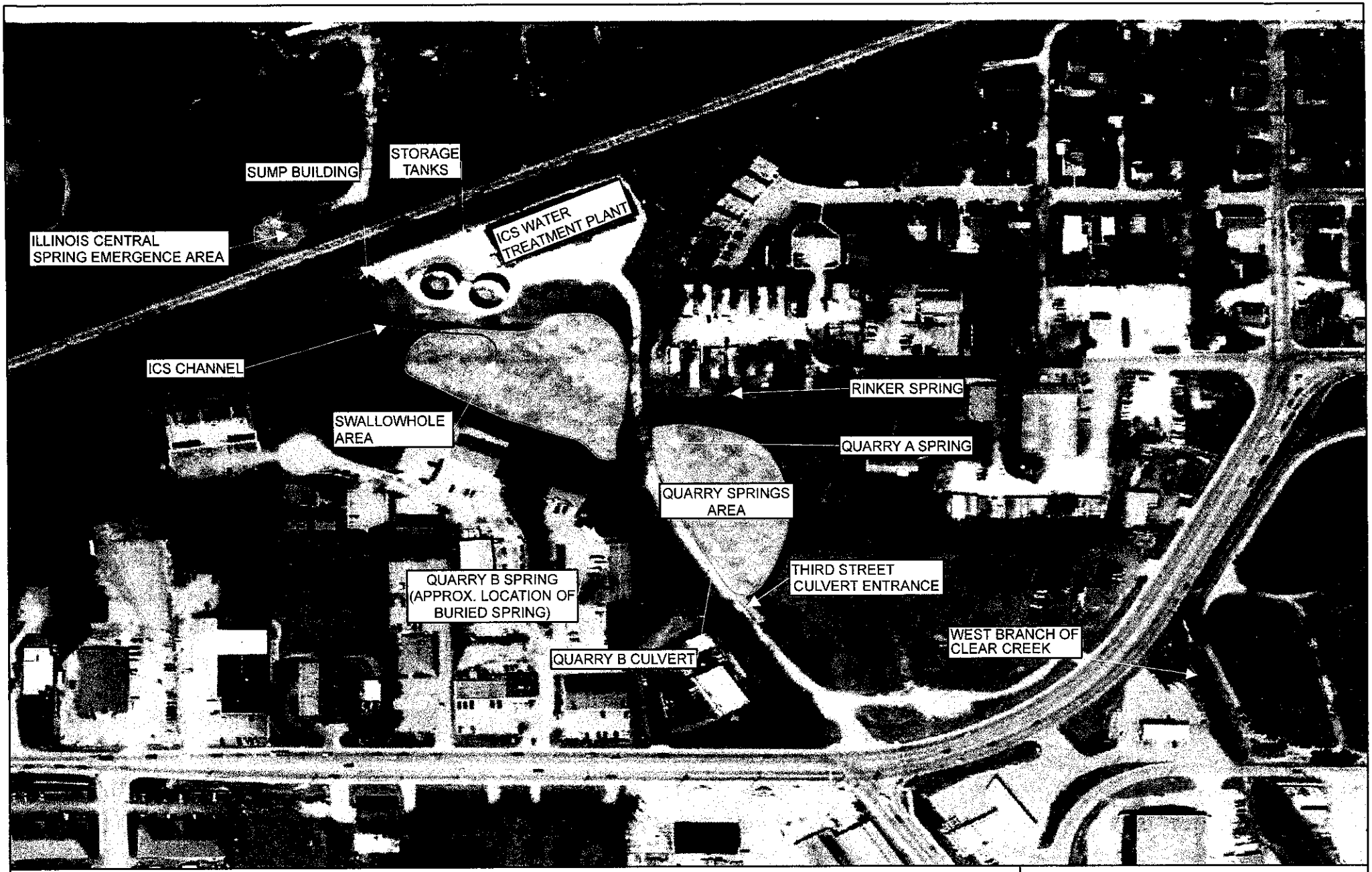
Submission	**Due Date**
Draft Remedial Design/Remedial Action Work Plan	60 days after entry of the Amendment to the Consent Decree
Final Remedial Design/Remedial Action Work Plan	30 days after receipt of comments from the Governmental Parties
Draft Sampling and Analysis Plan for the Delineation of PCB Contaminated Soils and Sediments	30 days after entry of the Amendment to the Consent Decree
Final Sampling and Analysis Plan for the Delineation of PCB Contaminated Soils and Sediments	30 days after receipt of comments from the Governmental Parties
Revised Quality Assurance Project Plan and Health & Safety Plan	30 days after entry of the Amendment to Consent Decree
Final Quality Assurance Project Plan and Health & Safety Plan	30 days after receipt comments from the Governmental Parties

Report on the Results of Soil and Sediment Sampling	90 days after approval of Final Sampling and Analysis Plan or Quality Assurance Project Plan, whichever is later
Draft Excavation Plan for Soil and Sediment	90 days after approval of Final Sampling and Analysis Plan or Quality Assurance Project Plan, whichever is later
Final Excavation Plan for Soil and Sediment	30 days after receipt of comments from the Governmental Parties
Preliminary Design - Effluent Line	6 months after entry of the Amendment to Consent Decree
Final Design – Effluent Line	30 days after receipt of comments from the Governmental Parties
Construction of the Effluent Line and Excavation of the ICS Emergence, Swallowhole and Quarry Springs Area	250 days after approval of the Effluent Line Final Design or Final Excavation Plan for Soils and Sediments, whichever is later
Rinker Spring/Quarry Spring and Surface Water Drainage Investigation Plan	15 months after entry of the Amendment to Consent Decree
Preliminary Design for the stormwater storage tank overflow treatment system	8 months after entry of the Amendment to Consent Decree
Final Design for the stormwater Storage Tank Overflow Treatment System	90 days after receipt of comments from the Governmental Parties

Report on the results of Rinker Spring/Quarry Spring and Surface Water Drainage Investigation	28 months after entry of the Amendment to the Consent Decree
Completion of Construction of the stormwater storage tank overflow treatment system	18 months after entry of the Amendment to the Consent Decree
Preliminary Design of the Rinker and Quarry Springs collection system and Related Modifications for the ICSWTP	29 months after entry of the Amendment to the Consent Decree
Final Design of the Rinker and Quarry Springs collection system and Related modifications for the ICSWTP	30 days after receipt of comments on the Preliminary Design from the Governmental Parties
Completion of Construction of the Rinker and Quarry Springs Collection system and related modifications of the ICSWTP	38 months after entry of the Amendment to the Consent Decree
Draft Operations and Maintenance Plan	25 months after entry of the Amendment to the Consent Decree
Final Operation and Maintenance Plan	30 days after receipt of comments on the Draft Operation and Maintenance Plan
Updated Operation and Maintenance Plan	30 days after completion of Construction of the Rinker and Quarry Springs Collection System
Revised Long-term Groundwater Monitoring Plan	25 months after entry of the Amendment to the Consent Decree
Final Long-term Groundwater Monitoring Plan	30 days after Receipt of Comments on the Draft Long-term Groundwater Monitoring Plan

Institutional Controls Work Plan	34 months after entry of the Amendment to the Consent Decree
Completion of Institutional Controls	39 months after entry of the Amendment to the Consent Decree
Completion of Remedial Action Report	39 months after entry of the Amendment to the Consent Decree
Request for certification of Completion of Work	Within 90 days after CBS concludes that all phases of the Work (including O & M) have been fully performed
Closure Plan	Within 30 days after receipt of U.S. EPA's Certification of Completion of Work

FIGURE 1



LEGEND

ILLINOIS CENTRAL SPRING (ICS) FORMER CREEK CHANNEL

GENERAL FOCUS AREAS

N
W E
S

0 100 200 Feet

SOURCE: US AIRPHOTO 04-14-2005

LEMON LANE LANDFILL
BLOOMINGTON, INDIANA

FIGURE 1
LEMON LANE OPERABLE
UNITS 2 AND 3 SOW

ATTACHMENT A

ENVIRONMENTAL PROTECTION EASEMENT
AND
DECLARATION OF RESTRICTIVE COVENANTS
LEMON LANE LANDFILL

This Environmental Protection Easement and Declaration of Restrictive Covenants is made this ____ day of _____, 20___, by and between _____, ("Grantor"), having an address of _____, and _____ _____ ("Grantee"), having an address of _____ _____.

[Note: Grantor and Grantee cannot be the same entity. Grantee may be a State agency other than IDEM or a local authority]

WITNESSETH:

WHEREAS, Grantor is the owner of a parcel of land located in the County of Monroe, State of Indiana, more particularly described on Exhibit A attached hereto and made a part hereof (the "Property");

[Note: Exhibit A is to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of the Environmental Protection Easement and Restrictive Covenant.]

WHEREAS, the Property is part of and/or relates to the Lemon Lane Landfill Superfund Site ("Site"), which the U.S. Environmental Protection Agency ("EPA"), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9605, placed on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 8, 1983;

WHEREAS, in two Record of Decision Amendments, dated May 12, 2000 and September 29, 2006 respectively, (collectively the "ROD Amendments"), the EPA Region Five (5) Regional Administrator selected a Remedial Action for the Site, which provides, in part, for the following actions: removal of PCB contaminated material from the landfill, capping of the landfill, cleanup of soil and sediment contaminated with PCBs, and treatment of PCB contaminated spring water from Illinois Central Spring and other associated springs With the exception of the matters identified in Exhibit B, the Remedial Action has been implemented at the Site;

[Note: Exhibit B is to be prepared and customized to fit the facts and circumstances that exist at the time that the Environmental Protection Easement and Restrictive Covenant is prepared and executed.]

WHEREAS, the areas of the Property where hazardous substances remain above levels allowing for unrestricted use and unlimited exposure are depicted in Exhibit C and described in Exhibits D and E, attached thereto.

[Note: Exhibits C, D and E are to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of Environmental Protection Easement and Restrictive Covenant. Exhibit C shall be a map of the Property depicting the different areas where restrictions on uses of Property shall apply. Exhibit D shall be a legal description of the remedy components on the Property – e.g., cap, monitoring well, etc. Finally, Exhibit E shall be a legal description of the areas of restricted uses.]

WHEREAS, the remedial action for the Site is being conducted pursuant to CERCLA;

WHEREAS, the Grantor hereto has agreed to grant a permanent right of access over the Property to the Grantee for purposes of implementing, facilitating and monitoring the remedial action;

WHEREAS, the parties hereto have agreed to impose on the Property use restrictions as covenants that will run with the land for the purpose of protecting human health and the environment;

WHEREAS, Grantor wishes to cooperate fully with the Grantee in the implementation of all response actions at the Site;

WHEREAS, the Grantor and Grantee intend that the provisions of this Environmental Protection Easement and Declaration of Restrictive Covenants also be for the benefit of the United States and the Indiana Department of Environmental Management ("IDEM") as third party beneficiaries ("Third Party Beneficiaries"); and

WHEREAS, the Commissioner of IDEM has approved of this instrument and Grantor and Grantee intend this instrument to be a restrictive covenant pursuant to Indiana Code (IC) 13-11-2-193.5 that IDEM may enforce in a court action pursuant to IC 13-14-2-6(5).

NOW, THEREFORE:

1. Grant: Grantor, on behalf of itself, its successors and assigns, in consideration of the Remedial Action performed at the Site by the Grantee, IDEM or the EPA under the Consent Decree in the case of United States of America v. CBS Corporation, No. 1:81-cv-0448-RLY-KPF (S.D. Ind.), does hereby covenant and declare that the Property shall be subject to the restrictions on use set forth below, and does give, grant and convey to the Grantee, and its assigns, with general warranties of title, 1) the perpetual right to enforce said use restrictions,

and 2) an environmental protection easement of the nature and character, and for the purposes hereinafter set forth, with respect to the Property.

2. Purpose: It is the purpose of this instrument to convey to the Grantee real property rights, which will run with the land, to facilitate remediation of past environmental contamination and to protect human health and the environment by reducing the risk of exposure to contaminants. It is also the purpose of this instrument that the EPA and IDEM and each of their successors and assigns as Third Party Beneficiaries shall have the right to enforce the terms of this instrument and that IDEM shall also have the authority to enforce this instrument pursuant to IC 13-14-2-6(5).

3. EPA and IDEM as Third Party Beneficiaries: Grantor on behalf of itself and its successors, transferees, and assigns and the Grantee on behalf of itself and its successors, transferees and assigns hereby agree that the EPA and IDEM and their successors and assigns shall be Third Party Beneficiaries under this instrument.

4. Restrictions on use: The following covenants, conditions, and restrictions apply to the use of the Property, run with the land for the benefit of the Grantee and are binding upon the Grantor including its successors, transferees, assigns or other persons acquiring an interest in the Property and their authorized agents, employees, or persons acting under their direction and control.

[Note: Restrictions on use shall be developed in accordance with the ROD Amendments, the Lemon Lane Landfill Statement of Work for Operable Units 1, 2 and 3, and the facts and circumstances relating to Property that is the subject of the Environmental Protection Easement and Restrictive Covenant.]

5. Modification or Recission of restrictions: Any request for modification or rescission of this instrument or of provisions of this instrument shall be made to the Grantee, IDEM and EPA at the addresses given below. This instrument may be modified or rescinded only with the prior written approval of EPA, IDEM and the Grantee. Grantor on behalf of its successors, transferees, assigns or other persons acquiring an interest in the Property agrees to file any modification to or rescission of this Environmental Protection Easement and Declaration of Restrictive Covenants approved by EPA, IDEM and the Grantee with the appropriate Registrar of Deeds and a certified copy shall be returned to the EPA, IDEM and the Grantee at the addresses listed below.

6. Environmental Protection Easement: Grantor hereby grants to the Grantee for its use an irrevocable, permanent and continuing right of access unless rescinded pursuant to paragraph 5 at all reasonable times to the Property for purposes of:

a) Implementing, operating and maintaining the response actions in the ROD Amendments, including but not limited to those actions generally described herein;

b) Verifying any data or information submitted to EPA or IDEM;

c) Verifying that no action is being taken on the Property in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

d) Monitoring response actions on the Site and conducting investigations relating to contamination on or near the Site, including, without limitation, sampling of air, water, sediments, soils, and specifically, without limitation, obtaining split or duplicate samples;

e) Conducting periodic reviews of the remedial action, including but not limited to, reviews required by applicable statutes and/or regulations; and

f) Implementing additional or new response actions that the EPA or IDEM determine that such actions are necessary to protect public health or the environment because (i) either the original remedial action has proven to be ineffective or (ii) that new technology has been developed which will accomplish the purposes of the remedial action in a significantly more efficient or cost effective manner; and will not impose any significantly greater burden on the Property or unduly interfere with the then existing uses of the Property.

7. Reserved rights of Grantor: Grantor hereby reserves unto itself, its successors, and assigns, all rights and privileges in and to the use of the Property which are not incompatible with the restrictions, rights and easements granted herein.

8. EPA and IDEM Entry, Access, and Response Authority: Nothing in this document shall limit or otherwise affect EPA and IDEM's rights of entry and access or EPA's and IDEM's authority to take response actions under CERCLA, the National Contingency Plan ("NCP"), or other federal and state law. The Grantor and Grantee consent to officers, employees, contractors, and authorized representatives of the EPA and IDEM entering and having continued access to this property for the purposes described in paragraph 6.

9. No Public Access and Use: No right of access or use by the general public to any portion of the Property is conveyed by this instrument.

10. Notice requirement: Grantor agrees to include in any future instrument conveying any interest in any portion of the Property, including but not limited to deeds, leases and mortgages, a notice which is in substantially the following form:

NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS, DATED _____, 20__, RECORDED IN THE PUBLIC LAND RECORDS ON _____, 20___, IN BOOK _____, PAGE _____, IN FAVOR OF, AND ENFORCEABLE BY _____ AS GRANTEE, AND IN FAVOR OF AND ENFORCEABLE BY THE UNITED STATES OF AMERICA AND THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT AS THIRD PARTY BENEFICIARIES.

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor must provide Grantee with a certified true copy of said instrument and, if it has been recorded in the public land records, its recording reference.

11. Enforcement: The Grantee, and the EPA and IDEM as Third Party Beneficiaries shall be entitled to enforce, individually or jointly, the terms of this instrument by resort to specific performance or legal process. IDEM shall be entitled to enforce this document pursuant to IC 13-14-2-6(5). All remedies available hereunder shall be in addition to any and all other remedies at law or in equity, including CERCLA. Enforcement of the terms of this instrument shall be at the discretion of the Grantee, the EPA and IDEM and any forbearance, delay or omission to exercise its rights under this instrument in the event of a breach of any term of this instrument shall not be deemed to be a waiver by the Grantee, EPA or IDEM of such term or of any subsequent breach of the same or any other term, or of any of the rights of the Grantee, the EPA or IDEM.

12. Waiver of certain defenses: Grantor hereby waives any defense of laches, estoppel, or prescription.

13. Covenants: Grantor hereby covenants to and with the Grantee and its assigns, that the Grantor is lawfully seized in fee simple of the Property, that the Grantor has a good and lawful right and power to sell and convey it or any interest therein, that the Property is free and clear of encumbrances, except those noted on Exhibit F attached hereto, and that the Grantor will forever warrant and defend the title thereto and the quiet possession thereof.

[Note: Exhibit F is to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of Environmental Protection Easement and Restrictive Covenant.]

14. Recordation: Unless this Instrument is rescinded under Paragraph 5, the Grantor, its successors or assigns shall re-record this Instrument including any subsequent modifications and amendments forty-nine (49) years from the date of first recording, or any subsequent recordings, to insure its continued applicability under the Marketable Title for Real Property Act found in IC 32-20.

15. Notices: Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and shall either be served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantor:

_____
_____
_____

To Grantee:

_____
_____
_____

To Third Party Beneficiary:

U.S. Environmental Protection Agency
Superfund Division Director
77 West Jackson Boulevard
Chicago, IL 60604

To Third Party Beneficiary:

Indiana Department of Environmental Management
Office of Land Quality
100 N. Senate Avenue
Mail Code – 66-31 IGCN 1101
Indianapolis, IN 46204-2251

16. General provisions:

a) Controlling law: The interpretation and performance of this instrument shall be governed by the laws of the United States or, if there are no applicable federal laws, by the law of the State of Indiana.

b) Liberal construction: Any general rule of construction to the contrary notwithstanding, this instrument shall be liberally construed in favor of the grant to effect the purpose of this instrument and the policy and purpose of CERCLA. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this

instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability: If any provision of this instrument, or the application of it to any person or circumstance, is found to be invalid, the remainder of the provisions of this instrument, or the application of such provisions to persons or circumstances other than those to which it is found to be invalid, as the case may be, shall not be affected thereby.

d) Entire Agreement: This instrument sets forth the entire agreement of the parties with respect to rights and restrictions created hereby, and supersedes all prior discussions, negotiations, understandings, or agreements relating thereto, all of which are merged herein.

e) No Forfeiture: Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

f) Joint Obligation: If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

g) Successors: The covenants, terms, conditions, and restrictions of this instrument shall be binding upon, and inure to the benefit of the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property. The term "Grantor", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantor" and their personal representatives, heirs, successors, and assigns. The term "Grantee", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantee" and their personal representatives, heirs, successors, and assigns. The rights of the Grantee and Grantor under this instrument are assignable, subject to the notice provisions hereof.

h) Termination of Rights and Obligations: A party's rights and obligations under this instrument terminate upon transfer of the party's interest in the Easement or Property, except that liability for acts or omissions occurring prior to transfer shall survive transfer.

i) Captions: The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

j) Counterparts: The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the Grantee and its assigns forever.

IN WITNESS WHEREOF, Grantor has caused this Environmental Protection Easement and Declaration of Restrictive Covenant to be signed in its name.

Executed this _____ day of _____, 20__.

NAME OF GRANTOR

By: _____

STATE OF INDIANA

) ss

COUNTY OF MONROE

On this __ day of _____, 20__, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____, known to be the _____ of _____, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they are authorized to execute said instrument.

Witness my hand and official seal hereto affixed the day and year written above.

_____

Notary Public in and for the
State of _____

My Commission Expires: _____.

This Environmental Protection Easement and Declaration of Restrictive Covenant is accepted this ____ day of _____, 20__.

NAME OF GRANTEE

By: _____

_____

Attachments:	Exhibit A	-	legal description of the Property
	Exhibit B	-	Remedial Actions to be completed
	Exhibit C	-	map of Property depicting the different areas of restrictions
	Exhibit D	-	legal description of the remedy components on the Property
	Exhibit E	-	legal description of the areas of restricted uses
	Exhibit F	-	list of recorded encumbrances

Appendix H

EPA Region 5 Records Ctr.
237773

DECLARATION FOR THE NEAL'S LANDFILL RECORD OF DECISION AMENDMENT

SITE NAME AND LOCATION

The Neal's Landfill site is located in Bloomington, Indiana. The National Superfund Database identification number is IND980614556. This Record of Decision (ROD) Amendment addresses contaminated water and sediment, and in this ROD Amendment are referred to as Operable Unit 2 and Operable Unit 3, respectively.

STATEMENT AND BASIS AND PURPOSE

This decision document presents the Selected Remedy for the Neal's Landfill site, located in Bloomington, Indiana. This ROD amendment presents the remedial action selected in accordance with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This ROD Amendment will become part of the Administrative Record file per Section 300.825(a)(2) of the NCP. The Administrative Record which contains the information on which selection of the remedial action was based, is available for review at the Monroe County Public Library in Bloomington, Indiana, as well as at the United States Environmental Protection Agency, Region 5, Superfund Records Center.

ASSESSMENT OF SITE

The response actions selected in the ROD amendment are necessary to protect the public health or welfare or the environment from actual or threatened release of hazardous substances into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for the Neal's Landfill site addresses groundwater and sediment contaminated by PCBs from springs on the Neal's Landfill site. The source control operable unit (operable unit 1) was completed in 1999 and addressed the principle threat waste through the excavation and off-site disposal and off-site incineration of high concentrations of PCB waste, including capacitors containing PCBs. The Selected Remedy consists of improving the spring water collection system and performing a sediment cleanup in Conard's Branch. The major components of the groundwater and sediment operable units consist of the following:

- Improvement of the spring water collection system to capture PCB-contaminated groundwater seeps which currently bypass the current collection system.
- Install a new effluent line farther downstream in Conard's Branch for discharging water treated by the water treatment plant. This will prevent treated water from being collected by the new spring water collection system.

- Continue to operate the 450 gallons per minute (gpm) water treatment plant, which is capable of treating up to 500 gpm. The water treatment plant will meet a revised PCB effluent standard of 0.3 parts per billion (ppb). A revised Operation and Maintenance Plan will also be implemented for the water treatment plant.
- Implement a soil and sediment cleanup for in-stream sediments, bank soils and floodplain soils in Conard's Branch. The cleanup criteria is 1 parts per million (ppm) on average for PCBs located in-stream sediments and bank soils and 5 ppm on average for floodplain soils. The estimated volume of contaminated soils and sediment is 1,141 cubic yards and this material will be disposed of off-site in a permitted landfill. The improvements to the spring water collection system for the 450 gallons per minute treatment plant and the sediment and soils cleanup are expected to reduce the PCB levels in fish tissue to acceptable levels within 10 years, based upon a fate and transport model.
- Implement institutional controls to prevent residential and commercial development for the 10-acre landfill cap, prevent residential development in the southeast portion of the site, prevent residential development and certain farming activities within the floodplain area of Conard's Branch and prevent groundwater use on the site.

STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy for the groundwater operable unit satisfies the statutory preference for treatment as a principal element of the remedy. Treatment is not employed for the sediment operable unit, but the remedy is consistent with other soil/sediment cleanups completed in Bloomington and the surrounding area.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure and it will take more than five years to attain remedial action objectives and cleanup levels, a policy review will be conducted within five years of construction completion for the site to ensure that the remedy is, or will be protective of human health and the environment.

RECORD OF DECISION AMENDMENT DATA CERTIFICATION CHECKLIST

The following information is included in the Decision summary section of the Record of Decision Amendment. Additional information can be found in the Administrative Record located at the Monroe County Public Library.

- Chemicals of concern and their respective concentrations are located on Pages 9, 10, 14, and 16.
- Baseline risks represented by the chemicals of concern are located on Pages 11 through 19.
- Cleanup levels established for chemicals of concern and the basis for these levels are located on Pages 19 and 20.

- Description of how source materials constituting principal threats are addressed is addressed on Page 40.
- Description of the current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD Amendment are located on Page 11.
- Description of the potential land and groundwater use that will be available at the site as a result of the implementation of the low flow collection system and sediment and soils cleanup is located on Page 35.
- Description of the estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected is located in Table 9.
- Description of the key factors that led to selecting the remedy is located on Page 40 and 41.

AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

The United States Environmental Protection Agency is the lead Agency for developing and preparing this Record of Decision Amendment. The State of Indiana, City of Bloomington, and Monroe County are signatories to the Consent Decree and those parties have all submitted letters of concurrence for the implementation of the above referenced alternative.

Richard C Karl

Richard C. Karl, Director
Superfund Division

9-25-07

Date

RECORD OF DECISION AMENDMENT
NEAL'S LANDFILL
OPERABLE UNITS 2 AND 3

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

CBS Corporation (formerly known as Westinghouse Electric Corporation and Viacom Inc.) owned and operated a capacitor production facility in the City of Bloomington, Indiana. The insulating fluid used in the manufacture of the capacitors contained a polychlorinated biphenyl (PCB) dielectric fluid. PCBs are mixtures of up to 209 individual chlorinated compounds called congeners. Many commercial PCB mixtures are known in the United States as Aroclors.

Neal's Landfill began operation in 1950. Municipal and industrial wastes were deposited at the landfill until 1972. The landfill was originally known as Whitehall Pike Landfill and was later renamed Neal's Landfill after a former owner and operator. Municipal waste was the main type of refuse deposited at the landfill. Between 1958 and 1965, the landfill was expanded into topographic low areas adjacent to a central east-west oriented ridge. During 1966 and 1967, scrap and off-specification electrical capacitors from the Westinghouse plant in Bloomington were disposed of at the landfill along with PCB-contaminated capacitor parts, filter aids, and sawdust resulting in the release of PCB-contaminated dielectric fluids. The total volume of landfill material was approximately 320,000 cubic yards based on landfill borings completed in the 1980s.

Neal's Landfill is located approximately five miles due west of the City of Bloomington, Monroe County, Indiana (see Figure 1). The site consisted of approximately 18 acres that were used as an open dump and landfill on a larger property owned by a number of various parties. The most recent owner has passed away and the property, including the landfill, was bequeathed to the Sycamore Land Trust. The Sycamore Land Trust is currently determining if it is going to accept the property. State Route 48 is located approximately 800 feet directly south of the site. Access to the landfill is restricted by a security fence and private drive south from Vernal Pike.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Neal's Landfill was placed on the National Priorities List (NPL) in October 1981 and is one of the six sites addressed under the terms of a Consent Decree (CD) entered by the United States District Court for the Southern District of Indiana on August 22, 1985. The parties to the Consent Decree include the United States Environmental Protection Agency (U.S. EPA), Indiana Department of Environmental Management (IDEM), City of Bloomington, Monroe County, and CBS Corporation. The Consent Decree called for the construction of a permitted, Toxic Substances Control Act (TSCA) approved, dedicated, municipal solid waste-fired incinerator to be used to destroy PCB-contaminated soils and materials excavated from the six sites.

Public opposition to the incinerator arose before and after entry of the Consent Decree. CBS submitted applications for the necessary permits to design and build the incinerator in 1991. The Indiana State Legislature, however, passed several laws which prevented any immediate consideration of CBS's permit application. In February 1994, the parties settled upon a set of principles to guide the process of exploring alternative remedies. These principles, known as the Operating Principles, provided, among other things, that the selection of remedial alternatives would be conducted in accordance with the U.S. EPA Record of Decision (ROD) Amendment process. The Operating Principles are available for review in the Administrative Record located at the Monroe County Public Library.

In November 1997, Judge S. Hugh Dillin issued an Order requiring that the six Consent Decree sites be remediated by December 1999. Judge Dillin also assigned Special Master Kennard Foster to oversee the progress of the parties toward meeting the December 1999 deadline. On February 1, 1999, Judge Dillin issued another Order approving and adopting the Report and Recommendations of Special Master Kennard Foster which (1) extended the deadline for completion of the source control at the remaining five sites until December 31, 2000, and (2) ordered the parties to engage in settlement discussions with respect to other issues, including remedial measures to address groundwater and surface water contamination. The source control remedies were completed by the December 31, 2000 deadline, and CBS and the governmental parties are in the process of negotiating a global settlement[1] for all of the remaining issues regarding the six Consent Decree sites.

Investigations for contamination at Neal's Landfill began as early as 1976. Extensive sampling and initial site cleanup activities began in 1983. The 1983 initial site remedial measures were implemented in two phases pursuant to a Stipulation and Order. In the first phase, a security fence was installed around the entire perimeter of the site. Visible capacitors and associated stained soils were removed. A low-permeability clay cap was placed over the primary fill areas. Drainage control features and erosion control measures were installed. This action removed visibly identifiable areas of concentrated contaminants on the surface of the landfill. Sediment sampling was also performed in Conard's Branch, Southwest Seep Branch, and Richland Creek (see Figure 2). These activities were completed in May of 1984.

The second phase of the interim remedial measures was completed under the terms of the 1985 Consent Decree. Sediments were removed from a 4,500-linear-foot length of Conard's Branch and 300 linear feet of Richland Creek. The sediment cleanup was completed in October 1988 and approximately 5,000 tons of stream bed sediments and stream bank material were excavated and temporarily stored at an interim storage facility until they were disposed of at an approved landfill in 1998. CBS constructed a water treatment plant to collect water up to 1 cubic foot per second (cfs) from South Spring, North Spring and the Southwest Seep. Based upon data acquired from the treatment plant, the facility is designed for 450 gallons per minute (gpm) capacity, but often treats

[1] The global settlement will include both technical and non-technical issues.

as much as 500 gpm. In the Consent Decree, the discharge criterion for the water treatment plant was set to 1 part per billion (ppb) PCBs. The treatment plant became operational in February 1990.

The final remedy for the site memorialized in the 1985 Consent Decree was never implemented by CBS. After the parties agreed in February of 1994 to explore alternatives to the remedy set forth in the 1985 Consent Decree, U.S. EPA and CBS undertook a new, detailed investigation of the site. Based upon this re-investigation, U.S. EPA issued a Proposed Plan for the source control operable unit of the alternative remedy on December 21, 1998, and held a 45-day public comment period. The other governmental parties, including IDEM, City of Bloomington, and Monroe County concurred on the ROD Amendment. The ROD Amendment was signed on March 29, 1999.

The source control operable unit remediation involved the following:

- Excavation and disposal of 41,747 tons of PCB-contaminated material greater than or equal to 50 parts per million (ppm) to Environmental Quality Company's Wayne Disposal Landfill, in Belleville, Michigan.

- Excavation and transport of a total of 4,119 capacitors contaminated with PCBs to Onyx Environmental in Port Arthur, Texas, for incineration.

- Shrinking the size of the landfill from 18-acres to 10-acres through the consolidation of landfill material.

- Collection, shredding, and disposal of 28,881 tires under the final Neal's Landfill cap.

- Installation of a Resource Conservation Recovery Act (RCRA) Subtitle C-compliant cap over the remaining landfill material. The cap consists of six inches of topsoil, 18-inches of clean granular fill, a geocomposite drainage layer, a 40-millimeter thick geomembrane, and a geosynthetic clay layer.

- Construction of perimeter drainage and a stormwater retention pond.

- Installation of 5 piezometers into the bottom of the landfill waste to monitor accumulation of any groundwater.

- Clean up of areas outside the landfill boundary.

- Implementation of Long-term Groundwater Monitoring and RCRA Cap Inspection and Maintenance Plans.

- Development and implementation of institutional controls.

The Neal's Landfill RCRA Cap Inspection and Maintenance Plan was approved in April 2001. The following activities are performed by CBS pursuant to the approved plan:

- Routine quarterly inspections of the landfill cap for damage.
- Mowing.
- Annual application of herbicide at the fence lines and rip-rap drainage ways.
- Biennial topographic survey and subsidence report.

The continuing release of PCBs and other hazardous constituents from springs connected to the Neal's Landfill and the subsequent contamination of soils and sediment from the releases from these springs requires the need for two additional operable units, which are set forth in this ROD Amendment.

COMMUNITY PARTICIPATION

The community has been involved at the Neal's Landfill site. The U.S. EPA provided a Technical Assistance Grant (TAG) to a citizens group called Citizens Opposed to PCB Ash (COPA). In addition to hiring experts to review documents, COPA has used this grant to develop an Internet web page (www.copa.org) to distribute information to the public. The U.S. EPA and IDEM have participated in, at minimum, quarterly Citizens Information Committee meetings with the public to update them on recent site activities. These meetings are shown on the local Bloomington cable access station.

The Proposed Plan for the water treatment operable unit (OU 2) and sediment operable unit (OU 3) for the Neal's Landfill site was made available to the public for 30 days on July 6, 2007. A 30-day extension of the public comment period was provided at the start of the comment period. Additional days were added to the public comment period taking into consideration the amount of time elapsed before certain documents missing from the Administrative Record (AR) were added. The public comment period for the Proposed Plan ended on September 17, 2007, for a total of 74 days of public comment. The AR in electronic form was placed in the Monroe County Public Library. Interested parties were able to receive copies of the AR for review and for the development of comments on the Proposed Plan for OU 2 and OU 3. Approximately 6,000 OU 2 and OU 3 Proposed Plan postcards were mailed to residents in the Bloomington area and an Internet link was provided to a fact sheet for review.

A public meeting was held on August 7, 2007, to present the Proposed Plan for OU 2 and OU 3 to the public and a transcript of that meeting was prepared. Representatives from U.S. EPA and the State of Indiana were present to answer questions. U.S. EPA's response to comments received during the public comment period is included in the Responsiveness Summary, which is part of this Record of Decision Amendment for Operable Units 2 and 3.

SCOPE AND ROLE OF THE OPERABLE UNITS

This action is the final action for the Neal's Landfill site and addresses both contaminated groundwater and sediment, known respectively as Operable Units 2 and 3. The 1999 ROD Amendment provided for source control by addressing the principal threat waste through excavation and by disposing of PCB-contaminated material off-site in a chemical waste landfill and incinerating PCB capacitors filled with PCB-contaminated oil off-site at a permitted facility. The remaining landfill material was consolidated and capped with a RCRA Subtitle C compliant cap. These final two operable units are intended to prevent current and future exposure to contaminated media through treatment of groundwater and removal of contaminated sediment. The treatment of groundwater in this response is intended to permanently reduce the toxicity, mobility, and volume of the releases of PCBs into Conard's Branch and Richland Creek, thereby protecting individuals who might swim or fish in these streams as well as protect animals that might feed in and along them.

SITE CHARACTERISTICS

A large number of groundwater and sediment investigations have been conducted at Neal's Landfill since the early 1980s. Many of these investigations uniquely pertain to the groundwater flow in a karst system. Karst terrain is a landscape produced through the interaction of slightly acidic rainwater with soluble limestone bedrock. This process known as dissolution forms a variety of landscape features, including sinkholes, subterranean voids, solution conduits, caves, and springs. Drainage in the Neal's Landfill area is predominantly subterranean through the karst features. The drainage is characterized by rapid groundwater flow from sinkholes through a branchwork of subterranean solution conduits and caves to discharge points at springs. Contaminants in karst groundwater may move rapidly through the drainage network to springs located miles from the source area without the benefit of normal attenuation processes. The following is a partial list of investigations:

- Geophysical surveys to understand the site geology including magnetometry, topographic analysis, air photo analysis, seismic refraction, ground penetrating radar, borehole geophysics, frequency domain magnetics, and equipotential direct current resistivity survey.

- Installation of over 20 monitoring wells to evaluate groundwater conditions.

- Well video logging.

- A residential well survey and two residential well sampling events in 1986 and 1999.

- Development and implementation of a groundwater monitoring plan including the sampling of wells, springs and nearby streams.

- Low flow and high flow on-site and off-site dye tracer tests to determine groundwater flow pathways and delineate groundwater drainage basins.

- Continuous and periodic water level monitoring in wells and piezometers to determine groundwater elevations.

- Continuous and periodic surface water flow measurements in springs and streams.

- Direct investigation of the subsurface karst drainage system through cave entry, exploration, and survey.

- Investigation to discover groundwater conduits upgradient of the landfill through geophysical methods, drilling, and excavation of sinkholes.

- Analysis and development of a discharge capture model to evaluate flow and PCB mass released.

- Treatability studies to evaluate the settling of PCBs in Conard's Branch during storm flow conditions.

- Development of a fate and transport model using hydrodynamics, sediment transport, PCB fate and transport and PCB bioaccumulation to assist in evaluating remedial alternatives.

- Sediment sampling, stream bank sampling, and floodplain sampling in Conard's Branch and Richland Creek.

- Fish tissue sampling in Conard's Branch and Richland Creek and analysis using PCB Aroclor and congener analytical methods.

Site Geology and Hydrogeology

The Neal's Landfill site is situated on a topographic saddle that overlies a watershed divide on an east-west oriented ridge. Natural surface drainage is generally to the north and west into tributaries of Richland Creek. The northern tributary, known as Conard's Branch, drains the northern portion of the landfill and flows into Richland Creek 4,800 feet northwest of the site. The west-flowing tributary, referred to as Taylor Branch, drains the southern portion of the landfill and flows into Richland Creek about 6,000 feet west of the site. Headwater portions of Taylor Branch extended through the southeast portion of the landfill. During early operation of the landfill, these valley areas were filled in to a depth of about 20 to 25 feet. Surface drainage was impeded and ponded behind the waste in an area referred to as the "Cattail Pond." Water from a seep known as the Southwest Seep was captured and treated by the water treatment plant. After the source control operable unit was completed and the site drainage was modified, the Southwest Seep dried up and is no longer being treated by the treatment plant.

The site is located near the eastern margin of the Crawford Upland Physiographic Province, and is characterized by rugged topographic features that include steep slopes. The unconsolidated overburden consists mainly of residual clays and silts. Waste material is separated from the underlying bedrock by a layer of clay. The bedrock is composed of thin limestone, sandstones, and shales assigned to the Mississippian-age West Baden Group that overlie a thick sequence of carbonate rock assigned to the Paoli and St. Genevieve Limestone of the Blue River Group. Valley bottoms immediately north and south of the saddle are eroded into lower parts of the St. Genevieve Limestone. The entire area is underlain by the St. Louis Limestone, the lowest unit of the Blue River Group. Three different members make up the St. Genevieve Formation, including (in descending order) the Levias Member, the Spar Mountain member, and the Fredonia Member. Thin shale chert (a type of rock) beds are also present.

Strata in the region generally dip or slope from the crest of the Cincinnati Arch to the west or southwest into the Illinois Basin at a rate of 25 to 30 feet per mile. Local variations of this regional trend occur. Correlation of chert marker beds in site boreholes suggests a northwesterly dip in the immediate area of the landfill.

The Paoli and St. Genevieve Limestones support development of dissolution features and karst. Numerous karst features, including sinkholes, sinking streams, caves, and springs, exist in the area. Subterranean flow routes from sinkholes, sinking streams, and wells to spring emergences in Conard's and Taylor Branches were identified during dye tracer tests. Subterranean drainage from Neal's Landfill is known to resurge at springs located at the head of Conard's Branch, collectively referred to as the Northwest Spring System.

Northwest Spring System

The Northwest Spring System includes North Spring, South Spring, and five storm water overflow springs in the vicinity of South Spring (see Figure 3). Dye tracer experiments and groundwater quality data both suggest that all the springs comprising the Northwest Spring System are common discharge points for a single groundwater flow system and that they are fed by a single solutional conduit flow system. Such common source overflow/underflow spring systems are common in the south-central Indiana karst area. The overflow springs are normally dry but contribute most of the discharge to Conard's Branch during high-flow storm events. During such storm events, flow from the springs may be continuous for several days. The springs are referred to as Overflows 0, 1, 2, 3, and 4. Overflow springs during storm events begin to flow in the order 0, 1, 2, 3, and 4. A small storm event may activate flow only in Overflows 0, 1, and 2. Larger storm events will also activate Overflow 3, and the largest storm events will activate Overflow 4.

North Spring is the lowest underflow spring associated with the Northwest Spring System. North Spring appears to be supplied by the South Spring conduit system as well as by independent drainage from adjacent areas. Lower PCB concentrations have been detected at North Spring, which reflects the dilution caused by this additional drainage contribution. Flow rates from the Northwest Spring System springs were gauged

periodically from 1983 to 2001. Continuous measurements have been made since February 2001, primarily at a flow measurement weir on Conard's Branch located below South Spring. Flows at the weir may exceed 11,000 gpm during storm events. There is evidence that both peak flows and flow volumes from the Northwest Spring System have decreased since 1983. This has been attributed largely to surface drainage alterations that occurred at the landfill as a result of the 1999 source control remedial action. Prior to the waste removal and consolidation, surface water from approximately 102 acres around the landfill drained into sinkholes in the vicinity of the "cattail pond," contributing to the flow at the Northwest Spring System. During the source control operable unit, this surface water was redirected toward Taylor's Branch, and as a result, the flow at the Northwest Spring System has decreased substantially.

Aggregate flows from North Spring and South Spring of up to about 500 gpm are captured by lined catch basins and routed directly to the water treatment plant. At present, some of the flow from the Overflows 1, 2, and 3 is captured in small rip-rap-lined collection basins and is routed to the lined basin at South Spring. If spring flow exceeds the capacity of the water treatment plant, the excess flow overtops the lined basins and discharges directly to Conard's Branch. Modeling data show that the existing water treatment plant treats 47% of the spring flow and 38% of the PCB mass released from the Northwest Spring System.

Groundwater Basin and Delineation

A series of dye tracer tests were completed to delineate the size and location of the groundwater basin discharging at the Northwest Spring System. Dye was placed into a number of sinkholes and sinking streams in the area and springs were sampled for dye to determine if a connection existed. Figure 4 shows the subterranean connection established by the dye tracer tests and defines the area with groundwater draining to the Northwest Spring System. The dye tracer tests have indicated that the Northwest Spring System drains a total area of 350 to 400 acres that includes the 18-acre landfill area. Neal's Landfill is located at the extreme downstream end of the groundwater basin. It is thus apparent that a large volume of groundwater discharging at the Northwest Spring System is potentially affected by PCB releases that occur from a small area very close to the spring discharge points.

Karst Conduit Investigations

CBS conducted an extensive karst conduit investigation at Neal's Landfill to evaluate how the Northwest Spring System becomes contaminated with PCBs. The dye tracing results and measured flows in excess of 11,000 gpm indicate the spring system is supplied from a large, integrated karst conduit system. It was further recognized that the simplest and most direct way to evaluate PCB contamination of this conduit system was by direct access, mapping, and sampling. CBS identified several on-site and off-site sinkholes for potential connection to the conduit system. One sinkhole northwest of the landfill was excavated in September 2004 and found to provide direct access to the conduit system. The conduit was accessible both upstream and downstream of the

excavation. Downstream entry in November 2004 revealed a network of small distributary cave passages supplying the various springs at the headwaters of Conard's Branch. CBS mapped about 75 feet of conduit passage. Dye tracing and pumping suggested that the conduit was the primary source of water to South Spring. Upstream exploration of the conduit was conducted during the period of July 2005 to September 2005. About 145 feet of conduit extending southeast of the sinkhole and toward the landfill was explored and mapped. Penetration ended at a passage constriction, and exploration of the conduit was discontinued because the passage was blocked and the safety concerns for the exploration team. Sediment samples collected from the cave floor contained up to 56 ppm PCBs. The conduit elevation was observed to be very close to the water level observed in adjacent monitoring wells.

In 2006, CBS directed attention toward finding the conduit at a location immediately upstream from the landfill. A geophysical study to locate conduits in this area was conducted in June 2006, with a follow-up survey using a different technique in August. This investigation focused on the southeast corner of the landfill where monitoring well data indicated that it might be possible to divert clean groundwater upgradient from the landfill and avoid PCB contamination as the water flowed beneath the landfill. The geophysical surveys suggested two areas where such conduits might be located. A total of six exploratory rock borings were drilled down to the water table in August 2006 at locations in these areas targeted by the geophysical surveys. The drilling was unsuccessful in finding the main conduit.

Two sinkholes south of the landfill were excavated in additional efforts to find the upstream conduit in September 2006. Both excavations were made down to the water table. Minor solution voids were found in the bedrock in both excavations, but neither encountered a significant lateral conduit.

The last phase of the conduit investigation was conducted in October 2006. Additional dye tracer tests were conducted from Sinkholes 2 and 5 upgradient of the landfill (see Figure 4) and dye monitoring was conducted at the August 2006 exploratory rock boring locations and at one of the excavated sinkhole areas. No dye was detected at any of these locations leading to the conclusion that there was no evidence that any of the exploratory borings (targeted by the geophysical methods) or the excavated sinkhole were located near the main upstream conduit.

Spring Water Sampling

South Spring has been sampled monthly during nonstorm conditions since the completion of the source control operable unit in 1999. PCB concentrations have ranged from 0.34 ppb to 2.6 ppb. Analysis of the data from South Spring shows that PCBs are always present in water from South Spring, but that levels are decreasing at about 6% per year. The highest PCB concentrations occur early during storm events. A total of 19 storm events have been sampled since the completion of the source control operable unit in 1999. Flows at the Conard's Branch weir have been as high as 12,250 gpm (March 12, 2006). A peak PCB concentration of 30 ppb was observed early during a storm on April

7, 2000. The most recent storm sampled on November 16, 2006, produced a peak flow of 7,500 gpm and a peak PCB concentration of 4.5 ppb.

Part of the southwestern portion of the site is known to drain to the southwest to Taylor Spring and Branam Spring. Since the completion of the source control operable unit in 1999, 30 samples have been collected at Branam Spring. Of these 30 samples, only 2 have detected PCBs, and these have shown PCB concentrations slightly above the detection limit of 0.1 ppb. Taylor Spring has been non-detect for PCBs during 20 of 24 events with the highest detected concentration at 0.2 ppb PCBs. Flow rates for both springs average less than 10 gpm but can be as high as 50 gpm during storm events. Monitoring at North Spring since the completion of the source control operable unit in 1999 has shown PCB concentrations ranging from 0.12 ppb to 2.1 ppb during low-flow conditions.

Sediment Investigations

Sediment investigations were completed both in Conard's Branch and Richland Creek. The main sediment sampling event occurred in 2004 and began with U.S. EPA completing a sediment thickness study in Conard's Branch and Richland Creek in November 2003. CBS performed its main sediment sampling event in October 2004, which began in Conard's Branch and continued to approximately 7 miles downstream in Richland Creek. The results of the sediment thickness study show that starting in Conard's Branch to where State Route 43 meets Richland Creek in Owen County (approximately 3 miles downstream), less than 500 cubic yards of sediment is present. A majority of the sediment measured by U.S. EPA during the sediment thickness study occurred downstream of the State Route 43 meets Richland Creek in Owen County, with over 12,000 cubic yards located between 3 and 7 miles downstream of the landfill.

A number of sampling events in and around Conard's Branch and Richland Creek have taken place over the years. The 2004 sampling event was the most recent and extensive and included in-stream surface sediment samples, in-stream deep core samples, bank soil samples, and floodplain soil samples. Surface sediment samples included the top one inch of sediment; bank samples included 0 to 3 inches and 3 to 6 inches in depth; floodplain samples included 0 to 3 inches, 3 to 6 inches and 6 to 9 inches in depth; and finally the deep sediment cores ranged from 0 to 29 inches depending on the sediment thickness. Figures 5 through 10 show (by stream section) the entire results of the 2004 sampling event. Within Conard's Branch, in-stream surface sediment samples show a PCB concentration range from below detection limit (< 0.1 ppm) to 3.0 ppm; bank soil samples show a PCB range from below detection limit (< 0.1 ppm) to 66 ppm; and floodplain soil samples show a range from below detection limit (< 0.1 ppm) to 19 ppm PCBs. Results show that Richland Creek has much lower concentrations of PCBs, that most samples collected were below the detection limit (< 0.1 ppm) and that all samples contained less than 1 ppm PCBs. All in-stream surface sediment samples were below the detection limit of 0.1 ppm PCBs, and all bank soil, floodplain soil (at the Vernal Pike bridge and Richland Creek), and deep core sediment samples were less than 1 ppm PCBs, with the highest result being 0.55 ppm in one deep core sediment sample.

CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

The Neal's Landfill site is located in a rural setting, surrounded primarily by agricultural and wooded land. A few residences are located within one mile of the site. If the Sycamore Land Trust accepts the willed property, which includes the landfill property and a number of properties near the site, future development would be limited in the area surrounding the landfill.

Prior to September 2001, a majority of the homes surrounding Neal's Landfill were using wells as a drinking water source. A nearby quarrying operation affected the groundwater elevation of some nearby wells and the affected households have been placed on a rural water supply. Groundwater associated with the landfill was not affected from the quarrying operations and has not affected any nearby drinking water wells or sources. The latest well survey shows 13 residences using wells for drinking water within 1-mile of the site and PCBs have not impacted these wells. The drinking water well survey will be updated and wells may be sampled based upon the results of the survey.

SUMMARY OF SITE RISKS

U.S. EPA completed two focused risk assessments for the purpose of quantifying the threat to public health and the environment from actual or threatened releases of hazardous substances into the environment. One risk assessment focused upon the current and future effects of such releases on human health. The other assessment focused upon the current and future effects of such releases upon the environment. Each risk assessment is discussed, in turn, below.

Human Health Risks

A Superfund human health risk assessment estimates the baseline risk to human health. This is an estimate of the likelihood of health problems occurring if no cleanup action is taken at a site. To estimate the baseline risk at a Superfund site, U.S. EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, U.S. EPA evaluates the data collected at a particular site to determine which data are appropriate to consider in the risk assessment. For example, here the recent data are used rather than historical data because concentrations of PCBs in water and fish tissue can change over time and current data are most reflective of future concentrations. Next, U.S. EPA looks at the concentrations of contaminants found at a site, as well as past scientific studies on the effects these contaminants have had on people (or animals when human studies are unavailable). Comparisons between site-specific concentrations

and concentrations reported in past studies help U.S. EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, U.S. EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, U.S. EPA calculates a reasonable maximum exposure (RME) scenario, which represents the highest level of human exposure that could reasonably be expected to occur.

In Step 3, U.S. EPA uses the information from Step 2, combined with information on the toxicity of each chemical to assess potential health risks. U.S. EPA considers two types of risk: cancer and non-cancer. For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = CDI \times SF$$

Where: Risk = a unitless probability (e.g., 2×10^{-5}) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that are usually expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the RME estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the cancer risks individuals face from other causes such as smoking or exposure to too much sun. The chance of an individuals developing cancer from all other causes has been estimated to be as high as one in three. U.S. EPA's generally acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (referred to as an exposure duration; e.g., 30 years for an adult resident) with a reference dose (RfD) derived for a similar exposure period. A RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). A HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemicals of potential concern within a medium or across all media to which a given individual may reasonably be exposed. A HI less than 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. A HI greater than 1 indicates that site-related exposures might present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

Where: CDI = Chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic).

In Step 4, U.S. EPA determines whether site risks are great enough to cause health problems for people at or near the Superfund site. The results of the three previous steps are combined, evaluated and summarized. U.S. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk. In the evaluation of risk, a potential upper-bound risk of 1 in 1,000,000 extra cancer case is used by U.S. EPA as a point of departure for determining remediation goals, but a probability as high as 1 in 10,000 extra cancer case is acceptable in some circumstances.

PCBs are the only chemical of concern at the Neal's Landfill site. U.S. EPA calculated PCB risks at Neal's Landfill site through two methods (Aroclor and Toxicity Equivalents [TEQ]). Laboratory analysis included measuring PCBs by the Aroclor method and the congener method. With the congener method, thirteen of the 209 congeners are referred to as dioxin-like PCBs, as they produce a toxic response similar to 2, 3, 7, 8-tetrachloro-p-dioxin (TCDD). The concentration of each congener is converted to a dioxin equivalent, which is referenced as the TEQ. U.S. EPA has proposed an alternate slope factor for TCDD, which is more conservative, but this has not been finalized.

In evaluating the human health risks posed by the remaining PCB releases from Neal's Landfill, U.S. EPA focused on the health effects to children, youths, and adults coming into contact with water, sediment, and soil (including bank soil and floodplain soil) in and along Conard's Branch and Richland Creek, along with eating fish from Richland Creek. U.S. EPA believes that human exposure to PCBs from the site results from the following pathways:

- Consumption of fish from Richland Creek by an adult recreational fisherman who consumes between one (1-mile site) and three (12.7-mile site) half-pound meals per month.

- Exposure to sediment within Conard's Branch and Richland Creek through skin contact and incidental ingestion through recreational activities.

- Exposure to surface water within Conard's Branch and Richland Creek through skin contact and incidental ingestion through recreational activities.

- Exposure to soil (including bank soil and floodplain soil) in and along Conard's Branch and Richland Creek through skin contact and incidental ingestion through recreational activities.

Extensive fish sampling was conducted in both Conard's Branch and Richland Creek over the years. In Richland Creek, fish sampling has occurred as far as approximately 35 miles downstream of the landfill (see Figure 2 and Figure 11). Since the completion of the source control remedy, fish were collected for PCB analysis on one occasion at a location 12.7 miles downstream from the landfill, on three occasions at locations 3 and 5.5 miles downstream from the landfill, and on five occasions at a location 1 mile downstream from the landfill. Both pelagic fish (water-column swimming fish such as longear sunfish and rock bass) and benthic fish (bottom-dwelling fish such as white sucker) were sampled. Conversion factors of one-quarter and one-half were used to convert whole pelagic and benthic fish PCB concentrations, respectively, to fillet PCB concentrations. The sampling locations used in Richland Creek and average PCB fish concentrations are shown in Table 1.

Table 1 – Summary of Average PCB Fish Concentrations

Fish Tissue	1-Mile Site	3-Mile Site	5.5- Mile site	12.7-Mile Site
Pelagic – PCBs in ppb	182	114.8	NA	92
Pelagic – TEQ in ppt	3.0	1.0	NA	NA
Benthic – PCBs in ppb	808	182.8	192	165
Benthic – TEQ in ppt	10.2	1.4	2.3	NA
ppb – parts per billion	ppt – parts per trillion		NA – No Available Data	

In evaluating the risk, U.S. EPA determined that the fish in Conard's Branch were not of sufficient size or type to justify further consideration in the human health risk assessment. As for evaluating risks to humans from the consumption of fish from Richland Creek, an analysis of the amount of fish within the creek was completed to determine if enough fish were available to consume. CBS only completed population studies at the 1-mile site. At the 3-mile site, 5.5-mile site and 12.7-mile site, U.S. EPA estimated the ingestion rates based upon primary factors known to affect the distribution, abundance, and community structure of fish in streams similar to Richland Creek. The size of the fish were also taken into consideration in developing the amount of fish that can be consumed along with a factor for converting whole fish sample results to an edible fillet concentration. Pelagic and benthic fish ingestion rates were also adjusted to reflect a relative presence of 80 and 20 percent pelagic and benthic fish, respectively, in the total biomass. Table 2 below shows the fish tissue ingestion rates at the sampling locations.

Table 2 – Summary of the Fish Tissue Ingestion Rates

	Location-Specific Fish Tissue Ingestion Rates (grams/day)			
Feeding Guild	**1-Mile Site**	**3-Mile Site**	**5.5-Mile Site**	**12.7-Mile Site**
Pelagic Fish	6	7.3	9.2	18.3
Benthic Fish	1.5	1.8	2.3	4.6
Total	7.5	9.1	11.5	22.9

Table 3 below gives a summary of the carcinogenic and non-carcinogenic risks associated with the ingestion of fish at each of the fish sampling locations.

Table 3 – Summary of Site Risks Based Upon Ingestion of Fish

Location	Fish	PCB Risk (Aroclor)	PCB risk (TEQ)	Hazard Index (Aroclor)	Hazard Index (TEQ)
1-Mile	Pelagic	6.7×10^{-6}	8.3×10^{-6}	0.39	0.13
	Benthic	7.4×10^{-6}	7.0×10^{-6}	0.43	0.11
3-Mile	Pelagic	5.1×10^{-6}	3.4×10^{-6}	0.3	0.052
	Benthic	2.0×10^{-6}	1.2×10^{-6}	0.12	0.018
5.5- Mile	Pelagic	-	-	-	-
	Benthic	2.7×10^{-6}	2.4×10^{-6}	0.16	0.038
12.7-Mile	Pelagic	1.0×10^{-5}	-	0.6	-
	Benthic	4.6×10^{-6}	-	0.27	-

The results from Table 3 show the following:

- Total risks vary moderately by location; that is, risks for the 1-, 3-, 5.5-, and 12.7-mile sites are similar. (Note: Risks at the 5.5-mile site are lower than at the other sites.) Likewise, risks for pelagic and benthic fish are similar at the 1-mile site; at the 3- and 12.7-mile sites, benthic fish risks are about two to three times higher than risks associated with pelagic fish.

- Total risks based on total PCBs range from 1.5×10^{-5} (about 2 in a population of 100,000) based on ingestion of both pelagic and benthic fish at the 12.7-mile site to 2.7×10^{-6} (about 3 in a population of 1,000,000) at the 5.5-mile site.

- Risks calculated based on total PCBs match closely with those calculated based on TCDD TEQs using the existing SF (1.5×10^{5} [mg/kg-day]$^{-1}$). Risks based on U.S. EPA's proposed alternative TCDD SF (1×10^{6} [mg/kg-day]$^{-1}$) are about 5 to 10 times higher than those based on total PCBs and 6 to 7 times higher than those based on the TCDD TEQ using the current TCDD SF.

- Risks based on total PCBs and assuming ingestion of both pelagic and benthic fish fall within U.S. EPA's generally acceptable risk range for site-related exposures (1×10^{-4} to 1×10^{-6}) at all locations and equaled or exceeded 1×10^{-5} only at the 1- (1.4×10^{-5}) and 12.7-mile (1.5×10^{-5}) sites.

- Risks based on TCDD TEQs and the existing SF (1.5×10^{5} [mg/kg-day]$^{-1}$) and U.S. EPA's proposed SF (1.0×10^{6} [mg/kg-day]$^{-1}$) also fall within U.S. EPA's

generally acceptable risk range at all locations assuming ingestion of both types of fish.

- Hazards do not vary significantly by location or fish type; that is, hazards for the 1-, 3-, 5.5-, and 12.7-mile sampling locations are similar. (Note: As for risks, hazards at the 5.5-mile site are lower than at the other sites). Likewise, hazards for pelagic and benthic fish are similar at the 1-mile site. At the 3- and 12.7-mile sites, pelagic fish hazards are two to three times higher than hazards associated with benthic fish.

- Hazards based on total PCBs and ingestion of both pelagic and benthic fish are less than 1 at all locations.

- Hazards calculated based on total PCBs do not match as closely with those calculated based on TCDD TEQs as the risks. Hazards based on TCDD TEQs range from about 3 to 6 times lower than hazards based on total PCBs.

- Hazards based on TCDD TEQs are less than 1 at all locations assuming ingestion of both types of fish.

Other exposure pathways in Conard's Branch and Richland Creek besides fish tissue ingestion were evaluated for risk. Table 4 below is a summary of the average PCB concentrations in surface water, soil, and sediment for use in the risk calculations.

Table 4 – Summary of the Average PCB Concentrations

Exposure Point	Surface Water (ppm)	Sediment (ppm)	Bank Soil (ppm)	Floodplain Soil (ppm)
South Spring	1.25×10^{-3}	-	-	-
North Spring	6.76×10^{-4}	-	-	-
Conard's Branch	5.56×10^{-4}	1	7.2	3.6
1-Mile Site	1.04×10^{-4}	1.04×10^{-4}	-	-
3–Mile Site	1.5×10^{-4}	1.5×10^{-4}	-	-
5.5-Mile Site	-	-	-	-
12.7-Mile site	-	-	-	-
Section B	-	3.2×10^{-2}	-	2.2×10^{-1}
Section C	-	-	1.4 x 10-2	-
Section D	-	1.9×10^{-2}	-	-
Section E	-	2.7×10^{-2}	2.4×10^{-1}	-
Section F	-	3.6×10^{-1}	-	-
Section G	-	2.1×10^{-1}	-	-

The values in Table 4 were used in the calculation of dermal contact and incidental ingestion risks and the following is a summary of the PCB results:

- Dermal contact and incidental ingestion of surface water in Conard's Branch and Richland Creek produce a cancer risk of less than 3 in 1,000,000.

- Dermal contact and incidental ingestion of surface water in Conard's Branch and Richland Creek produce a non-cancer risk using the hazard index for PCBs of less than 1.

- Dermal contact and incidental ingestion of Conard's Branch and Richland Creek floodplain soil, bank soil and sediment produce a cancer risk of less than 1 in 1,000,000.

- Dermal contact and incidental ingestion of Conard's Branch and Richland Creek floodplain soil, bank soil, and sediment produce a non-cancer risk using the hazard index for PCBs of less than 1.

In addition, IDEM has set fish advisories to inform individuals as to the risk of eating fish from Richland Creek. Near the Neal's Landfill site, IDEM has categorized the creek as having a Group 3 fish advisory, which indicates the general population can eat one meal per month safely (except pregnant, pre-pregnant, breastfeeding women, and children do not eat). For creek chub greater than 7 inches and suckers greater than 11 inches, the advisory is Group 4, which indicates one meal every two months for the general population and the same exceptions as Group 3.

Using the information from the human health risk assessment and considering the Richland Creek stream characteristics, U.S. EPA determined that 0.2 ppm PCBs in fillets would be the fish remediation goal.

Ecological Risks

To evaluate the risk to ecological receptors, U.S. EPA follows a procedure similar to the four-step procedure described above with respect to the human health risk assessment. The ecological risk assessment for the Neal's Landfill site focused on whether exposure to PCBs by mammals and birds feeding on contaminated fish and crayfish from Conard's Branch and Richland Creek is high enough to potentially cause reproductive problems. Protection of fish-eating birds and mammals is expected to be protective of aquatic organisms as well because PCBs bioaccumulate in species as they are passed through the food chain. Therefore, animals that feed on fish are exposed to higher levels of PCBs compared to the fish themselves. Fish-eating mammals are represented by mink, and fish-eating birds are represented by kingfisher.

The exposures to mink and kingfisher are based on analyses of fish collected from Conard's Branch and Richland Creek in August 2001, November 2002, and May 2003 and crayfish collected in May 2003. Fish data collected in November 2005 was also analyzed. The ecological risk assessment fish sampling locations are Conard's Branch, Richland Creek at Vernal Pike, Richland Creek at the Route 43 bridge in Owen County, Richland Creek (5.5 miles downstream), Richland Creek and the Route 43 bridge in

Hendricksville (12.7 miles downstream), Richland Creek northwest of the town of Solsbery (21.8 miles downstream), and Richland Creek at the State Route 54 bridge in Bloomfield (34.5 miles downstream).

PCB concentrations in crayfish were also included in the exposure estimates for mink and kingfisher. Because crayfish were not collected at all sites or times, the ratio of PCB concentrations in co-located fish and crayfish in 1982 and 1998 was used to model PCBs in crayfish from measured fish data to fill in missing crayfish data. Risk is evaluated both for total PCBs and for dioxin TEQ. Missing crayfish TEQ data are modeled from fish data based on co-located fish and crayfish samples collected in 2003. Risks are calculated for both RME, which is based on an upper estimate of the average PCB or TEQ exposure, and central tendency exposure (CTE), which is based on the average measured exposure.

Mink exposure is modeled with a dietary composition of 66% fish, 13% crayfish, and 21% prey from land, based on a field study in Michigan, and assuming no PCB contribution from non-aquatic prey. Risk is estimated by HQs calculated by dividing the modeled dietary PCB concentrations by the dietary concentration resulting in no adverse effects in mink feeding studies (no effect HQ) and the lowest concentration that caused adverse effects (low effect HQ).

The results for total PCBs and TEQ using the fish sampling data show that mink are at risk of adverse reproductive effects to at least 2 miles downstream from the landfill. Between 3 and 5.5 miles downstream from the site, limited data exist to calculate the risk, but it is possible that some risk exists. Low to no risk exists beyond 13 miles downstream from the landfill. A dead mink was discovered on the State Route 48 and Richland Creek bridge in 2004, and the United States Fish and Wildlife Service sampled the liver of the mink for PCB analysis. Calculating the risk to the mink using the PCB and TEQ liver data showed that risk may be near the lowest level for reproductive effects. These risk results are consistent with the risks calculated using fish data.

Kingfisher exposure is modeled with a dietary composition of 80% fish and 20% crayfish based on several field studies in Midwestern states. PCB toxicity studies have not been performed with kingfisher; therefore, to allow use of toxicity data for other species of birds, kingfisher dietary exposure was converted to dose (PCBs or TEQ per kilogram body weight per day). Since the sensitivity of kingfisher to PCBs is unknown, two sets of PCB toxicity values were used to represent higher and lower sensitivities to PCBs. The risk associated with TEQ dose was evaluated with a single high-quality set of toxicity values. TEQ risk was also evaluated through a separate procedure by modeling the accumulation of dioxin-like PCB congeners in kingfisher eggs. The risks associated with TEQ in eggs were assessed with two sets of toxicity values to represent higher and lower sensitivities to dioxin-like effects.

The range of toxicity values used for kingfisher resulted in a range of risk estimates, with the egg-based approach showing higher risk compared to the ingestion dose-based approach. The range of overlap in risk estimates between the two kingfisher approaches

is referred to as "consensus HQs." The consensus HQs were selected as the best estimates of kingfisher risk because they represent the convergence of separate approaches based on independent estimates of toxicity. The kingfisher consensus HQs show similar trends as the mink risk estimates – risk of adverse reproductive effects to at least 2 miles downstream from the landfill; possible risk between 3 and 5.5 miles downstream, but with very limited data; and no or low risk beyond 13 miles downstream. An additional line of evidence is the potential risk to fish due to measured accumulation of dioxin-like PCB congeners in fish tissue. The toxicity data are based on a laboratory study of long-term exposure of rainbow trout to dioxin. The focused risk assessment showed risk of growth suppression and behavioral impairment in fish in Conard's Branch and the upper portion of Richland Creek. The downstream extent of elevated risk to fish is similar to that for mink or kingfisher, after adjusting the fish risk estimates for reported differences among fish species in dioxin sensitivity.

The RME no effect HQs for mink feeding in Richland Creek within 2 miles of Neal's Landfill range from 2 to 9 and the low effect HQs range from 1 to 2. The RME consensus HQs for kingfisher range from 4 to 20 for no effect, and 1 to 4 for low effect in the same reach. The risk estimates are much higher for foraging in Conard's Branch, the closest reach to Neal's Landfill; however, Conard's Branch is not large enough to fully support either mink or kingfisher, so risks were estimated by assuming combined foraging in Conard's Branch and Richland Creek. The RME no effect HQs for mink feeding in both Conard's Branch and Richland Creek range from 3 to 20, and the low effect HQs range from 2 to 6. The RME consensus HQs for kingfisher range from 9 to 60 for no effect, and 3 to 10 for low effect over the same reaches.

The risk estimates were used to calculate fish PCB goals that are expected to be protective of mammals or birds feeding on fish downstream of Neal's Landfill. The goals in Richland Creek are 0.7 ppm (no effect) to 0.9 ppm (low effect) PCBs in whole-fish based on risk to mink, and 0.25 to 0.9 ppm (no effect) to 1.2 to 2.6 ppm (low effect) PCBs based on risk to kingfisher. A separate set of fish goals was calculated for Conard's Branch assuming feeding in both Conard's Branch and Richland Creek. The goals in Conard's Branch are 1.8 ppm (no effect) to 2.3 ppm (low effect) PCBs in whole-fish based on risk to mink, and 0.5 to 2 ppm (no effect) to 2.4 to 5 ppm (low effect) PCBs based on risk to kingfisher. The wider range of goals for kingfisher reflects the greater uncertainty over PCB effects in kingfisher compared to the well-studied effects in mink.

REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) for the site are the following:

- Reduce the amount of PCBs released from groundwater to Conard's Branch and Richland Creek through mass reduction.

- Improve PCB levels in fish for beneficial reuse by reducing PCBs released to Conard's Branch and Richland Creek.

- Reduce the amount of PCB mass in sediments that may be available to fish by reducing PCBs released.

The RAOs were developed for the purpose of developing an array of alternatives. Based upon the human health and ecological risk assessments, the remediation goals for the site will focus on fish tissue. Based upon the human health risk assessment, the remediation goals will be to reduce PCB concentrations to a level of 0.2 ppm in fillets within Richland Creek. This would allow a maximum of one meal of fish per week by all populations. The fish sampling location in Richland Creek at the State Route 48 and State Route 43 bridge, about 3 miles downstream from the site, will be used for future fish sampling since that location is capable of producing enough fish to support sport fishing.

Based upon the ecological risk assessment and using the mink as the target organism, Table 5 is a summary of the remediation goals based upon whole fish (assumes mink feeding 75% of the time in Richland Creek and 25% of the time in Conard's Branch). These PCB fish remediation goals are also protective of kingfisher.

Table 5 - Summary of Ecological PCB Remediation Goals

Location	PCB Remediation Goals (ppm)
Conard's Branch – Average whole fish concentration	1.8 to 2.3
Richland Creek at Vernal Pike – Average whole fish concentration	0.7 to 0.9

DESCRIPTION OF ALTERNATIVES

Groundwater and Sediment Operable Unit

Disposal of capacitors containing PCB oil and other PCB waste material from the former Westinghouse capacitor plant at Neal's Landfill have resulted in PCBs migrating deep into the karstic limestone bedrock. High concentrations of PCBs were discovered during the 1999 source control excavation in the southeast portion of the site. In addition, sampling of water and sediment during the 2005 cave entry showed PCBs in both the water and sediment. The southeast corner of the site and conduits that travel under the landfill hold a reservoir of potentially mobile PCBs. Numerous hydraulic tests show a direct connection between the conduits and the Northwest Spring System.

The karst conduit investigation indicates that the Northwest Spring System is the discharge point for an approximate 350 to 400-acre groundwater drainage basin. The spring system flows in direct response to rainfall and infiltration to the groundwater system within this area. U.S. EPA analyzed spring flow records and determined that the mean hourly spring flow for the Northwest Spring System is about 400 gpm. Although flow rates can be much lower than that in the summer months, peak flow rates during

storm events can be higher than 11,000 gpm. PCBs are present in the Northwest Spring System discharge at all flow rates.

Before the 1999 source control cleanup, Neal's Landfill covered approximately 18 acres. The source control operable unit cleanup reduced the size of the landfill to approximately 10 acres. The 10-acre landfill only occupies a small portion of the approximately 400-acre Northwest Spring System drainage basin. The karst cave investigation and groundwater basin study has not demonstrated that clean water upgradient from the landfill can be diverted around the landfill. Moreover, PCBs in the karst bedrock cannot be effectively contained, removed, or treated by remedial action focused at the landfill. U.S. EPA concludes that the capture of PCBs at any point, or points, within the karst drainage system upstream from the Northwest Spring System is unlikely because of the inability to locate any major conduits where groundwater flows could be intercepted and diverted away from the contaminated areas under the landfill. Therefore, U.S. EPA's approach is to control PCBs released from the landfill by treating the discharge from the Northwest Spring System, which is the point where PCB-contaminated groundwater emerges from the groundwater system and flows into the headwaters of Conard's Branch.

The release of PCBs from Neal's Landfill has also contaminated sediment with PCBs in Conard's Branch and Richland Creek. Sediment contaminated with PCBs will affect the PCB levels in fish tissue. The sediment sampling results from Richland Creek show nearly all samples less than 1 ppm PCBs. Also, there is little or no sediment in Conard's Branch or Richland Creek until approximately 3 miles downstream of the landfill. Based upon the lack of sediment and the results of the human health and ecological risk assessments, no sediment cleanup was evaluated for Richland Creek. In Conard's Branch, in-stream sediment, bank soils and floodplain soils show a number of locations with PCB contamination greater than 1 ppm.

Fate and Transport Model

To assist in the development and evaluation of the alternatives for the groundwater and sediment operable units, CBS developed a PCB fate/transport and bioaccumulation model. The model was used to predict future levels of PCBs in fish in Conard's Branch and Richland Creek following the assumed implementation of a variety of different potential remedial action alternatives. As described in the Remedial Action Objectives section, the (1) remediation goal for human health is 0.2 ppm PCBs in fillets within Richland Creek and (2) ecological remediation goals are average whole fish concentrations in Conard's Branch of 1.8 to 2.3 ppm PCBs and average whole fish concentrations in Richland Creek of 0.7 to 0.9 ppm PCBs. These remediation goals were used in the fate and transport model to assist U.S. EPA in determining the best alternative to address the continuing release of PCBs from the Northwest Spring System.

Models have been used at a number of sites to assist the U.S. EPA in decision-making. The model developed by CBS relies upon various components that have been peer-reviewed by U.S. EPA in the past in connection with the cleanup of other sites. Models are a series of mathematical equations that describe the processes controlling contaminant exposure. For PCB exposure in a groundwater and surface water system like Neal's

Landfill, there are four groups of important processes that occur. The four sub-models or parts of the overall model are hydrodynamic, sediment transport, PCB fate, and PCB bioaccumulation. Data collected at the site, along with data from literature and experiences from modeling other systems, are used in the model to describe the Neal's Landfill groundwater and surface water system. To calibrate the model, extensive site-specific data such as sediment PCB concentrations, surface water flow data, PCB water sampling data obtained during storm and non-storm events, and fish and aquatic biota data were used to ensure that the model is as accurate as possible. The modeling effort provides valuable insights regarding the factors that control transport and fate of PCBs in Conard's Branch and Richland Creek.

The fate and transport model was used to quantify the relative importance of the various PCB sources to fish such as spring base flow, spring storm flow, water treatment plant effluent, in-stream sediments, and groundwater seeps along Conard's Branch. This type of assessment as to how each PCB source affects PCB concentrations in fish is helpful in developing and evaluating remedial alternatives. Table 6 below shows the results from the fate and transport model regarding the approximate contributions of spring water flow rates to PCB concentrations in fish.

Table 6 – Contribution of Water Sources to Fish PCBs Under Different Flow Regimes

Location	Species	Conard's Branch Weir - Low Flow < 10 gpm	Conard's Branch Weir - Moderate Flow 10 to 500 gpm	Conard's Branch Weir - High Flow > 500 gpm
Conard's Branch	Creek Chub	67%	22%	11%
Richland Creek at Vernal Pike	Creek Chub	42%	27%	31%
	Longear Sunfish	44%	27%	29%

Table 6 shows that the contributions of uncollected spring water flows to Conard's Branch when weir flows are less than 10 gpm provide the biggest source of PCBs to fish since these conditions are prevalent during the summer months when fish achieve much of their annual growth. High spring water flow conditions, and to a lesser extent, moderate spring water flow conditions contribute less PCBs to Conard's Branch fish since they are less frequent and last no longer than several days, which limits the ability of the fish to uptake the PCBs. In Richland Creek, low spring water flow conditions produce less of an effect on PCB levels in fish because the PCB concentrations in Richland Creek are diluted as compared to the PCB concentrations found in low-flow conditions at Conard's Branch.

In addition to evaluating how water flows influence PCB concentrations found in fish, the fate and transport model evaluated how the various sources of PCBs influence PCB concentrations in fish. Four sources of PCBs to fish were evaluated. The available PCB sources include (1) water that bypasses collection in Conard's Branch, (2) effluent from

the current water treatment plant, (3) North Spring area seeps that bypass the current collection system, and (4) sediment. The seeps near North Spring were discovered through sampling within Conard's Branch. The sampling results in Conard's Branch showed that these seeps were not being collected by the North Spring collection system resulting in low levels of PCBs being untreated within Conard's Branch. Table 7 below shows the approximate contribution of sources to PCB levels in fish.

Table 7 – Approximate Contribution of Sources to PCB Levels in Fish

Location	Species	Water From Northwest Spring System	Effluent from Water Treatment Plant	North Spring Area Seeps Bypass Water	Sediments
Conard's Branch	Creek Chub	24%	11%	37%	27%
Richland Creek	Creek Chub	36%	8%	21%	35%
	Longear Sunfish	24%	6%	14%	56%

For example, Table 7 shows that the fate and transport model predicts that creek chub in Conard's Branch receive 24% of its PCBs from the water coming from the Northwest Spring System that bypasses collection, 11% of the PCBs from the effluent leaving the current water treatment plant, 37% of PCBs from the North Spring area seeps, and 27% of PCBs from the sediment in Conard's Branch.

To further evaluate the PCB sources, comparisons of PCB sources to water under both storm and low-flow conditions were also developed as shown in Figure 11. During storm flows, 98% of the PCBs in Conard's Branch are produced from the Northwest Spring System, 0.8% of PCBs to the water in Conard's Branch comes from the water treatment plant effluent, 1% of the PCBs to the water in Conard's Branch are from the North Spring area seeps, and 0.1% of the PCBs in Conard's Branch during storm events are from sediments in Conard's Branch. During low flow events, 9% of the PCBs to water in Conard's Branch come from the Northwest Spring System, 22% of the PCBs are from the water treatment plant effluent, 53% of the PCBs to water are from the North Spring area seeps and 16% of the PCBs to water in Conard's Branch come from the sediments.

Comparing Table 7 and Figure 11 shows that the source of PCBs in creek chubs within Conard's Branch are similar to the source of PCBs during low flow providing additional evidence that PCBs within Conard's Branch fish are controlled by low-flow PCB sources.

In summary, key findings of the fate and transport model are as follows:

- Storm events producing flows greater than 500 gpm do not produce a major effect on PCB levels in fish due to the large flows not producing a long period of exposure, which limits the PCB bioaccumulation in fish.

- PCB concentrations in fish are affected most by PCB-contaminated spring water during low-flow periods. Currently, 37% of the PCBs contributed to creek chub in Conard's Branch are from the North Spring area seeps which currently bypass collection.

- Sediment contamination and stream bank contamination in Conard's Branch have an effect on PCB levels in creek chub, with sediments and bank soils contributing 27% of the PCBs found in the fish.

Technical Impracticability Waiver

This Technical Impracticability (TI) Waiver relates only to the point source discharge at the point of water treatment prior to discharge to the creek during storm events. Since site investigations at Neal's Landfill have failed to define a plume in the karst geology and a definable plume does not appear to exist, it is not possible to set cleanup goals for the groundwater that would allow beneficial reuse consistent with CERCLA Section 121(d)(2)(A).

As described previously, disposal of capacitors containing PCB oil and other PCB waste material from the former Westinghouse capacitor plant at Neal's Landfill have resulted in PCBs migrating deep into the karstic limestone bedrock. During the 1999 source control operable unit, high concentrations of PCB-contaminated material were discovered during excavation of the southeast portion of the site, and many areas were excavated to bedrock due to these high concentrations. The southeast portion of the site is known from dye tracer testing to drain via a system of karst dissolution conduits to the Northwest Spring System. These conduits contain a mobile reservoir of PCBs that are released through the spring system. The Northwest Spring System is the discharge point for a groundwater drainage basin of approximately 400 acres. Spring flow is in direct response to rainfall and infiltration to the groundwater system within this area. Although the 10-acre landfill occupies only a small portion of this drainage area, it is located in the extreme downstream portion of the groundwater basin and in a position to contribute PCBs to the drainage from the entire area.

Experience has shown that conventional recovery-well systems typically utilized in porous media environments are not likely effective in recovery of contaminated groundwater in karst environments. Extensive site-specific investigations at Neal's Landfill have shown that it not is possible to isolate the drainage from the landfill area in a manner that would allow capture or treatment of only the landfill groundwater. Consequently, the upstream most recovery points for affected groundwater are the spring orifices. Control of the PCB releases to Conard's Branch must therefore involve control and treatment of the large volumes of Northwest Spring System flow.

Flow from the Northwest Spring System has been measured for many years, and since February 2001, the mean annual spring flow rate is about 400 gpm. Although flow rates can be much lower than that in the summer months, peak flow rates during storm events are routinely higher than 11,000 gpm and flows greater than 500 gpm can last for many days, depending on seasonal factors and the rainfall distribution.

Evaluating the flow data from the Northwest Spring System since February 2001 shows one particularly large flow event. For 21 days beginning on December 29, 2004, approximately 61.4 million gallons of water bypassed the 500 gpm water treatment plant. The 61.4 million gallons of water are equivalent to 188 acres of water, one foot in depth. To contain 61.4 million gallons of water for treatment would require a large number of storage tanks or a large lagoon. At the Illinois Central Spring water treatment plant, two storage tanks each store 600,000 gallons of stormwater. When flows are reduced from the spring, the water within the tanks is drained and treatment of the stormwater can occur. If the equivalent size storage tanks were used at Neal's Landfill for the Northwest Spring System, 102 storage tanks would be required. Construction costs of the tanks would be over $66 million dollars.

In contrast to storage tanks, a large lagoon was evaluated to store the stormwater from the Northwest Spring System. A lagoon storing stormwater 4 feet in depth would require 47 acres. The size of the lagoon could vary depending upon the depth of the water within the lagoon. For example, water 10 feet in depth would require a lagoon of approximately 19 acres to store the 61.4 million gallons of stormwater.

Constructing 102 storage tanks each capable of storing 600,000 gallons is not practicable due to the large area required to place the 102 storage tanks. More appropriate would be the use of a storage lagoon. If a 47-acre lagoon was used, the difficulty in finding the required space along with the construction difficulties due to the requirement of removing significant quantities of rock and ensuring the containment of the water make constructing a large lagoon technically impracticable from an engineering perspective. Another problem with addressing such a large volume of water is the time required to treat the stored water. Assuming the 500 gpm water treatment plant is treating 100 gpm from the Northwest Spring System and 400 gpm from the storage lagoon, it would require 106 days to drain. This timeframe would produce additional storms so the likelihood that the lagoon would be consistently filled with water is high. This lagoon would be an attractive nuisance to both humans and ecological receptors. Ecological receptors such as geese and ducks using the storage lagoon would be exposed to PCB-contaminated water at higher concentrations compared to Richland Creek or Conard's Branch.

Taking into consideration the limitations of the site available to construct the storage areas and the impediments to keeping the unit operational under such conditions, the U.S. EPA is exercising a TI waiver of the National Pollution Discharge Elimination System (NPDES) substantive requirements for stormwater flow greater than 500 gpm that bypasses the water treatment plant.

The TI waiver applies to all the alternatives and is being implemented under CERCLA Section 121(d)(4)(C) which is technical impracticability from an engineering perspective. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) waived are discussed in the Evaluation Criteria for Superfund Remedial ARARs section.

Remedy Components

After evaluating the PCB sources to water and fish, remedial alternatives were developed to address the unacceptable ecological and human health risk. The alternatives were evaluated in the fate and transport model to determine if the PCB risk goals developed for fish (See Remedial Action Objectives Section) could be met. Including the "No Action Alternative," U.S. EPA evaluated seven alternatives to address contaminated groundwater and sediment caused by Neal's Landfill. The No Action Alternative must be evaluated as part of all Superfund remedy decisions. Under U.S. EPA's regulations, the "No Action Alternative" can include continuation of interim remedial measures, such as the continued operation of the water treatment plant built as an interim measure under the 1985 Consent Decree. Nevertheless, U.S. EPA also considered the alternative of shutting off this water treatment plant.

The development of the alternatives took into consideration the continued use of the current 450 gpm water treatment plant, which can treat up to 500 gpm. Due to the technical impracticability of storing all the stormwater that bypasses the water treatment plant, storage of a smaller amount of stormwater was evaluated.

Seven alternatives were developed based upon the ability to address springs at base flow, springs at storm flow, the North Spring area seeps and sediment. U.S. EPA did evaluate the possibility of capturing a smaller volume of stormwater compared to storing all of the stormwater. A storage volume of 2 million gallons was evaluated in the fate and transport model. These seven alternatives were evaluated in detail in the fate and transport model and are as follows:

- Alternative 1- No Action (this Alternative would shut down the current 500 gpm treatment system).
- Alternative 2 – Continue to operate the 500 gpm water treatment plant.
- Alternative 3 – Continue to operate the 500 gpm water treatment plant with improvements to the water collection system, and perform a sediment and floodplain cleanup in Conard's Branch.
- Alternative 4 – Continue to operate the 500 gpm water treatment plant, add 2 million gallons of stormwater storage, improve the water collection system, and perform a sediment and floodplain cleanup in Conard's Branch.

- Alternative 5 – Expand the current water treatment plant to 1,000 gpm, improve the water collection system, and perform a sediment and floodplain cleanup in Conard's Branch.

- Alternative 6 - Expand the current water treatment plant to 1,000 gpm, add 2 million gallons of stormwater storage, improve the water collection system, and perform a sediment and floodplain cleanup in Conard's Branch.

- Alternative 7 – Continue to operate the 500 gpm water treatment plant, improve the water collection system, add three stormwater settling basins, and perform a sediment and floodplain cleanup in Conard's Branch.

The seven alternatives were each evaluated in the fate and transport model to determine if the fish goals would be met if the alternative was implemented. Table 8 shows the expected percentage of PCB reduction in fish concentrations predicted by the model for each of the seven alternatives 10 years after the implementation of the alternative. As described in the Remedial Action Objectives section, the objectives of the groundwater and sediment operable units are to reduce the amount of PCBs that are released in Conard's Branch and Richland Creek and to meet the remediation goals developed for fish tissue in the ecological and human health risk assessments. The fate and transport model predicts that spring water during storm events, which is not currently captured for treatment by the existing water treatment plant, does not have an unacceptable effect on PCB fish-tissue levels. It appears that the PCB-contaminated water released during storm events has little effect on fish because the duration of the conditions during storms does not produce a long enough exposure to greatly affect the PCB concentrations in fish. For Alternatives 3 through 7, the model predicts that the fish tissue remediation goals for both ecological and human health will be met within 10 years after the remedy is constructed.

Table 8 – Percent Reduction in PCB Levels in Fish Tissue After 10 Years

Alternative	Description of Alternative	% Reduction Year 10 Average Conard's Branch Creek Chub	% Reduction Year 10 Average Richland Creek Creek Chub	% Reduction Year 10 Average Richland Creek Longear Sunfish
1	No Action	0%	0%	0%
2	Current 500 gpm Treatment System	69%	63%	51%
3	Water Collection System Improvement + Sediment Cleanup to 1 ppm PCBs + 500 gpm Treatment System	83%	69%	56%
4	Water Collection System Improvement + Sediment Cleanup to 1 ppm PCBs + 500 gpm Treatment System + 2 Mgal Storage	83%	71%	57%

Alternative	Description of Alternative	% Reduction Year 10 Average Conard's Branch Creek Chub	% Reduction Year 10 Average Richland Creek Creek Chub	% Reduction Year 10 Average Richland Creek Longear Sunfish
5	**Water Collection System Improvement + Sediment Cleanup to 1 ppm PCBs + 1000 gpm Treatment System**	86%	74%	60%
6	**Water Collection System Improvement + Sediment Cleanup to 1 ppm PCBs + 1000 gpm Treatment System + 2 Mgal Storage**	86%	75%	60%
7	**Water Collection System Improvement + Sediment Cleanup to 1 ppm PCBs + 500 gpm treatment System + 3 Settling Basins**	85%	74%	60%

PCB-contaminated sediment contributes approximately 27% of the PCBs in fish tissue within Conard's Branch; therefore, addressing PCB-contaminated sediment is critical to meeting the fish goals. Accordingly, U.S. EPA evaluated only leaving the sediment in place (No Action Alternative) and the removal of PCB-contaminated in-stream and bank sediment to 1 ppm PCBs on average, along with removal of floodplain soils to 5 ppm PCBs on average for Alternatives 3 through 7.

The estimated volume of PCB-contaminated sediment and soils is 1,141 cubic yards using the cleanup criteria for sediment, banks, and floodplain. CBS will take the excavated sediment and soils for off-site disposal in permitted landfills capable of accepting PCB-contaminated material. If PCB concentrations are less than or equal to 50 ppm PCBs, then the PCB-contaminated material will be disposed of in a special waste landfill. If sediments and soils are contaminated with concentrations of greater than 50 ppm PCBs, then a TSCA chemical waste landfill will be used for disposal. For costing purposes, U.S. EPA assumed that 100 tons of the sediments and soils are contaminated with greater than 50 ppm PCBs. Additional sampling to supplement historical sediment sampling data will be required prior to beginning the cleanup activities. It is estimated that remediation of the sediment, banks and floodplain soils will cost $1,184,109.

Below are descriptions of the Alternatives evaluated for the groundwater and sediment operable units. Costs are calculated using present worth, because this indicates how much money will need to be available today to completely fund the construction and operation and maintenance. To calculate the present worth, a 7% discount rate was used and a timeframe of 30 years of operation. The 30 years of operation and maintenance is used only for the purpose of estimating cost. The actual operation and maintenance period may be longer than 30 years or may be shorter.

Alternative 1: No Action (Shut Down the Current Water Treatment Plant)

Estimated Capital Cost: $0
Estimated Annual Operation and Maintenance: $0
Estimated Present Worth Cost: $0
Estimated Construction Timeframe: 0 months

The No Action Alternative is required to be evaluated pursuant to the National Contingency Plan 40 CFR 300(e)(6). In this alternative, the current treatment plant will be shut down and no further remedial activities will be implemented. The Capital Cost, Annual Operation and Maintenance Costs and Present Worth Costs are all $0.

Alternative 2: Continue to Operate the Current 500 gpm Water Treatment Plant

Estimated Capital Cost: $0
Estimated Annual Operation and Maintenance: $118,000
Estimated Present Worth Cost: $1,463,484
Estimated Construction Timeframe: 0 months

In this alternative, the current water treatment plant will continue to operate with no additional remedy components. The PCB-contaminated water is treated through the use of cartridge filters to remove suspended solids and carbon adsorption. The treatment plant (1) treats up to 500 gpm of water which is on average about 47% of the total spring flow and (2) captures about 38% of the PCB mass released. Fish remediation goals will not be met with this alternative.

Alternative 3: Continue to Operate the Current 500 gpm Water Treatment Plant with Improvement of Water Collection System and Sediment and Flood Plain Cleanup

Estimated Capital Cost: $1,305,513 ($1,184,109 for sediment operable unit and $121,404 for groundwater operable unit)
Estimated Annual Operation and Maintenance: $118,000
Estimated Present Worth Cost: $2,768,997
Estimated Construction Timeframe: 6 months

In this alternative, an improvement in the water collection system would be implemented to capture additional spring water for treatment by the current treatment system, which can treat up to 500 gpm. This improved collection system would be located farther downstream in Conard's Branch and would capture additional water near North Spring. To prevent water that has been treated by the treatment plant from being retreated, the discharge point for the treated water will also be moved farther downstream in Conard's Branch. A conceptual approach for improving the collection system and moving the effluent discharge point farther downstream in Conard's Branch is shown in Figure 12.

Sediment in Conard's Branch and within the banks would be remediated to 1 ppm PCBs on average and 5 ppm PCBs on average in the Conard's Branch floodplain. The total volume of sediment and soil to be excavated is estimated to be 1,141 cubic yards. Additional sampling will be required to fully define the contaminated areas. The

excavated sediment and soils, if contaminated with concentrations of less than or equal to 50 ppm PCBs, will be disposed of off-site in a special waste landfill. If the sediments and soils are contaminated at levels greater than 50 ppm PCBs, then those sediments and soils will be disposed of off site in a chemical waste landfill. It is estimated that 100 tons of sediments and soils are greater than 50 ppm PCBs. The fish remediation goals will be met in 10 years for this alternative.

Alternative 4: Continue to Operate the Current 500 gpm Water Treatment Plant with Improvement of Water Collection System, Add Two Million Gallons of Stormwater Storage and Sediment and Flood Plain Cleanup

Estimated Capital Cost: $ 3,005,513
Estimated Annual Operation and Maintenance: $148,000
Estimated Present Worth Cost: $4,841,268
Estimated Construction Timeframe: 6 months

In this alternative, Alternative 3 would be implemented and two million gallons of stormwater storage would be added. The improvement in the collection system and additional stormwater storage would increase the percentage of spring flow treated to 59% with a 48% reduction in PCB mass. Sediment, bank soils, and floodplain soils in Conard's Branch would be remediated as described in Alternative 3. The fish remediation goals will be met in 10 years for this alternative.

Alternative 5: Expand the Current 500 gpm Water Treatment Plant to Treat 1,000 gpm with Improvement of Water Collection System and Sediment and Flood Plain Cleanup

Estimated Capital Cost: $2,500,323
Estimated Annual Operation and Maintenance: $138,000
Estimated Present Worth Cost: $4,211,987
Estimated Construction Timeframe: 6 months

In this alternative, the current water treatment plant which treats up to 500 gpm will be expanded to treat 1,000 gpm and the improvement to the collection system and relocation of the discharge point for the treated water farther downstream (as described in Alternative 3) will be implemented. The expansion of the water treatment plant to 1,000 gpm will treat 66% of the spring flow with a 50% reduction in PCB mass. Sediment, bank soils, and floodplain soils in Conard's Branch would be remediated as described in Alternative 3. The fish remediation goals will be met in 10 years for this alternative.

Alternative 6: Expand the Current 500 gpm Water Treatment Plant to Treat 1,000 gpm with Improvement of Water Collection System, the Addition of Two Million Gallons of Stormwater Storage and Sediment and Flood Plain Cleanup

Estimated Capital Cost: $4,200,323
Estimated Annual Operation and Maintenance: $168,000
Estimated Present Worth Cost: $6,284,259
Estimated Construction Timeframe: 6 months

In this alternative, Alternative 5 would be implemented and two million gallons of stormwater storage would be added to the 1,000 gpm system. The percentage of spring flow treated would be 74% and PCB mass would be reduced by 64%. Sediment, bank soils, and floodplain soils in Conard's Branch would be remediated as described in Alternative 3. The fish remediation goals will be met in 10 years for this alternative.

Alternative 7: Continue to Operate the 500 gpm Water Treatment Plant with Improvement of Water Collection and the Addition of Three Settling Basins in Series and Sediment and Flood Plain Cleanup

Estimated Capital Cost: $3,901,013
Estimated Annual Operation and Maintenance: $163,000
Estimated Present Worth Cost: $5,925,385
Estimated Construction Timeframe: 6 months

In this alternative, the water treatment plant which treats up to 500 gpm will continue to operate as described in Alternative 3, but a series of three settling ponds in series, for a total of 18-acres in size, will be installed to treat stormwater. With this Alternative, all the water would be treated to some degree and 75% of the PCB mass released would be captured and treated. Sediment, bank soils and floodplain soils in Conard's Branch would be remediated as described in Alternative 3. The fish remediation goals will be met in 10 years for this alternative.

Common Elements and Distinguishing Features of Each Alternative

Section 121(d) of CERCLA and the National Oil and Hazardous Substances Contingency Plan (NCP) Section 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4). All of the alternatives, except the "No Action" alternative, require compliance with ARARs, unless they are waived. The water and sediment operable units contemplated for the site are subject to two types of ARARs. First, action-specific ARARs set forth requirements on how certain actions must be performed at the site. Second, chemical-specific ARARs set forth numeric values or methodologies for the handling of certain hazardous substances. Each category of ARARs is discussed below.

a. Action Specific ARARs

1. NPDES Requirements

The current 500 gpm water treatment plant is regulated by the State of Indiana through a NPDES permit. The current permit uses a 1 ppb discharge criteria. The selection of a water operable unit remedial alternative will eliminate the NPDES permit, because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Therefore, new substantive discharge requirements will be developed for the water treatment plant. Nevertheless, certain

regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARs:

- Surface Water Quality Criteria for Specific Substances - 327 Indiana Administrative Code (IAC) 2-1-6, Table 1
- Conditions applicable to all permits - 327 IAC 5-2-8 (3), (7), (8), (9), (10), (11), (12), (13), (14)
- Considerations in the calculation and specification of effluent limitations - 327 IAC 5-2-11(a) (1), (2), (3), (4), (5)(C); (d), (e), (f), (g), (h)
- Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system - 327 IAC 5-2-11.1(a), (b), (d), (f), (g), (h)
- Applicability of Best Management Practices - 327 IAC 5-9-2 (a), (c), (d), (e), (i), (j)
- Monitoring - 327 IAC 5-2-13 (a), (c), (d), (e), (f)

The Indiana Department of Environmental Management has stated in correspondence that it typically sets an effluent limit of 0.3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. Spring water up to 500 gpm from the Northwest Spring System will be captured and treated and will be subject to the 0.3 ppb PCB discharge criteria. IDEM has also stated that discharge criteria for constituents other than PCBs will not be required. According to the fate and transport model, spring water flows greater than 500 gpm are responsible for only 11% to 31% of the PCBs found in fish in Conard's Branch and Richland Creek. Further, and more importantly, it is not necessary to capture these flows for the remedy to be protective of human health and the environment. Rather, the fate and transport model shows that the capture and treatment of spring water during low flow conditions (i.e. flows less than 500 gpm) is enough to reduce PCBs in fish to the point where their consumption will no longer pose an unacceptably high risk to human health and the environment.

Under CERCLA Section 121(d)(4), U.S. EPA may select a remedial action that does not attain a level or standard of control at least equivalent to ARARs if U.S. EPA finds that compliance with such requirements is technically impracticable from an engineering perspective. As discussed previously, the U.S. EPA is implementing a TI waiver pursuant to CERCLA Section 121(d)(4)(C) for water that is not treated by the water treatment plant. Due to the large volume of stormwater produced from the karst geology, the ability to store and eventually treat all the stormwater is technically impracticable from an engineering standpoint. For example, during a 21-day period beginning on December 29, 2004, 61.4 million gallons of water, or 188-acre feet, bypassed the existing 500 gpm water treatment plant. Storing this large amount of water for eventual treatment would require over 100 storage tanks able to contain 600,000 gallons each, or a 47-acre storage lagoon 4 feet in depth.

The following ARARs will be waived for spring water flows in excess of 500 gpm that bypass the water treatment plant:

- 327 IAC 2-1-6 Table
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11(a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1(a), (b), (d), (f), (g), (h)

As a result of this TI Waiver, no discharge criteria will be given to spring water not treated by the 500 gpm treatment plant.

2. Fugitive Dust Requirements

Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for "fugitive dust," i.e., particulate matter that escapes beyond the boundaries of the site. These emission limits are relevant and appropriate with respect to dust resulting from the excavation of Conard's Branch sediment, bank and floodplain soils. Likewise, the emission limits are relevant and appropriate with respect to on-site construction for the water operable unit.

Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right-of-way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust. This requirement is relevant and appropriate not only with regard to the excavation of Conard's Branch sediment, bank and floodplain soils, but also for all the construction activities contemplated under the water operable unit.

b. Chemical-specific ARARs

1. 329 IAC 4.1-4 Requirements for storage and disposal of PCB wastes

Under 329 IAC 4.1-4, any sludge, soil, or other material generated by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR § 761.61. This requirement is relevant and appropriate with respect to PCB-contaminated soil/sediment generated by the excavation of Conard's Branch sediment, bank and floodplain soils or by the construction of the new water collection system and movement of the effluent line farther downstream of the site. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

2. 329 IAC 3.1 Universal Waste Rule

Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether they meet the characteristics of hazardous waste. If they meet these characteristics, then they must be disposed of in an approved RCRA-permitted facility in accordance with 40 C.F.R. §§ 260-280. This requirement is relevant and appropriate with respect to waste generated by the excavation of the Conard's Branch sediment, bank and floodplain soils or by the construction of the new water collection system and

movement of the effluent line farther downstream of the site. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

3. 329 IAC 10 Solid Waste Land Disposal Facilities

Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste. This requirement is relevant and appropriate with respect to waste generated by the excavation of Conard's Branch sediment, bank and floodplain soils or by the construction of the new water collection system and movement of the effluent line farther downstream of the site. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

4. 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants

Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. U.S. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

5. 326 IAC 2-5.1-3(a)(1)(D) Permits for New HAP Source

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

6. 326 IAC 2-5.1-2(a)(1)(A) Registrations

Under 326 IAC 2-5.1-2(a)(A), a source of HAP that has the potential to produce twenty-five tons per year and equal to or greater than five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with emissions lower than five tons per year is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit of five tons per year, the remedy must comply within the substantive requirements of the registration rule, although registration will not be required for the site. U.S. EPA does not anticipate that any of the proposed remedies will meet this threshold.

c. Use Restrictions

The Alternatives (except the No Action Alternative) share common elements, including the requirement of use or access restrictions. Use or access restrictions will be implemented through institutional controls. Institutional controls are administrative or legal constraints that minimize the potential for exposure to contamination by limiting

land or resource use. Specific actions taken at sites to restrict access or use could include: Governmental Controls – such as zoning restrictions or ordinances; Proprietary controls – such as easements or covenants; Enforcement Tools – such as consent decrees or administrative orders; and Informational Devices – such as deed notices or state registries.

Several types of access or use restrictions employed simultaneously can increase the effectiveness of institutional controls. The following is a list of institutional controls that will be implemented:

- Residential and commercial development will be prohibited within the fence line surrounding the 10-acre landfill to prevent damage to the landfill cap and to the landfill gas vents.
- The southeast portion of the former landfill was remediated to industrial PCB standards and residential development in this southeast portion will be prohibited.
- Residential development and certain farming activities, such as grazing, within the floodplain area of Conard's Branch will be prohibited.
- Groundwater use will be prohibited at the landfill.

d. Operation and Maintenance

Each of the Alternatives (except the No Action Alternative) requires a program of Operation, Monitoring and Maintenance, and this will include routine inspection. It is anticipated that institutional controls will be relatively simple to develop, likely through a layered approach. Institutional controls may include proprietary controls (easements and/or covenants); deed restrictions; and enforcement tools (Administrative Orders on Consent and/or Consent Decrees), which will ensure the long-term reliability of the controls.

Expected Outcome of Each Alternative

U.S. EPA expects that Alternatives 3 through 7 will meet the fish remediation goals within 10 years or less based upon the fate and transport model. A long-term monitoring program will be implemented by CBS, which will verify if the fish remediation goals will be met. With the completion of the source control operable unit, industrial/commercial development may occur outside the landfill fence line. If the Sycamore Land Trust accepts the property, future development of the property would be unlikely.

COMPARATIVE ANALYSIS OF ALTERNATIVES

The U.S. EPA is required by CERCLA and the NCP to use nine criteria to evaluate the remedial alternatives against each other to determine the most appropriate remedy for the site. The nine criteria fall into three groups: threshold criteria, primary balancing criteria and modifying criteria. A description of the three criteria groups includes the following:

- Threshold criteria are requirements that each alternative must meet in order to be eligible for selection.
- Primary balancing criteria are used to weigh major trade-offs among alternatives.
- Modifying criteria are considered after public comment is complete and are of equal importance to the balancing criteria.

Each alternative is compared to the other to determine which alternative is the best balance of the nine criteria. The discussion below is a description of comparative analysis, and Table 9 provides a summary of the comparison.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion and addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternative 1 is not protective because the fate and transport model shows that if the current water treatment plant was shut down, PCB levels in fish would increase by as much as four times the current levels. Likewise, Alternative 2 is not protective because the fate and transport model shows that PCB concentrations in fish tissue would never achieve the PCB goals for abating risks to humans and animals from the consumption of contaminated fish. CERCLA requires the selection of a remedy that is protective of human health and the environment. Consequently, neither Alternative 1 nor Alternative 2 meet this requirement and will be eliminated from any further consideration.

The remaining five alternatives (i.e. Alternatives 3 through 7) are protective of human health and the environment because the fate and transport model shows that fish remediation goals will be achieved within 10 years or less after completion of any one of these remedies. Comparing Alternatives 3, 4, 5, 6, and 7 against each other based upon the reduction of PCB levels in fish shows only slight differences among the Alternatives.

In the sediment operable unit, the remediation of the Conard's Branch sediment and bank soils to a 1 ppm PCB standard on average and 5 ppm PCBs on average for the floodplain soils will be protective of human health and the environment. Sediment contributes 27% of the PCBs found in fish tissue in Conard's Branch. According to the fate and transport model, PCB concentrations in fish will achieve U.S. EPA's goals within ten years or less if sediment in Conard's Branch is cleaned up and maintained at a concentration of 1 ppm or less. Since Richland Creek sediment contamination is under 1 ppm PCBs, a sediment cleanup is not required there.

Compliance with Applicable or Relevant and Appropriate Requirements

Compliance with ARARs is a threshold criterion, unless a waiver is implemented.

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a State in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of state or federal law, or alternatively, whether there is a basis for invoking a waiver of the ARAR. The water operable unit remedial alternatives require the improvement of the collection system and the operation of an on-site water treatment plant. This plant will not need to obtain a NPDES permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. 96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant. In the Common Elements and Distinguishing Features of Each Alternative section, the ARARs that are required to be met are listed. In addition, U.S. EPA is implementing a TI waiver pursuant to CERCLA Section 121(d)(4)(C) for certain ARARs that would otherwise apply to water that is not treated by the 500 gpm treatment plant. Due to the difficulty in storing a very large volume of stormwater and the timeframe required to treat stormwater, a TI waiver from an engineering perspective is justified. It is technically impracticable from an engineering standpoint to have to construct 102 storage tanks or a 47-acre lagoon, four feet in depth, to treat the large volume of stormwater produced from the Northwest Spring system. The following ARARs will be waived for water not treated within the 500 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 500 gpm treatment plant.

All ARARs will be met, excluding the ARARs associated with the TI waiver.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is a balancing criterion and refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk, if any, that will remain onsite following remediation and the adequacy and reliability of controls to mitigate these risks.

All of the remedial alternatives remaining under consideration will provide long-term protection of human health and the environment. As discussed above, the fate and transport model shows that the two primary contributors of PCBs in fish tissue in Conard's Branch and Richland Creek are (1) PCBs released during low-flow conditions and (2) PCBs in the sediment and banks of Conard's Branch. To address the first problem, each of the remedies will limit releases of PCBs into these streams at concentrations greater than 0.3 ppb until such time that the influent into the water treatment plant is equal to or less than 0.3 ppb. Further, to address the second problem, each of the remedies will require the removal of PCB-contaminated sediment in Conard's Branch with a concentration greater than 1 ppm and will require the removal of PCB-contaminated soil in the floodplain of Conards' Branch with a concentration greater than 5 ppm. After the remedy is completed, PCB concentrations should not only achieve target levels for fish tissue within ten years, but should also continue to meet these target levels in perpetuity.

Since it is not technically feasible to capture and treat all PCBs released from the Site, there is a risk associated with all the remedies that the sediment in Conard's Branch could become recontaminated as a result of PCBs that bypass the treatment facility. The degree of this risk differs among the remedial alternatives depending upon the degree of mass reduction achieved by the remedy. For instance, Alternative 7 poses the lowest risk of recontamination because it will achieve the greatest mass reduction in comparison to the other alternatives. Regardless of the remedy selected, U.S. EPA intends to establish operation and maintenance requirements specifying that PCB concentrations in sediment must be maintained at a level that prevents recontamination of fish. Thus, all of the remedies should continue to maintain reliable protection of human health and the environment even if recontamination of the sediment should occur.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment is a balancing criterion and refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

All the remedial alternatives under consideration require the continued operation of the water treatment plant using the cartridge filters and carbon adsorption system to remove PCBs from spring water. Further, they all require that soil and sediment removed from Conard's Branch with a concentration greater than 50 ppm will be disposed of off-site in a landfill permitted to accept such PCB waste. Soil and sediment with PCB

concentrations less than or equal to 50 ppm will also be disposed of off-site in a permitted special waste landfill. The off-site disposal will not reduce the toxicity, mobility or volume through treatment since no treatment will occur at the landfill. Treatment was not considered based upon the small volume of material and past activities implemented for contaminated soil and sediment at the other Bloomington PCB sites.

Despite the above similarities, the remedial alternatives differ significantly in terms of mass reduction. Alternative 7, which includes the construction of settling lagoons, will achieve the greatest reduction in the mass of PCBs released into Conard's Branch, reducing current releases by 64%. In contrast, Alternative 3, which expands the collection system for the existing treatment plant, will achieve the lowest reduction in mass of PCBs released in Conard's Branch, reducing current releases by 39%. However, as discussed previously, the fate and transport model does not show that removing the most mass will have a large impact on PCB levels in fish tissue, and therefore, it does not have a large impact on the protectiveness of the remedy. Accordingly, PCB mass reduction is not a factor that has been weighted heavily in U.S. EPA's remedy selection.

Short-Term Effectiveness

Short-term effectiveness is a balancing criterion and addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

All five alternatives that are protective for the water operable unit can be implemented. Standard construction methods can be used and the short-term risk to construction workers and potential contact with contaminated soils and groundwater will be eliminated through engineering controls and the implementation of health and safety protocols. The excavation of sediment and soils from Conard's Branch and the floodplain area will be monitored to ensure that the surrounding community and workers are protected from PCBs that may be present either through fugitive dust or volatilization. Increased truck traffic may occur in the area for the transport of contaminated sediment and similar precautions used during the source control operable unit will be implemented.

Implementability

Implementability is a balancing criterion and addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The five protective alternatives for the water operable unit can all be implemented. The ability to store two million gallons of stormwater as described in Alternative 4 and Alternative 6 along with constructing settling basins as described in Alternative 7 is feasible. The necessary construction equipment is available and operating the technology is common practice. The proposed excavation activities also can be implemented and will not pose unacceptable problems or risks.

Cost

Cost is a balancing criterion and to calculate the cost for each alternative, a 7% discount rate was used and net present value costs were completed. Total net present value costs and assumed operation and maintenance costs for both the water and sediment operable units are described in Table 9.

State/Support Agency Acceptance

State and support agency acceptance is a modifying criterion. The State of Indiana, along with the City of Bloomington and Monroe County, support the implementation of Alternative 3.

Community Acceptance

Community acceptance is a modifying criterion. The public comments are addressed in the attached Responsiveness Summary. A citizens group that is in litigation against U.S. EPA submitted comments opposing Alternative 3 and recommending complete excavation of the landfill. CBS Corporation submitted a large amount of comments stating the risk assessments have overestimated the risk and that no further action would be a more appropriate remedy.

PRINCIPAL THREAT WASTES

The NCP establishes an expectation that U.S. EPA will use treatment to address the principal threats posed by a site whenever practicable (NCP 300.430(a)(1)(iii)(A). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

The principal threat waste was addressed in the 1999 source control operable unit. The conduit and cave investigation did not produce evidence of dense non-aqueous phase liquids or high concentrations of PCBs as principal threat wastes. Additional evidence of the lack of high concentrations of PCBs as principal threat waste was through the analysis of the spring flow data. Analysis of the sampling data shows a 6% yearly decrease in PCB concentrations in South Spring since the completion of the source control operable unit. The groundwater treatment alternatives will address the non-principal threat waste.

SELECTED REMEDY

U.S. EPA selects Alternative 3 (sediment cleanup/collection system improvements and operation of the water treatment plant which treats up to 500 gpm) for both the water and sediment operable units. This alternative was selected over the other alternatives because

it is expected to achieve substantial and long-term risk reduction through the removal of sediment and improvements in the water collection system during low-flow conditions. The fate and transport model shows that the improvement of the water collection system to capture the North Spring bypass water, along with completing the sediment removal and continuing to run the water treatment plant over time, will reduce PCB levels in fish tissue to acceptable levels based upon the fate and transport model. Other remedial alternatives remove greater PCB mass than Alternative 3, but PCB mass does not produce a large increased reduction in PCB concentrations in fish. This is because most of the PCBs in fish are attributable to the low volumes of PCBs released during periods of low flow. The fate and transport model shows that fish accumulate PCBs primarily during low-flow conditions in the summer months when the fish are growing. Short-term exposures to PCBs released during storm events do not have a significant impact upon PCB concentrations in fish, even though the mass of PCBs released during storm events is much higher than the mass released during low-flow events. Therefore, implementing Alternative 3 will meet the remediation goals and is cost effective compared with the other alternatives. The capital cost for Alternative 3 is $1,305,513 ($1,184,109 for the sediment portion), annual operation and maintenance costs are $118,000, and the total present worth costs over 30 years is $2,768,997.

With Alternative 3, the treatment plant will continue to operate until water from the Northwest Spring System is less than 0.3 ppb PCBs for a 12-month period. An alternative shut-off criteria may be proposed, and if U.S. EPA determines that the alternative shut-off criteria provides a standard that is protective of human health and the environment, then the shut-off criteria identified in this ROD Amendment may be modified consistent with the substantive and procedural requirements of CERCLA and the NCP.

The fate and transport model predicts that PCB levels in fish will be reduced to acceptable levels within 10 years through the implementation of Alternative 3. To verify if the predictions in the model are correct, a long-term monitoring program will be developed and implemented to monitor the site remedy. If the remedy is not functioning as planned, a special remedy reopener will be used and additional investigation and additional remediation may be required to ensure that the remedy is protective of human health and the environment. Further, as mentioned above, the operation and maintenance requirements for the remedy will specify that PCB concentrations in sediment must be maintained at a level that prevents recontamination of fish tissue after the goals for fish tissue concentration have been achieved.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, U.S. EPA must select remedies that are (1) protective of human health and the environment, (2) comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), (3) are cost-effective, and (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and

significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Selected Remedy, Alternative 3, will protect human health and the environment through removing contaminated sediment from Conard's Branch, improvement in the spring water collection system and the continued operation of the 500 gpm water treatment plant. The human health fish remediation goals of 0.2 ppm PCBs in fillets within Richland Creek and the ecological fish remediation goals of 1.8 to 2.3 ppm PCBs on average in whole fish within Conard's Branch and 0.7 to 0.9 ppm PCBs on average in whole fish within Richland Creek will be met within 10 years after completion of construction of the selected remedy. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled and no cross media impacts are expected from the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy for the groundwater and sediment operable units will meet the respective ARARs and a TI Waiver has been granted for water not treated by the 500 gpm water treatment plant.

The following is a list of action specific ARARs for the Selected Remedy:

The current 500 gpm water treatment plant is regulated by the State of Indiana through a NPDES permit. The current permit uses a 1 ppb PCB discharge criteria. Based upon discussions with the State, the selection of a water operable unit remedial alternative will eliminate the NPDES permit, because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Therefore, new substantive discharge requirements will be developed for the water treatment plant. Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARs:

- Surface Water Quality Criteria for Specific Substances - 327 IAC 2-1-6, Table 1

- Conditions applicable to all permits - 327 IAC 5-2-8 (3), (7), (8), (9), (10), (11), (12), (13), (14)

- Considerations in the calculation and specification of effluent limitations - 327 IAC 5-2-11(a) (1), (2), (3), (4), (5)(C); (d), (e), (f), (g), (h)

- Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system - 327 IAC 5-2-11.1(a), (b), (d), (f), (g), (h)

- Applicability of Best Management Practices - 327 IAC 5-9-2 (a), (c), (d), (e), (i), (j)

- Monitoring - 327 IAC 5-2-13 (a), (c), (d), (e), (f)

The State of Indiana typically sets an effluent limit of 0.3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. Spring water up to 500 gpm from the Northwest Spring System will be captured and treated and will be subject to the 0.3 ppb discharge criterion. Based on the fate and transport model, it is not necessary to capture and treat more water because the additional water does not pose an unacceptable risk to human health and the environment.

Under CERCLA Section 121(d)(4), U.S. EPA may select a remedial action that does not attain a level or standard of control at least equivalent to ARARs if U.S. EPA finds that compliance with such requirements is technically impracticable from an engineering perspective. As discussed below, the U.S. EPA is implementing a TI waiver pursuant to CERCLA Section 121(d)(4)(C) for water that is not treated by the water treatment plant. Due to the large volume of stormwater produced from the karst geology, the ability to store and eventually treat all the stormwater is technically impracticable from an engineering standpoint. For example, during a 21-day period beginning on December 29, 2004, 61.4 million gallons of water, or 188-acre feet, bypassed the 500 gpm water treatment plant. Storing this large amount of water for eventual treatment would require over 100 storage tanks able to contain 600,000 gallons each, or a 47-acre storage lagoon 4 feet in depth.

The following ARARs will be waived for water not treated within the water treatment plant:

- 327 IAC 2-1-6 Table 1

- 327 IAC 5-2-8 (10), (11), (12), (13) (14)

- 327 IAC 5-2-11(a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)

- 327 IAC 5-2-11.1(a), (b), (d), (f), (g), (h)

As a result of this TI Waiver, no discharge criteria will be given to spring water not treated by the 500 gpm treatment plant.

Additional action specific ARARs associated with fugitive dust control are as follows:

- 326 IAC 6-4-2

- 326 IAC 6-4-4

The following is a list of chemical specific ARARs for the Selected Remedy:

- 329 IAC 4.1-4 Requirements for Storage and Disposal of PCBs
- 329 IAC 3.1 Universal Waste Rule
- 329 IAC 10 Solid Waste Land Disposal Facilities
- 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants
- 326 IAC 2-5.1-3(a)(1)(D) Permits for New Hazardous Air Pollutants
- 326 IAC 2-5.1-2(a)(1)(A) Registrations

Cost Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money spent. In making this determination, the following definition was used. "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP 300.430.(f)(1)(ii)(D)). This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The capital cost for Alternative 3 is $1,305,513 with operation and maintenance expected to cost $118,000 per year. Calculating a net present value using a 7% discount rate shows a total cost of $2,768,997. The cost of the sediment operable unit alone is $1,184,109.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

U.S. EPA has determined that the Selected Remedy for the groundwater and sediment operable units represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, U.S. EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory

preference for treatment as a principal element, and bias against off-site treatment and disposal, and considering State and community acceptance.

The Selected Remedy treats PCB- contaminated spring water prior to discharge to Conard's Branch, which flows into Richland Creek. The Selected Remedy satisfies the criteria for long-term effectiveness through the collection and treatment of spring water. The Selected Remedy does not present short-term risks and the technology to implement the remedy is not unusual. The remediation of soils/sediment at Conard's Branch does not utilize permanent solutions and alternative treatment technologies for the estimated 1,141 cubic yards, but it is consistent with previous PCB cleanups in which off-site disposal was utilized.

State/Support Agency Acceptance

The State of Indiana, the City of Bloomington, and Monroe County all support the implementation of Alternative 3.

Community Acceptance

Community acceptance is an important part of the remedy selection process and was assessed during the public comment period and associated public participation activities. Community acceptance of the preferred alternative identified in the Proposed Plan for the ROD Amendment was fully evaluated at the conclusion of the public comment period. The public comments are addressed in the attached Responsiveness Summary.

Preference for Treatment as a Principal Element

By continuing to treat spring flow less than 500 gpm, improve the collection system, and complete the sediment operable unit, the Selected Remedy addresses the remaining threats posed at the site through the use of treatment technologies. By utilizing the necessary treatment for the groundwater operable unit, the statutory reference for remedies that employ treatment as a principal element is satisfied. Treatment is not employed for the sediment operable unit, but the remedy is consistent with the other soil/sediment cleanups completed in Bloomington and the surrounding area.

Five-Year Review Requirements

Because the site remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a policy review will be conducted.

DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan for Operable Units 2 and 3 was released for public comment on July 6, 2007. The Proposed Plan identified Alternative 3 as the Preferred Alternative for

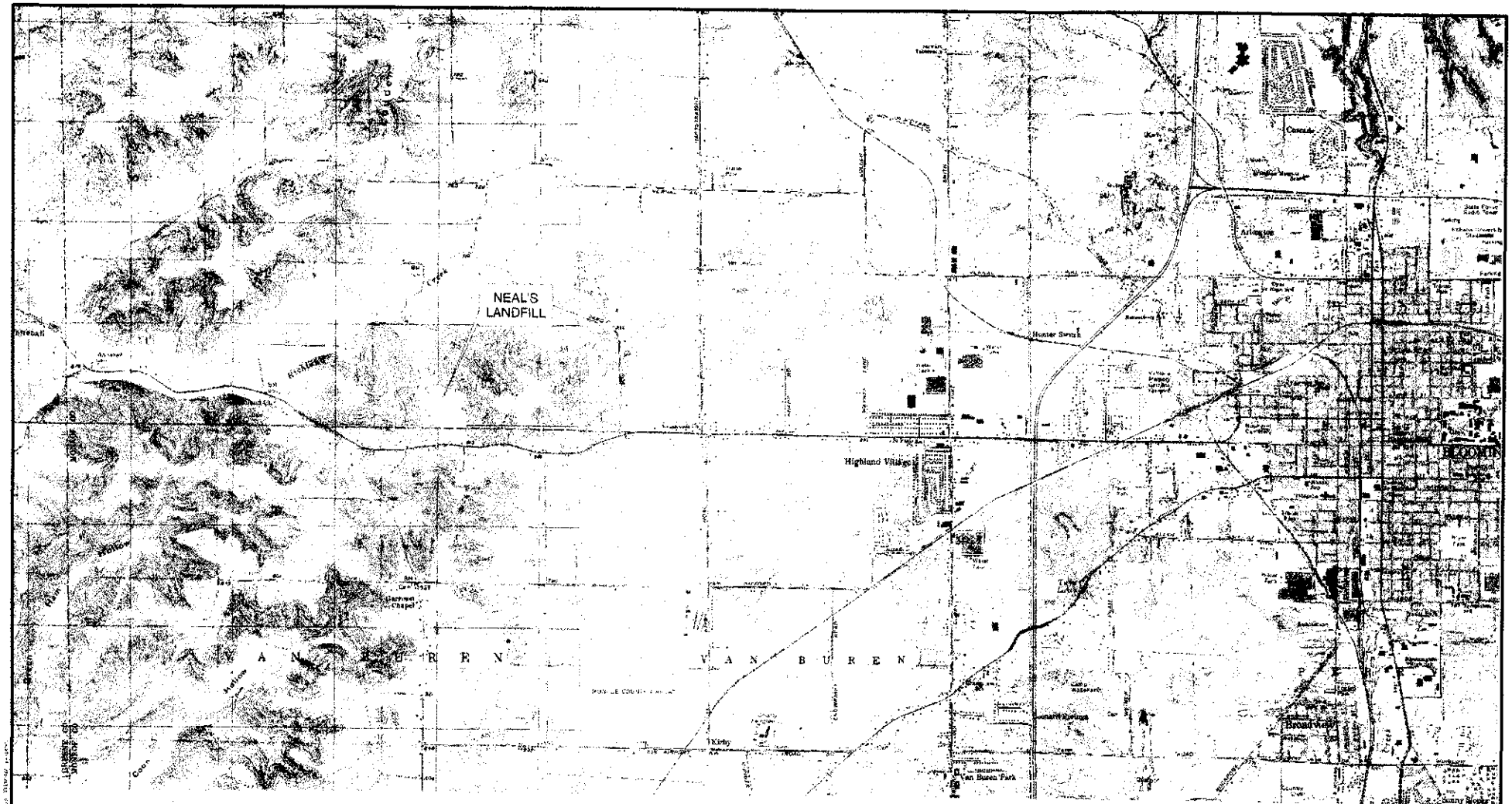
addressing the continuing release of PCBs from springs into Conard's Branch and Richland Creek and a proposed soil/sediment cleanup in and near Conard's Branch. U.S. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy as originally identified in the Proposed Plan were necessary or appropriate.

Table 9
Comparative Analysis of Remedial Alternatives

Criteria	Alternative 1: No Action	Alternative 2: 500 gpm Treatment System	Alternative 3:Source Control + 500 gpm Treatment System	Alternative 4: Source Control + 500 gpm Treatment System + 2 Mgal Storage	Alternative 5: Source Control + 1000 gpm Treatment System	Alternative 6: Source Control + 1000 gpm Treatment System + 2 Mgal Storage	Alternative 7: Source Control + 500 gpm Treatment System + 3 Settling Basins
HUMAN HEALTH AND THE ENVIRONMENT	(-) = Does Not Meet (+) Meets						
Protection of Human Health	-	-	+	+	+	+	+
Ecological Protection	-	-	+	+	+	+	+
COMPLIANCE WITH ARARs	(-) = Does Not Meet (+) Meets						
Chemical-Specific ARARs	-	+	+	+	+	+	+
Location-Specific ARARs	-	+	+	+	+	+	+
Action-Specific ARARs	-	+	+	+	+	+	+
Other Criteria, Advisories, Guidance	-	+	+	+	+	+	+
LONG-TERM EFFECTIVENESS AND PERMANENCE	(+) => Increasing Effectiveness (++++)						
Magnitude of Residual Risk - Human	+	++++	++++	++++	++++	++++	++++
Magnitude of Residual Risk - Ecologi	+	++++	++++	++++	++++	++++	++++
Adequacy and Reliability of Controls	+	++++	++++	++++	++++	++++	++++
MOBILITY AND VOLUME THROUGH TREATMENT	(+) => Greater Reduction (++++)						
Treatment/Recycling Processes Utiliz	-	+	++	++	+++	+++	++++
Amount of Hazardous Materials Dest	-	+	++	++	+++	+++	++++
Degree of Expected Reductions in To	-	+	++	++	+++	+++	++++
Irreversibility	-	+	++	++	+++	+++	++++
Type and Quantity of [Process] Resid	-	+	++	++	+++	+++	++++
SHORT-TERM EFFECTIVENESS	(+) => Increasing Effectiveness (++++)						
Protection of Community and Worker	+	++++	+++	+++	+++	+++	+++
Environmental Impacts	+	++++	+++	+++	+++	+++	+++
Time Until Remedial Action Objective	+	++++	+++	+++	+++	+++	+++
IMPLEMENTABILITY	(+) => Increasing Potential (++++)						
Ability to Construct and Operate the T	++++	++++	++++	++++	++++	++++	+++
Reliability of the Technology	++++	+++	++++	+++	++++	++++	+++
Ease of Undertaking Additional Reme	++++	+++	++++	++	++++	++++	++++
Ability to Monitor Effectiveness of the	++++	+++	++++	++	++++	++++	++++
Ability to Obtain Approvals from Othe	+	++	++++	++	++++	++++	++
Coordination with Other Agencies	+	++	++++	++++	++++	++++	++++
Availability of Off-Site Treatment, Sto	++++	++++	++++	++++	++++	++++	++++
Availability of Necessary Equipment a	++++	++++	++++	++++	++++	++++	+++
Availability of Prospective Technologi	++++	++++	++++	++++	++++	++++	++++
COST	Comparative Cost (without Mod A or B)						
Capital	$0	$0	$1,305,513	$3,005,513	$2,500,513	$4,200,323	$3,901,013
O&M	$0	$1,463,484	$1,463,484	$1,835,755	$1,711,665	$2,083,936	$2,024,373
Present Worth	$0	$1,463,484	$2,768,997	$4,841,268	$4,211,987	$6,284,259	$5,925,385

FIGURES

Figure 1 – Site Location Map
Figure 2 – Conard's Branch and Richland Creek Sampling Locations
Figure 3 – Northwest Spring System
Figure 4 – Neal's Landfill Groundwater Dye Testing and Drainage Basin Delineation
Figures 5 through 10 – Sediment Sample Locations and Sampling Results
Figure 11 – Comparison of PCB Sources to the Water Column under Storm and Low Flow Conditions
Figure 12 – Richland Creek Sampling Locations and Exposure Points
Figure 13 – Conceptual Layout of New Spring Treatment Facility Discharge Line and Conard's Branch Collection Station



LEGEND

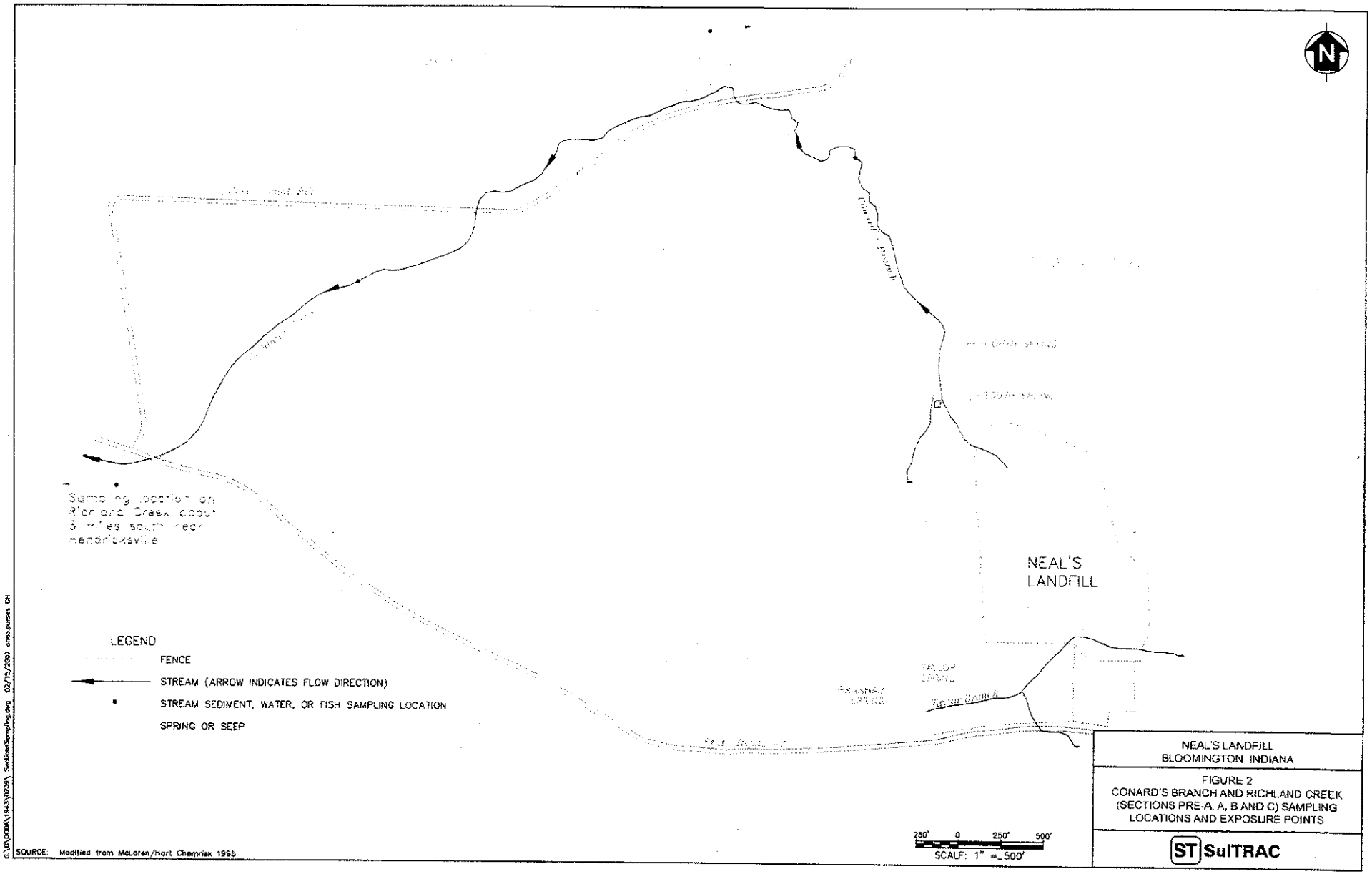
NEAL'S LANDFILL

SOURCE: MODIFIED FROM USGS, WHITEHALL, INDIANA QUADRANGLE, 1960, AND BLOOMINGTON, INDIANA QUADRANGLE, 1990.

NEAL'S LANDFILL
BLOOMINGTON, INDIANA

FIGURE 1
SITE LOCATION MAP

Tetra Tech EM Inc.


N
NEAL'S
LANDFILL
LEGEND
FENCE
STREAM (ARROW INDICATES FLOW DIRECTION)
STREAM SEDIMENT, WATER, OR FISH SAMPLING LOCATION
SPRING OR SEEP
250' 0 250' 500'
SCALE: 1" = 500'
SOURCE: Modified from McLaren/Hart Chemrisk 1998
NEAL'S LANDFILL
BLOOMINGTON, INDIANA
FIGURE 2
CONARD'S BRANCH AND RICHLAND CREEK
(SECTIONS PRE-A, A, B AND C) SAMPLING
LOCATIONS AND EXPOSURE POINTS
SulTRAC

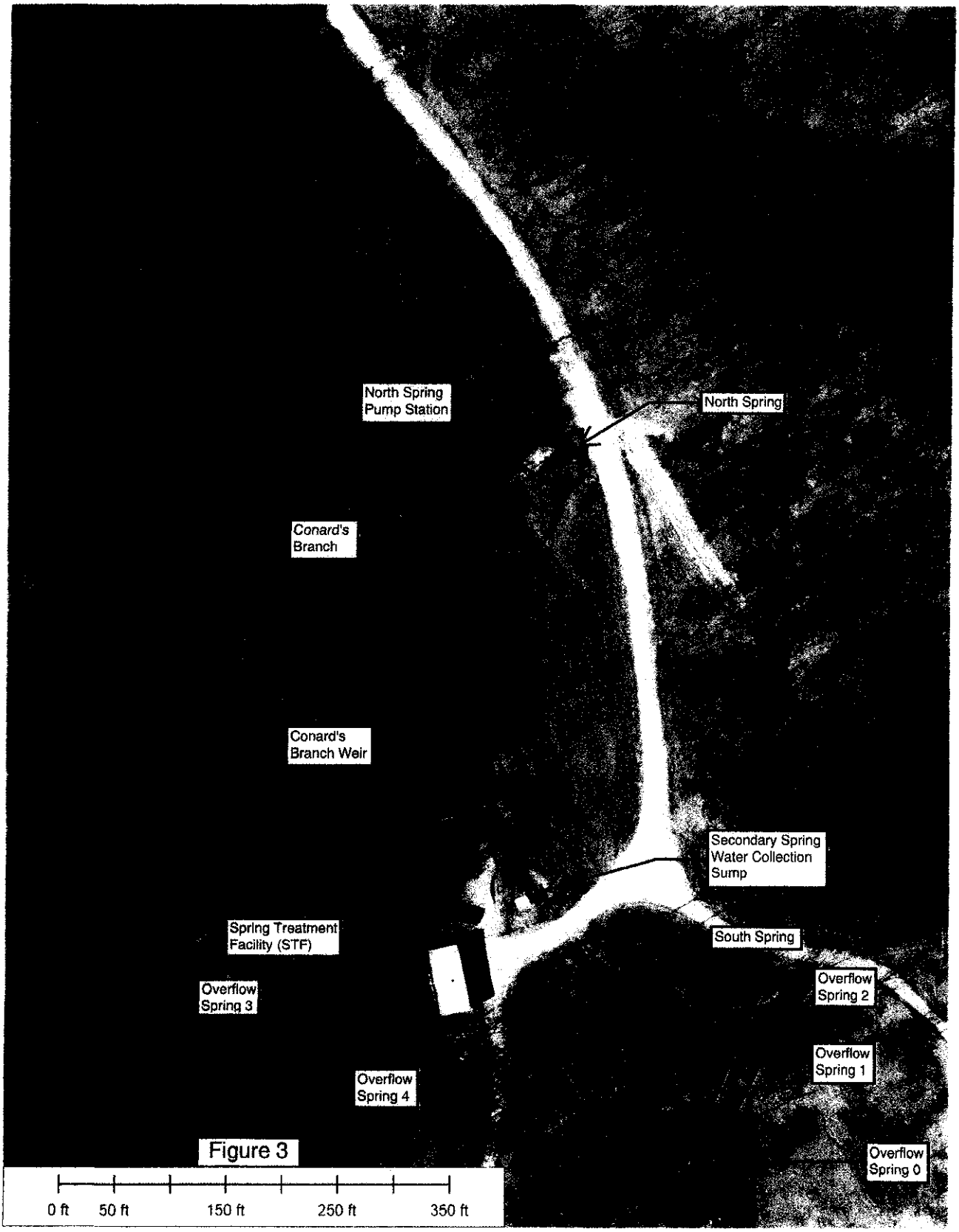


Figure 3: **Northwest spring system**

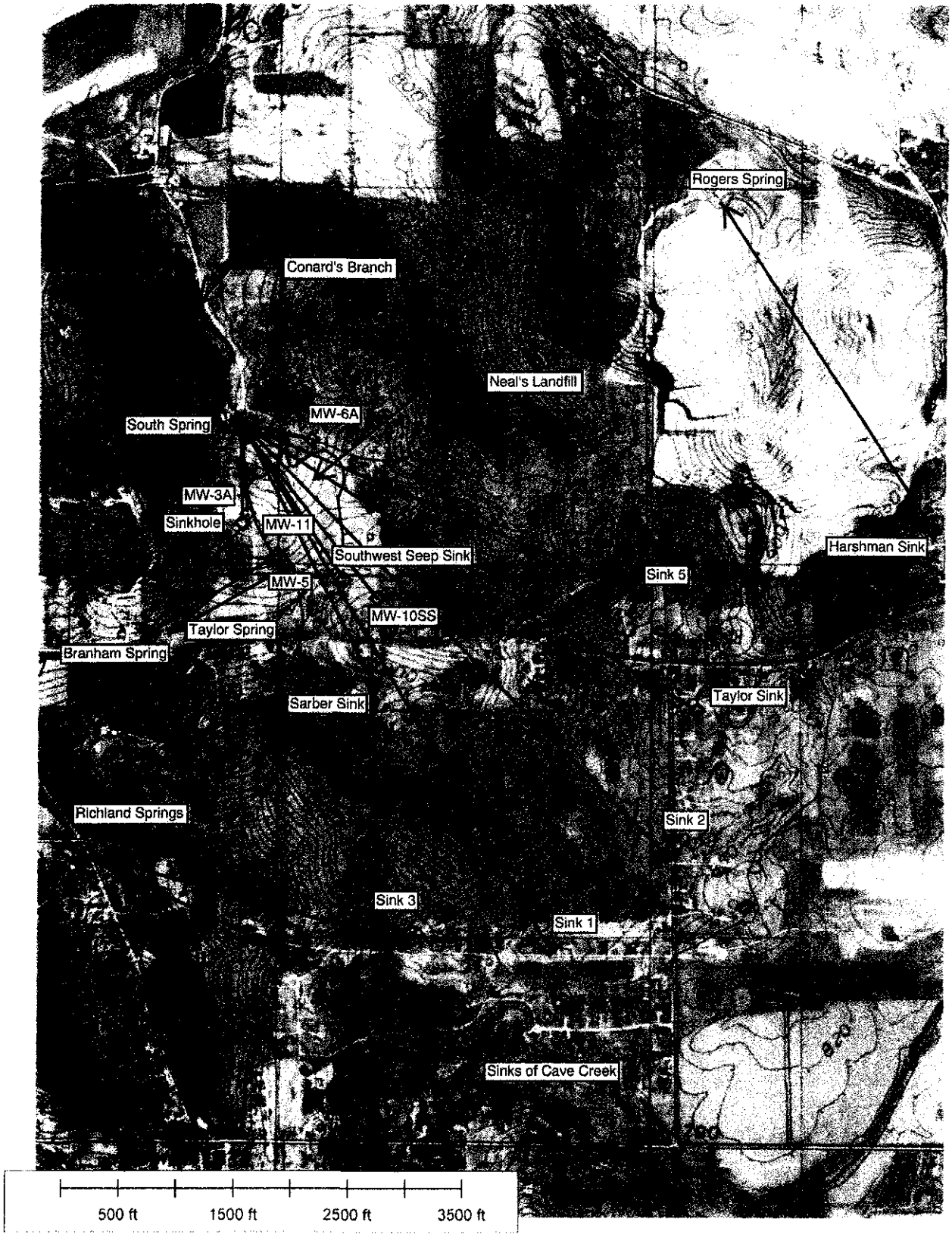
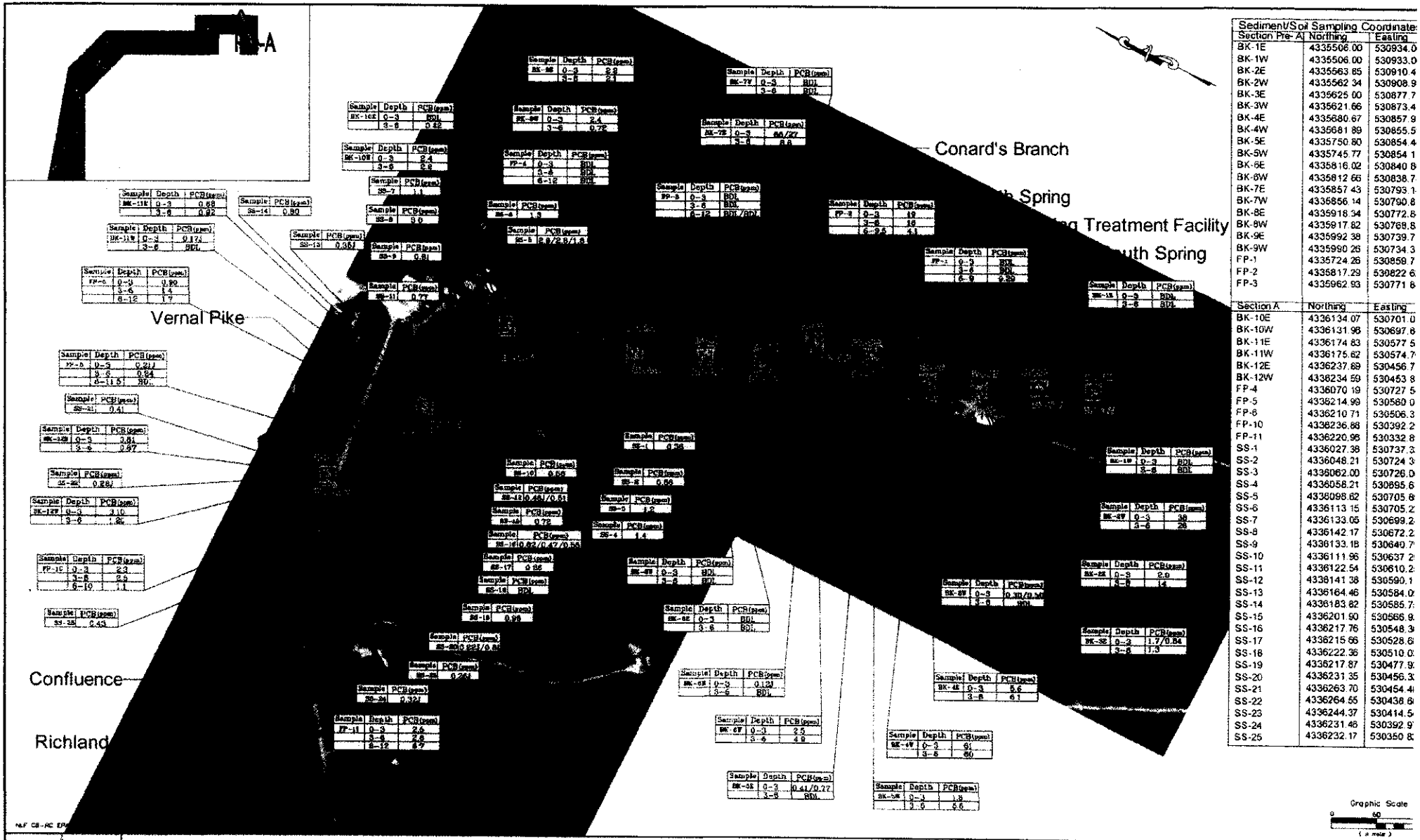


Figure 4: **Neal's Landfill groundwater dye testing and drainage basin delineation.**



Sediment/Soil Sampling Coordinates		
Section Pre-A	Northing	Easting
BK-1E	4335506.00	530934.0
BK-1W	4335506.00	530933.0
BK-2E	4335563.85	530910.4
BK-2W	4335562.34	530908.9
BK-3E	4335625.00	530877.7
BK-3W	4335621.66	530873.4
BK-4E	4335680.67	530857.9
BK-4W	4335681.89	530855.5
BK-5E	4335750.80	530854.4
BK-5W	4335745.77	530854.1
BK-6E	4335816.02	530840.8
BK-6W	4335812.66	530838.7
BK-7E	4335857.43	530793.1
BK-7W	4335856.14	530790.8
BK-8E	4335918.34	530772.8
BK-8W	4335917.82	530768.8
BK-9E	4335992.38	530739.7
BK-9W	4335990.26	530734.3
FP-1	4335724.26	530859.7
FP-2	4335817.29	530822.6
FP-3	4335962.93	530771.8
Section A	Northing	Easting
BK-10E	4336134.07	530701.0
BK-10W	4336131.96	530697.8
BK-11E	4336174.83	530577.5
BK-11W	4336175.62	530574.7
BK-12E	4336237.89	530456.7
BK-12W	4336234.59	530453.8
FP-4	4336070.19	530727.5
FP-5	4336214.99	530580.0
FP-6	4336210.71	530506.3
FP-10	4336236.88	530392.2
FP-11	4336220.96	530332.8
SS-1	4336027.38	530737.3
SS-2	4336048.21	530724.3
SS-3	4336062.00	530726.0
SS-4	4336058.21	530695.6
SS-5	4336098.62	530705.8
SS-6	4336113.15	530705.2
SS-7	4336133.05	530699.2
SS-8	4336142.17	530672.2
SS-9	4336133.18	530640.7
SS-10	4336111.96	530637.2
SS-11	4336122.54	530610.2
SS-12	4336141.38	530590.1
SS-13	4336164.46	530584.0
SS-14	4336183.82	530585.7
SS-15	4336201.50	530566.9
SS-16	4336217.76	530548.3
SS-17	4336215.66	530528.6
SS-18	4336222.36	530510.0
SS-19	4336217.87	530477.9
SS-20	4336231.35	530456.3
SS-21	4336263.70	530454.4
SS-22	4336264.55	530438.6
SS-23	4336244.37	530414.5
SS-24	4336231.46	530392.9
SS-25	4336232.17	530350.8

Graphic Scale

0 50

(1 inch = 50 feet)

PSARA

LEGEND

- Flood Plain Sample Area
- Bank Soil Sample Location
- Surficial Sediment Sample Location

Note: All PCB results are reported on a dry basis.
"J" denotes estimated value.
BDL = below detectable limits. Samples were analyzed to a detection limit of 0.1 ppm (wet basis) for all PCB Aroclors except Aroclor 1221, which has a detection limit of 0.2 ppm on a wet basis.

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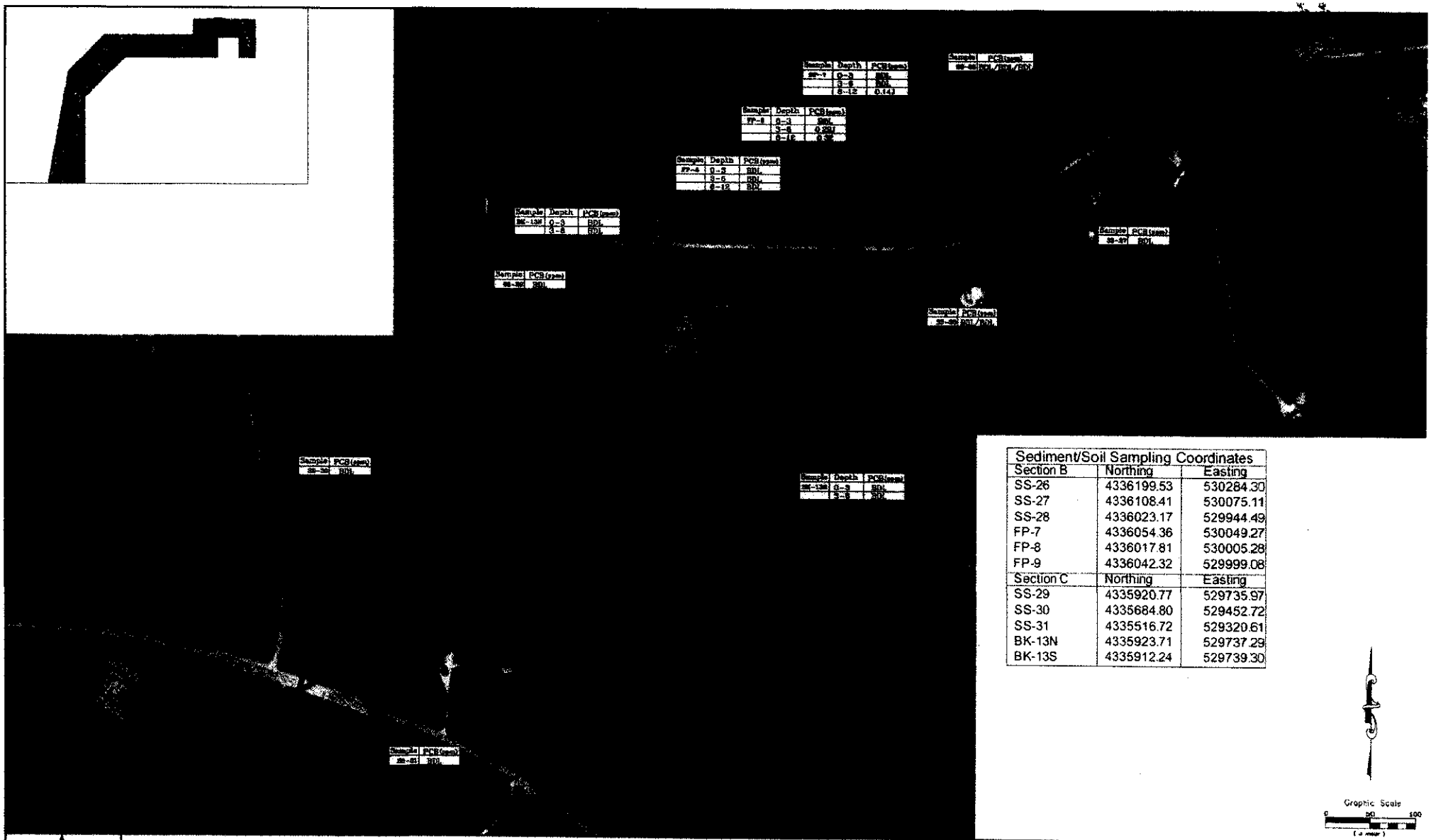
Figure 5
Sample Locations and PCB Results
Section Pre-A and A
Conard's Branch-Richland Creek

Drawn By	Date	Scale
BLR	12/13/04	1"=100'



Sediment/Soil Sampling Coordinates		
Section B	Northing	Easting
SS-26	4336199.53	530284.30
SS-27	4336108.41	530075.11
SS-28	4336023.17	529944.49
FP-7	4336054.36	530049.27
FP-8	4336017.81	530005.28
FP-9	4336042.32	529999.08
Section C	Northing	Easting
SS-29	4335920.77	529735.97
SS-30	4335684.80	529452.72
SS-31	4335516.72	529320.61
BK-13N	4335923.71	529737.29
BK-13S	4335912.24	529739.30

Graphic Scale

0 50 100

(in meter)

PSARA

LEGEND

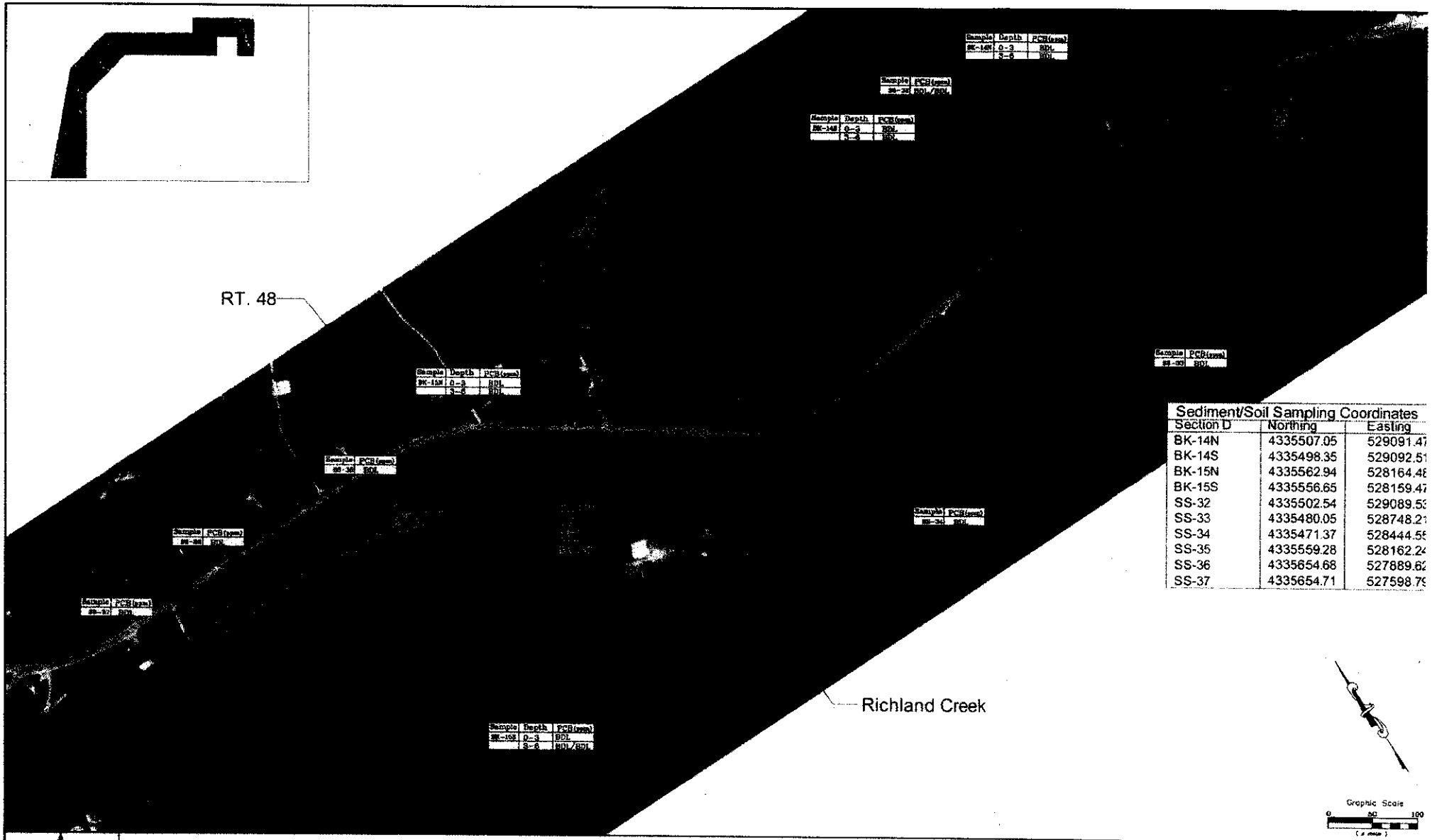
- Flood plain Sample Area
- Bank Soil Sample Location
- Surficial Sediment Sample Location

Note: All PCB results are reported on a dry basis.
"J" denotes estimated value.
BDL = below detectable limits. Samples were analyzed to a detection limit of 0.1 ppm (wet basis) for all PCB Aroclors except Aroclor 1221, which has a detection limit of 0.2 ppm on a wet basis.

VIACOM, Inc.

Figure 6
Sample Locations and PCB Results
Section B and C
Conard's Branch--Richland Creek

Drawn By:	Date:	Scale:
BLR	12/13/04	1"=100m



Sediment/Soil Sampling Coordinates		
Section D	Northing	Easting
BK-14N	4335507.05	529091.47
BK-14S	4335498.35	529092.51
BK-15N	4335562.94	528164.48
BK-15S	4335556.65	528159.47
SS-32	4335502.54	529089.53
SS-33	4335480.05	528748.21
SS-34	4335471.37	528444.55
SS-35	4335559.28	528162.24
SS-36	4335654.68	527889.62
SS-37	4335654.71	527598.79

PSARA TECHNOLOGIES INC

LEGEND

Bank Soil Sample Location

Surficial Sediment Sample Location

Note. All PCB results are reported on a dry basis. BDL = below detectable limits. Samples were analyzed to a detection limit of 0.1 ppm (wet basis) for all PCB Aroclors except Aroclor 1221, which has a detection limit of 0.2 ppm on a wet basis

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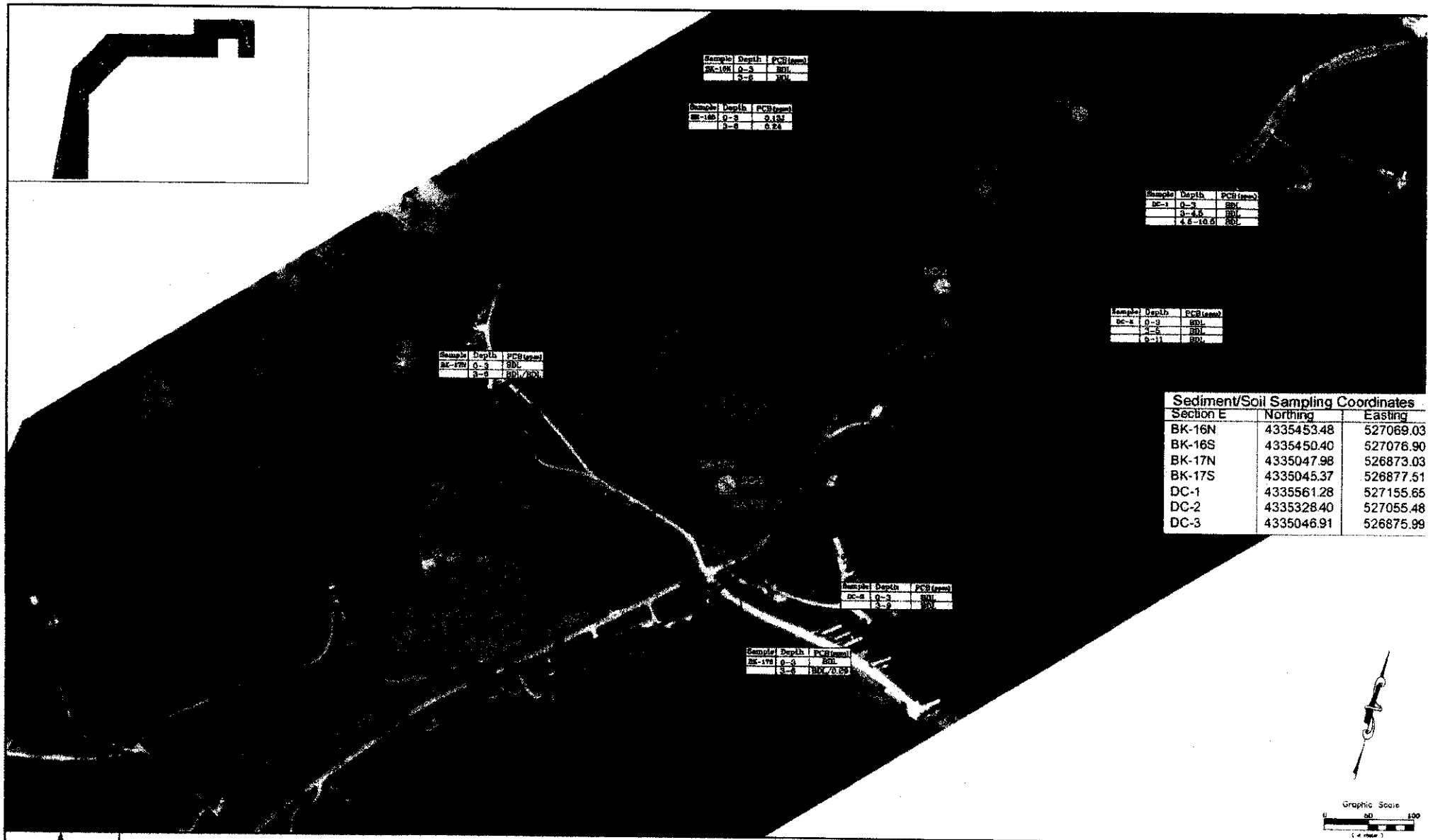
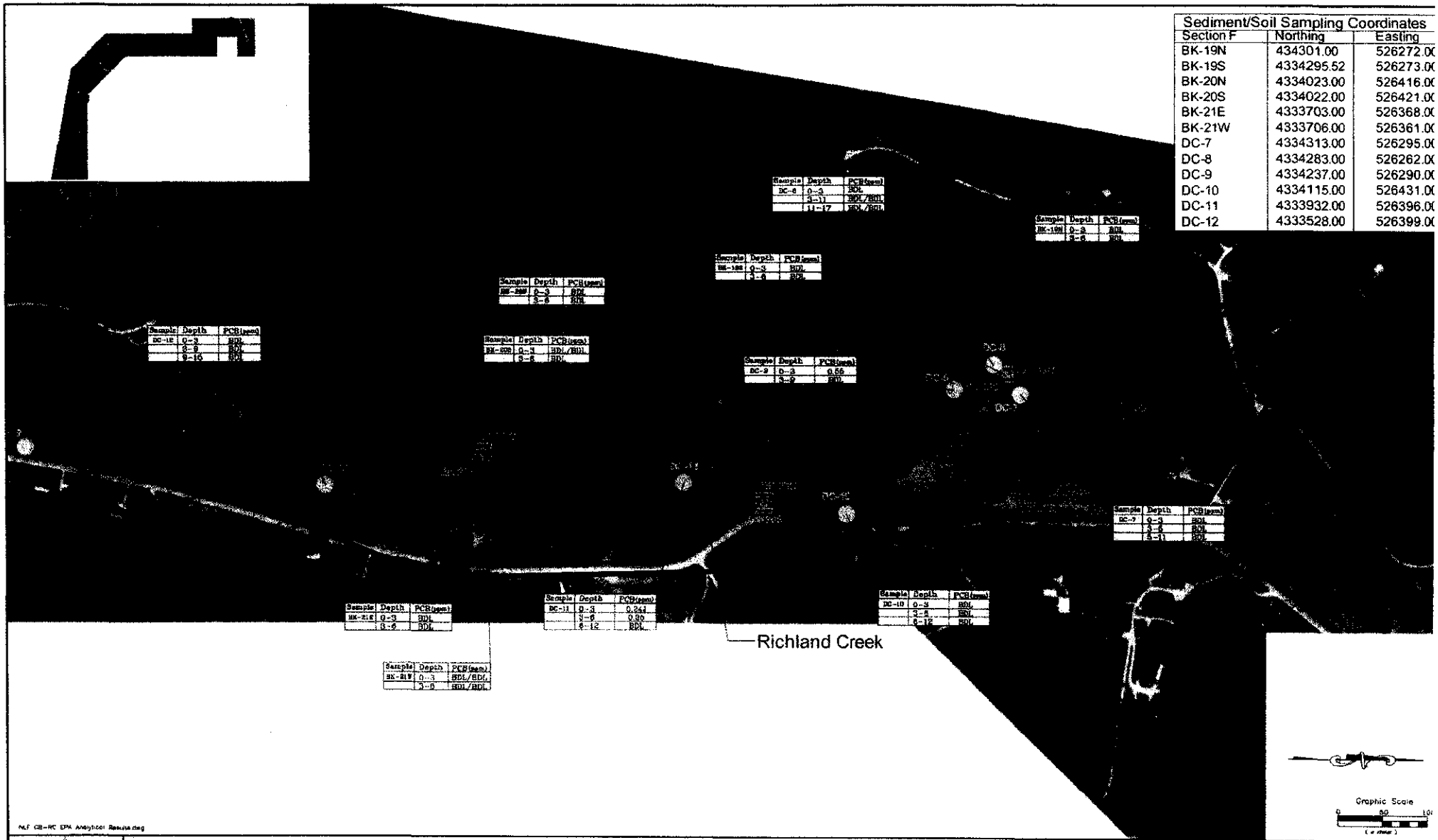
Figure 7
Sample Locations and PCB Results
Section D
Conard's Branch-Richland Creek
Sediment/Soil Sampling Locations

Drawn By:	Date:	Scale:
BLB	12/13/04	1"=100m


Sediment/Soil Sampling Coordinates
Section E | Northing | Easting
BK-16N | 4335453.48 | 527069.03
BK-16S | 4335450.40 | 527076.90
BK-17N | 4335047.98 | 526873.03
BK-17S | 4335045.37 | 526877.51
DC-1 | 4335561.28 | 527155.65
DC-2 | 433532840 | 527055.48
DC-3 | 4335046.91 | 526875.99
Graphic Scale
0
50
100
LEGEND
Deep Core Sample Location
Bank Soil Sample Location
Note: All PCB results are reported on a dry basis.
"J" denotes estimated value.
BDL = below detectable limits. Samples were analyzed to a detection limit of 0.1 ppm (wet basis) for all PCB Aroclors except Aroclor 1221, which has a detection limit of 0.2 ppm on a wet basis.
PSARA
VIACOM, Inc.
Figure 8
Sample Locations and PCB Results
Section E
Conard's Branch-Richland Creek
Drawn By: RLR
Date: 12/13/04
Scale: 1"=100ft



Sediment/Soil Sampling Coordinates		
Section F	Northing	Easting
BK-19N	434301.00	526272.00
BK-19S	4334295.52	526273.00
BK-20N	4334023.00	526416.00
BK-20S	4334022.00	526421.00
BK-21E	4333703.00	526368.00
BK-21W	4333706.00	526361.00
DC-7	4334313.00	526295.00
DC-8	4334283.00	526262.00
DC-9	4334237.00	526290.00
DC-10	4334115.00	526431.00
DC-11	4333932.00	526396.00
DC-12	4333528.00	526399.00

Sample	Depth	PCB(ppm)
DC-8	0-3	BDL
	3-11	BDL/BDL
	11-17	BDL/BDL

Sample	Depth	PCB(ppm)
BK-19N	0-3	BDL
	3-6	BDL

Sample	Depth	PCB(ppm)
BK-19S	0-3	BDL
	3-6	BDL

Sample	Depth	PCB(ppm)
BK-20S	0-3	BDL
	3-6	BDL

Sample	Depth	PCB(ppm)
DC-10	0-3	BDL
	3-6	BDL
	6-15	BDL

Sample	Depth	PCB(ppm)
BK-20N	0-3	BDL/BDL
	3-6	BDL

Sample	Depth	PCB(ppm)
DC-9	0-3	0.66
	3-9	BDL

Sample	Depth	PCB(ppm)
DC-7	0-3	BDL
	3-6	BDL
	6-11	BDL

Sample	Depth	PCB(ppm)
BK-21E	0-3	BDL
	3-6	BDL

Sample	Depth	PCB(ppm)
DC-11	0-3	0.244
	3-6	0.89
	6-12	BDL

Sample	Depth	PCB(ppm)
DC-10	0-3	BDL
	3-6	BDL
	6-12	BDL

Sample	Depth	PCB(ppm)
BK-21W	0-3	BDL/BDL
	3-6	BDL/BDL

Graphic Scale

0 50 100

(in meters)

NLF CB-RC EPA Analytical Results.dwg

PSARA
ENVIRONMENTAL INC.

Deep Core Sample Location

Bank Soil Sample Location

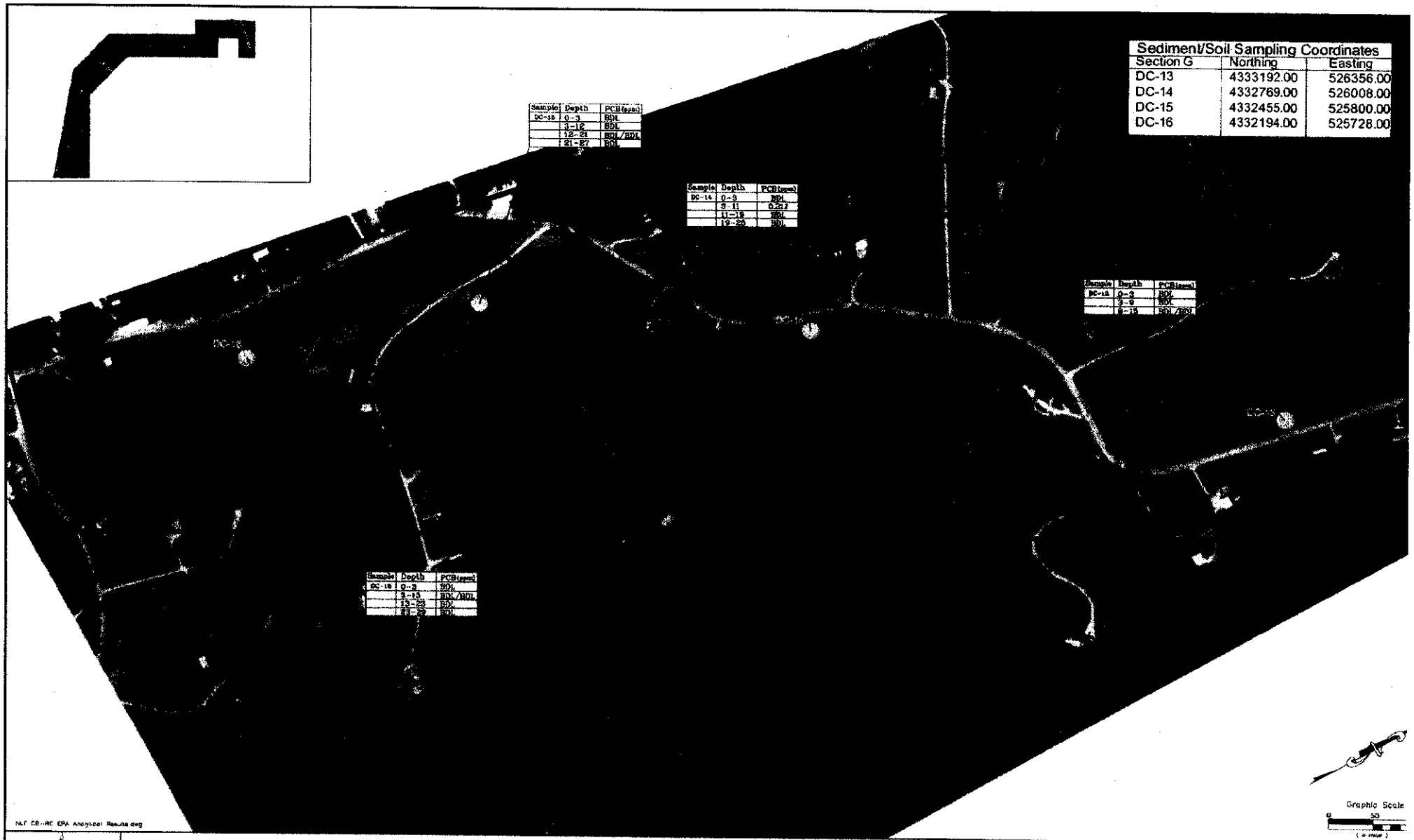
LEGEND

Note: All PCB results are reported on a dry basis.
"J" denotes estimated value.
BDL = below detectable limits. Samples were analyzed to a detection limit of 0.1 ppm (wet basis) for all PCB Aroclors except Aroclor 1221, which has a detection limit of 0.2 ppm on a wet basis.

VIACOM, Inc.

Figure 9
Sample Locations and PCB Result
Section F
Conard's Branch-Richland Creek

Drawn By:	Date:	Scale:
RLR	12/13/04	1"=100m



PSARA

LEGEND

Deep Core Sample Location

Bank Soil Sample Location

Note: All PCB results are reported on a dry basis.
"J" denotes estimated value.
BDL = below detectable limits. Samples were analyzed to a detection limit of 0.1 ppm (wet basis) for all PCB Aroclors except Aroclor 1221, which has a detection limit of 0.2 ppm on a wet basis.

VIACOM, Inc.

Figure 10
Sample Locations and PCB Re
Section G
Conard's Branch-Richland Cr

Drawn By:	Date:	Sca
RLR	12/13/04	1"=4

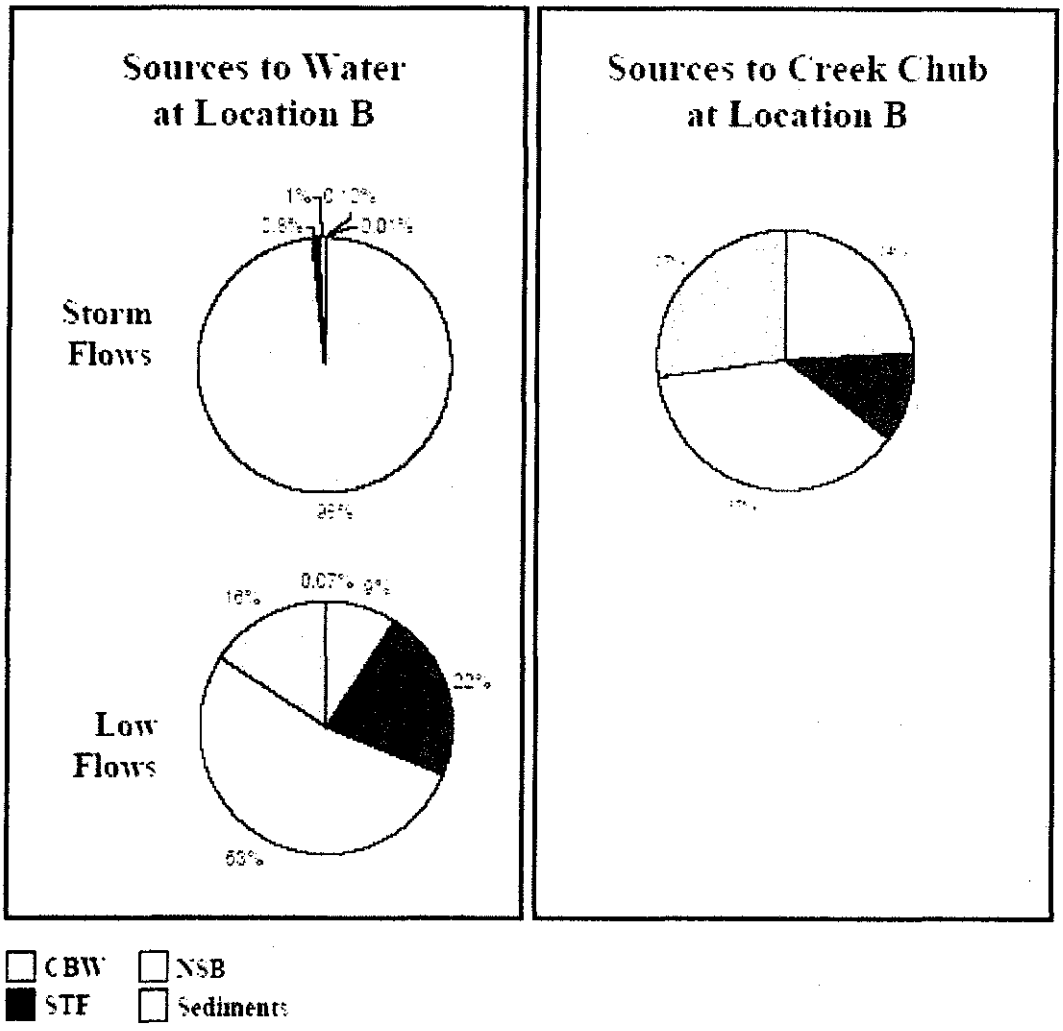
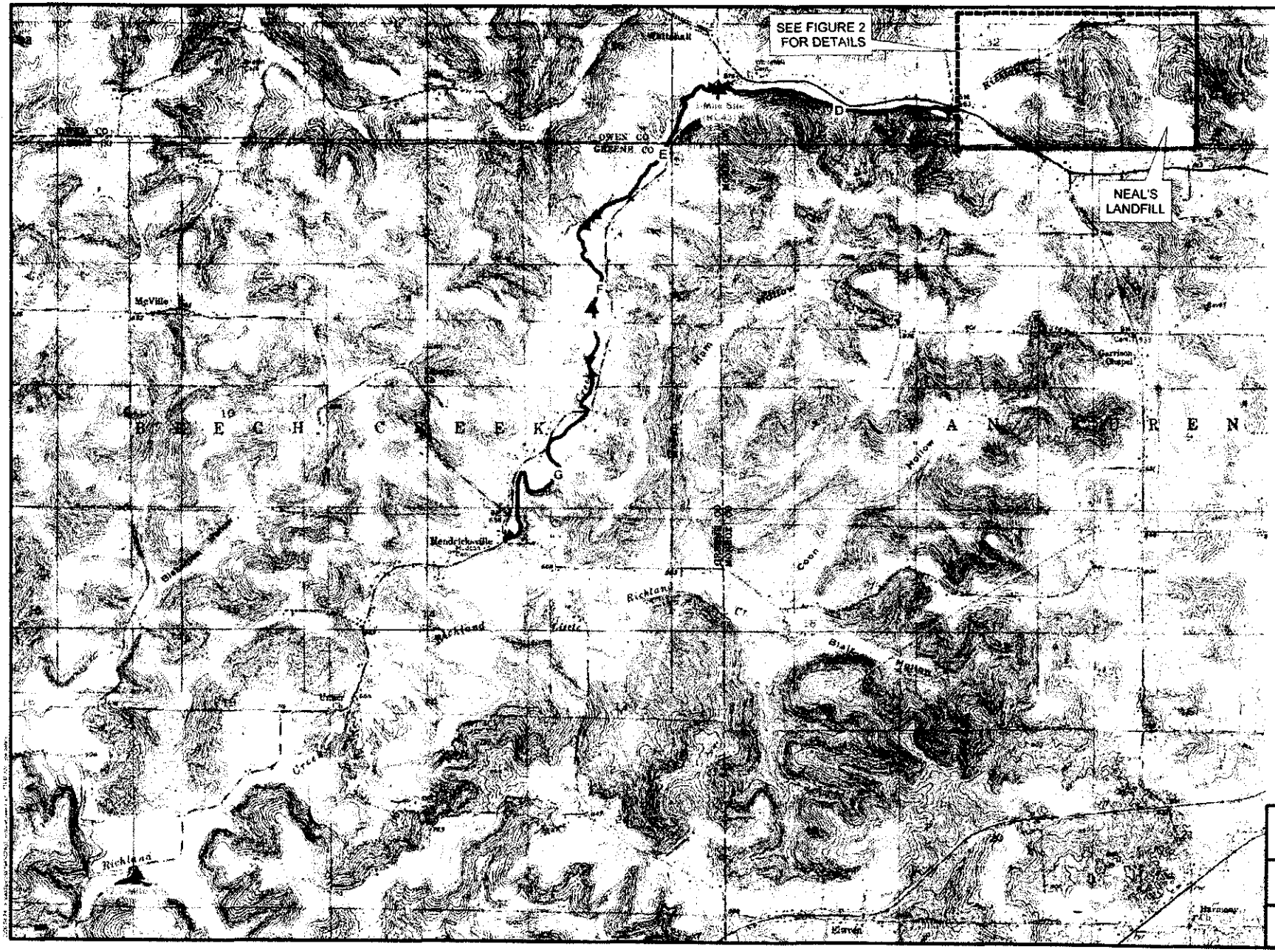


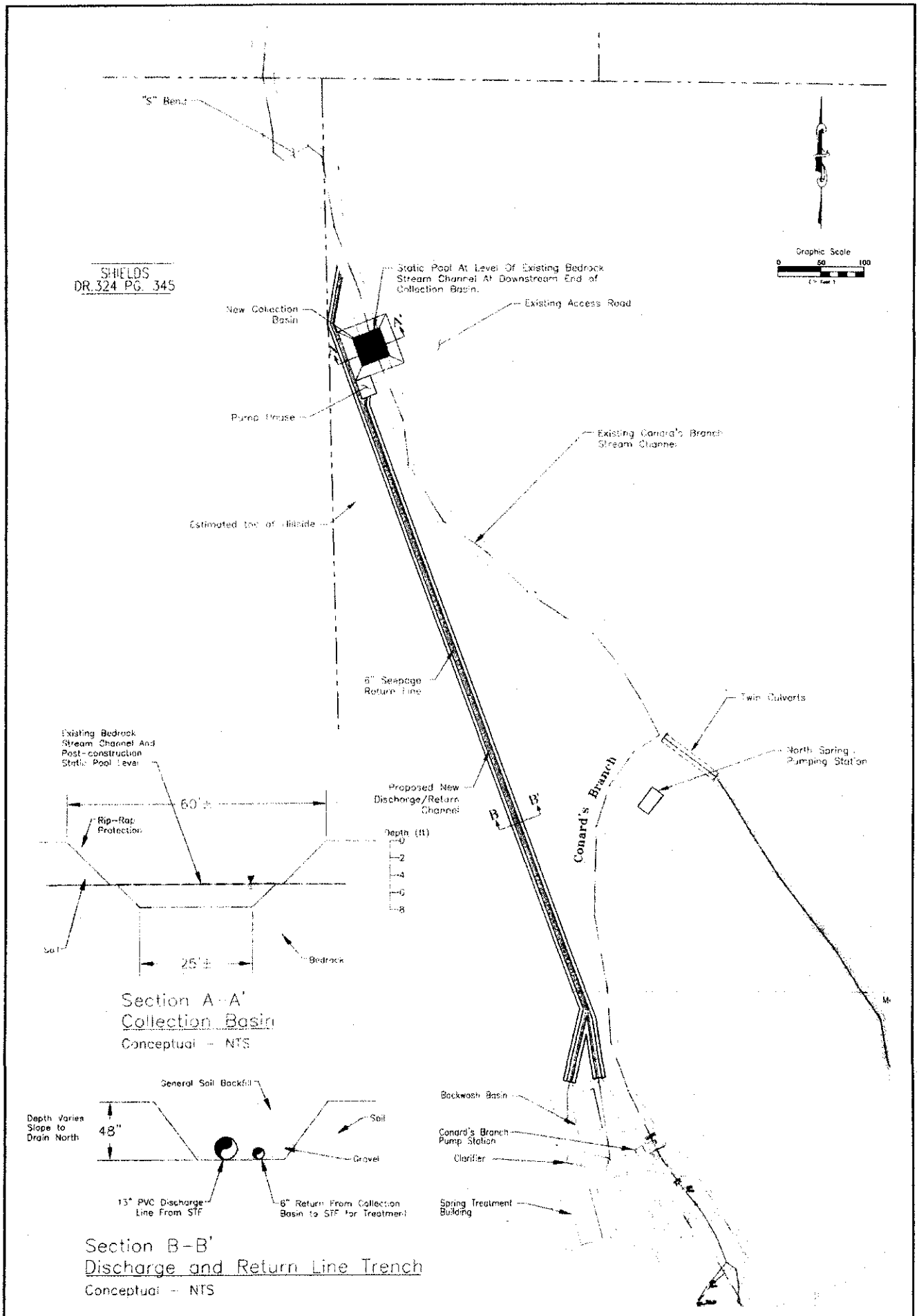
Figure 11: Comparison of PCB sources to the water column under storm and low flow conditions



NEAL'S LANDFILL
BLOOMINGTON, INDIANA

FIGURE 12
RICHLAND CREEK SAMPLING LOCATIONS AND EXPOSURE POINT

TETRA TECH EM INC



New Conard Branch Channel - 2.dwg 02/19/07 - 04:01pm FAB LAYOUT1

PSARA

LEGEND

CBS Corporation

Figure 13
Neal's Landfill
Conceptual Layout of New STF
Discharge Line and Conard's Branch
Collection Station
Bloomington Indiana

RESPONSIVENESS SUMMARY FOR OPERABLE UNITS 2 AND 3
NEAL'S LANDFILL

Comment 1: SENES Oakridge Inc. (SENES), who is a consultant working for the Citizens Opposed to PCB Ash (COPA) stated that based upon the available information, SENES would agree with the selection of Alternative 3 (United States Environmental Protection Agency chosen alternative). The commenter continues stating that this alternative addresses the local contamination, increases the amount of water treated, and is expected to achieve the fish remediation goals in the desired time frame. In addition, of the Alternatives that are expected to achieve the goals, it is the most cost effective. The commenter continues with stating that (1) it would have been good to divert the groundwater conduit upstream and that tanks or settling basins to store water would bring its own set of problems since it would require considerable land and contaminated water and sediment would be open to wildlife and perhaps to livestock or people; and (2) doubling the size of the spring treatment facility would treat more mass but does not justify the increased cost. The commenter would like to see this option revisited in the future if the remediation goals are not met. The commenter continues stating that it is essential that the remedial efforts predicted by the model are seen in fact and that if the monitoring does not show the anticipated improvement, reassessment of the remedy will be required.

Response 1: The U.S. EPA agrees with the commenter. The Agency is of the opinion that Alternative 3 is the best balance of the nine criteria. It is important to point out that the extensive monitoring will help to verify the predictions of the fate and transport model. If the model predictions are incorrect, a reopener clause will be used to perform additional investigations and implement a revised remedy to ensure that the fish remediation goals are met and the remedy remains protective of human health and the environment.

Comment 2: SENES stated that U.S. EPA discusses in Appendix A of the human health risk assessment that the estimated rate of increase in harvestable fish biomass with increasing downstream distance could be underestimated and would mean that the sustainable ingestion rates for downstream locations would be underestimated, and consequently, the calculated risks for those locations would be underestimated. The commenter states however, it is doubtful that any underestimate in ingestion rates or calculated risks would be large and even doubling the ingestion rates would be unlikely to change the decisions that were made on the basis of the human health risk assessment.

Response 2: U.S. EPA agrees with the commenter that changing the ingestion rates would unlikely change the results of the human health risk assessment.

Comment 3: COPA stated that they would like to see zero PCB mass escape and would prefer alternatives that would eliminate any discharge of PCBs into the environment; however, that they do agree that the selected alternative meets the guidelines of reducing risk to acceptable levels.

Response 3: U.S. EPA understands the concern of the commenter regarding the release of PCB mass downstream into Richland Creek. The results of the fate and transport model show that water flow greater than 500 gallons per minute that bypasses the water treatment plant does not have a large effect on PCB levels in fish and the fish remediation goals will be met without capturing and treating this water. The PCBs that bypass the water treatment plant during storms flow downstream into the larger Richland Creek, and do not pose unacceptable risk. Therefore, to treat this mass which bypasses the current water treatment plant is unnecessary. It should be pointed out that water sampling data show a 6% yearly decrease in PCB concentrations from South Spring since the completion of the source control in 1999. Continued monitoring of water, sediment and fish tissue after the construction of the groundwater and sediment operable units will verify if the fish remediation goals are being met and if the fate and transport model was accurate in its predictions.

Comment 4: The League of Women Voters stated that they would favor Alternative 4 which adds two million gallons of stormwater storage to U.S. EPA's chosen alternative. The commenter states that considering that increasing the size and operation of an enlarged plant would be very expensive, and that the enlarged plant would be oversized for most of its functional life, a better engineering approach would seem to be to add storm water storage capacity at Neal's Landfill. The two million gallon figure suggested under option four is reasonable considering historical storm water events gauged at the treatment facility at the north end of Neal's landfill near where the flow enters Conard's Branch. The addition of such an impoundment would also provide passive PCB removal through sedimentation and would thus prolong the life of the carbon in the treatment plant. A down side to a storm water storage facility, if open to the air would be the potential for PCB volatilization and for bioturbation and wildlife exposure to the accumulated PCB-laden sediment.

Response 4: U.S. EPA did not choose Alternative 4 because the fate and transport model shows that the addition of stormwater storage offered no significant advantages in terms of reducing PCB levels in fish tissue. The results of the fate and transport model show only a 1 to 2 % decrease in fish PCB concentrations after 10 years with storing two million gallons of stormwater. The PCB mass treated would increase by approximately 9% with the addition of stormwater storage, but this does not justify the addition with only a one to two percent reduction in PCB levels in fish. If the long-term monitoring of water, sediment and fish tissue does not produce the expected results as predicted in the fate and transport model, then the storage of stormwater may be reevaluated.

Comment 5: Protect Our Woods states that water treatment cannot work in a karst environment, that karst is unpredictable and uncontrollable, and U.S. EPA stated correctly some decades ago that complete excavation should be the site remedy. The commenter continues that U.S. EPA should reconsider its position and do additional excavation of PCBs at Neal's Landfill not only in the soil, but also in the karst bedrock, wherever PCBs can be found. According to the commenter, the expectation that water treatment and sediment removal will be effective when there are still PCB reservoirs in

place at Neal's Landfill is simply unrealistic, and the commenter asserts that the proposed remedy is not protective of public health and the environment, locally or globally.

Response 5: U.S. EPA disagrees with the commenter. First, water treatment can be successful in a karst environment and the results of the fish sampling and spring sampling since sampling begun in the 1980s have shown a reduction over time in Conard's Branch, Richland Creek and Clear Creek Second, additional excavation at the Site to remove PCBs from the landfill and the karst bedrock does not make sense for the reasons explained by U.S. EPA when it selected the remedy for the source control operable unit. Since the early 1980s when U.S. EPA thought complete excavation of PCBs was the most appropriate remedy, a large amount of information has been gathered and developed regarding water contamination at the site. Further, the evaluation of the Neal's Landfill system in the fate and transport model has convinced U.S. EPA that completing the source control, groundwater and sediment operable units will produce a remedy that is protective of human health and the environment.

Comment 6: Protect Our Woods states that PCBs are a persistent toxic compound, bioaccumulate, biomagnifiy in the aquatic and terrestrial food chains and ultimately what matters is the total mass of PCB released. The commenter disagrees with U.S. EPA's position that unless a single source can be shown to have significant impact standing alone that can be tied to local risks that it is not actionable under Superfund. The commenter states that "unwise practices" have resulted in over-exposure to PCBs by allowing multiple PCB release points and multiple PCB contamination sources. According to the commenter, the cumulative impacts of all these sites have created this over-exposure problem and the only way to deal with it is by eliminating those sources one at a time. The commenter contends that Bloomington is one of the major PCB release points in the country and that leaving PCBs in the environment to be released over time is an abandonment of U.S. EPA's obligation under Superfund and is an abandonment of our ethical obligation to future generations.

Response 6: U.S. EPA disagrees with the commenter. The Superfund program is concerned with selecting an implementing a remedy to address and abate risks to human health and the environment posed by specific sites. At Neal's Landfill, U.S. EPA has determined that it is not necessary to excavate and remove all source contamination to achieve a remedy that is protective of human health and the environment. Rather, for the reasons set forth in the administrative record for Neal's Landfill, U.S. EPA believes that the source control remedy for the first operable unit, in combination with the remedial components required by Alternative 3, will be protective of human health and the environment. The commenter also states that Bloomington is a major PCB release point in the country without providing any data to support the statement. Evaluation of air data completed previously by an Indiana University professor shows PCB air levels similar to other cities in the Midwest such as Chicago or Milwaukee.

Comment 7: Protect Our Wood states that they would like U.S. EPA to reconsider its decision to not capture and treat storm flow. The commenter states that large storms produce enough PCBs in one day as many days of low flow and Protect Our Woods

would like U.S. EPA to thoroughly assess and then address base flow or underflow springs as well as surface or overflow springs.

Response 7: The commenter is referred to the Fate and Transport Model Report, dated March 5, 2007, for a detailed discussion of why storm events are not affecting fish tissue and the subsequent human health and ecological risk. According to the model, the PCBs released during storm events at flows greater than 500 gpm do not require capture since they provide only 11% of the PCBs to fish tissue in Creek Chub within Conrad's Branch, 31% of the PCBs in fish tissue in Creek Chubs within Richland Creek at Vernal Pike, and 29% of the PCBs in Longear Sunfish within Richland Creek at Vernal Pike. The fate and transport model predicts that the fish remediation goals will be met within 10 years and that storm events greater than 500 gpm are not greatly affecting PCB levels in fish. Monitoring after completion of the construction will verify if the fate and transport model is correct in its predictions. If the predictions are inaccurate, the site remedy will be reopened by U.S. EPA. Regarding the request to thoroughly assess and address base flow or underflow springs as well as surface or overflow springs, U.S. EPA is addressing the contaminated springs. Improvements in the low-flow collection system will capture PCB-contaminated water during low-flow conditions that are not currently being treated. A number of investigations have occurred, including dye trace studies to identify springs that are connected to the Neal's Landfill site. U.S. EPA has fully assessed the springs connected to Neal's Landfill and the commenter is referred to the Administrative Record for further information.

Comment 8: Protect Our Woods states that they would like a thorough assessment of the PCB releases into the air that contribute to the total mass of PCBs released.

Response 8: U.S. EPA did evaluate air sampling data obtained during the implementation of the source control operable unit along with the report developed by QEA Corporation (Attachment 1 of the Responsiveness Summary which is an excerpt from the Fate and Transport Model Report – March 5, 2007). U.S. EPA analysis of the air data and the results of the model simulation of volatilization show that PCB air emissions are minor and do not require evaluation in either the human health or ecological risk assessment.

Comment 9: Protect Our Woods states that there should be a renewed assessment of the extent and scope of contamination at Neal's Landfill and that the characterization was inadequate. The borings placed 100 feet apart missed large amounts of capacitors.

Response 9: The commenter is referred to the Responsiveness Summary for the source control operable unit for a specific response to this comment. U.S. EPA did determine the nature and extent of contamination during the source control operable unit. The Remedial Action Objectives have been met with the source control operable unit and with the implementation of operable units 2 and 3, the Neal's Landfill site will be protective of human health and the environment.

Comment 10: Protect Our Woods states that John Foster indicated that there were known contaminated areas outside the boundaries of Neal's Landfill that had been ignored and those areas need to be addressed.

Response 10: U.S. EPA did meet with John Foster at Neal's Landfill after the completion of the source control operable unit to discuss his concerns about contamination outside the boundaries of the site. Mr. Foster who was an equipment operator during the installation of the interim cap in the 1980s could not provide any specifics regarding contaminated areas outside the fence. His recollection was in reference to areas on the north side of the sloped area of the landfill. This area was excavated during the 1999 remediation. The area outside the fence was evaluated and no evidence of disposal was discovered. Sampling data to verify the cleanup also did not demonstrate that disposal occurred outside the fence line. If the commenter has specific information on disposal areas outside the fence line, feel fee to submit the information to U.S. EPA for evaluation.

Comment 11: Protect Our Woods states that in their view, U.S. EPA is legally incorrect in excluding additional excavation, as at least an alternative to be considered by and evaluated in their proposal. In Protect Our Woods view, additional excavation is required.

Response 11: U.S. EPA is unclear as to what the commenter is referring to when stating that U.S. EPA is "legally incorrect" by not including a complete excavation remedy for operable units 2 and 3. U.S. EPA followed the National Contingency Plan (NCP) and CERCLA throughout the development of this ROD Amendment, as well as the ROD Amendment process for the source control operable unit U.S. EPA did evaluate complete excavation during the source control operable unit and determined it was not the best balance of the nine criteria. As a result, U.S. EPA did not select complete excavation as the remedy for the source control operable unit.

Comment 12: One commenter stated that U.S. EPA's goal in fish is disappointing since that goal should be zero. The commenter continues stating that Westinghouse would want a goal that is cost effective, but the U.S. EPA's goal should be the complete removal of all PCBs from the environment. The commenter argues that PCBs go down stream during storm events and are washed away so the solution to pollution is dilution, which is not appropriate. The commenter asserts that the public expects a higher standard from U.S. EPA.

Response 12: U.S. EPA evaluated the risk of PCBs in fish tissue to human health and to ecological receptors and determined that the fish remediation goals are protective of human health and the environment. In addition, the fate and transport model has predicted that these fish remediation goals would be met in 10 years. U.S. EPA has carefully reviewed the model and determined that it has been developed appropriately. Using U.S. EPA's most recent risk assessment guidance and evaluating the health effects of PCBs and the dioxin-like PCBs, having zero discharge is not necessary to protect human health and the environment.

Comment 13: Protect Our Woods states that U.S. EPA includes its usual caveat on page 1 that U.S. EPA in consultation with other government parties will select the final remedy for the site after reviewing and considering all information submitted during the public comment period and may modify the Preferred Remedial alternative or select another remedial alternative. The commenter argues that such statements have to betaken with a grain of salt for past experience has proven the Preferred Alternative is engraved in stone before the public sees the Proposed Plan.

Response 13: U.S. EPA disagrees with the commenter. U.S. EPA does take public comments into consideration and responds to those comments in the Responsiveness Summary. The U.S. EPA has issued a Technical Assistance Grant (TAG) to Citizens Opposed to PCB Ash (COPA) to help facilitate the dissemination of information and hire consultants to provide assistance in evaluating the technical information. If public comments disclosed facts or considerations which indicate that the Preferred Remedial Alternative is inappropriate, improper, or inadequate, U.S. EPA would modify the Preferred Remedial Alternative or select another remedial alternative.

Comment 14: Protect Our Woods states that the necessity for "complete removal" of electrical capacitors filled with PCBs, PCB-contaminated soils, ash, and other materials from the NPL Sites of LLL and NL, was incorporated into the "EPA-issued Consent Decree of December 1984" because they had been dumped in "karst without bottom liners," which enabled the groundwater to rise up into the landfills during storms with resultant leaching of the PCBs into the groundwater and escape into the environment from many springs connected to the landfills. According to the commenter, the scientific consultants hired by U.S. EPA in the early 1980s, Dr. Richard Powell, Philip LaMoreaux, and R.A. Griffin, (all knowledgeable about KARST in many and varied ways) stressed the need for complete removal as an end in itself and not tied to incineration. The commenter argues that if an alternative remedy to incineration was found to be desirable, complete removal of the PCBs over Karst without liners would still be appropriate and applicable.

Response 14: U.S. EPA did not issue the Consent Decree that required the excavation and incineration of PCB-contaminated at Neal's Landfill and other sites in and around Bloomington. Rather, the Consent Decree, which memorialized the remedy selected by U.S. EPA, was issued by the United States District Court for the Southern District of Indiana. In 1994, as a result of community opposition to the incineration remedy, the parties to the Consent Decree informed the Court that they planned to return to the negotiating table in an effort to reach consensus upon an alternative remedy for the Bloomington sites. They further informed the Court that their discussions would be based upon a reinvestigation of the sites to determine the risks to human health and the environment. Based upon the reinvestigation of Neal's Landfill, U.S. EPA no longer believes that complete excavation of the site is the best remedy for abating risks posed by the Site. As explained by U.S. EPA when it selected the alternative remedy for the source control operable unit, data does not show water rising up into the landfill during

storms and resulting in PCB leaching into groundwater. Rather, the data supports the conclusion that PCBs deep in the rock under and around the landfill are most likely the source of on-going releases into Conard's Branch and Richland Creek. Accordingly, U.S. EPA now believes that the best remedy to abate risks at Neal's Landfill is the "hot spot" removal already implemented by CBS in combination with remedial activities set forth under Alternative 3. As explained by the parties to the Consent Decree in filings with the Court, the parties intend to modify the Consent Decree to replace the original remedy for Neal's Landfill with this alternative remedy.

Comment 15: Protect Our Woods has been disturbed for years by U.S. EPA's failure to recognize that PCBs are highly volatile, vaporize readily, and are no respecter of boundaries, traveling amazing distances, found everywhere on earth and bio-accumulate in all life on earth and are persistent in the environment. The commenter asserts that U.S. EPA has omitted PCBs' vaporization characteristic in design and description of its final remedial actions for cleanup of Bennett's Quarry Dumps and Neal's Landfill. Further, the commenter asserts that this characteristic was omitted by U.S. EPA from various Risk Assessments because U.S. EPA only acknowledged dermal exposure and ingestion of PCBS as possible risks. Protect Our Woods believes U.S. EPA's action level of 1000 ng/m3 is a permissive U.S. EPA invention because no threshold exists below which PCBs can be considered harmless. Finally, the commenter assert that PCBs bio-accumulate, which the commenter calls "an insidious fact for a community that gets another release of PCB emissions from many springs into their atmosphere of PCBs every time it rains and storms."

Response 15: The commenter is incorrect in stating that PCBs are highly volatile compound. PCBs are classified as a semi-volatile compound due to its Henry's Law Constant. The commenter is referred to Attachment 1 which shows that between 2001 and 2005, total volatilization from Conard's Branch was calculated to be 0.09 kg, which represents 3% of the total PCB mass entering from the spring and water treatment plant effluent. In development of the human health and ecological risk assessments, U.S. EPA did evaluate the inhalation pathway and determined that it was a minor risk compared to the ingestion of fish. Regarding the 1,000 nanograms per meter cubed standard, this value was used as an action level during the excavation phase based upon the National Institute of Occupational Safety and Health (NIOSH) standard and was not a permissive U.S. EPA invention. The statement that no threshold exists below which PCBs can be considered harmless is incorrect and goes against the scientific literature. U.S. EPA agree with the commenter's assertion that PCBs bio-accumulate, but for the reasons just explained, U.S. EPA disagrees that volatization of PCBs contribute significantly to the bio-accumulation of PCBs in human and ecological receptors at Neal's Landfill

Comment 16: Protect Our Woods states that U.S. EPA does not describe Neal's Landfill in its Proposed Plan OU2 & 3 as it appeared to the public. The Monroe County Health Department (MCHD, the Indiana State Board of Health and U.S. EPA's scientists (ISBH) (Sanitary Engineering Division) from 1966-1972 when vast numbers of Westinghouse defective capacitors filled with PCBs (estimated by Westinghouse under oath around 40,000) were being dumped, scavenged and burned at the Landfill along with vast

amounts of the toxic solvent Trichloroethylene and tons of PCB-saturated filter clay, sawdust and rags, used to cleanup the Westinghouse Plant from spilled PCBs etc.

According to the commenter, Neal's Landfill was a scandalous common dump, a renegade operation where no attempt was made to abide by any "sanitary" rules. The commenter complains that U.S. EPA gives a great deal of space in its Proposed Plan for OU2 & 3 to listing response actions performed at the Landfill, but that U.S. EPA fails to state the actual total removal of waste situated over Karst without a liner. According to the commenter, U.S. EPA did acknowledge on March 16, 2002 that Operable Unit 1 had failed with high levels of PCBs still pouring out into the environment during storms. The commenter derides the response action selected by U.S. EPA with respect to the source control operable unit, calling the action a "farce" because U.S. EPA characterized as a "hot spot" any area where PCB concentrations exceeded 500 ppm. Further, the commenter asserts that the plan prepared for the scope of contamination study was clearly not representative of the site. Finally, the commenter accuses U.S. EPA of denigrating the significance of Neal's Landfill as a National Priority List Site to which U.S. EPA's scientific consultants accorded particular significance, recommending an RI/FS be prepared and complete removal performed as soon as possible to protect public health and the environment.

Response 16: Contrary to the commenter's assertions, U.S. EPA has described and characterized Neal's Landfill based upon all facts known to U.S. EPA about activities that occurred at the Site. Further, the commenter's assertion that U.S. EPA has acknowledged failure of operable unit 1 is incorrect. The purpose of operable unit 1 was to eliminate threats posed by PCBs within the former waste pile at Neal's Landfill and to prevent these PCBs from continuing to act as a source for the contamination released into Conard's Branch. The "hot spot" removal performed by CBS has been successful in achieving these goals. That said, it has always been U.S. EPA's position that additional response actions must be undertaken to address PCB contamination that had migrated out of the former waste pile before the "hot spot" removal was completed. Having now completed an investigation of this contamination that is the equivalent of a Remedial Investigation and Feasibility Study, U.S. EPA has concluded that its original remedial decision should be amended to incorporate the remedial components set forth under Alternative 3. These remedial components, in combination with the response actions required by operable unit 1, will result in a final alternative remedy that is protective of human health and the environment. Finally, the commenter's criticism of the "hot spot" removal are not pertinent to the remedial action now proposed by U.S. EPA. Commentators from Protect Our Woods raised the same criticisms when U.S. EPA originally proposed the "hot spot" removal. U.S. EPA considered and rejected these criticisms for the reasons explained by U.S. EPA in the responsiveness summary attached to the ROD Amendment for operable unit 1.

Comment 17: Protect Our Woods states that U.S. EPA appears to base its use of 500 ppm for the "hot spot" removal on a 1990 Directive titled Guidance on Remedial Actions for Superfund Sites with PCB Contamination. This guidance states that principal threats will generally include material contaminated at concentrations exceeding100 ppm for

sites in residential areas and concentrations exceeding 500 ppm for sites in industrial areas. According to the commenter, U.S. EPA should have based the "hot spot" removal upon the 100 ppm standard because Neal's Landfill is located in a rural area, not an industrial area. The commenter bases this argument upon U.S. EPA's statement in the proposed plan for operable units two and three that Neal's Landfill is located in a rural setting, surrounded primarily by agricultural and wooded land, with few residences within one mile of the site.

Response 17: This comment is not pertinent to the response action proposed by U.S. EPA with respect to groundwater, surface water and sediment contamination. Rather, it is pertinent to the response action that U.S. EPA proposed and selected with respect to the source control operable unit. That said, the commenter is incorrect in asserting that Neal's Landfill is not an industrial site. It qualifies as an industrial site because landfill operations occurred on the property, including the acceptance of municipal and industrial waste. While the area surrounding the site is agricultural and wooded, this fact is not dispositive with respect to the classification of the landfill. Many Superfund sites are classified as industrial even though the surrounding property is something other than industrial such as residential or rural.

Comment 18: Protect Our Woods notes that Dr. Richard Powell and Dr. Philip La Moreaux, who are experts on the geology and hydrology of karst, were retained by U.S. EPA in the mid-1980s to study Neal's Landfill and the surrounding area. The commenter notes the experts found evidence of a hydrogeologic connection between the landfill and Northwest Spring System, and that the experts concluded that PCBs from the site were being released into Conard's Branch and Richland Creek. According to the commenter, the experts concluded that the only viable method of protecting public health and the environment was to remove all PCB-contaminated waste from the landfill. The commenter further states that the experts recommended that action be taken as soon as possible because the bedrock around the site was highly fractured and jointed, causing PCB-contaminated leachate to migrate rapidly through the bedrock The commenter states that the experts opined that releases of PCBs from the Northwest Spring System were likely to continue for decades unless some remedial action was taken.

The commenter states that U.S. EPA prepared an RI/FS in 1983 supporting the complete removal of all PCBs from the site, but that CBS rejected this approach as too costly. According to the commenter, CBS agreed to a "sweetheart" deal that would allow the company to build its own incinerator, using City of Bloomington's municipal solid waste as fuel, for which the City would pay tipping fees. According to the commenter, U.S. EPA's experts arranged for a protective provision to be inserted in the Consent Decree that required the complete removal of all PCBs from the Site

Response 18: As explained in response to comment 14, the original remedy selected by U.S. EPA was never implemented by CBS because the parties agreed to return to the negotiating table for the purpose of exploring an alternative remedy to protect public health and the environment. As part of their discussion, the parties further agreed that the alternative remedy would be based upon new investigations of the sites. As a result of

these new investigations, U.S. EPA has learned new facts about releases of PCB-contaminated groundwater that were not known by U.S. EPA or its experts when the original remedy was selected in the mid-1980s. For instance, U.S. EPA learned that there are in-stream springs in Conard's Branch that are contributing to PCB releases during low-flow. Based upon the new investigation of the Site, U.S. EPA considered and rejected the complete excavation of Neal's Landfill as the best approach for addressing source contaminate at the Site. U.S. EPA refers the commenter to the responsiveness summary for the source control operable unit for an explanation as to why complete excavation was not chosen by U.S. EPA. U.S. EPA now believes that the "hot spot" removal, combined with the remedial components set forth under Alternative 3, offers the best approach for protecting public health and the environment.

Comment 19: Protect Our Woods states that U.S. EPA did not conduct a Remedial Investigation/Feasibility Study (RI/FS) with respect to the original remedy set forth in the Consent Decree. The commenter further states that, upon learning that U.S. EPA did not perform an RI/FS, citizens were able to secure an affidavit from Hugh Kaufman who concluded that an RI/FS is required prior to selection of a remedy at a CERCLA remedial action site. The commentator states that citizens have never been granted an RI/FS and, as a result, they have never been part of the decision-making process. Instead, the commenter complains that citizens are only permitted to "comment" on what has been negotiated between U.S. EPA and the PRP.

Response 19: The commenter apparently believes that the public typically is afforded an opportunity to participate in the preparation of an RI/FS. If so, the commenter is mistaken. An RI/FS is a document frequently generated by U.S. EPA for the purpose of presenting the results of a remedial investigation and analyzing various remedial alternatives for abating risks posed by the Site. In selecting remedial alternatives for the various Bloomington sites, U.S. EPA has not generated an RI/FS because none was required under U.S. EPA's regulations. U.S. EPA, however, has completed the functional equivalent of an RI/FS for the purpose of selecting alternative remedial actions for the various Bloomington sites. This fact was verified in 2000 by Hugh Kaufman in correspondence which was attached to the Lemon Lane Landfill ROD Amendment. The commenter is referred to the Responsiveness Summary for the source control operable unit for that site. The commenter is also incorrect in the assertion that the public has not been afforded an opportunity to participate in the remedy selection process for Neal's Landfill. U.S. EPA has met with the public in numerous public meetings, and it has published for public comment a proposed plan setting forth the various remedial alternatives considered by U.S. EPA for addressing PCB-contamination in groundwater, surface water and sediment. The Preferred Remedial Alternative set forth in the proposed plan is not binding upon either U.S. EPA or the PRP. In the event that public comments disclose facts or considerations which indicate that the Preferred Remedial Alternative is inappropriate, improper, or inadequate, U.S. EPA may modify the Preferred Remedial Alternative or select another remedial alternative. Thus, the public has been afforded the opportunity to participate in the remedy-selection process.

Comment 20: Protect Our Woods states that neither Monroe County/City of Bloomington community nor Protect Our Woods has supported the three remedies selected by U.S. EPA – namely, (1) the original remedy selected by U.S. EPA in the mid -1980s, (2) the ROD Amendment for Operable Unit 1, and (3) the Preferred Remedial Alternative for Operable Units 2 and 3. The commenter asserts that the community did not support the incineration remedy originally selected by U.S. EPA because, the scientific issues and questions surrounding many aspects of the incinerator's performance were substantial and without answers. Further, the commenter asserts that the Hot Spot cleanups failed because the scope of contamination studies were not representative of the landfills and because the identification of hot spots was poorly executed. According to the commenter, U.S. EPA's contractor, Tetra Tech, performed the scope of contamination studies but was not satisfied with the results, concluding: "Because of the variability in analytical data observed during the investigation and to conduct the RA in a cost-effective manner, Tetra Tech recommends that a comprehensive soil sampling and analysis program be implemented during the RA to determine the volume of material that contains PCB concentrations that equal or exceed 500 ppm and will need off-site disposal." The commenter asserts that the government parties in negotiation with CBS rejected Tetra Tech's recommendation to conduct further sampling of Neal's Landfill.

Response 20: U.S. EPA does not accept the commenter's assertion that the views of Protect Our Woods are representative of the entire Bloomington community. Based upon community participation in the Citizens Information Committee meetings and other public meetings, U.S. EPA is of the opinion that the majority of the Bloomington community is satisfied with the cleanups to date. Over 6,000 postcards were sent to Monroe County citizens notifying them of the Neal's Landfill Proposed Plan and no negative comments were received. Indeed, the interest of the community have been represented by the State, City of Bloomington and Monroe County – all of whom are parties to the litigation with CBS and all of whom support the Preferred Remedial Alternative and other remedial actions selected by U.S. EPA. Regarding the Tetra Tech recommendations, U.S. EPA implemented those recommendations through completing verification sampling during the remedial action.

Comment 21: One commenter from Protect Our Woods argues that U.S. EPA should require complete excavation of the Site because such a remedy was supported by U.S. EPA's consulting scientists when U.S. EPA selected the original remedy in the mid-1980s. The commenter argues that karst is always changing and evolving in response to both natural and man-made pressures. The commenter states that one may never discover where changes occur in karst because such changes are not predictable. Accordingly, the commenter argues that it is impossible to know to what extent, or how successful, the collection process of the Treatment Facility may be as new conduits develop and others change or take different directions, particularly under storm conditions.

Response 21: U.S. EPA does not agree that U.S. EPA will be unable to determine whether the collection process for the treatment system is successful. As an initial matter, CBS and U.S. EPA have conducted extensive dye-trace studies at the Site, and U.S. EPA is confident that all PCB-contaminated springs have been identified. Further,

the commenter fails to recognize the extensive monitoring program that will be done during the operation and maintenance phase. U.S. EPA will be able to determine how successful the collection process of the treatment facility may be since the fish within Conard's Branch and Richland Creek will be periodically sampled to determine if the fish remediation goals have been met or continue to be met.

Comment 22: Protect Our Woods states that the unpredictable nature of karst is evident from changes at the Site after CBS consolidated PCB-contaminated material with a concentration of less than 500 ppm. Specifically, the commenter notes that the southwest seep dried up and that several new springs appeared in Conard's Branch. The commenter also states that peak flows and flow volumes from the Northwest Spring System have decreased substantially since1983.

Response 22: The changes that have been observed post-source control operable unit have not been a result of consolidating landfill material less than 500 ppm. First, the surface water drainage was changed near the southwest portion of the site during the source control operable unit which affected how water enters the karst system. These drainage changes greatly improved the site by drying up the Southwest Seep and reducing the peak flow at the Northwest Spring System. The commenter infers that several new springs appeared in Conard's Branch due to the consolidation of landfill material. This is incorrect. U.S. EPA believes that the springs have always existed, but they were discovered only after the completion of the source control operable unit. The flow from these seeps will be captured during the implementation of operable units 2 and 3.

Comment 23: Protect Our Woods notes that the Technical Impracticability ("TI") Waiver for operable unit 2 relates only to the point source discharge at the point of water treatment prior to discharge to the creek during storm events. Referencing page 25 of the proposed plan for operable units 2 and 3, the commenter notes that peak flow rates from the Northwest Spring System during storms events are routinely higher than 11,000 gpm, and that flows greater than 500 gpm can last for many days, depending on seasonal factors and the rainfall distribution. The commenter notes that one particularly large flow event began on December 29, 2004 and continued for 21 days, bypassing approximately 61.4 million gallons of the 500 gpm water treatment plant. The commenter points out that U.S. EPA justifies the TI partially based on limited space for constructing 102 storage tanks or for building a a 47 acre lagoon – either of which would be necessary for capturing spring water during a storm event as large as the one that occurred on December 29, 2004.

The commenter argues that bypass of stormwaters over 500 gpm has been happening at this treatment plant since at least 1990 when the plant became operational. The commenter argues that citizens who knew the deficiencies about the NL Plant have called the plant a "farce" because it could only treat low flow, and because storm water over 500 ppm bypassed the plant, releasing PCBs into the environment. Further, the commenter argues that the 1 ppb limit established by IDEM with respect to the original remedy was not protective of public health and the environment. The commenter states

that the Fish & Wildlife Service ("F&WS") evaluated the plant and gave it a scathing report because of poor maintenance and function. The commenter states that the F&WS report should be pulled out of the File and read by U.S. EPA. The commenter asks that the Technical Impracticability Waiver be denied.

Response 23: The commenter has disclosed no facts or considerations which indicate that the Technical Impracticability Waiver is unwarranted. The Fate and Transport Model Report, dated March 5, 2007, explains why the capture and treatment of water in excess of 500 gallons per minute is not necessary to protect human health and the environment. Accordingly, as explained by U.S. EPA in the Technical Impracticability Waiver Report, dated July 3, 2007, U.S. EPA has determined that a Technical Impracticability Waiver is appropriate given the technical difficulties associated with capturing and treating the volume of water released during storm events. The commenter's criticism of the 1 ppb effluent set forth in the original Consent Decree is not germane to the treatment operations that U.S. EPA now proposes because the modified treatment plant will be subject to a more stringent effluent limit of 0.3 ppb. U.S. EPA is not aware of the F&WS report referenced by the commenter. U.S. EPA, however, has been working closely with F&WS field staff with respect to the proposed modification of the treatment plant, and F&WS field staff fully support the implementation of Alternative 3.

Comment 24: Protect Our Woods argues that it is irrational to single out fish for protection when, at the same time , U.S. EPA proposes a Technical Impracticability Waiver for PCB-contaminated water that bypasses the treatment plant during storm events. The commenter notes that the Fate and Transport Report provides the basis for U.S. EPA's determination that bypasses do not produce a major effect upon PCB concentrations in fish. As quoted by the commenter, the Fate and Transport Model Report states:

> Storm events producing flows greater than 500 gpm do not produce a major effect on PCB levels in fish due to the large flows not producing a long period of exposure which limits the PCB bio-accumulation in fish.
>
> PCB concentrations in fish are affected most by PCB-contaminated spring water during low flow periods. Currently, 37 % of the PCBs contributed to creek chub are from the North Spring by-pass water, which is not treated.
>
> Sediment contamination and stream bank contamination in Conard's Branch have an effect on PCB levels in creek chub, with sediments and bank soils contributing 27% of the PCBs found in the fish.

The commenter implies that the above conclusion is not reliable because it was prepared by CBS

Response 24: The commenter is incorrect that U.S. EPA has singled out fish for protection. As explained in the Ecological Risk Assessment, U.S. EPA has focused its risk assessment upon protecting Kingfisher and Mink since these animals are useful surrogates for other wildlife receptors that might feed upon PCB-contaminated fish. Further, since PCBs bio-accumulate as they move up the food chain, a remedy that is protective of Kingfisher and Mink should also be protective of fish. The commenter is also incorrect in his assertion that it is irrational to seek protection of ecological receptors while simultaneously seeking a Technical Impracticability Waiver for PCB-contaminated water that bypasses the treatment plant during storm events. As demonstrated by the Fate and Transport Model, the PCB released during storm events do not produce a major effect upon PCB concentrations in fish, and therefore, they do not produce a major effect upon other species, such as Kingfisher and Mink, that feed upon fish. U.S. EPA believes that the Fate and Transport Model is reliable because subcomponents of the model have been peer-reviewed in connection with other sites. Further, the commenter has disclosed no facts or considerations that should cause U.S. EPA to question the reliability of the Fate and Transport Model. U.S. EPA has acknowledged that the model poses certain inherent risks because – like all models – it is based upon various assumptions that cannot, at this stage, be either confirmed or refuted. To mitigate these risks, the final agreement with CBS shall include a remedy confirmation clause that will allow modifications of the remedy in the event that the goals for PCB concentrations in fish tissue are not met within 10 years after the completion of construction.

Comment 25: Protect Our Woods states that CBS obviously doesn't want to enlarge its present treatment facility or build a new one capable of collecting and treating a very large storm as can be anticipated in the future. According to the commenter, a remedy that requires complete removal of PCB-contaminated waste at the landfill is the only answer to abate risk posed by PCB-contamination in karst. The commenter argues that U.S. EPA should have considered complete excavation of the landfill as remedial alterative to address groundwater, surface water and sediment contamination. The commenter argues that U.S. EPA never informed the public of its decision to abandon complete excavation of the Site, and that the public still wants and needs complete removal of PCB-contaminated waste.

Response 25: U.S. EPA considered and rejected complete excavation of the landfill when it selected the ROD Amendment for the source control operable unit. The commenter is referred to the Responsiveness Summary for the source control operable unit, as well as to responses above, for an explanation of why complete excavation was not selected by U.S. EPA. Having considered and rejected compete removal as a remedial approach for the source control operable unit, it would have made little sense for U.S. EPA to reconsider this alternative with respect to the operable units to address PCB-contamination in groundwater, surface water and sediment. In any event, even if U.S. EPA had wanted to reconsider its decision to reject complete excavation as a remedial approach, such a remedial approach is not a feasible method of abating releases of contaminated groundwater to surface water. The groundwater investigation failed to identify all of the subterranean pathways by which PCBs are conveyed to the Northwest Spring System. Consequently, U.S. EPA has no idea where CBS would dig to remove all

of the PCBs in the karst bedrock. The commenter is incorrect that U.S. EPA never informed the public of its plan not to require the complete excavation of the landfill. This plan was not only published for public comment in advance of U.S. EPA's selection of the ROD Amendment for the source control operable unit, but the plan was also disclosed in numerous public meetings. Finally, U.S. EPA disagrees with the commenter's assertion that the "public" wants and needs complete removal of PCB-contaminated waste. U.S. EPA has provided numerous opportunities for the public to learn about, and comment upon, the Preferred Remedial Alternative to address PCB-contamination in groundwater, surface water and sediment. The relatively few negative comments that U.S. EPA has received leads U.S. EPA to believe that the public is predominantly supportive of the proposed remedy.

Comment 26: Protect Our Woods states that what we need is to have a meeting of all concerned parties and that includes the public and experts in various fields, both technical experts in Karst-those that participated in the decision-making process long ago if possible as well as financial experts who may be able to find ways to pay for Complete Removal of the remaining PCB-contaminated soils, ash and other materials; because our community cannot be held hostage any longer to principal responsible parties who do not want to do further removal but are willing to spend millions perhaps on Karst conduit and geophysical investigation with no progress in 8 years of trying. It's about time to seek Congressional Oversight Investigation of the entire Brouhaha we have had to bear up under since 1958 when Westinghouse began to dump capacitors in Lemon Lane Landfill.

Response 26: U.S. EPA has had numerous meetings with the public and top experts in fields such as karst terrain during this process. The State of Indiana, City of Bloomington and Monroe County have all been involved in determining the most appropriate remedies for the Bloomington sites, including Neal's Landfill. In addition, the U.S. EPA Ombudsman has evaluated the process and has determined that no further oversight is necessary. U.S. EPA will continue to attend CIC meetings to ensure the public stays informed and is involved.

Comment 27: National Pollution Discharge Elimination System (NPDES) program requirements of the Clean Water Act (CWA) are neither applicable, nor relevant and appropriate, requirements for the Neal's Landfill on-site water treatment plant. First, the Commenter states that it agrees with U.S. EPA that NPDES permit requirements are not applicable. Next, the Commenter states that the substantive NPDES requirements are not relevant and appropriate for the water treatment plant, because the NPDES requirements regulate the "discharge of pollutants" (defined as the addition of pollutants to navigable waters) from a "point source." In this case there is no NPDES-regulated "discharge of pollutants," because the proposed plant would not add pollutants to those already occurring as a result of existing groundwater and surface water flows. The commenter explains that, in short, "NPDES requirements are very ill-suited to the Neal's Landfill Superfund Site, which is very different from the situation in which they would normally apply. The NPDES requirements are intended to apply to the "discharge of pollutants," which is a defined term with a specific meaning under that statute. 33 U.S.C. §§ 1311, 1362(12). The term "discharge of a pollutant" is defined to mean "any addition of any

pollutant to navigable waters from any point source." 33 U.S.C. § 1362(12)." The commenter concludes that this definition does not apply to the Neal's Landfill water treatment facility because no "addition" of a pollutant is involved.

Response 27: U.S. EPA disagrees with the comment. The NPDES program requirements of the CWA are relevant and appropriate requirements for an on-site water treatment plant at Neal's Landfill's water treatment plant.

As the lead agency for the site, U.S. EPA is charged by 40 C.F.R. § 300.400(g) with identifying applicable or relevant and appropriate requirements to the release or remedial action contemplated for the site. As the commenter correctly notes, U.S. EPA determined that the NPDES program requirements of the CWA were not "applicable" to the Neal's Landfill water treatment plant that treats spring water from the Northwest Spring System. This is because Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), specifically exempts on-site removal and remedial actions, such as the water treatment plant, from the permit requirement imposed by the NPDES program. Nevertheless, U.S. EPA determined that the substantive requirements of the CWA were "relevant and appropriate" to the plant (and its proposed expansion as part of the final remedial action). Specifically, U.S. EPA determined that 327 IAC 5-2-11.1, which sets forth the procedure for establishing a water-quality based effluent limits (WQBEL) for various pollutants including PCBs, was "relevant and appropriate" to establishing the effluent limit for PCBs discharged by Neal's Landfill water treatment plant.

The Commenter argues that substantive requirements of the NPDES Program are not "relevant and appropriate" because their application is not well suited to a plant that is reducing discharges of pollutants instead of adding pollutants and is more like a treatment facility that is reinjecting treated groundwater into the same groundwater system in which it was flowing before being treated. The Commenter's argument confuses the difference between requirements that are "applicable" and those that are merely "relevant and appropriate." Even if a requirement is not "applicable," U.S. EPA is nevertheless required to determine whether a regulation may be relevant and appropriate to the circumstances of the release. 40 C.F.R. ' 300.400(g)(2). A "relevant and appropriate" requirement means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5 (emphasis added). U.S. EPA believes that the substantive requirements of the NPDES program are "well-suited" to the cleanup at Neal's Landfill and the water treatment plant, because the NPDES Program, similar to the proposed CERCLA action, is concerned with abating the harmful effects of pollutants discharged into the nation's waterways.

Under 40 C.F.R. § 300.400(g)(2), U.S. EPA is required to examine eight factors, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated. Id. An examination of these factors (below) shows that U.S. EPA reasonably determined

that the substantive requirements of the NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1 (the reference to 327 IAC 5-2-11.2 appears to be a typographical error repeated throughout), were "relevant and appropriate" to the proposed waste water treatment plant.

Factor 1: The purpose of the requirement and the purpose of the CERCLA action: The objective of 327 IAC 5-2-11.1 is to establish water quality based effluent limits for pollutants discharged into waters other than those within the Great Lakes system. The State of Indiana has established water quality criteria to restore and maintain the chemical, physical and biological integrity of the waters of the state. Pertinent to the present case, the State has determined that the concentrations of PCBs in Indiana waterways shall not exceed 0.79 parts per trillion ("ppt"). Based upon this water quality criteria, the State has also determined, in accordance with the guidelines set forth at 327 IAC 5-2-11.1, that dischargers of PCBs cannot discharge PCBs at a concentration greater than 0.3 parts per billion (ppb).

The problem addressed by 327 IAC 5-2-11.1 is similar to the circumstances of the remedial action proposed by U.S. EPA for the Neal's Landfill water treatment plant. Here, PCBs from the site were being released into Conard's Branch and Richland Creek, thus requiring the treatment plant, and continue to be released from the plant during certain storm events, thus necessitating this Neal's Landfill water treatment operable unit. To protect human health and the environment from these releases, U.S. EPA has proposed, among other things, to improving the low-flow collection system capabilities of the water treatment plant to capture and treat all low-flow PCB-contaminated water (which portions now bypass the plant) before it is discharged into Conard's Branch. A critical question in implementing this remedial action concerns the amount of PCB reduction that is necessary. That is, U.S. EPA must determine what concentration of PCBs can be discharged into Conard's Branch without threatening human health and the environment. The procedure set forth at 327 IAC 5-2-11.1 is directly relevant to answering this question, and it is therefore appropriate for U.S. EPA to use 327 IAC 5-2-11.1 in selecting the proposed final remedy for both the treatment plant discharge criteria and the discharge criteria for treated spring water that currently bypasses the treatment plant.

Factor 2: The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1, is concerned with protecting the waters of the State from the harmful effects of pollutants, such as PCBs. Similarly, the proposed remedial action is concerned with protecting Conard's Branch and Richland Creek - one of the State's waterways - from the harmful effects of PCBs. This factor, therefore, supports U.S. EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 3: The substances regulated by the requirement and substances found at the Site:

The State of Indiana's NPDES Program, including 327 IAC 5-2-11 and 327 IAC 5-2-11.1, regulates the discharge of "pollutants," which includes PCBs. PCBs are also the contaminant of concern with respect to the proposed remedial action. Therefore, these factors also support U.S. EPA's determination that the State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 4: The actions or activities regulated by the requirement and the remedial action contemplated at the CECRLA site:

Like all NPDES programs, the State of Indiana's NPDES Program regulates the "discharge" of pollutants into the State's waters. Section 503(12) of the CWA, 33 U.S.C. ' 1362(12), defines the "discharge of a pollutant" in relevant part to mean "any addition of any pollutant to navigable waters from any point source." Here, the Northwest Spring System and the Neal's Landfill water treatment plant are similar to a "point source" if it is not, in fact, a point source. U.S. EPA believes, therefore, that these circumstances at the site are similar enough to the activities regulated by the State NPDES program that the substantive requirements of that program are "relevant and appropriate" to the proposed remedial action.

Section 503(14) of the CWA, 33 U.S.C. ' 1362(d), defines the term "point source" to mean "any discernible, confined and discrete conveyance . . . from which pollutants are or may be discharged." Cases brought under the CWA establish that the term "point source" is to be broadly construed. Dague v. City of Burlington, 935 F.2d 1343, 1354-55 (2d Cir. 1991); Albahary v. City and Town of Bristol, Connecticut, 963 F.Supp. 150, 152-53 (D. Conn. 1997). The term not only includes pipes or ditches, but also large land areas, such as strip mining pits and mine tailing ponds. In Washington Wilderness Coalition v. Hecla Mining Company, 870 F.Supp. 983 (E.D. Wa. 1994), the Court held that two dirt-filled mine tailing ponds and a third, active, unlined mine tailing pond from which contaminants were leaching could be point sources. Similarly, in Sierra Club v. Abston Construction, 620 F.2d 41, 45 (5th Cir. 1980), the Court held that a strip mine was a point source where "the miner at least initially collected or channeled the water and other materials" that eventually resulted in a discharge into a navigable body of water. See also Beartooth Alliance v. Crown Butte Mines, 904 F.Supp. 1168, 1174 (D. Mont. 1995)("This Court finds that Glengarry Adit, McLaren Pit, and Como Pit are 'discernable, confined and discrete' conveyances constituting point sources.").

All of these cases support the conclusion that the Neal's Landfill, Northwest Spring system, and its water treatment plant, are point sources. The Neal's Landfill occupies a former valley that was filled with garbage and commercial and industrial waste including capacitors and PCB-containing dielectric fluids. The addition of these materials and wastes changed the surface and subsurface of the land and directed the flow of water or otherwise impeded its progress. As result of these activities, PCBs are now discharged from the Northwest Spring System into Conard's Branch and Richland Creek, and hence, the site is a "point source." Other human activities that have modified or redirected groundwater and surface water flows at the site and, thus, have established "point sources" at the site include: the culvert installed under road to water treatment plant,

piping to collect PCB-contaminated water from the overflow springs for eventual treatment and the North Spring collection system. Finally, the Neal's Landfill water treatment plant itself is a point source by the fact that the State has issued a NPDES permit which the U.S. EPA has agreed to modify under CERCLA.

A second argument made by the commenter is that discharges from the water treatment plant are not "discharges" under the CWA. Specifically, the commenter argues that the purpose of plant is to *reduce* the concentration of PCBs entering into Conard's Branch and Richland Creek. Since the plant is not *adding* pollutants to Conard's Branch and Richland Creek, the commenter maintains that the effluent discharged by the plant does not qualify as a "discharge" for the purposes of the CWA.

This argument overlooks the fact that the site, not the plant, is adding pollutants to Conard's Branch and Richland Creek. If the commenter's argument were correct, then a publicly owned treatment works (POTW) would not need to obtain an NPDES permit because a POTW does not add pollutants to the waste stream that flows through the plant. Rather, a POTW merely removes pollutants from the wastestream. Numerous courts, however, held that POTWs are subject to the NPDES program. Further, comparing a water treatment plant that treats groundwater and discharges treated groundwater off-site to surface water with an on-site reinjection system is disingenuous. Off-site discharges to surface water must meet NPDES discharge criteria just as on-site treatment and reinjection of groundwater would have to meet ARARs such as drinking water standards.

Factor 5: Any variances, waivers, or exemption of the requirement and their availability for the circumstances at the CERCLA site:

Under 327 IAC 2-1-8.8, the State may grant a variance from a water quality standard used to derive a Water Quality Based Effluent Limit (WQBEL) for a specific substance. In making this determination, the State must balance the increased risk to human health and the environment if the variance is granted against the hardship or burden upon the applicant if the variance is not granted. This determination is similar to the one that U.S. EPA made in selecting the proposed remedial alternative. Specifically, U.S. EPA found that the proposed remedial action was the best choice taking into account a number of factors, including cost. For the same reasons set forth in the proposed plan as to why Alternative 3 is the best choice among remedial alternatives, U.S. EPA believes that the variance under 327 IAC 2-1-8.8 should not be granted in the present case. Likewise, U.S. EPA believes that various exemptions available under its own regulations should not be granted here.

Factor 6: The type of place regulated and the type of place affected by the release or CERLA action:

As already noted, the State NPDES Program regulates dischargers of pollutants into the States' waterways. Similarly, under the proposed remedial action, U.S. EPA seeks to clean up a site that is discharging pollutants into a State waterway. Accordingly, this

factor supports U.S. EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 7: The type and size of structure or facility regulated and the type of size of structure or facility affected by the release or contemplated by the CERCLA action:

As already noted, the State NPDES Program regulates "point source" of pollutants discharged into the State's waterways. Neal's Landfill and the Northwest Spring System water treatment plant are all consistent with the sizes and types of point sources regulated under the Clean Water Act. The conclusion that Neal's Landfill, as well as the culvert installed under road to the water treatment plant, piping to collect PCB-contaminated water from the overflow springs for eventual treatment and the North Spring collection system are themselves each point source, is directly supported by Dague v. City of Burlington, 935 F.2d 1343 (2d Cir. 1990)(holding city landfill was a point source). Likewise, the proposed water treatment plant is consistent with the size and type of facilities that are routinely subject to the requirements of the NPDES Program. Accordingly, this factor supports U.S. EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Factor 8: Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

The requirements of 327 IAC 5-2-11.1 apply to all waterways in the State that are not part of the Great Lakes System, regardless of the use or potential use of the waterway. Accordingly, this factor supports U.S. EPA's determination that State NPDES Program is "relevant and appropriate" to the proposed remedial action.

Comment 28: U.S. EPA and the State of Indiana have identified 327 IAC 2-1-6, Table 1 as an ARAR. The table contains water quality limits for a wide variety of pollutants identified by the State from any source regulated by the State under the NPDES program. No effort is made to identify any specific pollutant that may be discharged from the treatment facility.

This approach is totally inconsistent with the CERCLA process of identifying specific ARARs that apply to specific CERCLA cleanups. Under CERCLA, an ARAR is supposed to be a specific "standard, requirement, criteria or limitation" that is relevant and appropriate to the specific hazardous substance, pollutant or contaminant at issue. 42 U.S.C. § 9621(d)(2)(A). Rather than identify limitations that would be applicable to the effluent from a treatment facility, U.S. EPA and the State simply identify the standards applicable to all possible pollutants that might be regulated under the program. Indeed, this approach is inconsistent with the way U.S. EPA and the State administer the NPDES program. When issuing an NPDES permit, the Indiana Department of Environmental Management (IDEM) does not simply list all the standards on Table 1; rather, it identifies the pollutants in the discharger's wastewater and only includes the limits for the pollutants identified.

The NCP defines "*relevant and appropriate requirements*" to mean substantive requirements of federal or state law, which "while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site." 40 C.F.R § 300.5. The process of identifying ARARs then involves identifying specific standards which have specific relationship to the hazardous substances found at the site. Instead of doing that, the U.S. EPA and the State simply refer to a generic table listing all substances regulated (327 IAC 2-1-6, Table 1). A general reference to the table is not sufficient. U.S. EPA and the State must identify the specific substances of concern that are present at this site and require limitations. Both CERCLA and the NCP provide that the only State standards which may qualify as ARARs are those which have been identified "in a timely manner." 42 U.S.C. § 9621(d)(2)(A)(ii); 40 C.F.R. § 300.5. The NCP further provides that a remedy must only meet those ARARs which are identified at the time a Record of Decision is signed. 40 C.F.R. § 300.430(f)(1)(ii)(B).

At Neal's Landfill, the only hazardous substance, pollutant or contaminant of concern that has been identified are PCBs. Accordingly, effluent limitations with respect to other substances may not be ARARs because there is no information to show that they may be relevant or appropriate for this Site. Therefore, the general reference to 327 IAC 2-1-6, Table 1 as an ARAR is not appropriate.

Response 28: U.S. EPA disagrees with the comment that the cited Section is not an ARAR. The Commenter's observation that section is neither applicable, nor relevant and appropriate, because the table contains water quality limits for a wide variety of pollutants and because the specific pollutant that may be discharged from the treatment facility is not identified, is associated with the Site is rejected. The requirement cited is still relevant and appropriate, because, as will be discussed more fully below, it provides "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5.

327 IAC 2-1-6, and Table I, identifies the minimum surface water quality standard and establishes surface water quality criteria for specific substances, including PCBs. This provision is relevant and appropriate in determining cleanup and discharge criteria, and is directly tied to determining the discharge criteria for PCBs under 327 IAC 5-2-11.1. To date, spring water contaminants, other than PCBs, have not been identified as being at levels of concern at the Site.

Comment 29: Regarding PCBs, U.S. EPA and the State have not identified a legally enforceable effluent limitation that qualifies as an ARAR. Instead, U.S. EPA and the State rely on 327 IAC 5-2-11 and 327 IAC 5-2-11.2 [sic] as the vehicle to set an effluent limit of 0.3 parts per billion (ppb), because that is the limit of quantitation (a level which can be reliably confirmed using existing measurement technology) using existing

technology. The 0.3 ppb effluent limitation for PCBs does not qualify as an ARAR, because it has not been "promulgated" by the State as a regulatory standard.

CBS states that under the terms of the 1985 Consent Decree and an Indiana Court Decision, U.S. EPA may not impose a more stringent PCB discharge limit than 1.0 ppb without CBS's consent.

Response 29: Indiana properly identified 327 IAC 5-2-11 and 327 IAC 5-2-11.1 as ARARs and used 327 IAC 5-2-11.1 as the promulgated standard, requirement, criteria, or limitation to set an effluent limit of 0.3 ppb for PCBs. With respect to State ARARs, 42 U.S.C. § 9621(d)(2)(A)(ii) provides that

> "any promulgated standard, requirements, criteria, or limitation under a State environmental . . . law that is more stringent than any Federal standard, requirement, criteria, or limitation . . . is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant and appropriate under the circumstances of the release of such hazardous substance or pollutant or contaminant, the remedial action selected . . . shall require, at the completion of the remedial action a level or standard of control for such hazardous substance or pollutant or contaminant which at least attains such legally applicable or relevant and appropriate standard, requirement, criteria, or limitation."

This provision does not require that a State's "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" take the form of a specific, promulgated numeric effluent limit. Rather, it simply requires that the "standard, requirements, criteria, or limitation" identified as an ARAR be promulgated. Here, 327 IAC 5-2-11.1 is the relevant and appropriate standard, requirement, criteria, or limitation promulgated by Indiana. 327 IAC 5-2-11.1(f) in pertinent part provides:

> (f) When the WQBEL for any substance is less than the limit of quantitation normally achievable and determined by the commissioner to be appropriate for that substance in the effluent, the permit shall contain the following provisions:
> (1) The permittee shall be required to use an approved analytical methodology for the substance in the effluent to produce the LOD and LOQ achievable in the effluent. The analytical method, and the LOD and LOQ associated with this method, shall be specified in the permit in addition to the following requirements:
> (A) The permit shall include conditions that state that effluent concentrations less than the limit of quantitation are in compliance with the effluent limitations.
> (B) In addition, the permit shall require the permittee to implement one (1) or more of the following requirements:
> (i) Develop a more sensitive analytical procedure.

(ii) Use an existing, more sensitive, analytical procedure that has not been approved by U.S. EPA.
(iii) Conduct studies to determine the bioaccumulative or bioconcentrative properties of the substance in aquatic species through caged-biota studies or fish tissue analyses of resident species.
(iv) Conduct effluent bioconcentration evaluations.
(v) Conduct whole effluent toxicity testing.
(vi) Other requirements, as appropriate, such as engineering assessments or sediment analyses.

For substances defined as BCCs, at a minimum, either item (iii) or (iv) shall be included in the permit.

(2) If the measured effluent concentrations for a substance are above the WQBELs and above the LOD specified by the permit in any three (3) consecutive analyses or any five (5) out of nine (9) analyses, or if any of the additional analyses required under subdivision (1)(B) indicate that the substance is present in the effluent at concentrations exceeding the WQBELs, the permit shall contain provisions that require the discharger to:

(A) determine the source of this substance through evaluation of sampling techniques, analytical/laboratory procedures, and industrial processes and waste streams; and
(B) increase the frequency of sampling and testing for the substance.

(3) The permit shall contain provisions allowing the permit to be reopened, in accordance with section 16 of this rule, to include additional requirements or limitations if the information gathered under subdivisions (1) and (2) indicates that such additional requirements or limitations are necessary.

Here, the WQBEL for PCBs is 0.001 parts per billion, which is below the limit of quantitation and limit of detection normally achievable and determined by the commissioner to be appropriate for PCBs. As a result, in accordance with the promulgated requirements of the NPDES program, the State set the effluent limit for PCBs at 0.3 ppb, which is the level at which concentrations of PCBs can be reliably quantified.

In identifying 327 IAC 5-2-11.1 as an ARAR, Indiana properly and timely identified a "promulgated standard, requirements, criteria, or limitation under a State environmental . . . law" and through application of that standard, requirements, criteria, or limitation derived the 0.3 ppb PCB effluent limitation.

U.S. EPA also notes that in footnote 6 to its Comment letter, CBS identifies a 3 ppb effluent limit taken from U.S. EPA Toxic Substances Control Act Spill Policy regulations (40 C.F.R. § 761.79(b)(1)(ii) as a higher (less stringent) limit than the "unpromulgated" limit of 0.3 ppb identified by the State. U.S. EPA concludes that the State limit of 0.3 ppb derived from application of Indiana's promulgated standard, requirements, criteria,

or limitation at 327 IAC 5-2-11.1 is more stringent than the Federal requirement and, therefore, will be used.

For purposes of identification of ARARs, U.S. EPA concludes that using a 0.3 ppb NPDES discharge limit arrived at consistent with 327 IAC 5-2-11.1(h) is appropriate. While U.S. EPA agrees that the existing Consent Decree establishes a PCB discharge limit of 1.0 ppb, U.S. EPA notes that CBS and the governmental parties are in discussions to amend the existing Consent Decree. This would include elimination of the NPDES permit and the existing discharge criteria in the Consent Decree.

Comment 30: One of the NPDES provisions identified as a potential ARAR is 327 IAC 5-2-13(f). This provision calls for composite sampling. This is not a standard or limitation. In operating the interim treatment plant required under Paragraph 59(a) of the Consent Decree, CBS has historically taken grab samples. CBS contends that sampling requirements should not be designated as ARARs because they are not standards, criteria, or limitations. But if U.S. EPA chooses to select a water treatment remedy, it should consider whether U.S. EPA should mandate composite sampling where grab sampling has been relied upon historically.

Response 30: U.S. EPA disagrees with the comment that the cited Section is not an ARARs. The Commenter's observation section is neither applicable, nor relevant and appropriate, because it does not identify a standard or limitation is rejected. The requirements cited is still relevant and appropriate, because, as will be discussed more fully below, it provides "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5.

327 IAC 5-2-13(d) establishes a substantive monitoring requirement and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring U.S. EPA's and IDEM's ability to conduct oversight.

Comment 31: To the extent that NPDES provisions are identified as ARARs, CBS agrees with U.S. EPA that a technical impracticability waiver is appropriate with respect to the application of these requirements to water that is not treated in the water treatment plant.

One provision in particular which should not be applied as an ARAR is 327 IAC 5-2-8(11), which concerns by-passes. Most of the remedial alternatives under consideration involve using the existing plant to capture and treat flows of similar volume. Although, in some of these alternatives, modifications would be made in the collection system, not all the flows from springs around Neal's Landfill would be diverted to the plant. Moreover, in periods of high flow from the collected sources, the plant would not be able to capture flows in excess of 1 cubic feet per second (or 450 gallons per minute) on a consistent basis. Although the existing system is often capable of handling 500 or even

550 gallons per minute in certain situations, it cannot handle volumes greater than 450 gallons per minute in all situations. Therefore, if this provision is designated as an ARAR, there must be a technical impracticability waiver with respect to flows that are not collected by the system and with respect to flows collected by the system but which are greater than 1.0 cubic feet per second or 450 gallons per minute.

Response 31: 327 IAC 5-2-8(11) establish the substantive requirements for handling circumstances where "bypass" occurs at the water treatment plant, and is relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. This provision is relevant and appropriate to how the plant is operated, and does not apply to water that is never intended to be captured and treated. Because this provision addresses plant operation, and imposes requirements that apply when the plant's operation is interrupted and thus results in bypass, it should not be waived.

Comment 32: Section 327 IAC 5-2-11.1(h) should not be considered an ARAR because it does not provide for any standard, requirement or limitation, but rather describes a process through which IDEM may impose more stringent standards than those currently in effect. Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), requires U.S. EPA to determine ARARs based on the legal requirements that *are in effect at the time the remedy is selected*, not on the basis of requirements which may come into effect in the future. 42 U.S.C. § 9621(d)(2)(A)(ii), (4); 40 C.F.R. § 300.430(f)(1)(ii)(B). Application of this provision would reserve a right for IDEM to impose more stringent standards later. Listing this provision as an ARAR is inconsistent with CERCLA's requirement that ARARs must be identified at the time of remedy selection.

Response 32: See response to 29.

Comment 33: Many of the NPDES provisions identified as ARARs do not set forth limits or requirements that IDEM imposes on dischargers, but rather describe the procedures that IDEM is supposed to follow in establishing such limits. These include: 327 IAC 5-2-11(d), (e), (f), (g) and (h) and 327 IAC 5-2-11.1(a), (b), (d), (f), (g), and (h) as ARARs. These provisions should not be designated as ARARs. The term ARAR in 42 U.S.C. § 9621(d)(2)(A) refers to the specific "standard, requirement, criteri[on], or limitation" itself, not the means by which it was determined.

Section 327 IAC 5-2-11.1(d) is particularly incongruous because it relates to the establishment of WQBELs for discharges of metals, and is neither applicable or relevant and appropriate since metals are not contaminants of concern at this site.

Response 33: U.S. EPA disagrees with the comment that the other cited Sections are not ARARs. The Commenter's observation that many of the sections cited are neither applicable, nor relevant and appropriate, because they provide a means for establishing standard, requirement, criteri[on], or limitation, and not an actual standard, requirement, criteri[on], or limitation, is rejected. The requirements cited are still relevant and appropriate, because, as will be discussed more fully below, they provide "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations

promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5.

327 IAC 5-2-11(d),(e),(f) (g), and (h) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for calculating, establishing, and specifying effluent limits and their use is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

As discussed in the response to Comment 29, 327 IAC 5-2-11.1 is an ARAR and was used to calculate the WQBEL effluent limit for PCBs. The commenter is citing to the subsections of that part of the Indiana Code. To the extent that the subsections must be referred to understand the context of, and calculate and arrive at, the WQBEL limit for PCBs, citation to 327 IAC 5-2-11.1 without reference to each subsection is appropriate. To date, spring water contaminants, other than PCBs, have not been identified as being at levels of concern at the Site.

Comment 34: The proposed Plan also cited various other administrative provisions of the IDEM NPDES program as ARARS. CBs does not believe that these provisions should be considered ARARs for the following reasons:

IAC Code Provision	**Requirement**	**Reason(s) why not an ARAR**
327 IAC 5-2-8(3)	Permittee shall take all reasonable steps to minimize or correct noncompliance with the permit	(1) There is no permit; and (2) this is no "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2).
327 IAC 5-2-8(7)	Permittee shall provide a right of access to IDEM and its contractors	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); and (3) CBS does not own or lease the property in question.
327 IAC 5-2-8(8)	Permittee shall maintain the facility in good order	(1) There is no permit; and (2) this is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A).
327 IAC 5-2-8(9)	Permittee's tampering with monitoring device is subject to criminal sanction	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C.

		§ 9621(d)(2); and (3) enforcement provisions are not ARARs.
327 IAC 5-2-8(10)	Establishes reporting requirements	Reporting requirements for CERCLA remedies are set forth in consent decrees or other enforcement documents
327 IAC 5-2-8(12)	Requirements for upset	EPA has already indicated that it intends to invoke CERCLA's technical impracticability waiver to supersede these requirements.
327 IAC 5-2-8(14)	Provisions relating to signing of reports and criminal sanctions for false reports	(1) There is no permit; (2) This is not a "standard, requirement, criteria, or limitation" under 42 U.S.C. § 9621(d)(2)(A); (3) procedural and enforcement provisions are not ARARs; and (4) these issues are generally addressed separately in a consent decree or other enforcement document.
327 IAC 5-2-11(a)(1)-(4)	Definitions of "Average Monthly Discharge," "Average Weekly Discharge," "Continuous Discharge," and "Daily Discharge," used in calculating effluent limitations.	Definitions are not in and of themselves "standard[s] requirement[s], criteria, or limitation[s]" under 42 U.S.C. § 9621(d)(2), and therefore not ARARs.
327 IAC 5-2-11(a)(5)(C)	Method of calculation for daily discharges	This methodology is not in and of itself a "standard, requirement, criteri[on], or limitation" under 42 U.S.C. § 9621(d)(2), and therefore not an ARAR.
327 IAC 5-2-11 (g))	Provisions relating to non-continuous dischargers	The Neal's Landfill plant operates on a continuous basis
327 IAC 5-9-2(a), (c), (d), (e)	Refers to best management practice programs for "ancillary manufacturing	There are no "ancillary manufacturing operations" in this situation. This

	operations"	provision is not an ARAR, because it is not applicable or relevant and appropriate under CERCLA. It is ill-suited for this situation.
327 IAC 5-9-2(i)	Discharger will amend the best management practices when there is a change to the system that affects the discharge	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.
327 IAC 5-9-2(j)	Provision relating to the amendment of best management practices plan if it proves ineffective	(1) This is not a substantive requirement of a permit, but a procedural provision relating to IDEM's administration of the program; and (2) under CERCLA, 42 U.S.C. § 9621(d)(2)(A), (4), and the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(B), ARARs must be identified and are fixed at the time of remedy selection.
327 IAC 5-2-13(a), (c), (d), (e), (f)	Monitoring provisions	These provisions are not ARARs in and of themselves.

Response 34: U.S. EPA disagrees with the comment that the cited Sections are not ARARs. Although no NPDES permit is required for the Site, the requirements cited are still relevant and appropriate, because, as will be discussed more fully below, they provide "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that . . . *address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*" 40 C.F.R. § 300.5.

327 IAC 5-2-8(7), (8), (9), (10), (12), and (14) all establish standards of control and other substantive requirements and criteria relevant and appropriate to determining the

operation of the Neal's Landfill water treatment plant, as well as the system for treatment of storm water that currently bypasses the water treatment plant. 327 IAC 5-2-8(7) establishes the substantive requirement of IDEM access to the plant, and is relevant and appropriate to ensuring U.S. EPA's and IDEM's ability to provide oversight of plant operations. 327 IAC 5-2-8(8) establishes the substantive requirement that the water treatment plant and its equipment be kept in good working order and operated efficiently and is relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. 327 IAC 5-2-8(9) and (10) establishes the substantive requirement that the operation of the water treatment plant and its equipment be monitored and identifies reporting requirements and sanctions for false reporting and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring U.S. EPA's and IDEM's ability to conduct oversight. 327 IAC 5-2-8(12) establish the substantive requirements for handling circumstances where "bypass" or "upset" occur at the water treatment plant, and are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards. 327 IAC 5-2-8(14) establishes substantive reporting requirements and sanctions for false reporting and is relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring U.S. EPA's and IDEM's ability to conduct oversight.

327 IAC 5-2-11(a)(1)-(4) and (5)(c); 327 IAC 5-2-11(g) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for calculating, establishing, and specifying effluent limits and their use is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

327 IAC 5-9-2 (i), and (j) establish cleanup standards, standards of control, and other substantive requirements, criteria, or limitations under state environmental laws that address the situation at the site by providing a way for determining, establishing, and specifying best management practices applicable to the Neal's Landfill water treatment plant and the plan for treating water that currently bypasses the plant as described in Alternative 3 effluent limits and is well suited to this Site. These requirements are relevant and appropriate to ensuring the plant's operation and ability to achieve the cleanup standards.

327 IAC 5-2-13(a), (c), (d), (e), and (f) establish substantive monitoring requirements and are relevant and appropriate to the plant's operations and ability to achieve the cleanup standards, as well as ensuring U.S. EPA's and IDEM's ability to conduct oversight.

Comment 35: CBS has stated that air emission provisions identified by IDEM are not ARARs. In the Fact Sheet, U.S. EPA notes that the State has identified as ARARs three requirements relating to major sources of hazardous air pollutants (HAPs). These requirements are plainly inapplicable and not relevant and appropriate. One requirement, 326 IAC 2-4.1, applies to major sources of HAPs. But, based on the description of the remedial alternatives in the Fact Sheet, there is no proposal to construct a major source of a HAP. The second requirement, 326 IAC 2-5.1-3(a)(1)(D), applies to

sources of HAPs which have the potential to emit ten (10) tons or more of a HAP in a year, and the third requirement, 326 IAC 2-5.1-2(a)(1)(A), applies to sources of HAPs which also have the potential to emit five tons or more of particulate matter. Again, no such source is contemplated. Accordingly, these requirements should not have been designated as ARARs. These requirements are not only wrongly identified as ARARs, but by identifying them, U.S. EPA has created the false impression that air emissions from the proposed remedies are more extensive than contemplated.

Response 35: The identified ARARS above could, under some circumstances, be relevant and appropriate for Alternative 3. Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. ' 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. U.S. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A Source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

Finally, under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. U.S. EPA does not anticipate that any of the proposed remedies will meet this threshold.

Comment 36: CBS states that they believe that the risk estimates that are provided in the revised Human Health Risk Assessment (HHRA) still contain many unnecessary precautionary default assumptions that contribute greatly to the uncertainty of the risk and hazard estimates. It appears that, in an effort to ensure that risks at the Site are not underestimated, a number of highly conservative default assumptions, which are not supported by available data or site characteristics, have been made and have resulted in substantially overestimated Site risks.

The key issues that have contributed to this overestimation and uncertainty include the following:

- Risks due to fish consumption are still overestimated due to the fact that the revised fish ingestion rates do not reflect realistic use of the resource. In addition, the exposure point concentrations (EPCs) used for some locations are based on an

extremely limited number of samples. Further, the toxicity equivalent quotient (TEQ) concentrations that have been used do not reflect the current toxic equivalency factors (TEF) that have been developed by the World Health Organization (van den Berg et al., 2006). Finally, U.S. EPA has used a methodology that was proposed in the Agencies' Dioxin Reassessment (EPA, 2000) to evaluate potential carcinogenic risks and noncarcinogenic hazards associated with the fish consumption pathway, despite the fact that this was a proposed draft approach that was strongly challenged during the peer review conducted by the National Academy of Sciences (NAS) and is currently being reconsidered by U.S. EPA.

- Risks due to other media at the Site, including surface water, sediment and soils, are also overestimated. This is due to the use of EPCs, in many locations, that are based on the maximum detected values and to the use of highly conservative exposure assumptions including high ingestion and dermal contact rates, and unrealistically high exposure frequencies.

- The total combined risk and hazard estimates, which include multiple pathways of exposure, are inappropriate due to the fact that risks and hazards have been "mixed and matched" from various portions of the Site to derive reach-specific total risk estimates. As a result, in some of the areas evaluated, the estimated risks are not representative of the potential exposure that could be attributed to those specific areas.

CBS has recommended alternative values based on their scientific merit and on additional consideration of site-specific characteristics and has combined these into alternative risk estimates. These revised risk estimates indicate that risks at this Site are likely to be lower than have been estimated in the HHRA.

Response 36: U.S. EPA's responses to each of the comments above regarding particular elements of the HHRA are addressed in the responses to specific comments below. However, U.S. EPA's responses to several points raised by CBS are summarized below.

- The assumption that fish biomass (and, therefore, potential fish tissue ingestion) will increase by 10 percent per river mile is based on the observed increase in size (for example, in width and flow rate) of Richland Creek as the distance downstream from Neal's Landfill increases. It is a well established point that, all things being equal, a larger stream will support a larger fish population than a smaller stream. U.S. EPA believes that in the absence of fish population estimates at downstream locations, the approach used produces reasonably conservative estimates of fish productivity that recognize the likely increase in fish biomass in Richland Creek downstream of Neal's Landfill. Uncertainties associated with the downstream fish tissue ingestion rates calculated based on the 10 percent assumption will be discussed in the next revision of the HHRA.

- U.S. EPA acknowledges the fact that white suckers are "generally less desirable for consumption than sunfish and that white sucker are generally expected to make up a small portion of a typical angler's diet." Consistent with revisions made previously to the Lemon Lane Landfill HHRA, U.S. EPA will revise the benthic fish tissue ingestion rate to reflect relative presence of benthic fish in the total biomass of Richland Creek. As noted in CBS's comment, white suckers make up "less than 20 percent" of the total biomass at the 1-Mile Site. Therefore, fish tissue ingestion rates at all reaches considered in the HHRA will be modified to reflect a relative presence of 80 and 20 percent pelagic and benthic fish, respectively, in the total biomass. So, for example, at the 1-Mile Site a pelagic fish tissue ingestion rate of 6 g/day was calculated (see Attachment 2 and Table 3 of the HHRA). If 6 g/day represents 80 percent of the total ingestion rate, then a benthic fish tissue ingestion rate of 1.5 g/day represents the remaining 20 percent. This represents a reduction of more than 60 percent in the benthic fish tissue ingestion rate.

- U.S. EPA acknowledges that the North and South Springs and Conard's Branch are unlikely to be visited often based on their physical characteristics and accessibility. Therefore, exposure frequencies for surface water, sediment, and soil exposures at these locations will be reduced to 20 days/year. Similarly, U.S. EPA acknowledges that Section E (beginning at the 3-Mile Site and extending more than 1.5 miles downstream) and Section F (beginning at the downstream end of Section E, extending about 1.5 miles downstream and including the 5.5-Mile Site) are more remote and are heavily overgrown with brush and woody debris as compared to Section C which includes the 1-mile Site; access to Sections E and F is expected to be less than at Section C. Therefore, exposure frequencies for Sections E (including the 3-Mile Site) and F will be reduced to 30 days/year.

- U.S. EPA acknowledges that the approach used in the HHRA to calculate total (or aggregate) risks and hazards included some double- and triple-counting of potential soil and sediment exposures. Therefore, sediment and soil risks and hazards will be revised to eliminate double- and triple counting of sediment and soil exposures. Specifically, sediment and soil risks and hazards will be reduced to reflect the assumption of equal amounts of sediment and soil exposures at each location. Also, because the available fish tissue biomass in Richland Creek may only support a small number (as low as one) of anglers, the majority of individuals that are exposed in and along the North and South Springs, Conard's Branch, and Richland Creek, are not likely to also ingest fish from Richland Creek at the assumed ingestion rates. Therefore, the revised HHRA calculations include two types of total risks and hazards: (1) totals for all relevant exposure pathways including sediment, soil, surface water, and fish tissue ingestion and (2) totals based only on all relevant sediment, soil, and surface water exposures.

Recalculated pathway-specific and total risks and hazards are summarized in Tables 1 and 2, respectively. Also, recalculated pathway-specific exposures, risks, and hazards are

documented in Tables A1 through A5 in Attachment 2. Reach-specific total risks are greater than or equal to 1E-06 (1 in 1,000,000) but less than 1E-04 (1 in 10,000) at all locations considered in Conard's Branch and Richland Creek (Conard's Branch – South Spring [2E-05]; North Spring [2E-05]; Section Pre-A [2E-05]; Section A [2E-05] and Richland Creek – Section B [2E-05];.Section C [2E-05]; Section D [9E-06]; Section E [9E-06]; Section F [3E-06]; and Section G [5E-06]) based on inclusion of fish tissue ingestion. On the other hand, location-specific total risks are greater than or equal to 1E-06 at the following Conard's Branch and Richland Creek locations when fish tissue ingestion is excluded (Conard's Branch – South Spring [4E-06]; North Spring [2E-06]; Section Pre-A [3E-06]; and Richland Creek – Section B [2E-06]; Section C [2E-06]; Section D [2E-06]; and Section E [2E-06]). Recalculated hazards equal or exceed 1 at South Spring (hazard = 1) and Section Pre-A (hazard = 1) based on inclusion of fish tissue ingestion and are less than 1 at all locations when fish tissue ingestion is excluded.

U.S. EPA has the mandate and authority to address any risks greater than 1E-06 and hazards greater than 1 including total risks and hazards inclusive of risks and hazards associated with fish ingestion that are expected to impact only a very small number of persons.

Further, PCBs are present in whole pelagic and benthic fish at concentrations greater than the Ambient Water Quality Criteria – derived fish tissue level of 0.025 part per million (ppm) and in pelagic and benthic fish fillets at concentrations greater than the PCB action level of 0.05 ppm used to trigger Indiana's fish consumption advisories. U.S. EPA's decision to require remedial action is consistent with the National Oil and Hazardous Substances Pollutant Contingency Plan (NCP) (U.S. EPA 1990) and U.S. EPA Policy.

Comment 37: CBS states that U.S. EPA has substantially reduced its fish consumption rates for the 1-Mile Site of Richland Creek from the rates used in the previous HHRA because the fish consumption rates used previously could not be supported by the productivity of that location. CBS commends U.S. EPA for considering the productivity and sustainable harvest from the 1-Mile Site in revising its fish consumption rate. However, there are still two major issues with the revised consumption rates estimated by U.S. EPA for this site.

First, the calculations of sustainable yield still assume that anglers would eat a four inch and above fish. Studies have shown that anglers prefer to keep and eat fish six inches and above. Beyond assuming that a four inch fish is desired by anglers, assuming a blanket minimum size disregards the different shapes and edible yield of fish by species. For example, sunfish and rock bass have body shapes that are considerably stouter than white suckers. Thus while studies show that anglers prefer pan fish (including sunfish and rock bass) of at least six inches in length, it is conceivable that some edible food could be obtained from a panfish as small as 4 inches. Whereas the more slender body of a white sucker of only 4 inches in length would yield considerably less edible mass. CBS continues to recommend that six inches be considered the minimum edible fish size.

Second, the Tetra Tech analysis indicates that the productivity of this reach can only support the estimated fish consumption rates for a single fish consumer without impacting the sustainability of the fishery. While as noted above, CBS still feels that consumption rate for even this single consumer is overestimated it is not typical risk assessment practice to base risk estimates on maximum exposures to a single individual. While Appendix A acknowledges this approach, this important limitation is not presented in the main body of the risk assessment. It is important that, if U.S. EPA continues to use this approach, this limitation be presented more directly so that risk managers will be able to consider this important factor in their decision-making concerning potential remedial activities.

Consideration of the quality of the fishery and information about recreational fish consumption rates from rivers and streams indicate that the estimated fish consumption rates that are being applied in the revised HHRA are not appropriate for this area. In addition, if more than one individual were to harvest and consume fish from this reach at the assumed rates, the result would be the depletion of the resource so that no fishing could occur there.

As discussed in previous comments on the HHRA for Neal's Landfill (CBS, 2004; 2005), the available fish consumption literature indicates that, for small streams, fish consumption rates in the range of 1 to 4 g/day would likely be appropriate, while in larger rivers and streams, the range of consumption rates is likely to be 1 to 12 g/day. At the 1-Mile Site, the Tetra Tech derived productivity can only support a maximum rate of 6 g/day for pelagic fish and 4 g/day for benthic fish for a single individual. While it is questionable whether any substantial amount of fishing occurs in this area, it is likely that if it does occur, more than one individual would be involved. If a total of 10 individuals fished this area each year, then the maximum sustainable rate per person would be 0.6 g/day for pelagic fish and 0.4 g/day for benthic fish, or a total of 1 g/day for each individual. It is recommended that this maximum sustainable rate be used to evaluate the 1-Mile Site. This rate is consistent with the median fish consumption rates reported for rivers and streams in the Maine angler survey (Ebert et al., 1993). It is important to note, however, that the median rate of 1 g/day that was reported in the Maine survey was based on fishing that occurred in considerably larger and more productive rivers and streams. Thus, even this rate is likely to overestimate consumption from the 1-Mile Site.

In attempting to derive more realistic fish consumption rates for the downstream reaches, in the absence of specific productivity information for them, U.S. EPA has assumed that there is a 10 percent increase in the fish consumption rate per river mile. There is no scientific justification for making this assumption as distance downstream will not be the determining factor in rates of fish consumption. Many factors, including accessibility, habitat, availability of desirable species, and availability of alternative fisheries have a substantial impact on the likelihood that individuals will use and consume fish from a particular fishery.

Rather than making unfounded assumptions about downstream productivity, it is recommended that U.S. EPA select fish consumption rates from the published literature

for similar types of waterbodies. As discussed above, Ebert et al. (1993) provided recreational fish consumption rates for fish obtained from rivers and streams in Maine. The median rate was 1 g/day, the arithmetic mean rate was 6.4 g/day, and the 95th percentile rate was 12 g/day. Given that these rates are based on fish obtained by individual anglers who obtained fish from multiple, larger, and more desirable fisheries than are being evaluated for Richland Creek, it is unlikely that these rates would underestimate consumption from the Richland Creek reaches being evaluated. In addition, in its National Sludge Rule, U.S. EPA recommended the use of rates of 1 to 4 g/day to evaluate smaller waterbodies (U.S. EPA, 2003). Thus, it is recommended that the rate of 1 g/day be used as a maximum rate for the 1-Mile Site, a rate of 4 g/day be used for the 3-Mile site, a rate of 6.4 g/day be used for the 5.5-Mile Site, and a rate of 12 g/day be used to evaluate the 12.7-Mile Site.

Response 37: CBS states that U.S. EPA continues to maintain that anglers may catch and ingest fish as small as 4 inches in length; therefore, fish as small as 4-inches in length will continue to be considered "harvestable." U.S. EPA acknowledges uncertainties associated with this definition of "harvestable" fish. For example, the sustainable fish tissue ingestion rate in each reach may be overstated to a degree based on inclusion of the biomass associated with fish between the size of 4 and 6 inches in length. Also, U.S. EPA is aware of the different body types of different species of fish. There is greater uncertainty associated with the assumption that a similar amount of edible tissue can be obtained from some fish (for example, sunfish and rock bass) as compared to others (for example, white sucker). The HHRA will be revised to discuss these uncertainties.

The HHRA will also be revised to clarify that exposures, risks, and hazards associated with fish tissue ingestion are applicable only to a small number of individuals. Accordingly, because the available fish tissue biomass in Richland Creek may only support a small number (as low as one) of anglers, the majority of individuals that are exposed in and along the North and South Springs, Conard's Branch, and Richland Creek are not likely to also ingest fish from Richland Creek. Therefore, the revised HHRA calculations include two types of total risks and hazards: (1) totals for all relevant exposure pathways including sediment, soil, surface water, and fish tissue ingestion and (2) totals based only on all relevant sediment, soil, and surface water exposures.

Finally, the assumption that fish biomass (and, therefore, potential fish tissue ingestion) will increase by 10 percent per river mile is based on the observed increase in size (for example, in width and flow rate) of Richland Creek as the distance downstream from Neal's Landfill increases. It is a well established point that, all things being equal, a larger stream will support a larger fish population than a smaller stream. U.S. EPA believes that in the absence of fish population estimates at downstream locations, the approach used produces reasonably conservative estimates of fish productivity that recognize the likely increase in fish biomass in Richland Creek downstream of Neal's Landfill. Uncertainties associated with the downstream fish tissue ingestion rates calculated based on the 10 percent assumption will be discussed in the HHRA.

In conclusion, U.S. EPA will continue to use the reach-specific fish tissue ingestion rates as presented in the HHRA.

Comment 38: CBS states that the fish tissue EPCs used for some locations of Richland Creek are highly uncertain due to the fact that they are based on an extremely limited number of samples. For example, in the 3-Mile reach, the total PCB EPC for pelagic fish is based on only three fish samples and the total PCB EPC for benthic fish is based on only five fish tissue samples. The EPCs for TEQ are based on even more limited data with only one sample available for pelagic fish and one sample available for benthic fish collected from the 3-Mile reach. At the 5.5-Mile reach, there are no fish tissue data available for PCBs or TEQ in pelagic fish, which are the fish that are most likely to be consumed. The only data available are for eight benthic fish that were collected.

In addition, Tetra Tech has calculated TEQ concentrations for fish tissue samples that were analyzed for PCB congeners. However, these calculated TEQ concentrations do not incorporate the most current TEF approach recommended by the WHO (van den Berg et al., 2006). In its revised recommendations for TEF, WHO has modified its recommended TEF for a number of PCB congeners. Based on the revised approach, CBS has recalculated the TEQ concentrations for all of the fish tissue scenarios evaluated. The revised TEQ concentrations are shown below and compared with the original values used by Tetra Tech.

Reach	Type of Fish	EPA Reported TEQ (ng/kg)	CBS Recalculated TEQ (ng/kg)
1-Mile	Pelagic	3.5	3.5
1-Mile	Benthic	8	9.3
3-Mile	Pelagic	1.4	1.0
3-Mile	Benthic	2.3	1.4
5.5-Mile	Pelagic	NE	NE
5.5-Mile	Benthic	3.3	2.3
12.7-Mile	Pelagic	NE	NE
12.7-Mile	Benthic	NE	NE

NE = Not evaluated by Tetra Tech.

Finally, Tetra Tech has based its benthic fish tissue EPCs for the 1-Mile Site on the fish tissue data for white suckers. As was discussed in previous comments on the draft HHRA that were submitted by CBS (2004; 2005), it is extremely unlikely that white sucker will be consumed. In fact, the productivity study conducted by CBS at the 1-Mile Site found that sucker constituted less than twenty percent of the fish biomass (52.5 kg/hectare) for fish that might be harvested for consumption (e.g., rock bass, yellow bullhead, white sucker and green sunfish). Thus, it is very unlikely that sucker would be exclusively harvested and consumed from this reach (Christian, 2006).

In its HHRA conducted for the Lemon Lane Landfill Site, U.S. EPA acknowledged that white sucker are "generally less desirable for consumption" than sunfish and that "white sucker are generally expected to make up a small portion of a typical angler's diet" (Tetra

Tech, 2006b). In that report, however, U.S. EPA stated that some anglers may be more opportunistic and thus may ingest a higher proportion of sucker. While this might be true if sucker were the only fish available in Richland Creek, this is not the case. Opportunistic anglers catch and consume the fish that they can catch most easily. In the case of Richland Creek, an opportunistic angler may catch and consume both pelagic fish and benthic fish but it is highly unlikely that that individual will preferentially consume sucker, given the higher available biomass of other, more desirable species. Instead if there are individuals who do consume any sucker, they also likely consume other available species. This information needs to be discussed in the risk characterization to provide perspective on the risk estimates that are presented based on the exclusive consumption of sucker.

Response 38: U.S. EPA acknowledges limitations in the number of fish tissue samples available to calculate EPCs at specific locations. The HHRA already discusses limitations associated with small numbers of samples. This discussion will be reviewed and revised as necessary. U.S. EPA acknowledges that the TEFs used in the HHRA have been updated. At the time the HHRA was prepared, the TEFs used represented the most up-to-date values. U.S. EPA will revise the TEQ calculations in the HHRA to incorporate the most recent TEFs (Van den Berg and others 2006).

Finally, U.S. EPA acknowledges the fact that white suckers are "generally less desirable for consumption than sunfish and that white sucker are generally expected to make up a small portion of a typical angler's diet." Consistent with revisions made previously to the Lemon Lane Landfill HHRA, U.S. EPA will revise the benthic fish tissue ingestion rate to reflect relative presence of benthic fish in the total biomass of Richland Creek. As noted in CBS's comment, white suckers make up "less than 20 percent" of the total biomass at the 1-Mile Site. Therefore, fish tissue ingestion rates at all reaches considered in the HHRA will be modified to reflect a relative presence of 80 and 20 percent pelagic and benthic fish, respectively, in the total biomass. So, for example, at the 1-Mile Site a pelagic fish tissue ingestion rate of 6 g/day was calculated (see Table A-1 in Attachment 2). If 6 g/day represents 80 percent of the total ingestion rate, then a benthic fish tissue ingestion rate of 1.5 g/day represents the remaining 20 percent. This represents a reduction of more than 60 percent in the benthic fish tissue ingestion rate.

Comment 39: CBS states that ss discussed in previous comments to U.S. EPA on the HHRA for the Site (CBS, 2004; 2005), there is considerable uncertainty associated with the use of dioxin TEQ to evaluate PCB congeners, including the uncertainties associated with the application of individual toxic equivalence factors, as well as the uncertainty associated with the selection of a cancer slope factor for dioxin. These uncertainties and the scientific validity of the entire approach have been the subjects of considerable debate among members of the scientific community and were a primary focus of the review of U.S. EPA's Dioxin Reassessment, which was conducted by the National Academy of Sciences (NAS).

A recent report by the NAS, subsequent to its review of the draft Dioxin Reassessment, noted that only four of the 12 PCB congeners for which WHO has developed TEFs were

included in the Dioxin Reassessment and thus were evaluated by the NAS (NAS, 2006, p. 53). The NAS report did not consider the other eight PCB congeners "because of concerns about the accuracy of previous in vivo and in vitro toxicological (relative potency) results." The NAS also concluded that the use of TEQ to estimate toxicity in humans may be inaccurate or incorrect due to the fact that the TEFs have been developed to evaluate the relative toxic potency of a mixture to which an animal is directly exposed by dietary intake but may not be an appropriate measure for internal TEQ concentrations and potential toxic effects (NAS, 2006, p. 61).

The NAS report also cast substantial doubt on the use of the current cancer slope factor (CSF) for dioxin to establish potential cancer risks due to TEQ. The NAS committee unanimously concluded that the current weight of scientific evidence favors the use of a non-linear model for extrapolating carcinogenic effects of dioxin-like compounds at low doses (p. 135). However, in accordance with current U.S. EPA policy, the CSF of 150,000 $(mg/kg\text{-}day)^{-1}$, which was used to evaluate potential risks due to the presence of these congeners in fish from Richland Creek, is based on a linear non-threshold model. This issue makes the use of the alternative CSF of 1.5E-06 $(mg/kg\text{-}day)^{-1}$ presented in the risk results even more uncertain.

Finally, the HHRA has reported the results of an evaluation of the noncarcinogenic hazards posed by the "dioxin-like" PCB congeners, using a reference dose of 1 pg/kg-day, based on the value it states was proposed in U.S. EPA's draft Dioxin Reassessment. However, the draft Dioxin Reassessment does not recommend or propose a reference dose for dioxin or dioxin-like compounds and U.S. EPA has never published a reference dose for dioxin in either its Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). While U.S. EPA used an allowable daily intake of 1 pg/kg-day to derive its ambient water quality criterion in 1984, and other agencies such as the Agency for Toxic Substance and Disease Registry (ATSDR) have derived allowable concentrations based on non-carcinogenic effects, U.S. EPA does not discuss noncarcinogenic potential in IRIS or in HEAST. In addition, the screening Risk-Based Concentrations derived by U.S. EPA Region III and Preliminary Remediation Goals derived by U.S. EPA Region IX, which are commonly used as screening values, do not consider the noncarcinogenic potential for dioxins and provide no reference dose (even a provisional reference dose from NCEA). Consequently, CBS recommends that the evaluation of noncarcinogenic effects due to TEQs be removed from the HHRA.

Due to the uncertainties associated with the evaluation of TEQ, both for the cancer and noncancer endpoints, CBS recommends that all TEQ analyses be eliminated from the HHRA. Such an analysis is unnecessary and contributes greatly to the overall uncertainty associated with the reported results of the HHRA.

Response 39: U.S. EPA is aware that there is uncertainty associated with use of dioxin toxicity equivalents (TEQ) to evaluate PCB congeners. However, as stated in the HHRA, U.S. EPA recognizes that the use of the TEQ methodology as an official policy is still under review, and that dioxin toxicity was reviewed by the NAS. U.S. EPA acknowledges the concerns raised during the NAS review regarding use of the TEQ

approach. Nonetheless, the TEQ methodology continues to be "widely applied in peer-reviewed published literature" (U.S. EPA 2004c). While acknowledging uncertainties associated with use of the TEQ methodology, the presence of these uncertainties does not warrant dropping the TEQ methodology entirely (U.S. EPA 2004b). U.S. EPA will continue to apply the TEQ methodology, albeit with updated TEFs [Van den Berg and others 2006]). However, U.S. EPA will expand its discussion of the uncertainties associated with use of the TEQ methodology to include some of the concerns raised by the NAS review.

U.S. EPA also acknowledges that the NAS favors use of a non-linear model for extrapolating carcinogenic effects of dioxin-like compounds at low doses. However, as noted above, the current CSF of 1.5E+05 $(mg/kg\text{-}day)^{-1}$ and the proposed CSF of 1E+06 $(mg/kg\text{-}day)^{-1}$ (both based on an assumed linear mode of action) were used to characterize carcinogenic risks associated with potential exposure to PCBs. U.S. EPA will continue to use these CSF values to characterize PCB carcinogenic risks. However, uncertainties associated with using CSFs based on a linear mode of action will be discussed in light of PCB's potentially non-linear mode of action.

With regard to the dioxin RfD of 1 pg/kg-day used in the HHRA to evaluate hazards associated with potential exposure to dioxin-like PCBs, U.S. EPA continues to assert that the scientific validity of the 1 pg/kg-day value has undergone significant peer review (U.S. EPA 1984, ATSDR 1998). The fact that (1) U.S. EPA has not discussed noncarcinogenic effects of dioxin in IRIS or HEAST and (2) U.S. EPA Region 3 RBCs and Region 9 PRGs do not consider noncarcinogenic potential for dioxins is an insufficient basis for removing consideration of the potential noncarcinogenic effects of dioxin-like PCBs from the HHRA. As noted in response to previous comments on the risk assessment prepared for the Lemon Lane Landfill, it is U.S. EPA policy to use previous toxicological values and policies until toxicity factors (including RfDs) are finalized.

Comment 40: CBS states that U.S. EPA has used an exposure duration of 30 years for the fish consumption pathway. While it is conceivable that an individual could fish Richland Creek every year for 30 years, it is highly unlikely that this would occur, even if the individual were to reside in the area for that period of time. Instead, an individual who regularly fishes from year to year is likely to be an avid sport angler who will visit higher quality fisheries during regular fishing trips.

Although it is highly unlikely that an individual will fish the Site for this extended period of time, it is possible that it could occur. However, it appears that the EPCs for fish tissues, which are based on recent sampling data, are not accurate predictors of the PCB concentrations to which fish consumers would be exposed over a 30-year period. The trend analysis conducted by QEA on behalf of CBS (QEA, 2006) indicates that PCB concentrations in fish tissues have been declining at a rate of approximately four percent per year. At this rate of decline, the 30-year average fish tissue concentrations would be substantially lower than the current concentrations, which have been used as the basis for estimating potential risks due to the fish consumption pathway. Thus, the HHRA should

clearly note that fish tissue concentrations are declining and that the use of current fish tissue concentrations in combination with an assumed exposure duration of 30 years is a highly conservative approach and likely overstates the potential for cancer risk.

Response 40: U.S. EPA's use of a 30-year exposure duration is consistent with long-established residential exposure duration under RME conditions. An individual angler may fish a particular stream or a particular stretch of a stream for a variety of different reasons; in fact, these reasons may change during different periods of that angler's life. For example, an angler may fish in a particular stream (for example, Richland Creek) based on its convenient location. Later in life, that same angler may continue to fish in Richland Creek for nostalgic reasons; they have fished there in the past and may consider fishing in Richland Creek to be relaxing and comforting. U.S. EPA has never asserted that anglers fish exclusively in Richland Creek. As suggested in CBS's comment, an avid sport angler may fish in higher quality fisheries in addition to Richland Creek. However, U.S. EPA maintains that the assumption that an angler may fish in Richland Creek to the extent necessary to meet the assumed fish tissue ingestion rates over a 30-year exposure duration is consistent with RME conditions.

U.S. EPA acknowledges that use of fish tissue EPCs based on recent fish tissue data is a conservative estimate of the fish tissue EPC to which anglers may be exposed over a 30-year period. There is evidence that PCB concentrations in fish tissues have been and are expected to continue to decrease. Nonetheless, the use of current fish tissue results to estimate fish tissue EPCs is consistent with standard industry practices and U.S. EPA guidance. U.S. EPA will discuss the on-going gradual decline in fish tissue concentrations and the fact that calculating exposures, risks, and hazards using fish tissue EPCs based on current fish tissue analytical data likely results in exposures, risks, and hazards being overestimated.

Comment 41: CBS states that the HHRA has concluded that direct contact with surface water provides the greatest potential for exposure due to the direct contact pathways. However, these estimates of exposure are exaggerated due to the assumptions that have been used to derive them. The overestimated exposure assumptions include the use of the maximum detected concentration at each location, inflated assumptions about exposure frequency, exposure time, and frequency of water ingestion, and an unlikely dermal surface area.

Response 41: U.S. EPA will respond individually to comments regarding (1) the EPC for surface water, (2) exposure frequency, and (3) dermal surface area.

Comment 42: CBS states that the surface water data upon which the EPCs have been based exclude a number of surface water samples that have been collected at RCVP and RC43. While Table B-12 in Appendix B reports a total of 3 samples at RC43 and 4 samples at RCVP, there are over 60 surface water sample results available for each of these stations. CBS acknowledges that the majority of those surface water sample results were taken during storm conditions and thus are not likely to be representative of the levels of PCBs to which individuals may be exposed since it is not likely that people will

visit these sites during significant rain events. However, there have been a few non-storm event samples taken at these locations since the 1999 source control remedy. These include the following:

Station ID	Sample ID	Date	Result	Units	Entity	Occasion
RCVP	NL 1893	11/14/02	0.014	ppb	CBS	Fish sampling
RCVP	RC 0019	5/27/03	0.013	ppb	CBS	Fish sampling
RCVP	NL 4410	3/26/04	<0.1	ppb	CBS	Pre-storm sampling
RCVP	NL 4491	4/16/04	<0.02	ppb	CBS	Low flow testing
RCVP	NL 4492	4/16/04	<0.02	ppb	CBS	Low flow testing
RC43	NLH 0756	8/1/01	<0.1	ppb	EPA	Fish sampling
RC43	NL 4437	3/26/04	<0.1	ppb	CBS	Pre-storm sampling

CBS requests that U.S. EPA consider all of the available, relevant surface water data in developing its EPCs for the surface water contact pathways.

Tetra Tech (2006) has based its surface water EPCs for the 1-Mile and 3-Mile Sites on the maximum surface water concentration at each location, despite the fact that there were a number of non-detect concentrations at each location and the long-term average concentrations were considerably lower. The maximum concentration was used because there were too few samples to calculate an upper confidence limit on the arithmetic mean (UCL). However, it is important to note that the use of a maximum concentration is not representative of the long-term surface water concentration to which recreationalists might be exposed. Instead, when one is considering long-term exposures, the average concentrations measured over time are most relevant, as has been acknowledged by U.S. EPA.

Using the analytical results for all of the relevant surface water samples collected at the 1-Mile and 3-Mile Sites, and assuming that concentrations listed as non-detect are present at half of their reported detection limits, the resulting arithmetic mean EPCs would be 0.046 µg/L for the 1-Mile Site and 0.09 µg/L for the 3-Mile Site. It is recommended that these values be used as the EPCs for the surface water pathways in these areas.

Response 42: As stated in Section 2.1.2, surface water analytical data collected in 2004 and 2005 were used as the basis for the surface water EPCs at the RCVP and RC43 locations. Therefore, a total of three of the results listed above in the CBS comment were not included because they were collected prior to 2004. The other results listed for the RCVP and RC43 locations were in fact considered in calculating the surface water EPCs for these locations. The confusion may have been that the significant majority of surface water samples collected at these two locations were collected as part of hourly or nearly hourly samples collected over one-day periods. For example, the RCVP sample with the ID NL 4410 was collected on March 26, 2004, at 1600 hours. Other samples were collected the same day at almost hourly intervals at this same location. For example, sample NL 4438 was collected at 1400 hours and sample NL 4439 was collected at 1500

hours. In order to not overly weight results collected on such a frequent basis (in order to better estimate long-term average concentrations), all samples collected on a single day were averaged. As noted in CBS's comment, because of the small sample number, the EPC was set equal to the highest detected concentration (0.104 ug/L). However, it is important to note that if the available results are first averaged for each day on which samples were collected and then these daily averages are, in turn, averaged, the overall average surface water concentration is 0.102 ug/L and not 0.046 ug/L as suggested by CBS. Similarly, the overall average calculated for the RC43 location is 0.12 ug/L and not 0.09 ug/L as suggested by CBS.

As presented in the EDMS (CBS 2006a), the significant majority of surface water analytical results for the RCVP and RC43 locations are reported as nondetect at a detection limit of 0.2 ug/L; one-half of this value is 0.1. Therefore, it is reasonable for a long-term average surface water concentration to be slightly above 0.1 ug/L.

All available surface water analytical results from 2004 and 2005 were considered in calculating surface water EPCs for the RCVP and RC43 locations. The surface water EPCs used in the HHRA 0.104 ug/L (RCVP) and 0.15 ug/L (RC43) are similar to the overall averages calculated for these locations: 0.102 ug/L (RCVP) and 0.12 ug/L (RC43). These small differences will make little difference in the calculated exposures, risks, and hazards. Therefore, surface water EPCs for the RCVP and RC43 locations will not be revised; the EPCs will remain as presented in the HHRA.

Comment 43: CBS states that the HHRA uses extremely high exposure frequencies of 34 days/year (adults) and 51 days/year (children and youths) to evaluate the surface water exposure pathways for the North and South Springs and all portions of Conard's Branch. For all reaches of Richland Creek, the exposure frequency is assumed to be 68 days/year. This frequency is based on the assumption that adult and youth recreationalists will spend 4 days per week for 13 weeks, from June through August, and 4 days per month at each Site during April, May, September, and October.

While it is plausible that individuals could occasionally visit the North and South Springs or Conard's Branch, it is not likely that they will visit them, even at the reduced frequency that has been assumed by U.S. EPA. There is no indication that this intensity of recreational activity is currently occurring in these areas or would be likely to occur in the future, given the characteristics of the waterbodies. U.S. EPA has acknowledged that individuals are not likely to visit these areas, due to their physical characteristics and accessibility. In fact, given these characteristics, it is very unlikely that individuals will spend any recreational time in these areas. The springs are shallow and are located at some distance from public roads, making regular access unlikely. In addition, Tetra Tech (2003b) reports that Conard's Branch has very limited access, the 3 to 5 foot banks are steeply incised and, with the exception of one large pool, the remainder of the reach ranges in width from 1 to 3 feet and is less than 6 to 12 inches deep. As a result, it is very unlikely that these areas are used for recreational purposes with any regularity.

Similarly, the 1-Mile Site is less than 2 feet deep and the reach ranges from 10 to 30 feet in width. This area does, however, have some side, channel and point gravel bars, and can be accessed more easily from the road, making it a somewhat more desirable recreational location. While there are very few houses nearby, it is possible that residents could occasionally access this area for some type of activity. Thus, while U.S. EPA's exposure frequency of 68 days/year is very conservative, given that surface water contact is only likely to occur during the summer months, it is still plausible.

As shown in the *Data Validation Review of Neal's Landfill Fish Samples November 2003 Validation* (Tetra Tech, 2004), the banks of the 3-Mile Site are steep in most locations and heavily overgrown with brush and woody debris, making access difficult. As a result, it is unlikely that individuals regularly visit this area and have water contact there, as has been assumed in the HHRA. Similarly, the 5-Mile Site of Richland Creek consists of an upper reach that has deep pools containing woody debris with heavily overgrown banks, making this type of exposure less likely in this area. Thus, while it is not impossible for individuals to have contact with surface water in these areas, it is highly unlikely that young children will participate in these activities in such areas, and very likely that these activities will occur with much less frequency than 68 days/year.

CBS recommends that reduced exposure frequencies be evaluated for the surface water pathways in most areas. For the North and South Springs and the reaches of Conard's Branch, it is recommended that no more than 12 days of exposure be evaluated. This equates to a visit to each area occurring one day each week during the warmest months of the year.

The higher exposure frequency of 68 days/year for surface water contact at the 1-Mile Site is conservative but plausible, given its proximity to a few residences and its greater accessibility. However, at the 3-Mile and 5.5-Mile Sites, it is not likely that surface water contact will occur more than 1 or 2 days/week during the summer months. Thus, for these reaches, an exposure frequency of 24 days/year is recommended.

Response 43: As noted by CBS, an exposure frequency of 68 days/year is plausible for the 1-Mile Site; therefore, no changes will be made to the exposure frequency for this location.

U.S. EPA acknowledges that the North and South Springs and Conard's Branch are unlikely to be visited often based on their physical characteristics and accessibility. CBS recommends an exposure frequency of 12 days/year (based on 1 day/week during the summer). However, exposure may not be limited to only the summer months. Therefore, an exposure frequency for all receptors of about 1 day/week during the summer and two days per month in the fall and spring (April, May, September, and October) or 20 days/year is more reasonable for these locations. The HHRA will be revised accordingly.

U.S. EPA acknowledges that Section E (beginning at the 3-Mile Site and extending more than 1.5 miles downstream) and Section F (beginning at the downstream end of Section

E, extending about 1.5 miles downstream, and including the 5.5-Mile Site) are more remote and are heavily overgrown with brush and woody debris. Therefore, access to these locations is expected to be less than at Section C which includes the 1-Mile Site. CBS recommends an exposure frequency of 24 days/year (based on 2 days/week during the summer months). However, exposure may not be limited to only the summer months. For the Lemon Lane Landfill, CBS recommended an exposure frequency "in the range of 1 day per week during the warmer months of the year, or 30 days/year, for less accessible reaches. In order to both reflect the lower expected frequency of exposure at Sections E and F and to maintain some consistency between risk assessments prepared for nearby sites, an exposure frequency of 30 days/year will be applied to Sections E (including the 3-Mile Site) and F. The HHRA will be revised accordingly.

Finally, U.S. EPA notes CBS's concern that young children are very unlikely to access Richland Creek at Section F which includes the 5.5-Mile Site. However, in order to be health protective, U.S. EPA will continue to assume young children may be exposed in Richland Creek at Section F, although the HHRA will be revised to discuss the factors that may significantly reduce or eliminate potential exposure to surface water by young children at Section F.

Comment 44: CBS states that U.S. EPA has assumed that wading occurs at the North and South Springs, all sections of Conard's Branch, and all of Richland Creek. In addition, U.S. EPA has assumed that young children swim during 50 percent of their summer exposure events in Section F. In deriving dermal surface areas, U.S. EPA has used variable depth information to determine what portions of the feet and legs might be exposed. While this approach reflects the specific physical characteristics of the water bodies being evaluated, it does not reflect the type of wading activity that is likely to occur on a regular basis. In fact, the depth of water available does not reflect the depth to which people are likely to wade. In most cases, when individuals are wading, they will not wade to a depth greater than knee height due to the fact that deeper wading may result in loss of balance. Thus, while CBS agrees with using the assumed surface areas for the North Spring, South Spring, and Sections Pre-A, A, and B, it believes that the feet and lower legs should be the maximally exposed dermal surface area during wading in the remainder of the reaches. Thus, for young children, older children and adults who wade, the skin surface areas in these areas would be 1,101, 2,559, and 3,595 cm^2, respectively.

It should also be noted, however, that adults and high-school aged adolescents are not likely to wade in these areas on a regular basis. While it may be reasonable to assume that young children and pre-adolescents between the ages of 7 and 13 years might be engaged in recreational activities that would involve regular wading, once children reach high-school age, regular activity of this type of activity is likely to lose its appeal. As a result, the assumption that these behaviors occur every year for 12 years is likely to substantially overestimate exposure to those individuals. This additional level of conservatism should be discussed in the risk characterization of the HHRA.

Response 44: CBS expressed no disagreement with receptor-specific surface areas used for the North and South Springs, and Sections Pre-A, A, and B; therefore, the values used in the HHRA will remain unchanged.

U.S. EPA agrees that individuals are not likely to regularly wade in water over their knees. Therefore, the skin surface areas for young children, youths, and adults are 1,101, 2,559, and 3,595 cm^2, respectively, for receptors wading in Sections C, D, and E based on exposure to feet and lower legs. It was assumed that young children will swim on 50 percent of the summer days in Section F. Therefore, the total surface area assumed for young children in Section F was calculated as shown:

$$(6{,}560\ cm^2 \times 6.5/30) + (1{,}101\ cm^2 \times 23.5/30) = 2{,}284\ cm^2$$

The skin surface areas for youths and adults wading in Section F are the same as those listed above for Sections C, D, and E.

Comment 45: CBS states U.S. EPA has used an exposure time of 2 hours/day to evaluate dermal exposure to surface water. This is a highly inflated estimate of the amount of time that individuals are likely to wade at the Site, particularly when considered in light of the high exposure frequencies used in the assessment. It is unlikely that an individual would spend this much time in the water during each exposure event. This is particularly true for older youths and adults who are not likely to spend substantial amounts of time in the water, even when visiting the creek.

Given the size of the water bodies and their limited appeals as recreational locations, it seems more realistic to assume that an individual spends no more than one hour in contact with the surface water during every exposure event. In its response to CBS's comments on the risk assessments for Bennett's Dump and Lemon Lane Landfill sites, U.S. EPA has acknowledged that its assumption of 2 hours is conservative and they indicated that they planned to revise the exposure time assumption in those risk assessments from 2 hours per day to 1 hour per day. CBS recommends that this same revision be made for the Neal's Landfill HHRA. Even this assumption would be likely to overestimate potential for contact for this exposure pathway.

Response 45: U.S. EPA acknowledges that the assumption that individuals are exposed for 2 hours/day on each day of exposure is conservative. Therefore, U.S. EPA is revising its exposure time assumption from 2 to 1 hour/day. Exposures, risks, and hazards associated with dermal exposure to surface water will be revised accordingly.

Comment 46: CBS states U.S. EPA has selected a water ingestion rate of 0.0382 L/day for adults and 0.0765 L/day for youths, based on swimming. They have derived these water ingestion rates by using the incidental ingestion of 0.05 L/hour (U.S. EPA, 1997) for an exposure time of 2 hours to derive a total of 0.1 L/day. For youths, they have assumed that individuals will only ingest water during the summer months (13 weeks or 52 visits if there is a visit four days/week) and thus have adjusted the ingestion rate by a factor of 52/68 so that they can combine this ingestion rate with a frequency of 68

days/year to derive their water ingestion rate. U.S. EPA has then assumed that adults will ingest water for approximately half of the time that youth receptors will. This approach is unnecessarily convoluted and does not reflect potential for exposure due to this pathway.

Surface water ingestion is only likely to occur if an individual is swimming or becomes submerged in the water and accidentally ingests some water. The depth of water in the North and South Springs and in Conard's Branch is too low to permit swimming or to result in submersion. As a result, the surface water ingestion pathways should be eliminated altogether from the HHRA for these reaches.

U.S. EPA has clearly acknowledged that swimming is not likely to occur in most portions of Richland Creek. If this is the case, then the only opportunity for an individual to ingest water would be if they were to fall, become submerged, and accidentally ingest surface water. It would not be anticipated that this accidental exposure would happen every time an individual visits the creek. Instead, it is possible that this type of accidental exposure might occur one or two times per year. Thus, CBS recommends that an surface water ingestion exposure frequency of 2 events/year be combined with a water ingestion rate of 50 mL/event to estimate exposures due to this pathway. This will represent more realistic estimates of exposures due to the accidental ingestion of surface water.

Response 46: U.S. EPA agrees that the approach used to calculate the rate of potential surface water ingestion rate was overly complex. Further because the methodology assumed exposure during swimming (an activity that was not assumed to occur in the North and South Springs and in Conard's Branch, and in much of Richland Creek, this approach did not adequately reflect site-specific conditions.

However, U.S. EPA disagrees with CBS's assertion that "surface water ingestion is only likely to occur if an individual is swimming or becomes submerged in the water and accidentally ingests some water." Individuals recreating in or along the North and South Springs, Conard's Branch, and Richland Creek may ingest surface water by scooping water from the creek to their mouth. One fluid ounce of water is equivalent to 29.6 milliliters (mL). U.S. EPA considers one fluid ounce to be a reasonable amount of water to assume an individual ingests to temporarily alleviate a thirst they may have especially on warmer days. U.S. EPA also assumes that children and youths may ingest water in this fashion on 50 percent of the days they are assumed to recreate in or along the North and South Springs, Conard's Branch, and Richland Creek. Adults are assumed to ingest water from the creek half as often as children and youths (about 25 percent of the days they are assumed to recreate in or along the North and South Springs, Conard's Branch, and Richland Creek). Therefore, receptor-specific revised surface water ingestion rates are calculated below.

<u>Children and Youths</u>

$$(0.030 \text{ L/day} \times 0.5) = 0.015 \text{ L/day}$$

Adults

(0.030 L/day x 0.25) = 0.0075 L/day

Receptor-specific surface water ingestion exposures will be adjusted accordingly.

Comment 47: CBS states U.S. EPA has also overestimated exposures and risks due to contact with bank and floodplain soils due to the use of high exposure frequencies, high dermal surface areas, and an unreasonably high estimate of soil ingestion by 7-18 year old youths.

As with the surface waters of the North Spring, South Spring, and Conard's Branch, it is very unlikely that individuals will regularly visit these areas and have contact with bank or floodplain soil. U.S. EPA has reduced its exposure frequency for Conard's Branch to reflect its limited accessibility and lower desirability as a recreational area. However, even the exposure frequencies of 38 days/year for adults and 57 days/year for youths and children substantially overestimate the likely frequency with which these areas will be visited or contacted. In addition, it does not appear that U.S. EPA has made any adjustments for lower frequencies that would be expected at the North and South Springs.

CBS asserts that there is little potential for actual contact with bank and floodplain soils at either of the springs or at any point along Conard's Branch. Thus, it recommends that a reduced exposure frequency of 12 days/year, representing one visit per month during the summer months, be used for these areas. For the 1-Mile Site, the assumed frequency of 76 days/year may be plausible given its proximity to a few residences. However, in the downstream reaches, there is no reason to assume that contact with soils will occur with more frequency than will contact with surface water. Thus a revised exposure frequency of 24 day/year is also recommended for these exposure pathways in those areas.

In addition, the HHRA has used an upper bound soil ingestion rate of 200 mg/day for youths, despite the acknowledgement in its guidance (U.S. EPA, 1997) that the more intensive soil ingestion, which is sometimes demonstrated in young children, ceases to occur by the age of six. Generally, risk assessments assume that an upper bound estimate of 100 mg/day is appropriate for older children and adults alike (U.S. EPA, 1997; 2002). Thus, CBS recommends that this exposure assumption be reduced accordingly.

Finally, the evaluation of exposure due to surface soil, bank soil, and floodplain soil contact assumes that 100 percent of the soil ingested and contacted on a daily basis will be contaminated soil. In fact, soils from the contaminated areas are likely to represent a very small fraction of the total incidental soil ingested daily, which will include a majority of soils from non-contaminated areas (i.e., away from the banks and outside of flood plain areas). As a result, it is not reasonable to assume that 100 percent of the soils contacted on each day of exposure will be contaminated soil. Given the relatively small sizes of the floodplain areas and bank soil areas, it is reasonable to assume that no more than half of the soil contacted daily will be derived from contaminated areas. Thus CBS

recommends that an additional factor of 50 percent be used in calculating potential exposures due to soil contact.

Response 47: U.S. EPA acknowledges that the North and South Springs and Conard's Branch are unlikely to be visited often based on their physical characteristics and accessibility. CBS recommends an exposure frequency of 12 days/year (based on 1 day/week during the summer). However, exposure may not be limited to only the summer months. Therefore, an exposure frequency for all receptors of about 1 day/week during the summer and two days per month in the fall and spring (April, May, September, and October) or 20 days/year is more reasonable for these locations. The HHRA will be revised accordingly.

For Sections B and C, the exposure frequency of 76 days/year was acknowledged by CBS as plausible. Therefore, this exposure frequency will remain unchanged for these reaches. Access to Section D is assumed to be similar to that assumed for Section C. Specifically, several homes are located along Section D and the 3-Mile Site (the downstream end of Section D) also provides ready access to Richland Creek. Therefore, the exposure frequency of 76 days/year will be retained for Section D.

For more downstream locations (Section E; no soil data is available for Sections F and G), U.S. EPA agrees that potential exposure to soil will occur at a similar frequency as assumed for surface water given the limited accessibility of these reaches. Therefore, potential exposure to soil at Section E (including the 3-Mile Site) is assumed to occur at a frequency of 30 days/year.

U.S. EPA acknowledges that as a group, the soil ingestion rate for youths (7 to 18 years) may be better represented by the rates used for adults, rather than the rates for younger children. Therefore, the risk assessment will be revised to use a soil ingestion rate of 100 mg/kg for youths (7 to 18 years).

Finally, U.S. EPA acknowledges that it is unlikely that all of the soil contacted by receptors will be from site-contaminated areas. Therefore, all receptor-specific soil exposures will be adjusted to incorporate a "fraction contaminated" factor of 50 percent.

Comment 48: CBS states that while the sediment contact pathways are not important pathways in terms of their contribution to total risks, the risk estimates for this pathway are overstated. This is because the analysis uses (1) the maximum sediment concentration from all reaches as the EPC despite the fact that many of the sediment samples were non-detect, (2) a very high exposure frequency of 68 days/year (as discussed in the preceding comments for the surface water pathways), (3) an inflated sediment ingestion rate that is not supported by the U.S. EPA guidance upon which it is purportedly based, and (4) an unreasonably high dermal adherence factor for youths, for whom one would not expect dermal adherence of sediment to be any greater than it would be for adults, given the same exposed body surface areas. However, the low risks that have been predicted in the HHRA for sediment contact pathways (cancer risks ranging from 3.9E-09 to 1.1E-07, and hazard indices ranging from 2.3E-04 to 6.7E-03),

despite the use of these very conservative assumptions, indicate that sediments at the Site do not pose a risk to the receptors evaluated. While any refinement of the exposure parameters to make them more site-specific and relevant will further reduce risks, it is not necessary or fruitful, from a risk point of view, to provide additional comments on these pathways.

Response 48: Sediment EPCs were calculated consistent with U.S. EPA guidance as discussed in Appendix B to the HHRA. Specifically, the frequency of censored (nondetect) results was appropriately considered in calculating the EPCs. Further, contrary to CBS's comment, the maximum concentration was not selected as the EPC in all cases; the sediment EPCs for Sections A and F are less than the maximum detected concentration. Therefore, the EPCs were calculated in an acceptable and correct manner, consistent with U.S. EPA guidance and will not be revised.

The exposure frequency for sediment will be revised to match the revised surface water and soil exposure frequencies as discussed above.

As discussed above for soil ingestion, the sediment ingestion rate for youths will be reduced from 200 to 100 mg/day.

Finally, U.S. EPA agrees that there is no reason to believe that the amount of sediment adhering to the skin of youths (7 to 18 years) and children (1 to 6 years) will be greater than the amount of sediment that will adhere to the skin of adults. Therefore, the risk assessment will be revised to use an adherence factor of 0.3 mg/cm^2 for adults, youths (7 to 18 years), and children (1 to 6 years).

Comment 49: CBS states that in addition to the pathway-specific risk estimates that are presented in the HHRA, U.S. EPA has gone on to calculate total risks by aggregating exposures and risks across multiple pathways. Tables 9 and 10 of the HHRA provide summaries of aggregated total risks and hazard indices, respectively. To calculate these, U.S. EPA has summed exposures due to fish consumption with exposures due to direct contact with surface water, sediment, bank soil and floodplain soil to derive total risk estimates for most of the reaches evaluated. There are a number of problems with this approach that result in unrepresentative risk estimates and provide inaccurate information that can be extremely misleading for decision-making by risk managers.

First, these aggregate risk estimates assume that all individuals who have some contact with water, soil, or sediment are also fish consumers. In all cases, the risks associated with the fish consumption pathways have been combined with the risks associated with other direct contact pathways. It is not unreasonable to assume that individuals who fish from Richland Creek may have some contact with surface water or with soil/sediment in the area at which they fish. However, it is likely that the vast majority of individuals who may have contact with sediment or soil do not also consume fish from the Creek.

Appendix A of the HHRA makes it clear that the fish ingestion rates derived for the 1-Mile Site are based on the assumption that a single individual is consuming all of the

available fish. Thus, the total risk estimates that are provided in Tables 9 and 10 may only be relevant for a single individual at each reach and are not likely to be representative of the recreational population as a whole. Risk managers may be misled by these aggregate risk estimates into assuming that these total risks to individuals who use the Creek for recreational activities apply to a substantially larger population than is actually the case.

In addition, U.S. EPA has combined fish ingestion with the other pathways evaluated at the North Spring, South Spring, and Conard's Branch, despite its own acknowledgement that they do not expect fish to be consumed from these sections of the Site. The inclusion of fish consumption risks in the total risk estimates for these areas is particularly misleading because it implies that risks to individuals who visit these areas are much greater than they actually are, since the vast majority of the estimated risks are based on the consumption of fish that are not even present or likely to be consumed from these areas. These total risk estimates could consequently lead risk managers to make remedial decisions for these upstream areas based on activities that do not occur there. If those risk estimates are used as the basis for remedial activities at Conard's Branch or the Springs, those activities will result in no change in residual risks because the risk estimates are driven by the fish consumption pathway, which is incomplete in these areas. Instead, any remedial decisions that are made for North and South Springs or Conard's Branch should be based only on activities that could potentially occur in those areas, which do not include the consumption of fish. Thus, the fish consumption pathway should be eliminated from the total risk and hazard estimates that are provided for Conard's Branch and the North and South Springs.

In addition, U.S. EPA presents total risks for pelagic fish and for benthic fish but does not provide risk estimates for combined fish. If, as U.S. EPA asserts, individuals may be opportunistic fish consumers, then it is likely that their total fish consumption rate will not increase but rather that the mix of fish will change depending upon availability and success. Thus, in order to provide a more realistic estimate of risks due to consumption of all types of fish, it is recommended that U.S. EPA present total risks that represent a mixture of those types of fish rather than a sum. It would be reasonable and conservative, if it is assumed that pelagic fish are more desirable but benthic fish are more available, to assume that 50 percent of the fish consumed are pelagic fish and 50 percent benthic fish when attempting to provide estimates of total risk across all available species. Such an assumption is plausible but conservative for the 3-Mile and 5.5-Mile Sites. However, as discussed previously, the productivity study conducted at the 1-Mile Site indicated that suckers represented less than 20 percent of the available biomass of consumable fish species there. Thus, at this reach, the EPC for combined fish should be weighted (e.g., 20 percent sucker, 80 percent pelagic fish) to reflect this reach-specific availability.

Finally, U.S. EPA's approach for aggregating total risks and hazards double-counts (for the 3-Mile Site) and triple-counts actual direct contact exposures for the other reaches that were evaluated (except the 5.5-Mile and 12.7-Mile Sites where only exposure to sediment was evaluated). In evaluating the potential risks associated with sediments, bank soils, and floodplain soils along different reaches of the Site, U.S. EPA has

considered each exposure pathway as a discrete exposure. Thus, for each evaluation, total daily soil ingestion rates and dermal contact rates have been combined with media-specific EPCs to estimate potential risks. While this is already a highly conservative approach when considering a single medium, it is completely inappropriate to sum the estimated risks and hazards associated with multiple media because to do so, yields risk results that are completely unrepresentative of potential exposures in those areas.

For example, the HHRA has used an upper bound soil ingestion rate for adults of 100 mg/day, which is assumed to be a total daily soil/sediment ingestion rate. However, for South Spring, North Spring, Section Pre-A, Section A, Section B and Section C, U.S. EPA has evaluated potential exposure due to the ingestion of sediment, bank soil, and floodplain soil separately, each using 100 mg/day as an ingestion rate, and then has summed these pathways to get an aggregate risk estimate. Thus, these aggregate risk estimates assume that individuals ingest 100 mg of sediment, 100 mg of bank soil, and 100 mg of floodplain soil on each day of exposure, for a total of 300 mg/day. This is not characteristic of recreational exposures and is not consistent with U.S. EPA's recommended soil ingestion rate. Instead, if individuals have contact with sediment, floodplain soil, and bank soil on a given day of recreational activity, then using U.S. EPA's conservative rate of soil ingestion, these individuals will still only ingest a total of 100 mg/day but that total will be comprised of a combination of sediment, floodplain soil, and bank soil. In order to aggregate exposures for these pathways combined, the HHRA should either apportion the total soil ingestion rate among the different exposure pathways or should conduct a separate calculation that uses an EPC that is based on a combination of sampling data for all three media, weighted as is deemed appropriate. The same is true for the dermal pathway.

The same approach was used for the 3-Mile Site although only two duplicative media were evaluated (sediment and bank soil). However, the same approach as was described above should have been used to aggregate risks so that the ingestion and dermal exposure risks are not double-counted, as they currently are.

The same problem is associated with the aggregation of the dermal pathways. For bank soil and floodplain soil, it is separately assumed that the head, hands, forearms and lower legs are in contact with these two media and the media are summed. However, during time spent engaged in recreational activities in these areas, the total surface area will be constant but the soil/sediment contacting it will either be floodplain soil, bank soil, sediment or some combination of the three media. Similarly, the adherence factors overestimate the loading of soil or sediment to the skin when it is assumed that an individual is in contact with more than one of these media on the same day and the risks due to both are summed. If U.S. EPA intends to continue to combine potential risks due to these pathways, then it is important that the EPCs be modified to reflect a combination of media or that the adherence factors be adjusted to reflect the relative contribution of each medium to total exposure.

Response 49: U.S. EPA acknowledges that the approach used in the HHRA to calculate total (or aggregate) risks and hazards included some double- and triple-counting of

potential soil and sediment exposures. Therefore, sediment and soil risks and hazards will be revised to eliminate double- and triple counting of sediment and soil exposures. Specifically, sediment and soil risks and hazards will be reduced to reflect the assumption of equal amounts of sediment and soil exposures at each location. Specifically, receptor-specific total exposures (for example, 100 mg/day exposure to soil and sediment) will be equally divided across the media to which each receptor is assumed to be exposed.

Also, because the available fish tissue biomass in Richland Creek may only support a small number (as low as one) of anglers, the majority of individuals that are exposed in and along the North and South Springs, Conard's Branch, and Richland Creek, are not likely to also ingest fish from Richland Creek at the assumed ingestion rates. Therefore, the revised HHRA calculations include two types of total risks and hazards: (1) totals for all relevant exposure pathways including sediment, soil, surface water, and fish tissue ingestion and (2) totals based only on all relevant sediment, soil, and surface water exposures.

The revised approach of presenting total risks and hazards including and not including fish ingestion will help risk managers differentiate medium-specific contributions to total risks and hazards. U.S. EPA continues to believe that it is reasonable to assume that receptors exposed to sediment and surface water at the North and South Springs and in Conard's Branch may also be exposed through ingestion of fish from nearby portions of Richland Creek. By presenting total risks and hazards with and without fish ingestion, risk managers will be able to clearly see the contributions from potential exposures to sediment and surface water at the North and South Springs and in Conard's Branch as compared to the contribution of fish ingestion from Richland Creek.

U.S. EPA acknowledges the fact that white suckers are "generally less desirable for consumption than sunfish and that white sucker are generally expected to make up a small portion of a typical angler's diet." Consistent with revisions made previously to the Lemon Lane Landfill HHRA, U.S. EPA will revise the benthic fish tissue ingestion rate to reflect the relative presence of benthic fish in the total biomass of Richland Creek. As noted in CBS's comments, white suckers make up "less than 20 percent" of the total biomass at the 1-Mile Site. Therefore, fish tissue ingestion rates at all reaches considered in the HHRA will be modified to reflect a relative presence of 80 and 20 percent pelagic and benthic fish in the total biomass. So, for example, at the 1-Mile Site a pelagic fish tissue ingestion rate of 6 g/day was calculated (see Table A-1 in Attachment 2). If 6 g/day represents 80 percent of the total ingestion rate, then a benthic fish tissue ingestion rate of 1.5 g/day represents the remaining 20 percent. This represents a reduction of more than 60 percent in the benthic fish tissue ingestion rate.

Comment 50: CBS states that in an effort to demonstrate the degree of overestimation of the risk estimates provided in the HHRA, CBS has recalculated potential risks to these receptors using the recommended assumptions outlined and discussed above. These revised risk estimates, and the basis for each, are provided in the following sections.

Response 50: Because U.S. EPA does not agree with some of CBS's proposed parameter value revisions, review and comment on CBS's revised risk estimates is not warranted. Note: responses to CBS's comments regarding exposure parameters used by Tetra Tech in the risk assessment are addressed individually above. However, U.S. EPA has recalculated potential risks to adult, youth, and child receptors using the revised assumptions and parameter values discussed above in U.S. EPA's responses.

Comment 51: CBS states that U.S. EPA's revised pathway-specific and total risk and hazard estimates are summarized in Tables 1 and 2, respectively, and are documented in Tables A1 through A5 in Attachment A. Specifically, Table A1 presents revised general and chemical-specific exposure parameter values, Table A2 presents medium-specific EPCs, Table A3 presents revised fish tissue risks and hazards, Table A4 presents revised surface water exposures, risks, and hazards, and Table A5 presents revised sediment and soil exposures, risks, and hazards.

Fish Consumption

To recalculate risks due to fish consumption, CBS has used fish consumption rates that are more reflective of the published literature on consumption of fish from rivers and streams. Thus, rates of 1 g/day, 4 g/day, 6.4 g/day and 12 g/day have been used to evaluate the 1-Mile, 3-Mile, 5.5-Mile and 12.7-Mile Sites.

These estimates are still very conservative, given the fact that a 30-year exposure duration has been used for all reaches. In fact, the limited number, sizes and types of fish present in these reaches is likely to severely limit their desirability as sport fisheries, making it unlikely that any long-term repeated fishing activity by the same individuals will occur. Instead, while it is conceivable that an angler might try to fish these reaches, the characteristics of the waterbodies and the lack of availability of large numbers of desirable species make it highly unlikely that an individual would return again and again over a period of 30 years when there are other, higher quality freshwater fisheries nearby. In addition, the fish trend analysis (QEA, 2006) indicates that fish tissue concentrations are decreasing at a rate of four percent per year. Thus the EPCs for fish tissue, which are based only on recent sampling results and do not reflect changes over time, and thus likely overestimate exposures over this duration. To show this impact of the downward trend on risk estimates, the risk and hazards were recalculated assuming the 4% downward trend continues for the 30 year exposure period.

The fish consumption pathway has not, however, been included in the aggregated total risk estimates for South Spring, North Spring or the remainder of Conard's Branch. In addition, a total risk estimate for combined fish has been included in the risk summary. For all the reaches, it is very conservatively assumed that half of the fish consumed are pelagic fish and half are benthic fish.

Surface Water Exposure

CBS has recalculated potential risks due to direct contact and ingestion of surface water, using long-term water concentrations based on average concentrations (when available) and maximum concentrations when not available. To do this, those samples that have non-detectable concentrations have been assumed to be present at ½ their detection limits, except for Sections F and G, where all analytical results were non-detect.

Since contact with surface water is only likely to occur during wading or swimming activities that take place during the summer months, the exposure frequencies have been adjusted. A frequency of 12 days/year has been used to evaluate North Spring, South Spring and Conard's Branch. A frequency of 24 days/year has been used to evaluate the 3-Mile, 5.5-Mile and 12.5-Mile sites.

Potential exposure through the ingestion of surface water has been eliminated as an exposure pathway from all reaches in which swimming does not occur and for which the average depth is too shallow to present a reasonable opportunity for accidental submersion and ingestion. In addition, the exposure frequency used for the ingestion of surface water in those areas where such exposure could occur has been modified to reflect the fact that exposure is only likely to occur as the result of accidental submersion.

For the wading scenario, exposed dermal surface areas have been modified to reflect the fact that individuals are not likely to wade into water past the depth to their knees, even if there is deeper water available. Thus, the surface areas used by U.S. EPA are the same for all areas, as presented in U.S. EPA Table 3, except that the maximum value for each receptor age group does not exceed the surface area for the feet and lower legs.

It has also been assumed that individuals will not spend more than 1 hour wading or swimming in surface water. Thus the exposure time has been reduced to 1 hour/event.

Floodplain and Bank Soil Exposures

The potential risks due to contact with floodplain and bank soil exposures have been recalculated to reflect the recommended changes in exposure frequencies. In addition, it should be noted that for Section A of Conard's Branch, Table 5 indicates that the EPC used for floodplain soil was 2.7 mg/kg. However, the detailed EPC derivation provided in Table B-12 of Appendix B indicates that the EPC should actually be 2.3 mg/kg. Thus this change has been made in the recalculation of potential risks associated with contact with floodplain soils in this area.

In addition, as discussed previously, U.S. EPA guidance recommends that an ingestion rate of 100 mg/day is a reasonable upper bound estimate for older children and adults. Thus, the revised risk estimates incorporate this ingestion rate for floodplain and bank soil exposures for youths.

Finally, CBS has added a factor for the fraction of soil contacted daily that is contaminated. That factor has been conservatively assumed to be 50 percent to reflect the fact that individuals will also spend at least half of their days in areas that are not contaminated.

Sediment Exposures

As discussed above, sediment exposures have not been recalculated due to the fact that the estimated exposures were already well below levels of concern. It should be noted, however, that if more reasonable parameters were used for the EPC, the exposure frequency, the sediment ingestion rate, and the dermal adherence factor, estimated risks for these pathways would be substantially lower.

Total Risks

Tables 9 and 10 of the HHRA present total risks and hazards for each of the areas of interest by combining risks associated with each of the exposure pathways evaluated. As discussed previously, in many areas, those risk estimates include potential exposure through the ingestion of fish, despite the acknowledgement from U.S. EPA that fish consumption will not occur in some of those areas. Thus, the recalculation of total risks eliminates the fish consumption pathway from all areas of the Site at which fish consumption is not expected to occur. For areas where fish consumption might occur, the recalculated total risks provide risk estimates for direct contact plus the ingestion of pelagic fish, direct contact plus the ingestion of benthic fish, and direct contact plus the ingestion of a combination of fish types.

In recognition of the fact that not all individuals who recreate along the site will also be fish consumers, a total risk for all of the relevant direct contact pathways in each reach of Conard's Branch or Richland Creek is provided. On days when exposure is expected to result from contact with more than one medium (floodplain soil, bank soil, and or sediment), the risks have been apportioned to reflect exposure to a combination of these media, not the summation of potential exposures to each. Thus, in areas where individuals are exposed to three soil/sediment media, it has been assumed that 1/3 of exposure is derived from each discrete medium. Similarly, in areas where individuals are exposed to two soil/sediment media on a given day, it has been assumed that ½ of exposure is derived from each discrete medium. Finally, in those areas where exposure only occurs due to one soil/sediment pathway, it is assumed that 100 percent of exposure is derived from that medium.

CBS has recalculated the potential risks and hazards for each of the reaches and presents the total risks for the combined pathways, using the recommended alternative EPCs and exposure assumptions discussed previously. Detailed calculations are provided in Attachment A to these comments. The resulting recalculated cancer risks and hazard indices are presented in Tables 1 and 2 using the same exposure point concentrations derived by Tetra Tech. Tables 3 and 4 present the risks and hazard indices assuming

exposure point concentrations averaged over a 30 year exposure period assuming a 4% decline in PCB levels in fish during the 30 year period.

Recalculated risks using the Tetra Tech exposure concentrations for the fish ingestion pathways are all either below or near the most conservative end of the U.S. EPA's acceptable risk range of 1E-04 to 1E-06, except for the ingestion of benthic fish in Section G, for which the estimate is slightly higher than the midpoint of that range. All hazard indices for fish consumption are below U.S. EPA's target hazard index of 1. When all of the relevant direct contact pathways are combined for each reach, excluding fish consumption, the estimated risks and hazards are all below or slightly exceed the 1E-06 risk benchmark and all hazard indices are below 1. When fish consumption is combined with direct contact exposures, the risks are dominated by the fish consumption pathways. As a result, the estimated total risks for each area are slightly higher but similar to the risks calculated for the fish consumption pathways. Using the average 30 year exposure point concentrations with a 4% decline, all risks/hazards decrease by about 45%.

These recalculated risk results indicate that risks in all reaches evaluated for the Site are well within U.S. EPA's acceptable risk range and only exceed the 1E-05 risk level when one assumes that an individual eats only benthic fish from Section G and that the exposure point concentrations do not change over the 30 year period. It is unlikely that fish consumption from this reach would be limited to benthic species or that the PCB levels in fish would be static for a 30 year period (existing data shows a downward trend). When it is instead conservatively assumed that an individual consumes a combination of benthic and pelagic species from this area, and that the concentrations of PCBs in fish continue to decline, the risk estimate for this pathway drops below the 1E-05 risk level.

Response 51: As described in the response to Comment 50, U.S. EPA does not agree with some of CBS's proposed parameter value revisions, review and comment on CBS's revised risk estimates is not warranted.

Comment 52: The risk assessment has only one line of evidence - the calculation of theoretical hazard quotients for mink and kingfisher. This line of evidence is biased, as dictated by Superfund guidance, to be very conservative and is not a direct measure of any real effect on wildlife at the site. Other lines of evidence could be evaluated to reduce uncertainty and to determine if in fact there is any real impact in the field. Specifically, a survey of which receptors are actually present at the site and their reproductive status might be warranted before extensive remedial activities are deemed necessary. However, U.S. EPA did not consider other lines of evidence. U.S. EPA guidance for ecological risk assessment (U.S. EPA, 1997, 1998) lists other lines of evidence that can be considered, including:

- Measurements of the abundance, diversity and other characteristics of exposed invertebrate, fish and wildlife communities

- Measurements of reproductive success in fish, birds and mammals

- In-situ, whole-media, and dietary toxicity tests using selected receptors or appropriate surrogate species

These lines of evidence incorporate more site-specific information, based on actual site biological measurements, to reduce uncertainty and to see if effects are evident. As such, these lines of evidence can act as a reality check on theoretical projections of risk that are derived from hazard quotients. The approach taken by U.S. EPA is only the first step in the risk assessment process and the conservative nature of the assumptions and parameters used in the assessment make it useful only to rebut the presumption of risk. It is not appropriate to use such an assessment to conclude that there is risk to any ecological receptors (Fairbrother, 2003).

U.S. EPA has responded to this issue by noting (U.S. EPA 2005):

> "There are several problems associated with the proposal to measure adverse effects in field studies that are related to the nature of releases at this site. Neal's Landfill is a continuing source of PCBs to Richland Creek via Conard's Branch. To have value for establishing site-specific water quality goals for these releases in place of ambient water quality standards, the field studies have to be appropriately scaled to target the risks associated with these releases over the most contaminated portions of the receiving water body, in this case, the first few miles downstream of the point of release. A major limitation is that replication will not be feasible in the study design. A second limitation is that suitable receptors may not be available for study in the appropriate location in a particular field season. A third limitation is uncertainty over whether and to what extent the monitored species are actually exposed to site contaminants, and through which pathways. If the receptors included in the field study feed predominantly off-site or feed predominantly on non-aquatic prey, the study results will have little relevance for decisions concerning source control of surface water releases. A fourth limitation is that the study will likely require several years to gather sufficient data (assuming the previous limitations can be adequately addressed), further delaying remedial actions at the site".

In essence, U.S. EPA is saying that field studies are problematic for a number of reasons which are associated with the "nature of the releases" and scale of the site. U.S. EPA is not very explicit in how the "nature of the releases" will prevent "replication" in study design. However, U.S. EPA does perform field studies at many other superfund sites as part of the risk assessment process. Of particular note is the U.S. EPA comment that "uncertainty over whether and to what extent the monitored species are actually exposed to site contaminants and through which pathways". With this statement U.S. EPA is showing concern that the conservative assumptions they have made in the risk assessment may not be borne out by actual field studies. U.S. EPA also lists timing as a reason not to do field studies. However, CBS originally made the comment about the lack of field studies to ground truth the U.S. EPA risk estimates over 3 years ago. Had the U.S. EPA seriously considered the usefulness of field studies at that time, field studies would certainly have been timely with regard to risk assessment conclusions.

So the remedy for U.S. EPA possibly discovering that their assumptions are overly conservative is to avoid performing any field study that might show this. Surely there are some field studies that could be performed that would be appropriate to the scale of this site and place in perspective the theoretical risk calculated by U.S. EPA using their conservative assumptions.

For example, U.S. EPA recently added risk to fish in their latest version of the risk assessment. In estimating a theoretical risk to fish, U.S. EPA has used very conservative assumptions including TRVs for salmonids which are one of the most sensitive species with respect to dioxin like contaminants (U.S. EPA has done this knowing full well that salmonids are not a potential receptor in these water bodies). Performing population studies of resident fish to evaluate the existence of any significant population level effects by comparing to reference sites is a standard practice and could have been readily performed. In fact, CBS has performed some population studies on fish in Richland Creek both upstream and downstream of the Neal's Landfill drainage (CBS 2006, Tetra Tech 2003). U.S. EPA has reviewed these studies and could have used or supplemented this data to evaluate the existence of any substantial population impacts on fish communities and/or populations.

Response 52: The ERA considered three lines of evidence: potential risks to mink, kingfisher, and fish, which showed similar levels and spatial patterns of risk. A supplemental line of evidence considered in the ERA is that the PCB concentration in the liver of a road-killed mink is consistent with the mink exposure model and the risk estimates in the ERA for that location.

The ERA is consistent with Superfund guidance and practice at other sites.

Neal's Landfill is an ongoing continuous source of PCBs to Conard's Branch and Richland Creek. The initial approach taken in the ERA was to use site-specific measurements of PCB accumulation in fish to assess potential risk to animals (mink and kingfisher) feeding predominantly on fish, because remedial actions based on protectiveness for fish-eating animals is expected to be protective for the myriad aquatic organisms included in freshwater communities. However, this assumption of umbrella protection of aquatic organisms through assessment of fish-eating animals is only applicable when the fish-eating animals are assessed for full utilization of the contaminated body of water. The assumption of protection of aquatic species is invalid when risk to fish-eating animals is assessed for partial utilization of the receiving body of water, whether calculated as potential risk from fish tissue data, or assessed in a field study of fish-eating animals that only feed part of the time in the area of concern. This is the scaling issue for field studies of mink or kingfisher for assessing the risks of PCB releases from Neal's Landfill. PCB accumulation in fish is very high near Neal's Landfill, the source of PCBs, and decreases downstream. Correspondingly, the potential risk to fish-eating animals is elevated through at least 2 miles downstream, is possible but sparsely documented 3 and 6 miles downstream, and is below levels of concern beyond 13 miles downstream. In order to modify the risk conclusions in the ERA based on

dietary exposure to measured PCB concentrations in fish, a field study of mink or kingfisher would need to measure the impacts on animals utilizing the first few miles of Conard's Branch and Richland Creek downstream of Neal's Landfill. Animals feeding further downstream would not provide useful information for assessing risks in the upper portion near Neal's Landfill. In any given field season, the number of usefully positioned territories would be small.

Field studies of fish are not spatially limited to the same degree because fish have much small home ranges compared to mink or kingfisher. Since completion of the ERA in 2005, a field study of the age structure and growth of creek chub populations in Conard's Branch and the upper portion of Richland Creek has been published (Henshel, et al. 2006, see Attachment 3). Adverse effects were reported for both growth and survival in comparison with a reference location. The observed decrease in long-term survivorship in female creek chub is consistent with assessment of risk to fish in the ERA, which concluded that creek chub would need to be more than an order-of-magnitude less sensitive than adult rainbow trout (the source of the toxicity information) to not be at risk of decreased survival in the upper portion of Richland Creek, and more than 2 orders-of-magnitude less sensitive to not be at risk in Conard's Branch. The field study was replicated at in a second PCB-contaminated stream with similar results.

The study on the toxicity of dioxin to rainbow trout (a salmonid) was used in the ERA because it is the only available controlled study on the effects of long-term exposure to adult fish. As discussed in the ERA, salmonids are among the most sensitive species to dioxin-like effects in eggs, but rainbow trout are *less* sensitive than several other species at the juvenile stage. The ERA explicitly recognizes that the species present in Conard's Branch and Richland Creek are unlikely to have the same sensitivity to dioxin-like chemicals as rainbow trout, and utilized the available information on species sensitivity differences (based on toxicity studies with juvenile fish and fish eggs) to adjust risk estimates. The risk characterizations for fish in the ERA are based on the adjusted risk estimates (sunfish and sucker), and, where adjustment for inter-specific difference in sensitivity was not possible (creek chub), on the magnitude of the sensitivity difference necessary to conclude that risk is unlikely. Since creek chub would have to be 1 to 2 orders of magnitude less sensitive than rainbow trout to not be at risk, it appears likely that creek chub may be adversely impacted. The field study of creek chub populations by Henshel, et al. (2006) provides supporting evidence that creek chub survival is reduced in Conard's Branch and the upper portion of Richland Creek.

Comment 53: Since the assessment uses the same TRVs that U.S. EPA has used in the other Bloomington area ERAs, CBS has the same comments made previously with respect to those TRVs. Specifically:

- The methods used to derive some of the TRVs for both mink and birds are novel and their utility and accuracy have not been established. In particular, CBS has a number of concerns about the TRVs and the methods that were applied in deriving them that were presented in the document entitled "Toxicity Reference Values (TRVs) for Mammals and Birds Based on Selected Aroclors", from U.S. EPA Region V, dated

March 6, 2003 (which is included as a part of U.S. EPA 2006, Focused Ecological Risk Assessment, PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek, August 10). For example, the combination of data from various studies and then the extrapolation of NOAELs and LOAELs from the combined data sets have several obvious limitations, including the comparability of methods between studies. While U.S. EPA avoids the use of term "extrapolation" in favor of the term "interpolation" when using this technique, in fact the U.S. EPA is extrapolating in some cases beyond the tested dosage in one study to dosage levels tested in different studies under different conditions. To our knowledge, these approaches have not been externally peer reviewed and are in contrast to the typical U.S. EPA method of deriving TRVs from relevant single high value studies.

- The TRVs for mink have been adjusted to account for two breeding seasons. It is not clear that this is a generally accepted or scientifically valid procedure. In their TRV memo, U.S. EPA evaluated the Brunström *et al.*, (2001) study and concluded that "the low effect TRV for exposure over 2 breeding seasons (1.3 ppm PCB) is 42% of the corresponding TRV for 1 season exposure (3.1 ppm), and the 2-season no effect TRV (1.1 ppm) is 47% of the 1-season value (2.4 ppm)." These TRVs are clearly artifacts of the interpolation method used by U.S. EPA since only two doses were evaluated by Brunström *et al.*, (2001) and yet U.S. EPA derived four different TRVs from this study. Furthermore, U.S. EPA's TRVs are based on a narrow definition that considers only a single endpoint rather than deriving a TRV based on the most sensitive, ecologically relevant endpoint(s), as is commonly done with setting a TRV. Clearly, the results of Brunström *et al.*, (2001) demonstrate the toxicity of the European Clophen technical mixture. If one focuses on reduced birth weight of kits as an endpoint, then it is clear from this study that the LOAEL TRV (0.3 mg Clophen A50/mink/d or 2 mg/kg in diet) is the same for both the 6-month and 18-month exposures (compare Tables 3 and 5 in Brunström *et al.*, 2001). However, the more sensitive endpoints from this study were the numbers of 2-week old kits per mated female and weights of kits at 2 and 5 weeks of age. Using these more sensitive endpoints, the LOAEL is 0.1 mg Clophen A50/mink/d (or 0.67 mg/kg in feed) at the 18-month exposure. However, since the authors did not present data on these endpoints for the 6-month exposure, there is no way to directly compare TRVs for 6 and 18-month exposures for these endpoints. Thus, this study does not support the derivation of a 1-season to 2-season uncertainty factor. Similarly, U.S. EPA's analysis of the Restum *et al.*, (1998) study does not support a 1-season to 2-season uncertainty factor. Again, the TRVs derived from this study by U.S. EPA are artifacts of the interpolation method used by U.S. EPA and the narrow definition of a TRV that utilized a single endpoint rather than deriving a TRV based on the most sensitive, ecologically relevant endpoints. As before, the lowest dose tested for both seasons determined a LOAEL and therefore, the uncertainty associated with estimating a NOAEL from this study would be relative great. For example, based on the most sensitive, ecologically relevant endpoint from this study, reduced body weight of 6-week old male kits, it is clear that the LOAEL TRV (0.25 mg PCBs/kg in diet) is the same for both the 6-month and 18-month exposures (compare Tables 8 and 9 of Restum *et al.*, 1998). Thus, this study and the other study cited by U.S. EPA

(Brunström *et al.*, 2001) do not support the derivation of a 1-season to 2-season uncertainty factor. The most recent high quality studies (for example the Housatonic River fish feeding studies detailed in Bursian et al 2003) have not involved multiple breeding seasons. Similarly the USFWS is planning a similar mink feeding study with Hudson River Fish and this is also proposed as a single season study (Hudson River Natural Resource Trustees 2006). This is an indication that multiple breeding seasons are not judged to be a significant factor in TRV development for mink by much of the scientific community including U.S. EPA or FWS at other high profile PCB sites. If this factor was omitted, the resulting Hazard Quotients would drop by about a factor of 2.

- Relative to assessment of potential effects thresholds in mink, the study conducted by Michigan State University under contract with the U.S. EPA (Bursian *et al.*, 2003) where fish from the Housatonic River were fed to mink is the highest quality, most relevant study from which TRVs can be determined. U.S. EPA disregards this study because the original technical grade of PCBs released at the Housatonic River was Aroclor 1260. While the original PCB technical mixture released to the Housatonic River may have been different from those released at this site, it has been established that TEQs are the most accurate predictor of toxicity to mink. A variety of weathering and bioaccumulation processes have altered both the PCBs released in Bloomington streams and those released to the Housatonic. Upon review of the residue data from both the Housatonic mink feeding study and Neal's Landfill fish, the relative potency of the dioxin-like activity, in the units of mg TEQs/kg PCBs, were found to be lower for the Neal's Landfill fish than for the Bursian study fish (Table 1). Additionally, for both sites PCB congener 126 (not dibenzofurans which can be the main contributor to TEQs for a neat Aroclor 1260) was found to be the main contributor of TEQs. Thus, selection of this study as the basis for TRVs is relevant and likely conservative for this site. U.S. EPA has used Aroclor 1260 field derived TRVs at sites contaminated with Aroclor 1242 in other high profile risk assessments. For example, in the Hudson River ERA (U.S. EPA 2000), U.S. EPA used a NOAEL TRV for great blue heron that was based on a Halbrook (Halbrook *et al.* 1999) field study where Aroclor 1260 was the contaminant. The main contaminant released at the Hudson River site is also Aroclor 1242, the same as at Neal's Landfill. While most recently, U.S. EPA has chosen to compare the LC20 and LC10 reported in the Bursian study (Bursian 2006) to their TRVs derived for this site, the probit analysis used to derive the EC20/10 results reported in the Bursian 2006 study is incomplete. For example, there is no detailed analysis of the goodness of fit for the fitted curve and the results of the probit analysis, presented in figure 2 of the Bursian 2006 paper, are less than convincing that a reasonable fit of the selected model exist to the actual data. It should also be noted that figure 2 in Bursian 2006 only presents summary data for the mortality at 6 weeks which prevents any real assessment of the goodness of fit. While a properly conducted probit analysis can derive valuable information concerning non-tested dosages, relying on the results of a probit analysis without an analysis of the model to the fit to the observed data can be misleading. CBS has recalculated an estimated risk to mink using the TRVs

developed in Bursian 2003 (NOAEL and LOAEL). This assessment was previously sent to U.S. EPA (Viacom 2004) and is included here as Appendix B.

- The TRVs used to assess toxicity for kingfishers are all from other bird species. Gallinaceous birds, such as chickens and pheasants are among the most sensitive birds with respect to exposures to PCBs and other dioxin-like chemicals. The assessment fails to evaluate recent scientific evidence that kingfishers may be much less sensitive than any of these birds. This evidence is found in the Housatonic field studies (Henning and Brooks, 2003). At the Housatonic site, where PCB levels in fish are one to two orders of magnitude greater than they are at this site, there was no noticeable impact to breeding success of native kingfishers near the site. While the original PCBs disposed of at the Housatonic site may be different from those disposed of at Neal's Landfill, it has been established that the TEQs are the most accurate predictor of toxicity to fish eating birds. The TEQs of the Housatonic fish when evaluated as mg TEQs/kg PCBs are similar, but higher, than those found at the Neal's Landfill site. This large discrepancy between predicted risk to reproduction and actual field measured reproduction shows how relying on a single line of evidence such as theoretical hazard quotients can lead to improper conclusions.
- There is a growing body of evidence that suggests that it is inappropriate to apply chicken based TRVs to piscivorous birds for TEQs. For example, studies over the last several years by a number of researchers indicate that predatory birds, such as bald eagles, ospreys, and kingfishers are much more resistant to the effects of dioxins and related chemicals (Woodford et. al., 1998; Kennedy et. al. 2003; Henning and Brooks, 2003). Elliott and Harris (2002) noted the following based on their extensive review of data for piscivorous birds:

    - *In summary, the results of this study are consistent with the emerging data from both field and laboratory studies which indicate that predatory birds are not particularly sensitive to some of the effects of TCDD. Assessments based on field studies on eagles (Elliott et al., 1996) and ospreys (Woodford et al., 1998) and the comparative egg injection work with kestrels, indicate that raptors are rather insensitive to some of the toxic and biochemical effects of TCDD and PCBs. Elliot et al., (1996) suggested a no-effect level (based on hepatic CYP1A in hatchlings) of 100 pg/g TEQs and a lowest effect level of 303 pg/g.*

- In summary, the raptor TEQ egg LOAEL ranges conservatively from 210 pg/g to 303 pg/g based on enzyme induction, which is not typically an endpoint chosen for an ERA since it is not an ecologically relevant endpoint and occurs at much lower concentrations than effects on reproduction and development. Furthermore, since these values are based on the induction of enzymes, it is likely that effect levels in predatory birds for ecologically relevant endpoints, such as reproductive and developmental endpoints, are much greater. If these TRVs were used in the U.S. EPA's ERA, then the predicted risks to piscivorous birds, such as kingfishers, would be substantially less, and if other TRVs were available for such raptors based on

endpoints such as reproductive/developmental endpoints, the predicted risk would again be much less.

- CBS has previously provided U.S. EPA TRVs for the Great Blue Heron (Viacom 2004) and this analysis is provided again in Appendix A. Since the Great Blue Heron is also a predatory piscivore, the TRVs derived for the Great Blue Heron are likely more representative for the Kingfisher. CBS therefore recommends that the TRVs in Viacom 2004 for the Great Blue Heron be used for the kingfisher rather than those the U.S. EPA has derived based on Gallinaceous birds. If this substitution were made, the calculated hazard quotients would drop to about those shown for the "LOAEL" kingfisher case in U.S. EPA's risk assessment. Those hazard quotients approximate 1 based on the 2003 data set and show little risk to avian piscivores.

Response 53: Eight sets of TRVs are used in the FERA, the comments pertain to 2 of these 8 sets. The TRVs in question are based on meta-analysis of multiple toxicity studies, a procedure used to derive mink dietary no effect (500 µg total PCB/kg diet) and low effect (600 µg/kg) TRVs, and kingbird ingestion dose no effect (400 µg total PCB/kg_{BW}-d) and low effect (500 µg/kg_{BW}-d) TRVs (a second set of kingbird PCB ingestion TRVs used in the FERA are not based on meta-analysis). The remaining 5 sets of TRVs in the FERA are derived through other approaches.

The methods used for the meta-analysis are not novel. The approach is based on Leonards, et al. (1995), who used meta-analysis to interpolate mink tissue-based PCB TRVs on a dioxin-equivalent (TEQ) basis. The method used in the FERA for normalizing data from multiple studies to combine them into a single meta-analysis is the same as used by Leonards, et al. (1995). Other examples of the same normalization approach for meta-analysis of ecotoxicological studies include Isnard, et al. (2001), Tanaka and Nakanishi (2001), and Calabrese (2005). The main differences between the methods in the FERA and Leonard, et al. (1995) are minor ones made for site-specific objectives. The FERA meta-analysis TRVs are derived for PCBs on an individual Aroclor basis, instead of TEQs; exposure to mink is quantified on a dietary basis, instead of tissue accumulation; a different regression method is used (adapted from U.S. EPA guidance on effluent toxicity testing); and, consistent with Superfund practice, TRVs are based on the range between no adverse effects and the onset of adverse effects, while the Leonards, et al. (1995) TRVs are based on a high incidence of adverse effects (affecting 50 % of exposed mink).

Following a suggestion of CBS (then Viacom), an uncertainty analysis has been performed for the two sets of meta-analysis TRVs. The procedure, recommended by Dr. John Giesy, ENTRIX, consultant to CBS, is to remove data points individually from the combined data set to assess the effect of incompatibilities between studies and treatments on the TRV interpolation. The results show that the TRVs for PCB dietary exposure to mink, and PCB ingestion dose to birds, are robust to data variability in the upper range of exposures, but not in the lower range of exposures. In other words, the "actual" TRVs are unlikely to be higher than the values used in the FERA–the analysis recommended by CBS resulted in no more than a 20 % increase in the calculated TRVs, and mostly less

than 10 % changes related to variability in the upper range of exposures, but the "actual" TRVs might be lower than derived for the FERA–the procedure resulted in 35 to 90 % decreases in calculated TRVs related to variability in the lower range of exposures. This implies that risk calculations based on these TRVs are unlikely to overestimate risk, but the possibility that risk might be underestimated cannot be ruled out.

Meta-analysis refers to techniques for combining the results of multiple studies into a single analysis. CBS incorrectly states that the TRVs derived through meta-analysis are extrapolated, but the meta-analytical method in the FERA is restricted solely to interpolation within the combined data sets, and extrapolation beyond the bounds of the empirical data is not allowed. Incompatibilities between studies because of differences in study design or other factors are potentially important limitations of meta-analysis and, therefore, were evaluated as part of the meta-analysis performed for the ERA.

As discussed in the ERA, multiple studies with several species of mammals show that the reproductive toxicity of PCBs increases with length of exposure or with number of generations continuously exposed.

CBS incorrectly states that Brunström et al. (2001) evaluated only two doses. Brunström et al. (2001) evaluated three doses (control, A50 low, and A50 high), and reported results separately for PCB exposures over 1 and 2 breeding seasons (6 and 18 months, respectively). For the meta-analysis, the single breeding season results were supplemented with one additional high dose reported by Kihiström, et al. (1992), for a total of 4 doses. There are sufficient data to derive 2 TRVs (no effect TRV and low effect TRV) for each of the two exposure durations.

The mink PCB TRV is based on the number of live kits per mated female, which, as a measure of reproductive capacity, is an ecologically relevant endpoint. Reproductive failure in ranch mink fed Great Lakes fish was an early indication that contamination (later shown to be PCBs) in the Great Lakes posed a health risk to mammals.

Brunström et al. (2001) reported whelping rate and litter size of live kits for both 6- and 18-month exposures, from which live kits per mated female can be calculated. For the 18-month exposure A50 high treatment, whelping rate and live litter size decreased by 58 and 55 %, respectively, compared to the control treatment, both of which are statistically significant differences. However, for the same dose with 6-months exposure, there were no more than 5 % differences in whelping rate and live litter size with the control treatment, which are not statistically discernible differences. The sole difference is exposure duration. The combined effect on whelping rate and live litter size resulted in more than a 4-fold decrease in the number of live kits per mated female after 18-months exposure compared to 6 months exposure in the A50 high treatment, for an overall 80 % reduction in live kits per mated female compared to the control treatment at the end of the experiment.

As CBS points out, kit survival at 2 weeks was not reported for the 6-month exposure groups, so this endpoint cannot be used to compare the relative effects of 6- and 18-

month exposures in the Brunström et al. (2001) study. However, comparison of kit survival in long-term and short-term exposure groups is possible in the Restum, et al. (1998) study.

Kit survival is inversely related to exposure duration in the Restum, et al. (1998) study. A dietary dose of 1.0 ppm PCB resulted in statistically decreased kit survival with 6-months exposure, but a dietary dose of 0.5 ppm PCB resulted in statistically decreased kit survival with 16- to 18-months exposure (at kit 3 and 6 weeks age) or with exposure over 2 consecutive generations (at birth, 3 and 6 weeks).

A site-specific mink feeding study was performed for the Housatonic River Superfund site (Bursian, et al. 2006). The dietary concentration of the treatment resulting in decreased kit survival (3.7 mg PCB/kg diet) is higher than the LOAEC TRVs used at other Superfund sites, but resulted in high kit mortality (54 %). The investigators performed probit regression analysis to calculate the dietary concentrations lethal to 20 % and 10 % of kits (LC_{20} and LC_{10}, respectively) and the associated 95 % confidence intervals (CI). The LC_{20} is 1 mg PCB/kg diet (CI: 0.5 – 1.9 mg/kg), and the LC_{10} is 0.2 mg PCB/kg diet (CI: 0.03 – 0.5 mg/kg) (rounded values based on Bursian, et al. 2006). The Bursian, et al. (2006) LC_{20} differs from the FERA LOAEC by less than a factor of 2, reasonably consistent with the observed difference in toxicity between PCB exposure over 1 breeding season versus exposure over 2 breeding seasons. In contrast, the Bursian, et al. (2006) LC_{10} is lower (more conservative) than the FERA NOAEC. However, the 95 % confidence intervals for the Bursian, et al. (2006) LC_{20} and LC_{10} include the values of the LOAEC (0.6 mg PCB/kg diet) and NOAEC (0.5 mg/kg) TRVs, respectively, used in the FERA.

CBS included the relative potency for only one of the treatments in the Bursian study in their comment, which is anomalously high compared to the other four exposure treatment groups (relative potencies from 9.3 to 10.3 mg TEQ/kg PCB). The average relative potency of all five of the exposure treatment groups in Bursian, et al. (2006) is 11.2 mg TEQ/kg PCB, which is lower (less toxic) than any of the data from Neal's Landfill reported in CBS Table 1. The mean relative potency of the Bursian, et al. (2006) study is less than one-half of the mean relative potency for all species collected from Richland Creek at Vernal Pike in May and November 2003 (CBS Table 1), and is only one-third of the relative potency of all species collected at that location by CBS in November 2005 (32.7 mg TEQ/kg PCB). The mean relative potency of the Bursian, et al. (2006) study is approximately two-thirds of the mean relative potency for all species collected from Conard's Branch in May and November 2003 (CBS Table 1), but is less than one-half of the relative potency of creek chub collected at that location by CBS in November 2005 (25.2 mg TEQ/kg PCB). Contrary to CBS's comment that TRVs based on Bursian, et al. (2006) would be "likely conservative" for Neal's Landfill, comparisons of mean relative potencies provide additional evidence that the mixture of PCBs released to the Housatonic River is much less toxic than the mixture released to Conard's Branch and Richland Creek. This means that the PCB TRVs for the Housatonic River site are not adequately protective for the Neal's Landfill site.

With regards to the comment on probit analysis, apparently CBS does not consider the Bursian, et al. (2006) study to be the "highest quality, most relevant study from which TRVs can be determined" when the analyses do not conform with CBS's objectives. The Bursian, et al. (2006) LOAEC resulted in high kit mortality by 6 weeks, which corresponds to nearly a 50 % decrease in the number of live kits at 6 weeks per mated female compared to the control treatment. This is a severe effect, therefore, the onset of adverse effects is expected to occur at some lower dose. The probit analysis performed by Bursian, et al. (2006) is an approach for calculating the dietary PCB exposure associated with the onset of adverse effects on kit mortality. It is obvious from longer-term studies with mink (and other mammals exposed to PCBs), that the results of toxicological studies involving exposures over a single breeding season will underestimate the reproductive toxicity of PCBs associated with exposures over more than one breeding season or to consecutive generations.

Chicken are known to be sensitive to PCBs, and chicken PCB toxicity data are used to derive one set of TRVs to represent higher sensitivity to PCBs, but a second set of TRVs based on doves is also used in the FERA to represent middle sensitivity to PCBs, which brackets uncertainty over the sensitivity of kingfisher to PCBs. It would be inappropriate to solely assess potential risk to kingfisher based only on TRVs for insensitive species when the sensitivity of kingfisher is not known.

The mink ERA submitted by CBS demonstrates that risk to mink may be avoided by use of TRVs based on the single-breeding season exposure study performed by Bursian, et al. (2006). As discussed above, the assertion that the relative potency of the feed used in the Bursian, et al. (2006) mink study is equivalent to that in fish near Neal's Landfill is based on incomplete and selective use of the Bursian, et al. (2006) data (only the relative potency of the one treatment with anomalously high potency is reported by CBS). Use of the mean relative potency of all of the Bursian, et al. (2006) treatments shows much lower relative potency compared to fish near Neal's Landfill, with as much as a 2- to 3-fold difference. Bursian, et al. (2006) also reported LC_{10} and LC_{20} TRVs, which bracket the probable onset of adverse effects. Use of these TRVs result in LC_{10} HQs of 8-9 for mean exposure, and 10-12 for UCL exposure; and LC_{20} HQs of 2 for mean exposure, and 3 for UCL exposure.

Data from a dioxin study with pheasant is used for dose-based TEQ TRVs. Although pheasant are also a gallinaceous species, pheasant is less sensitive to dioxin than chicken. One of CBS's consultants described pheasant as "one of the more tolerant species" to dioxin-like effects (Giesy, et al. 1995; see also Bowerman, et al. 1995).

The kingfisher field study performed at the Housatonic River site is limited by several shortcomings in design, including an insufficiently broad exposure gradient, lack of a control or reference population, and a method of evaluation that is subject to confounding because the results of the field study are compared to that of a single study from the literature for a different location. According to the Housatonic River ERA (USACE/U.S. EPA 2004):

"The belted kingfisher study results do not definitively support the conclusions of low risk because the data collected in the study are limited. There are several conclusions drawn by the authors that are not strongly supported by the information presented in the report. The conclusion that the kingfisher population is consistent with the quality of habitat present is speculative. ... It introduces significant uncertainties to conclude that the Housatonic River kingfishers fall within the range reported for other kingfisher populations when only one study is referenced."

"... EPA was not provided with an opportunity to review standard operating procedures or protocols prior to receiving the study report ..."

"There were, however, several shortcomings that resulted in uncertainties regarding the conclusions of the study. No information was provided regarding nest search intensity, important endpoints like clutch size and hatching success were not measured, and there were too few visits to the nests during the reproductive cycle. These shortcomings limit the ability to draw rigorous conclusions from the field study results."

"The lack of reference area and small sample size (i.e., n=6) with the statistics used is considered a major source of uncertainty in the kingfisher field study."

"The approach used to estimate dose in the belted kingfisher study had a number of shortcomings. ... The lack of reference area concentrations further compounds uncertainties in the dose gradient. Thus, there are major uncertainties in the dose gradient achieved by this approach, as it is likely too narrow to detect a significant dose-response relationship and the dose associated with a given nest is unknown."

"The kingfisher field study had limited ability to detect differences in reproductive success."

For these reasons, the Housatonic kingfisher field study is not considered an adequate study for reducing uncertainty over the relative sensitivity of kingfisher to PCBs.

CBS's comment on the differences between TEQ toxicity in chicken and "piscivorous birds" is based primarily on effects on raptors (eagles, osprey, kestrels), the sole exception, the aforementioned Housatonic kingfisher field study, is addressed above. The comments regarding raptors are not germane because kingfisher is not a closely related to raptors. Assuming kingfisher sensitivity to PCBs is similar to that of raptors is as uncertain as assuming it is similar to that of chicken. The ERA assesses risk to kingfisher based on a range of sensitivities to address this uncertainty. Also, in a review of avian studies of dioxin-like toxicity performed by U.S. EPA, chicken was not shown to be unusually sensitive:

"A conclusion of these analyses is that the domestic chicken is, as is generally recognized, the most sensitive tested species, but it is not aberrantly sensitive.

Given the wide range of sensitivities within birds and within mammals to dioxin-like chemicals, test data for chickens should be used." (U.S. EPA 2003).

The review also compared TRVs derived through the species sensitivity distribution (SSD) approach for laboratory versus field studies. The egg TEQ TRVs are lower (showing greater toxicity) based on field studies compared to TRVs based on laboratory studies, even when chicken are included in the laboratory SSD (U.S. EPA 2003). This indicates that the results of chicken studies are not necessarily overprotective for wild birds, and may even be insufficiently protective in some situations.

As discussed in the ERA, the particular values of the egg TEQ TRVs used in the ERA are based on enzyme induction, but the TRVs were chosen because they represent a middle range between the values reported in multiple field studies that resulted in reproductive impacts *as measured in the field*, which are ecologically relevant endpoints.

Kingfisher and heron are not closely related, so there is no basis for concluding that "the TRVs derived for the Great Blue Heron are likely more representative for the Kingfisher". CBS recommends that the great blue heron TRVs be used for kingfisher "rather than those the U.S. EPA has derived based on Gallinaceous birds", but CBS is really asking that the range of TRVs based both on chick and dove studies be replaced with the proposed great blue heron TRVs. The relative sensitivity of kingfisher to PCBs or dioxin-like effects compared to great blue heron is not known, therefore U.S. EPA considers the use of the range of TRVs in the ERA appropriate because it reflects uncertainty over kingfisher sensitivity.

The ERA for great blue heron submitted by CBS shows potential risk to herons feeding in Conard's Branch and the upper portion of Richland Creek based on TEQ in heron eggs. Although the submitted ERA shows very high hazard quotients for dietary TEQ exposure based on the NOAEL TRV, no assessment was made of potential risk on a dietary TEQ LOAEL basis. This leaves this aspect of the heron ERA in the same situation as for kingfisher, risk to dietary TEQ exposure is difficult to assess because species-specific LOAEL data are lacking for great blue heron. The results of the submitted great blue heron are contradictory, risk appears to be acceptable on a PCB basis, but unacceptable on a TEQ basis.

Comment 54: The World Health Organization (WHO) has recently re-issued its recommended mammalian TEFs for PCBs (WHO 2005). The new TEFs should be used for the assessment of risk in the Neal's Landfill risk assessment.

Response 54: Use of the revised World Health Organization mammalian TEFs has no effect on the risk characterization for mink because of approximately parallel changes in both exposure estimates and TRVs. Mean exposure and risk to mink in 2001, 2002, and 2003 were recalculated with the WHO_{2005} mammalian TEFs presented in van den Berg, et al. (2006). Mink dietary exposure on a TEQ basis in Conard's Branch and the upper reach of Richland Creek decreased by 30 % across the 3 years (range of -24 to -36 % for the combined Conard's Branch/Richland Creek exposure scenario). The overall effect on

risk also depends on recalculation of the TEQ TRVs with the revised TEFs. The mink TEQ TRVs used in the ERA are based on the geometric mean of the TRVs in two long-term mink studies (Restum, et al. 1998; Brunström, et al 2001). The congener data for the Restum, et al. (1998) study are reported in Tillitt, et al. (1996). The WHO_{2005} TEQs of the three exposure treatments in Restum, et al. (1998) are 24 % lower than the WHO_{1998} TEQs, and the WHO_{2005} TEQs of the two exposure treatments in Brunström, et al. (2001) are 53 % lower than the WHO_{1998} TEQs. The revised mink dietary WHO_{2005} TEQ NOAEC is 2.8 pg/g (compared to 4.6 pg/g WHO_{1998} TEQ), and the LOAEC is 11 pg/g (compared to 18 pg/g WHO_{1998} TEQ), for an overall -39 % decrease in TEQ TRVs. The net effect is a small increase in several mink NOAEC HQs and few mink LOAEC HQs, but, because of rounding of the final HQs, the majority of the mink LOAEC HQs and the rest of the mink NOAEC HQs are unchanged.

CBS has not complied with their own comment. The TEQs in the mink ERA submitted by CBS are calculated with WHO_{1998} TEFs.

Comment 55: Conard's Branch is a very shallow narrow stream. Since kingfishers are dive feeding birds and the water is so shallow, it is unlikely that kingfishers would use this stream reach extensively. U.S. EPA has acknowledged verbally that the vast majority of Conard's Branch is too shallow during non-storm conditions for the dive feeding Kingfisher. But U.S. EPA has stated that adequate water depth would be available during storm periods and that the PAC analysis shows that even short periods of feeding during storms can result in estimated unacceptable risk for the Kingfisher. However, U.S. EPA has failed to take into account that Kingfishers need clear water to locate their prey. During storm periods, the water depth will increase, but the turbidity of the water also increases dramatically (this is very obvious by reviewing the TSS data from any of the numerous storm events CBS has monitored in the stream) decreasing the ability of the kingfisher to see fish in the stream. CBS continues to recommend that a more appropriate avian receptor for Conard's Branch is the Great Blue Heron. Additionally, there is some direct toxicity data for Great Blue Heron and PCBs (see Viacom 2004). Therefore use of this receptor at this location would reduce the uncertainty in the avian risk estimate. CBS has shown a representative risk assessment for great blue herons at the NLF site and thus has developed appropriate factors (feeding range, ingestion rates, body weight, TRVs etc in Viacom 2004 and in Appendix A).

Response 55: Belted kingfishers depend on shallow water for catching prey. Reportedly, the majority of prey are caught within 5 to 6 inches below the surface (Prose 1985). Historically, belted kingfishers have nested along Conard's Branch. A kingfisher burrow was observed in 1997 in the bank of Conard's Branch downstream of the Vernal Pike overpass and upstream of the confluence with Richland Creek (Dan Sparks, USFWS, pers. comm.).

Comment 56: U.S. EPA has calculated theoretical hazard quotients greater than 1 for both mink and kingfisher for the upper reaches of the study area. The hazard quotients are driven by the amount of time for each receptor that they are assumed to forage from Conard's Branch. Conard's Branch is a small short stream that can only support foraging

part time for at most 1 mink and/or kingfisher. U.S. EPA is supposed to evaluate ecological risk at the community or population level (U.S. EPA 1999). While the U.S. EPA risk assessment does develop scenarios that show theoretical hazard quotients greater than 1 for these receptors based on very conservative assumptions, U.S. EPA does not show how such a small area could have any substantive impact on the population of either receptor in the broader context of the Richland Creek area.

Response 56: The OSWER directive refers to local populations at or near the site, not regional populations. According to U.S. EPA (1999):

> "The goal of the Superfund program is to select a response action that will result in the recovery and/or maintenance of healthy *local* populations/communities of ecological receptors that *are or should be present at or near the site. ...* Contaminated media that are expected to constrain the ability of *local* populations and/or communities of plants and animals to recover and *maintain themselves in a healthy state at or near the site* (e.g., contamination that significantly reduces diversity, increases mortality, or diminishes reproductive capacity) should be remediated to acceptable levels." [emphases added].

One of the reasons for assessing risk to mink and kingfisher is because protection of piscivorous wildlife from PCB-related risks is expected to be protective of fish and other aquatic organisms. The same rationale is used in setting the PCB federal ambient water quality criteria for environmental effects. Therefore, populations of fish may be at risk of adverse effects in the stream reaches in which mink and kingfisher are potentially at risk. The potential risk to fish in Conard's Branch and the upper portion of Richland Creek as implied in the risk findings for mink and kingfisher are supported by the additional assessment of direct risk to fish in the ERA and by the adverse effects on creek chub growth and survival in the field study by Henshel, et al. (2006).

Comment 57: The U.S. EPA has ignored the latest two data sets for PCB in fish (collected in November 2003 and November 2005) in its estimates of exposure. It should be noted that the average PCB content in fish at station B in the fall of 2005 was 2.27 ppm and at station D .4 ppm. These 2005 averages are below the stated goals for fish at these locations in U.S. EPA's proposed plan.

Response 57: The ERA for the Neal's Landfill has served its purposes for characterizing risk and calculating goals for reducing risk to ecological receptors. It will not be endlessly revised with each additional round of sampling. Data collected subsequent to completion of the ERA should be used for compliance monitoring and trend analysis.

There are pronounced seasonal fluctuations in PCB concentrations in fish related to large fluctuations in fish lipid contents. Fish lipid contents are very low in November, and PCB concentrations are correspondingly at their minima. Since fish lipid contents are much higher in the spring and summer, PCB concentrations are also greater during spring and summer. For this reason, the November fish PCB data sets under-represent exposures of fish, mink, or kingfisher to PCBs, and compliance of November whole-body

fish PCB averages with stated goals is an incomplete evaluation of whether risk objectives have been attained.

See Attachment 4 for the November 2005 fish sample data. The November 2005 average PCB content in creek chub at Conard's Branch (station B) is approximately one-half of the concentration at this station in November 2002 (4.05 to 4.89 ppm depending on two approaches for Aroclor analysis). However, the mean TEQ in Conard's Branch creek chub in November 2005 (53 pg/g) is only 25 % less than the November 2002 value (71 pg/g). The inconsistency between PCB and TEQ trends may be related to the change in PCB analytical methods between the sampling periods – Aroclor analysis in 2002 versus the sum of congeners method in 2005.

Evaluation of the average PCB concentration in station D (Richland Creek at Vernal Pike) fish in November 2005 is complicated by the absence of white sucker. In contrast, the average PCB concentration in fish at this station in November 2002 included data for white sucker. Trends should therefore be assessed for the two species collected in both sample events. This shows essentially no trend for PCBs, but a small increase in TEQ in 2005 compared to 2002. The mean PCB content in creek chub in 2005 (0.25 ppm) is barely below the 2002 range (0.27 to 0.33 ppm), but the mean TEQ content in 2005 (8 pg/g) is slightly higher than in 2002 (7 pg/g). The mean PCB content in longear sunfish in 2005 (0.55 ppm) is within the 2002 range (0.48 to 0.59 ppm), but the mean TEQ content in 2005 (16 pg/g) is higher than in 2002 (14 pg/g).

Risk estimates for the November 2005 data at the Richland Creek at Vernal Pike location is misleading without white sucker data. Risk may be approximated by assuming the same empirical relationship between mean concentrations in longear sunfish and white sucker as observed in November 2002. This is the same approach used to estimate missing crayfish data. In November 2002, mean PCB concentration in white sucker was 2.5 times that in longear sunfish, and mean TEQ was 1.8 times. With this approach, November 2005 mink risk estimates for PCBs are in the same range as November 2002: no effect to low effect HQs of 1 to 0.8, and NOAEL to LOAEL HQs for TEQ are slightly higher: 3 to 0.8. The risk estimates for Conard's Branch are lower than in November 2002, but still indicate risk: PCB HQ of 3 (no effect and low effect are the same because of rounding), and NOAEL to LOAEL HQs for TEQ of 8 to 2. The combined foraging scenario over Conard's Branch and Richland Creek for November 2005 shows somewhat smaller risk than in November 2002 for PCBs: no effect to low effect HQs of 2 to 1, but similar risk for TEQ: no effect to low effect HQs of 4 to 1. These are risk estimates for mean exposures, risk estimates for UCL exposures have not been recalculated.

Comment 58: U.S. EPA states in section 6.1 that there is no obvious trend to the fish data. CBS disagrees. U.S. EPA should reconsider this statement in light of the complete fish data set (through fall 2005). As U.S. EPA notes, evaluations of trends in fish data can be confounded by a number of factors. CBS has evaluated trends in both the spring water PCB levels (which ultimately drive PCB trends in fish), and in the PCB data in fish. These analyses were sent to U.S. EPA in CBS 2006a and CBS 2007. These analyses show that indeed there is a downward trend to both the concentration of PCBs in

the spring water and the fish. These analyses have been reviewed by U.S. EPA consultants and to the best of our knowledge U.S. EPA has concurred with CBS's conclusions on trend.

Response 58: U.S. EPA concurs with the trend analysis for spring water PCB levels, but considers the trend for fish to be more uncertain. The greater uncertainty in fish PCB trends arises partly because of the much smaller data base for fish samples compared to water samples, and partly because of the greater complexity of the biological and ecological processes affecting bioaccumulation of PCBs in fish compared to the physical processes affecting PCB levels in water. The statement that there is no obvious trend in the fish data included in the ERA is a valid observation, which is reinforced by the contradictory results of comparing mean TEQ in November fish samples between 2002 and 2005 – Conard's Branch data indicate a declining trend, but Richland Creek data indicate no or even increasing trends.

Comment 59: The U.S. EPA has added an assessment of risk to fish. The measure of effects is taken from a Giesy study on dioxin (TCDD) effects on rainbow trout. CBS has several comments on this approach:

Comment 59a: First, U.S. EPA has used a study on rainbow trout. There are no rainbow trout in the NLF drainage and the characteristics of the stream are such that trout will not inhabit this stream (it is a warm water fishery). Rainbow trout have shown to be very sensitive to the effects of dioxin and dioxin like chemicals.

Response 59a: See Response 52.

Comment 59b: Second, U.S. EPA is using a TRV that is based on exposure to dioxin. This ignores the large body of literature available on PCBs. This increases the uncertainty in the analysis and is unnecessary since studies directly assessing the effect of PCBs on fish are available.

Response 59b: U.S. EPA is not aware of controlled long-term PCB exposure studies to adult fish.

Comment 59c: The U.S. EPA conclusion that fish may be at risk in the NLF drainage appears to be at odds with the available fish population data that shows a diverse and plentiful population of fish both in the NLF drainage and at other Bloomington area sites with comparable or higher levels of PCBs (such as Stout's Creek).

Response 59c: As discussed in Response 52, the field study by Henshel, et al. (2006) shows adverse effects on creek chub survival and growth in Conard's Branch and the upper portion of Richland Creek, and in Clear Creek.

Comment 60: The U.S. EPA has added an assessment of a road killed mink reportedly found near the NLF site to the risk assessment. CBS has several comments on this approach:

Comment 60a: First, there is no way to verify where and when the mink was actually found. The mink was reportedly found by a local resident who was also a local environmental activist. This resident reportedly found the mink and then kept it in their freezer for some length of time before handing it over to USFWS for analysis.

Response 60a: The uncertain origin of the road-killed mink is addressed in the ERA. The agreement between modeled and measured accumulation of PCBs or TEQ in mink liver for that location is supporting evidence that the mink foraged in that location. The implication that the mink may have been planted would also require a sophisticated ability to either collect a mink from some other exposure area with PCB levels equivalent to, but not notably higher or lower than the PCB levels along that portion of Richland Creek, or an even more highly sophisticated ability to spike the mink carcass with a quite precise amount of PCBs to give the appearance of local accumulation. While neither scenario can be absolutely ruled out, they are also highly improbable.

Comment 60b: Second, the U.S. EPA analysis of the mink data assumes lipid values for certain key literature to evaluate effects. The use of assumed lipid values is key to their analysis and the validity of these assumed values cannot be verified and is inappropriate.

Response 60b: The use of assumed lipid values in the ERA to allow comparisons of the road-killed mink liver data with published effect levels on both a wet-weight and lipid-normalized basis is fully transparent – assumed values are marked in parentheses, and calculated vales not directly given in the original publications are marked with an asterisk. Comparisons can therefore be easily made with or without derived data.

Comment 60c: Many of the studies evaluated by U.S. EPA have issues which should disqualify them for consideration. For example, many of the studies U.S. EPA cites have endpoints of questionable population level relevance such as enzyme induction, hepatic vitamin A, or mandibular and squamas cell proliferation. The Saginaw Bay studies have been shown to be influenced by other contaminants. The study by Leonard et al (1995) is not a primary source of data and should not be used.

Response 60c: The purpose of the table was to show where the road-killed mink sample falls within a continuum of toxic responses, including no effect concentrations at which no adverse effects are expected. Comparisons were made on the basis of both PCBs and TEQs. TEQs incorporate the dioxin-like effects of co-contaminants into a single value. Leonards, et al. (1995) is included because they derived thresholds for severe adverse impacts on litter size and kit survival based on meta-analysis of multiple toxicological studies of mink, which provides an additional line of evidence for evaluating whether the accumulations of PCBs and TEQ by the road-killed mink were well above LOAECs (the evaluation shows they were not).

Comment 60d. CBS feels the quality assurance issues associated with using a road killed mink supplied by a local activist overwhelm the utility of the data. However, if the data were to be used, the Bursian 2003 study presents data on PCB levels in mink liver that

could be used for comparison. The levels of PCB found in the road killed mink liver (77 pg/g) are below levels found in Bursian 2003 livers that may cause population level effects such as kit survival beyond 6 weeks (the threshold from Bursian 2003 for kit survival is given as the geomean of the NOAEL and LOAEL and amounts to 111 pg/g TEQ in the liver of the adult females).

Response 60d: Bursian, et al. (2003) is included in the comparison in the ERA.

Comment 61: CBS has re-calculated the risk for a theoretical heron receptor (Appendix A) and calculated risks for a mink receptor (Appendix B) based on revised TRVs, exposure scenarios and site-use factors that are more reasonable. These calculations indicate that the risk to these two receptors based on average PCB levels in 2003 are minimal, with HQ values only exceeding 1.0 based on the NOAEL, but not for the LOAEL. The greatest HQ based on the NOAEL for mink (based on the 95% UCL concentration in diet) was 1.7 (for PCBs) and 2.7 (for TEQs), which indicates that there is little if any risk to mink. The greatest HQ based on the NOAEL for great blue herons (based on the 95% UCL concentration in diet or modeled concentration in eggs) was 1.0 (for PCBs), which indicates that there is little if any risk to great blue herons. When risks to great blue heron from exposure to TEQ are assessed, there is limited data for piscivores for ecologically relevant endpoints (something more relevant than enzyme induction). From the limited field data, Entrix derived a TRV and calculated a maximum NOAEC-based HQ of 40. This HQ has an uncertain amount of conservatism in it and as a single line of evidence would not support additional remedial actions. As noted above, since PCB levels in fish appear to be declining, it is anticipated that the current risk to receptors is less than even these calculated levels.

Response 61: The ERA for great blue heron submitted by CBS shows potential risk to herons feeding in Conard's Branch and the upper portion of Richland Creek based on TEQ in heron eggs. Although the submitted ERA shows very high hazard quotients for dietary TEQ exposure based on the NOAEL TRV, no assessment was made of potential risk on a dietary TEQ LOAEL basis. This leaves this aspect of the heron ERA in the same situation as for kingfisher, risk to dietary TEQ exposure is difficult to assess because species-specific LOAEL data are lacking for great blue heron. The results of the submitted great blue heron are contradictory, risk appears to be acceptable on a PCB basis, but unacceptable on a TEQ basis.

The mink ERA submitted by CBS demonstrates that risk to mink may be avoided by use of TRVs based on the single-breeding season exposure study performed by Bursian, et al. (2006). As discussed above, the assertion that the relative potency of the feed used in the Bursian, et al. (2006) mink study is equivalent to that in fish near Neal's Landfill is based on incomplete and selective use of the Bursian, et al. (2006) data (only the relative potency of the one treatment with anomalously high potency is reported by CBS). Use of the mean relative potency of all of the Bursian, et al. (2006) treatments shows much lower relative potency compared to fish near Neal's Landfill, with as much as a 2- to 3-fold difference. Bursian, et al. (2006) also reported LC_{10} and LC_{20} TRVs, which bracket the probable onset of adverse effects. Use of these TRVs in the CBS ERA result in LC_{10}

HQs of 8-9 for mean exposure, and 10-12 for UCL exposure; and LC_{20} HQs of 2 for mean exposure, and 3 for UCL exposure.

Comment 62: In summary, the U.S. EPA risk assessment is overly conservative for the following reasons:

a. The U.S. EPA has only calculated theoretical risk based on modeled conservative receptors. This approach is only appropriate to rebut the presumption of risk.
b. U.S. EPA has not performed any field studies to determine if their conservative risk estimates are realistic or to determine if there are any real effects to any populations of receptors.
c. U.S. EPA has not shown how their theoretical risk estimates over the small areas with hazard quotients greater than 1 could manifest into population level effects for any receptors.

U.S. EPA has failed to properly consider the latest studies with mink and piscivorous birds that show less sensitivity with PCBs.

Response 62: All of these comments have been addressed in previous responses.

CBS REFERENCES FOR HUMAN HEALTH RISK ASSESSMENT COMMENTS

CBS. 2004. *Comments of Viacom, Inc. on the U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill.* February.

CBS. 2005. *Viacom's Comments on U.S. EPA's Responses to February 26 Document "Comments of Viacom, Inc. on the U.S. EPA's Human Health Evaluation for Fish Consumption at Neal's Landfill."* April.

Christian, G.M. 2006. Memorandum to Russ Cepko Re: Fish tissue sampling for Aroclor and lipid analysis at Conard's Branch and Richland Creek near Neal's Landfill: Fall 2005. February 22.

Ebert, E., N. Harrington, K. Boyle, J. Knight, and R. Keenan. 1993. Estimating consumption of freshwater fish among Maine anglers. *North Am. J. Fisheries Management* 13:737-745.

EPA. 1997. *Exposure Factors Handbook.* U.S. Environmental Protection Agency, Office of Health and Environmental Assessment. Washington, DC. EPA/600/P-95/002. August.

EPA 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.* U.S. Environmental Protection Agency, Solid Waste and Emergency Response. OSWER 9355.4-24. December.

EPA. 2000. *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds. Part II. Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds.* Environmental Protection Agency. NCEA-I-0836. May.

EPA. 2003. *Exposure Analysis for Dioxins, Dibenzofurans, and CoPlanar Polychlorinated Biphenyls in Sewage Sludge; Technical Background Document.* U.S. Environmental Protection Agency, Washington, DC. October 17.

NAS. 2006. *Health Effects from Dioxin and Related Compounds: Evaluation of the EPA Reassessment.* Prepared by the Committee on EPA's Exposure and Human Health Reassessment of TCDD and Related Compounds. National Research Council. ISBN 0-309-66276-1. National Academies Press.

QEA. 2006. *Analysis of PCB Trends at Neal's Landfill Site: Fate and Bioaccumulation Models.* Prepared on behalf of CBS. April 20.

Tetra Tech. 2003a. Memorandum form J. Clark and A. Kletzien to Tom Alcamo Re: Human Health Evaluation for Fish Consumption at Neal's Landfill. Prepared for the U.S. Environmental Protection Agency by Tetra Tech EM Inc., Chicago, IL. October 31.

Tetra Tech 2003b. *Final Technical Memorandum Regarding Stream Conditions and Fish Sampling Neal's Landfill Site Bloomington, Monroe County, Indiana.* Prepared for the U.S. Environmental Protection Agency by Tetra Tech EM Inc., Chicago, IL.

Tetra Tech. 2004. *Data Validation Review of 'Neal's Landfill Fish Samples November 2003 Validation."* Prepared for the U.S. Environmental Protection Agency by Tetra Tech EM Inc., Chicago, IL. September 1.

Tetra Tech. 2006a. *Human Health Risk Assessment Neal's Landfill, Bloomington, Monroe County, Indiana.* Prepared for the U.S. Environmental Protection Agency by Tetra Tech EM Inc., Chicago, IL. April 28.

Tetra Tech. 2006b. *Human Health Risk Assessment, Lemon Lane Landfill, Bloomington, Monroe County, Indiana.* Prepared for the U.S. Environmental Protection Agency by Tetra Tech EM Inc., Chicago, IL.

Van den Berg, M, L.S. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, S. Schrenk, S. Tohyama, A. Tritscher, J. Tuomisto, M. Tyslkind, N. Walker, and R.E. Peterson. 2006. Review: The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Toxicological Sciences* 93(2): 223-241.

CBS REFERENCES FOR ECOLOGICAL RISK ASSESSMENT COMMENTS

Brunstrom, B., B Lund, A. Bergman, L. Asplund, I. Athanassiadis, M. Athanasiadou, S. Jensen and J. Orberg. 2001. Reproductive toxicity in mink (Mustela vison) chronically exposed to environmentally relevant polychlorinated biphenyls (PCBs). Environ Toxicol Chem 20:2318-2327

Bursian, S.J., C. Sharma, R. J. Aulerich, B. Yamini, R. R. Mitchell, C. E. Orazio, D. R. J. Moore, S. Svirsky and D.E. Tillitt. 2006. Dietary Exposure Of Mink To Fish From The Housatonic River, Berkshire County, Massachusetts, USA: Effects On Reproduction, Kit Growth And Survival. Environ. Toxicol. Chem Vol 25, No. 6 pp 1522-1540

Bursian, S.J., R.J. Aulerich, B. Yamini, and D.E. Tillitt. 2003. Dietary Exposure Of Mink To Fish From The Housatonic River: Effects On Reproduction And Survival. Revised Final Report to USEPA, June 10, 2003.

CBS 2006. NLF Fish Sampling Normandeau Letter Report, Email from Dottie Alke to Tom Alcamo dated 2/27/2006 with attachment letter from Normandeau providing results of fish sampling at NLF November 2005.

CBS 2006a. "Analysis of PCB Trends at the Neal's Landfill Site: Spring Model" QEA Technical Memo dated 4/18/2006. Transmitted by Email from Dottie Alke to Tom Alcamo 4/20/2006

CBS 2007. "Analysis of PCB Trends at the Neal's Landfill Site: Statistical Analysis of Fish Data" QEA Technical Memo dated 1/4/2007. Transmitted by Email from Dottie Alke to Tom Alcamo 1/5/2007

Elliott, J.E., R.J. Norstrom, A. Lorenzen, L.E. Hart, and H. Philbert. 1996. Biological effects of polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls in bald eagle (Haliaeetus leucocephalus) chicks. Environ. Toxicol

Elliott, J.E., and M.L. Harris. 2002. An ecotoxicological assessment of chlorinated hydrocarbon effects on bald eagle populations. Rev. Toxicol. 4: 1-60.
Fairbrother, A. 2003. Lines of evidence in wildlife risk assessments. Human Ecol. Risk Assessment. 9(6):1475-1491.

Halbrook, R.S., Brewer, R.L. Jr., and D.A. Buehler. 1999. Ecological Risk Assessment in a Large River-Reservoir: 7. Environmental Contaminant Accumulation and Effects in Great Blue Heron. Environ. Toxicol. Chem. 18:641-648Viacom 2004, Viacom's Response to USEPA's Ecological Risk Assessment, Letter from Dorothy M. Alke to Thomas Alcamo dated August 23, 2004.

Henning, M., and R.P. Brooks. 2003. Productivity and Density of Belted Kingfishers on the Housatonic River. Available at the following URL:

Hudson River Natural Resource Trustees. 2006. Study Plan for Mink Injury Investigations for the Hudson River. Available on the web at www.fws.gov/contaminants/restorationplans/hudsonriver/studyplanmink.pdf

Kennedy, S.W., S.P. Jones, and J.E. Elliott. 2003. Sensitivity of Bald Eagle (Haliaeetus leucocephalus) Hepatocyte Cultures to Induction of Cytochrome P4501A by 2,3,7,8-Tetrachlorodibenzo-p-dioxin. Ecotoxicol. 12:163-170.

Restum, J., S. Bursian, J. Giesy, J. Render, W. Helferich, E. Shipp, D. Verbrugge, and R. Aulerich. 1998. Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink: 1. Effects on mink reproduction, kit growth, and survival and selected biological parameters. J. Toxicol Environ Health Part A 54:343-375

Tetra Tech 2003. "Final Technical Memorandum Concerning Stream Conditions and Fish Sampling Neal's Landfill Site Bloomington, Monroe County, Indiana (undated)

USEPA 1999. Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principals for Superfund. OSWER Directive 9285.7-28P Washington, D. C.

USEPA. 1997. Ecological risk assessment guidance for Superfund: process for designing and conducting ecological risk assessments interim final. USEPA 540-R-97-006, Washington, D.C.
USEPA. 1998. Guidelines for ecological risk assessment final. EPA/630/R-95/002F, Washington, D.C.

USEPA 2005. Draft Response to Viacom Response to "Focused Ecological Risk Assessment PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek" dated December 30, 2003 USEPA Region 5, 8/12/04, EPA Memo from James Chapman to Tom Alcamo dated March 31, 2005

USEPA 2006, Focused Ecological Risk Assessment, PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek, August 14, 2006

USEPA. 2000. Revised baseline ecological risk assessment. Hudson River PCBs Reassessment. Phase 2 Report. November 2000.

Viacom 2004. Viacom Response to "Focused Ecological Risk Assessment PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek" dated December 30, 2003 USEPA Region 5, dated 8/23/04.

WHO 2005, The 2005 World Health Organization Re-Evaluation of Human and Mammalian Toxicity Equivalency Factors for Dioxins and Dioxin-like Compounds, available on the web at http://www.who.int/ipcs/assessment/tef_update/en/index.html

Woodford, J.E., Karasov, W.H., Meyer, M.W., Chambers, L. 1998. Impact of 2,3,7,8-TCDD exposure on survival, growth, and behavior of ospreys breeding in Wisconsin, USA. Environ. Toxicol. Chem. 17:1323-1331.

Alexander, G.R. 1977. Food of vertebrate predators on trout waters in north central Michigan. *Mich. Acad.* 10: 181-195.

Bursian, S. J., R. J. Aulerich, B. Yamini, and D. E. Tillitt. 2003. Dietary Exposure of Mink to Fish from the Housatonic River: Effects on Reproduction and Survival. Revised Final Report to USEPA, June 10, 2003. Available at: http://www.epa.gov/region1/ge/thesite/restofriver/reports/final_era/SupportingInformation%20and%20Studies%20for%20the%20HousatonicRiverProject/Dietary%20Exposure%20of%20Mink.pdf.

Custer, C.M., T.W. Custer, C.J. Rosiu, M.J. Melancon, J.W. Bickham, and C.W. Matson. 2004. Exposure and effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in tree swallows (*Tachycineta bicolor*) nesting along the Woonasquatucket River, Rhode Island. *Environ Toxicol Chem.*, (in press).

Dahlgren, R.B., Linder, R.L., and Carlson, C.W. 1972. Polychlorinated Biphenyls: Their Effects on Penned Pheasants. *Environ. Health Perspect.* 89-101.

Eisler, R. 1986. Polychlorinated biphenyl hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85 (1.7).

Elliott J.E, Butler R.W., Norstrom R.J., and Whitehead P.E. 1989. Environmental contaminants and reproductive success of great blue herons *Ardea herodias* in British Columbia, 1986-1987. *Environ. Poll.* 59:91-114.

Elliott J.E, and M.L. Harris. 2002. An ecotoxicological assessment of chlorinated hydrocarbon effects on bald eagle populations. *Rev. Toxicol.* 4: 1-60.

Giesy, J.P., J.P. Ludwig, and D.E. Tillitt. 1994a. Dioxins, dibenzofurans, PCBs, and colonial, fish-eating waterbirds. In A. Schecter, ed., Dioxins and Health, Plenum, New York, NY, USA, pp.249-307.

Giesy, J.P., D.A. Verbrugge, R.A. Othout, W.W. Bowerman, M.A. Mora, P.D. Jones, J.L. Newsted, C. Vandervoort, S.N. Heaton, R.J. Aulerich, S.J. Bursian, J.P. Ludwig, G.A. Dawson, T.J. Kubiak, D.A. Best, and D.E. Tillitt. 1994b. Contaminants in fishes from Great Lakes-influenced sections and above dams of three Michigan rivers. II: implications for the health of mink. *Arch. Environ. Contam. Toxicol.* 27:213-223.

Gilliland, C.D., C.L. Summer, M.G. Gillilland, K. Kannan, D. Villeneuve, K.K. Coady, P. Muzzall, C. Mehne, and J.P. Giesy. 2001. Organochlorine insecticides, polychlorinated biphenyls, and metals in water, sediment, and green frogs from southwestern Michigan. *Chemosphere* 44:327-339.

Harris, M.L., J.E. Elliott, R.W. Butler, and L.K. Wilson. 2003. Reproductive success and chlorinated hydrocarbon contamination of resident great blue herons (*Ardea herodias*) from coastal British Columbia, Canada, 1977 to 2000. *Environ. Poll.* 121:207-227.

Hart,L.E., Cheng, K.M., Whitehead, P.E., Shah, R.M., Ruschkowski, S.R., Blair, R.W., Bennet, D.C., Bandiera, S.M., andR.J. Norstrom. Dioxin contamination and growth and development in great blue heron embryos. *J. Toxicol. Environ. Health* 32: 331-344.

Kennedy, S. W., A. Lorenzen, S. P. Jones, M. E. Hahn, and J. J. Stegeman. 1996. Cytochrome P4501A Induction in Avian Hepatocyte Cultures: A Promising Approach for Predicting the Sensitivity of Avian Species to Toxic Effects of Halogenated Aromatic Hydrocarbons. *Toxicol. Appl. Pharmacol.* 141: 214-230.

Kennedy, S.W., S.P. Jones, and J.E. Elliott. 2003. Sensitivity of Bald Eagle (*Haliaeetus leucocephalus*) Hepatocyte Cultures to Induction of Cytochrome P4501A by 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin. *Ecotoxicol.* 12:163-170.

Leonards, P.E.G., T.H. De Vries, W. Minnaard, S. Stuijfzand, P.De Voogt, W.P. Cofino, N.M. Van Straalen, and B. Van Hattum. 1995. Assessment of experimental data

on PCB-induced reproduction inhibition in mink, based on an isomer- and congener-specific approach using 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxic equivalency. *Environ. Toxicol. Chem.* 14(4):639-652.

Nosek J.A., S.R. Craven, J.R. Sullivan, and S.S Hurley.1992. Toxicity and reproductive effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in ring-necked pheasant hens. *J. Toxicol. Environ. Health* 35: 187-198.

Nosek J.A., and R.A Faber.1984. Polychlorinated biphenyls and organochlorine insecticides in great blue heron and great egret eggs from the upper Mississippi River. Proceedings of the 15th Annual Meeting of the Mississippi River Research Consortium, pp. 241-259.

Sanderson, J.E., J.E. Elliott, R.J. Norstrom, P.E. Whitehead, L.E. Hart, K.M. Cheng, and G.D. Bellward. 1994. Monitoring biological effects of polychlorinated dibenzo-*p*-dioxins, dibenzofurans, and biphenyls in great blue heron chicks (*Ardea Herodias*) in British-Columbia. *J. Toxicol. Environ. Health* 41:435-450.

Thomas, C.M., and R.G. Anthony. 1999. Environmental contaminants in great blue herons (*Ardea herodias*) from the lower Columbia and Willamette Rivers, Oregon and Washington, USA. *Environ. Toxicol. Chem.* 18:2804-2816.

Tillitt, D.E., R.W. Gale, J.C. Meadows, J.L. Zajicek, P.H. Peterman, S.N. Heaton, P.D. Jones, S.J. Bursian, T.J. Kubiak, J.P. Giesy, and R.J. Aulerich. 1996. Dietary exposure of mink to carp from Saginaw Bay. 3. Characterization of dietary exposure to planar halogenated hydrocarbons, dioxin equivalents, and biomagnification. *Environ. Sci. Technol.* 30:283-291.

USEPA. 1993. Wildlife Exposure Factors Handbook Volumes I, II, and II. EPA/600/R-93/187b. Washington DC, Office of Research and Development. 93.

USEPA. 1995. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife, EPA/820/B-95/008.

USEPA. 1998. Guidelines for Ecological Risk Assessment, EPA/630/R-95/002F.

USEPA. 2000. Revised baseline ecological risk assessment. Hudson River PCBs Reassessment. Phase 2 Report. November 2000.

Woodford, J.E., Karasov, W.H., Meyer, M.W., Chambers, L. 1998. Impact of 2,3,7,8-TCDD exposure on survival, growth, and behavior of ospreys breeding in Wisconsin, USA. *Environ. Toxicol. Chem.* 17:1323-1331.

Alexander GR. 1977. Food of vertebrate predators on trout waters in north central Michigan. *Mich. Acad.* 10: 181-195.

Bursian, S. J., R. J. Aulerich, B. Yamini, and D. E. Tillitt. 2003. Dietary Exposure of Mink to Fish from the Housatonic River: Effects on Reproduction and Survival. Revised Final Report to USEPA, June 10, 2003. Available at: http://www.epa.gov/region1/ge/thesite/restofriver/reports/final_era/SupportingInformation%20and%20Studies%20for%20the%20HousatonicRiverProject/Dietary%20Exposure%20of%20Mink.pdf.

EPA. 2003. Focused Ecological Risk Assessment/PCBs and Mammalian and Avian Piscivores in Conard's Branch and Richland Creek/Neal's Landfill Site, Bloomington, Monroe County, Indiana. December 30, 2003.

EPA REFERENCES FOR RESPONSE TO HUMAN HEALTH RISK ASSESSMENT COMMENTS

Agency for Toxic Substance and Disease Registry (ATSDR). 1998. "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins." Public Health Service. U.S. Department of Health Services. December. On-Line Address: http://www.atsdr.cdc.gov/toxprofiles/tp104-p.pdf

CBS Corporation (CBS). 2006a. AFourth Distribution of the EDMS [Environmental Database Management System] Database and Flowlink Database on CD.@ January 17.

U.S. Environmental Protection Agency (EPA). 1984. "Ambient Water Quality Criteria for 2,3,7,8-Tetrachloro-dibenzo-p-dioxin." Office of Water Regulations and Standards. EPA 440/5-84-007. February. On-Line Address: http://www.epa.gov/waterscience/library/wpcriteria/dioxncriteria.pdf

EPA. 1990. ANational Oil and Hazardous Substances Pollutant Contingency Plan (NCP).@ *Federal Register.* Volume 55, Number 46. April 9.

EPA. 2004b. Technical Memorandum Regarding Review of AComments by Viacom, Inc. on U.S. EPA=s Human Health Evaluation for Fish Consumption at Neal=s Landfill.@ From Dr. Rick Hertzberg, Superfund Technical Support Center (STSC). To Patricia Daunt, Administrator, STSC, August 20. Forwarded to Dr. Milt Clark, Health and Science Advisor, Region 5, with Cover Sheet Dated August 23, 2004.

EPA. 2004c. Memorandum Regarding Responses to February 26, 2004, Document Titled AComments of Viacom, Inc. on the U.S. EPA=s Human Health Evaluation for Fish Consumption at Neal=s Landfill. From Milton Clark, Ph.D., Health and Science Advisor. To Thomas Alcamo, Remedial Project Manager. September 8.

Van den Berg, M. and others. 2006. "The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds". *ToxSci Advance Access*. July 7.

EPA REFERENCES FOR RESPONSE TO ECOLOGICAL RISK ASSESSMENT COMMENTS

Bowerman, W., J. Giesy, D. Best, and V. Kramer. 1995. A review of factors affecting productivity of bald eagles in the Great Lakes region: Implications for recovery. Environ Health Perspect 103: 51-59.

Brunström, B., B. Lund, A. Bergman, L. Asplund, I. Athanassiadis, M. Athanasiadou, S. Jensen, and J. Örberg. 2001. Reproductive toxicity in mink (*Mustela vison*) chronically exposed to environmentally relevant polychlorinated biphenyl concentrations. Environ Toxicol Chem 20: 2318-2327.

Bursian, S., C. Sharma, R. Aulerich, B. Yamini, R. Mitchell, C. Orazio, D. Moore, S. Siversky, and D. Tillitt. 2006. Dietary exposure of mink (*Mustela vison*) to fish from the Housatonic River, Berkshire County, Massachusetts, USA: effects on reproduction, kit growth, and survival. Environ Toxicol Chem 25: 1533-1540.

Calabrese, E. 2005. Paradigm lost, paradigm found: the re-emergence of hormesis as a fundamental dose response model in the toxicological sciences. Environ Pollut 138: 379-412.

Giesy, J., W. Bowerman, M. Mora, D. Verbrugge, R. Othoudt, J. Newsted, C. Summer, R. Aulerich, S. Bursian, J. Ludwig, G. Dawson, T. Kubiak, D. Best, and D. Tillitt. 1995. Contaminants in fishes from Great Lakes-influenced section above dams of three Michigan rivers. III: Implications for health of bald eagles. Arch Environ Contam Toxicol 29: 309-321.

Henshel, D., D. Sparks, T. Simon, and M. Tosick. 2006. Age structure and growth of *Semotilus atromaculatus* in PCB-contaminated streams. J Fish Biol 68: 44-62.

Isnard, P., P. Flammarion, G. Roman, M. Babut, P. Bastien, S. Bintein, L. Esserméant, J. Férard, S. Gallotti-Schmitt, E. Saouter, M. Saroli, H. Thiébaud, R. Tomassone, and E. Vindimian. 2001. Statistical analysis of regulatory ecotoxicity tests. Chemosphere 45: 659-669.

Kihiström, J., M. Olsson, S. Jensen, Å. Johansson, J. Ahlbom, and A. Bergman. 1992. Effect of PCB and different fractions of PCB on the reproduction of the mink (*Mustela vison*). Ambio 21: 563-601.

Leonards, P., T. de Vries, W. Minnaard, S. Stuijfzand, P. de Voogt, W. Cofino, N. van Straalen and B. van Hattum. 1995. Assessment of experimental data on PCB-induced reproduction inhibition in mink, based on an isomer- and congener-specific approach

using 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxic equivalency. Environ Toxicol Chem 14: 639-652.

Prose, B. 1985. Habitat Suitability Index Models: Belted Kingfisher. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.87). 22 p.

Restum, J., S. Bursian, J. Giesy, J. Render, W. Helferich, E. Shipp, D. Verbrugge, and R. Aulerich. 1998. Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink: 1. Effects on mink reproduction, kit growth, and survival, and selected biological parameters. J Toxicol Environ Health Part A 54: 343-375.

Tanaka, Y. and J. Nakanishi. 2001. Model selection and parameterization of the concentration-response functions for population-level effects. Environ Toxicol Chem 20: 1857-1865.

Tillitt, D., R. Gale, J. Meadows, J. Zajicek, P. Peterman, S. Heaton, P. Jones, S. Bursian, T. Kubiak, J. Giesy, and R. Aulerich. 1996. Dietary exposure of mink to carp from Saginaw Bay. 3. Characterization of dietary exposure to planar halogenated hydrocarbons, dioxin equivalents, and biomagnification. Environ Sci Technol 30: 283-291.

USACE/USEPA. 2004. Ecological Risk Assessment for General Electric (GE)/Housatonic River Site Rest of River. Volume 6. Appendix H: Assessment Endpoint – Piscivorous Birds. Prepared by Weston Solutions, Inc. for U.S. Army Corps of Engineers and U.S. Environmental Protection Agency. http://www.epa.gov/region1/ge/thesite/restofriver-reports.html

USEPA. 1999. Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites. Office of Solid Waste and Emergency Response. Oct. 7, 1999. OSWER Directive 9285.7-28 P.

USEPA. 2003. Analyses of Laboratory and Field Studies of Reproductive Toxicity in Birds Exposed to Dioxin-like Compounds for Use in Ecological Risk Assessment. National Center for Environmental Assessment, Office of Research and Development, Cincinnati. EPA/600/R-03/114F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=56937

Van den Berg, M., L. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, and R. Peterson. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicol Sci 93: 223-241.

ATTACHMENT 1

Technical Memorandum – Model Simulation of Volatilization

QEA
Quantitative Environmental Analysis, LLC

TECHNICAL MEMORANDUM

TO:	Russ Cepko - CBS	**DATE:**	April 2, 2007
FROM:	Kevin Russell	**RE:**	Model Simulation of Volatilization
CC:	Dottie Alke – CBS Jim Rhea – QEA David Glaser – QEA	**JOB#:**	VIAnea:130

A mathematical model of PCB fate and transport was developed and calibrated for two streams (Conard's Branch and Richland Creek) that are impacted by PCBs from the Neal's Landfill Site in Bloomington, IN (QEA 2007). QEA has developed this memorandum to provide additional detail on the simulation of PCB volatilization within the model. This memo describes the mathematical formulation for volatilization in the model and the parameter values that were used to represent this site, and summarizes the results for model-predicted volatilization flux.

Theory and Mathematical Formulation

Volatilization is the process by which PCBs are transported across the air-water interface. Transfer of PCBs at the air-water interface is calculated by the PCB fate sub-model as a function of two parameters: 1) the chemical's Henry's Law Constant; and 2) a mass transfer coefficient that describes the rate by which PCBs are transported across the air-water interface. In the PCB fate sub-model, PCB flux from the water column due to volatilization is expressed based on these parameters as follows:

$$J_v = k_L\left(c_d - \frac{c_{air}}{H^*}\right) \quad (1)$$

where:
- J_v = volatilization flux ($M\ L^{-2}\ T^{-1}$);
- k_L = volatilization mass transfer coefficient ($L\ T^{-1}$);
- c_d = freely dissolved PCB concentration in water ($M\ L^{-3}$), which is calculated internally in the model based on the PCB partitioning coefficient – see Section 3.2.1.3.6 in QEA 2007;

c_{air} = vapor phase PCB concentration in air (M L^{-3}); and
H^* = dimensionless Henry's Law Constant (--).

The Henry's Law Constant (*HLC*) equals a chemical's vapor pressure divided by its solubility in water and is calculated from the equilibrium ratio of gas phase and water phase concentrations measured in laboratory experiments. This ratio is a fundamental property of a chemical. A high *HLC* is indicative of a volatile chemical that preferentially accumulates in the air phase, while a low *HLC* is indicative of a non-volatile chemical that preferentially accumulates in the water phase. *HLC* values for PCBs are relatively low compared to other classes of organic chemicals (MacKay et al. 1992). Values of *HLC* are typically presented in units of partial pressure per unit aqueous concentration (e.g., Pa-m^3/mol), while the model uses a dimensionless ratio that is derived from *HLC* by dividing by the product of the universal gas constant and absolute temperature (thus converting pressure into concentration using the ideal gas law):

$$H^* = \frac{HLC}{R(T+273)} \tag{2}$$

where: R = Universal Gas Constant (= 8.314 J/K mol); and
T = water temperature, which is specified in the model inputs (°C).

The volatilization mass transfer coefficient (k_L in Equation 1) in the model is calculated based on the classic "two-film theory" of gas transfer (Whitman 1923; Lewis and Whitman 1924). In this model, k_L is dependent on the rates of mass transfer through relatively thin layers of water and air at the interface, which are in turn dependent on the concentration gradients in the layers, and the diffusivity of PCBs in the layers (O'Connor 1983, 1984):

$$k_L = \frac{k_g k_l}{k_g + \frac{k_l}{H^*}} \tag{3}$$

where: k_g = vapor phase mass transfer coefficient (L T^{-1}); and
k_l = water phase mass transfer coefficient (L T^{-1}).

The liquid phase mass transfer coefficient (k_l in Equation 3) is calculated internally by the model as a function of the PCB diffusivity in water and the water depth and current velocity (which are calculated by the hydrodynamic sub-model) using the O'Connor and Dobbins (1958) formulation:

$$k_l = \sqrt{\frac{D_w U}{h}} \tag{4}$$

where: D_w = molecular diffusivity of PCBs in water ($L^2\ T^{-1}$);
h = mean water depth from hydrodynamic sub-model (L); and
U = average current velocity from hydrodynamic sub-model ($L\ T^{-1}$).

Molecular diffusivity for this expression is calculated internally by the model using the equation presented by Hayduk and Laudie (1974):

$$D_w = \frac{13.26x10^{-5}}{\mu^{1.14}(\overline{V})^{0.589}} \quad (5)$$

where: μ = water viscosity (centipoise), which is calculated internally by the model as a function of water temperature; and
$\overline{V}$ = PCB molar volume (cm^3/mol).

Finally, the overall volatilization mass transfer coefficient calculated using Equations 3 through 5 is corrected for temperature effects using the standard Arrhenius Equation (e.g., Chapra 1997):

$$k_L(T) = k_L(20°C)\theta_v^{T-20} \quad (6)$$

where: θ_v = volatilization temperature correction factor (--).

Equation 4 predicts that mass transfer is positively related to current velocity, which reflects the fact that increased turbulence tends to increase the effective surface area of the air-water interface, and thereby the efficiency of gas-liquid exchange. Likewise, Equation 4 predicts that volatilization is inversely related to water depth (i.e., shallower areas will produce more volatilization than deeper areas). Finally, the dependence of k_L on temperature in Equation 6 results in the mass transfer coefficient being positively related to temperature (i.e., volatilization increases at higher temperature).

Application to the Neal's Landfill Site

Based on the equations presented above, the model computes volatilization flux for each computational grid element, dynamically over the course of a simulation. The following site-specific parameters are provided as input to the model: *HLC*, c_{air}, k_g, $\overline{V}$, and θ_v. Values used for these parameters in the Neal's Landfill model were as follows:

- The *HLC* of PCBs varies with chlorination level; a site-specific value was estimated based on published *HLC* values for PCB congeners (Brunner et al. 1990) and was adjusted within the range of values corresponding to Aroclors 1242 and 1248 during model calibration. A value for *HLC* of 5 Pa-m^3/mol, which corresponds to a dimensionless value (H^* in Equation 2) of 0.0021 at 20°C, was used in the model.

- The air phase PCB concentration (c_{air} in Equation 1) was set equal to zero because atmospheric PCB concentrations are typically several orders of magnitude lower than those in water, and thus this value has very little impact on the calculated volatilization flux (e.g., QEA 1999).
- The vapor phase mass transfer coefficient (k_g in Equation 3) was assigned a constant value of 100 m/d, which is a reasonable approximation for streams and rivers because of the limited impact of air motion (winds) on transfer in these systems (O'Connor 1983).
- The molar volume ($\overline{V}$ in Equation 5) was assigned a mean value of 260 cm^3/mol, which is consistent with published molar volumes for the major PCB homologs that compose Aroclors 1242 and 1248 (Mackay et al. 1992).
- The volatilization temperature correction factor (θ_v in Equation 6) was set to a typical value of 1.025 (e.g., Chapra 1997).

The remaining parameters used in the volatilization equations are computed internally by the model as described above (H^*, k_l, D_w, U, h, and μ), or are provided as model inputs (T).

Model Results

The model predictions suggest that volatilization is a relatively minor PCB mass transport process in Conard's Branch and Richland Creek. For example, the model mass balance over the 2001-2005 calibration period indicates that the total volatilization from Conard's Branch was calculated to be 0.09 kg, which represents 3% of the total PCB mass entering from the springs and Spring Treatment Facility effluent (see Figure 3-36 in QEA 2007).

A temporal plot of the model-predicted PCB volatilization rate (i.e., grams per day) is shown with the system flow rate in Figure 1, for years 2001 through 2005. The temporal plots demonstrate the model's calculation of increases in volatilization due to higher current velocities during high flow periods, as well as the generally higher volatilization rates during non-storm conditions in the summertime, due to lower water depths and higher temperatures.

References

Brunner, S., E. Hornung, H. Santi, E. Wolff, O.G. Piringer, J. Altschuh, and R. Brüggemann, 1990. Henry's Law constants for polychlorinated biphenyls: experimental determination and structure-property relationships. *Environ. Sci. Technol.* 24:1751-1754.

Chapra, S.C., 1997. *Surface Water-Quality Modeling.* New York: McGraw-Hill.

Hayduk, W. and H. Laudie, 1974. Prediction of diffusion coefficients for non-electrolytes in dilute aqueous solutions. *AIChE, J.* 20:611-615.

Lewis, W.K. and Whitman, W.G., 1924. Principles of gas absorption. *Industrial and Engineering Chemistry.* 16(12):1215-1220.

Mackay, D., W.Y. Shiu and K.C. Ma, 1992. *Illustrated handbook of physical-chemical properties and environmental fate for organic chemicals: Volume I, monoaromatic hydrocarbons, chlorobenzenes and PCBs.* Chelsea: Lewis Publishers.

O'Connor, D.J. and W.E. Dobbins, 1958. Mechanisms of reaeration in natural streams. *Trans. Am. Soc. Civ. Eng.* 123:641-684.

O'Connor, D.J., 1983. The effect of wind on the gas-liquid transfer coefficients. *J. Environ. Eng.* 109:731-752.

O'Connor, D.J., 1984. *The significance of gas exchange in water quality assessment and planning.* Gas Transfer at Water Surfaces. Eds. W. Brutsaert, and G.H. Jirka. D. Reidel Publishing Company.

Quantitative Environmental Analysis, LLC, 1999. *PCBs in the Upper Hudson River, Volume 2, A Model of PCB Fate, Transport and Bioaccumulation.* Prepared for General Electric Company, May 1999.

Quantitative Environmental Analysis, LLC, 2007. *Development, Calibration, and Application of a Mathematical Model of Surface Water PCB Fate, Transport, and Bioaccumulation at the Neal's Landfill Site, Bloomington, IN.* Prepared for CBS Corporation, March 2007.

Whitman, W.G., 1923. The two-film theory of gas adsorption. *Chem. Metallurg. Eng.* 29(4):146-148.

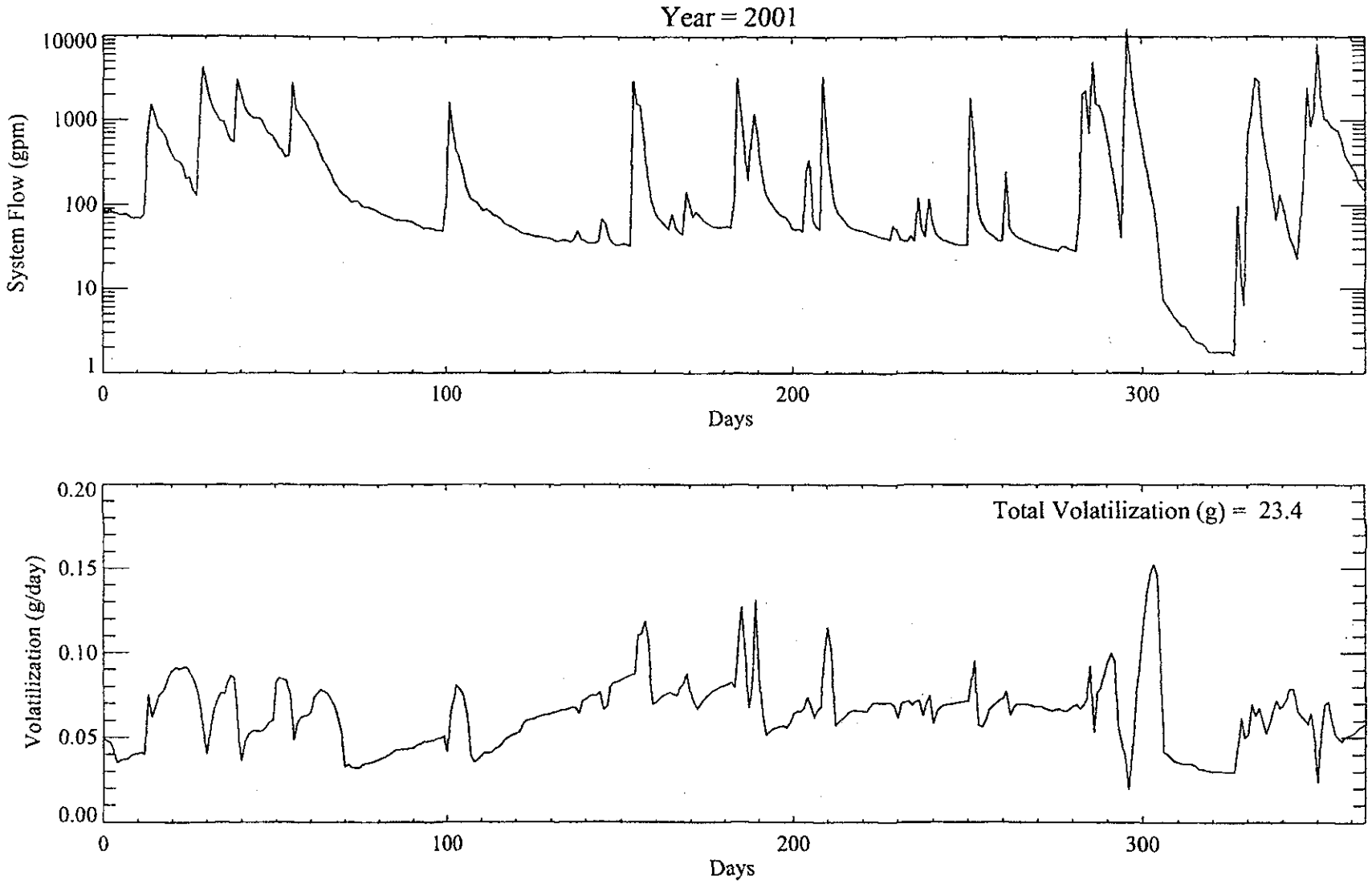


Figure 1a. Temporal profiles of flow and volatilization in Conard's Branch in 2001.

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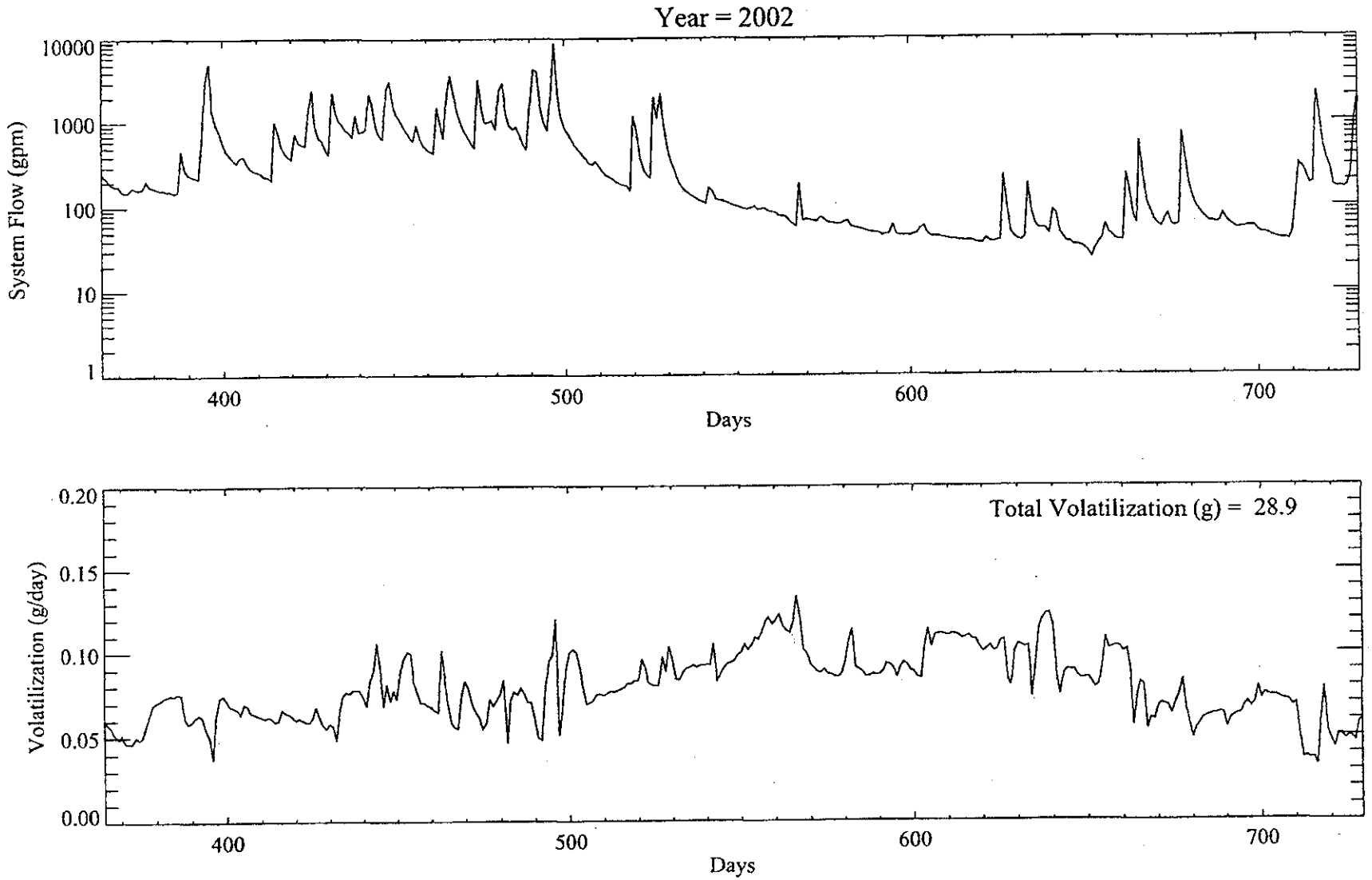

Figure 1b. Temporal profiles of flow and volatilization in Conard's Branch in 2002.

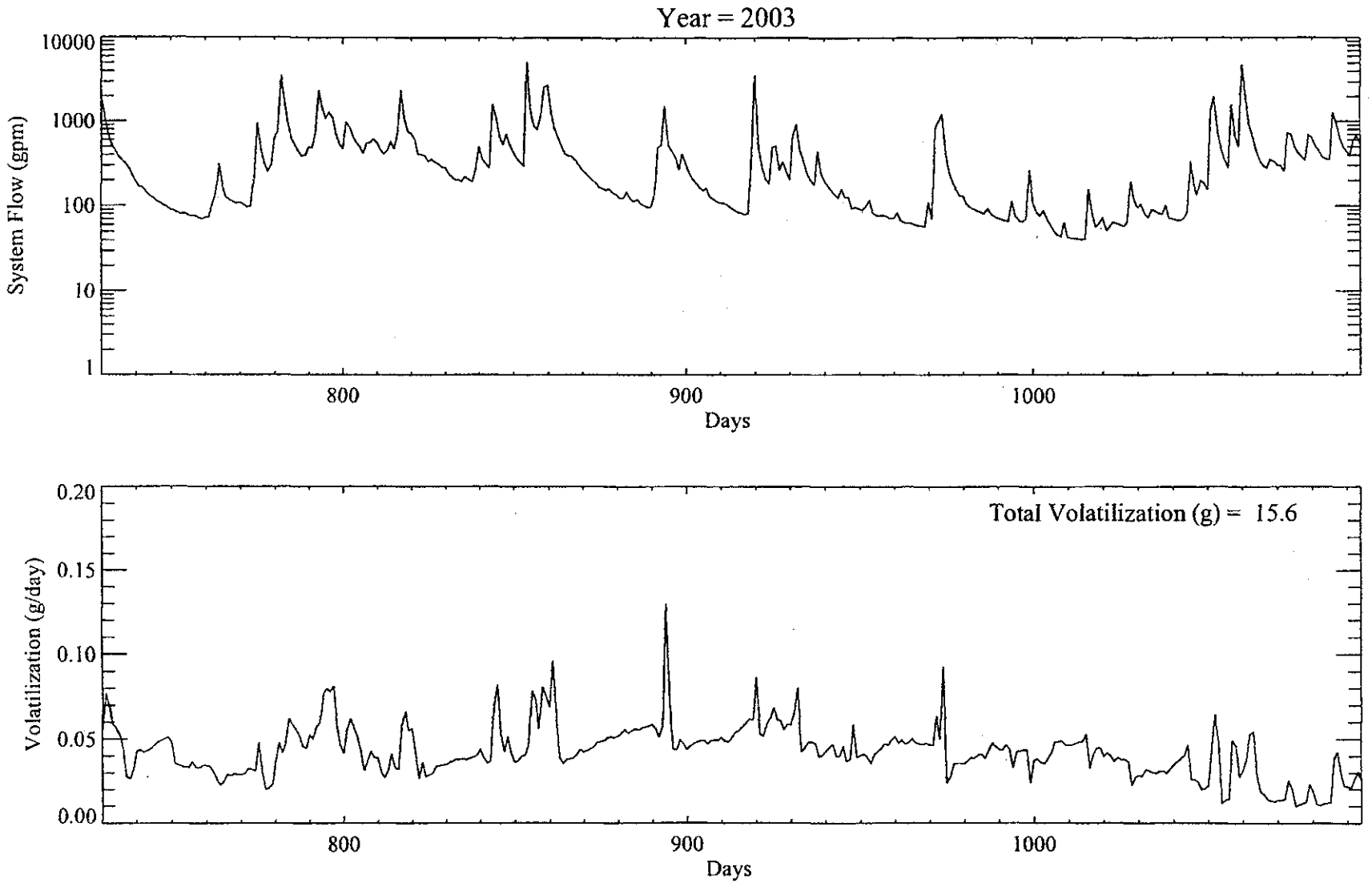

Figure 1c. Temporal profiles of flow and volatilization in Conard's Branch in 2003.

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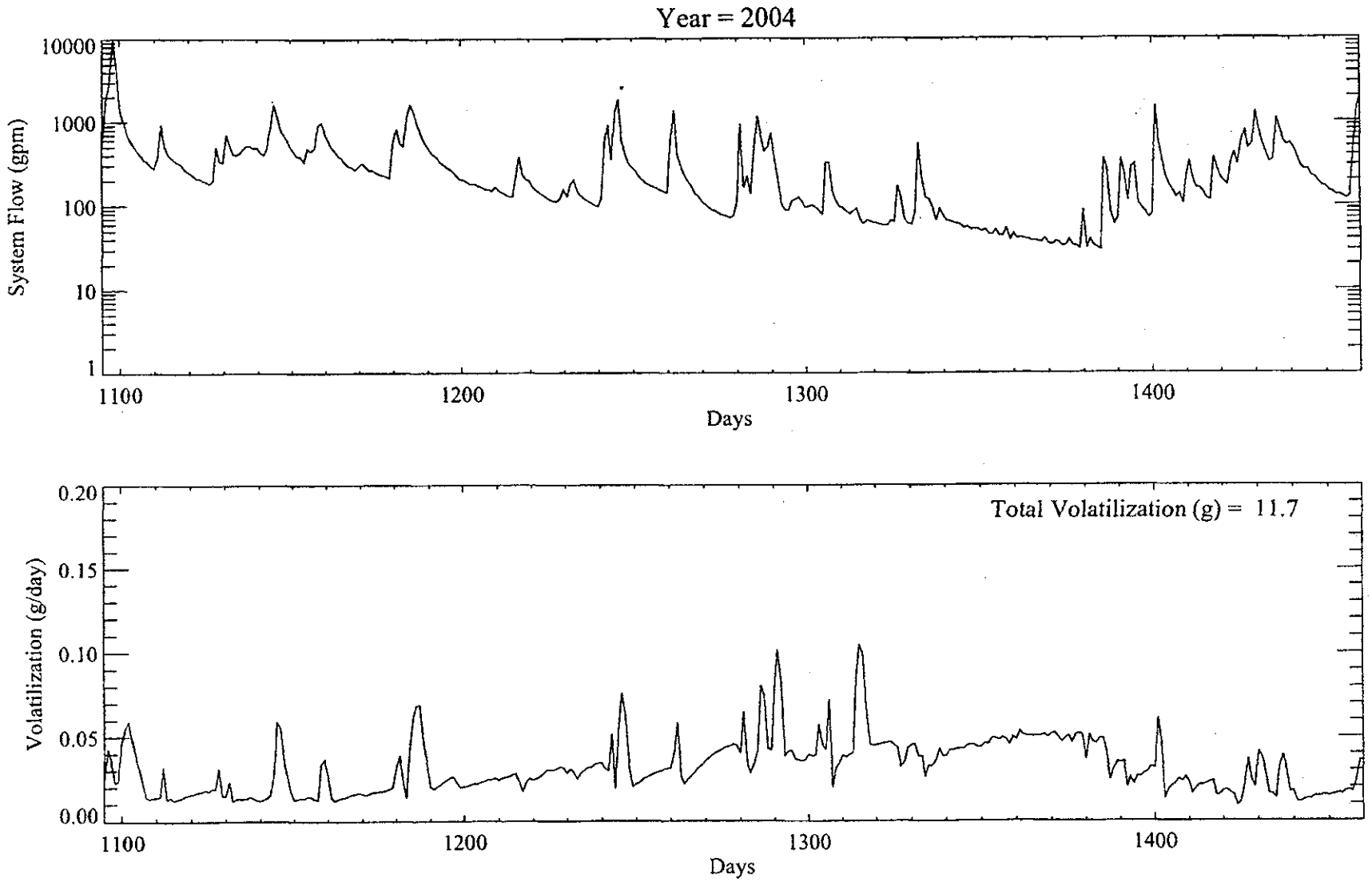

Figure 1d. Temporal profiles of flow and volatilization in Conard's Branch in 2004.

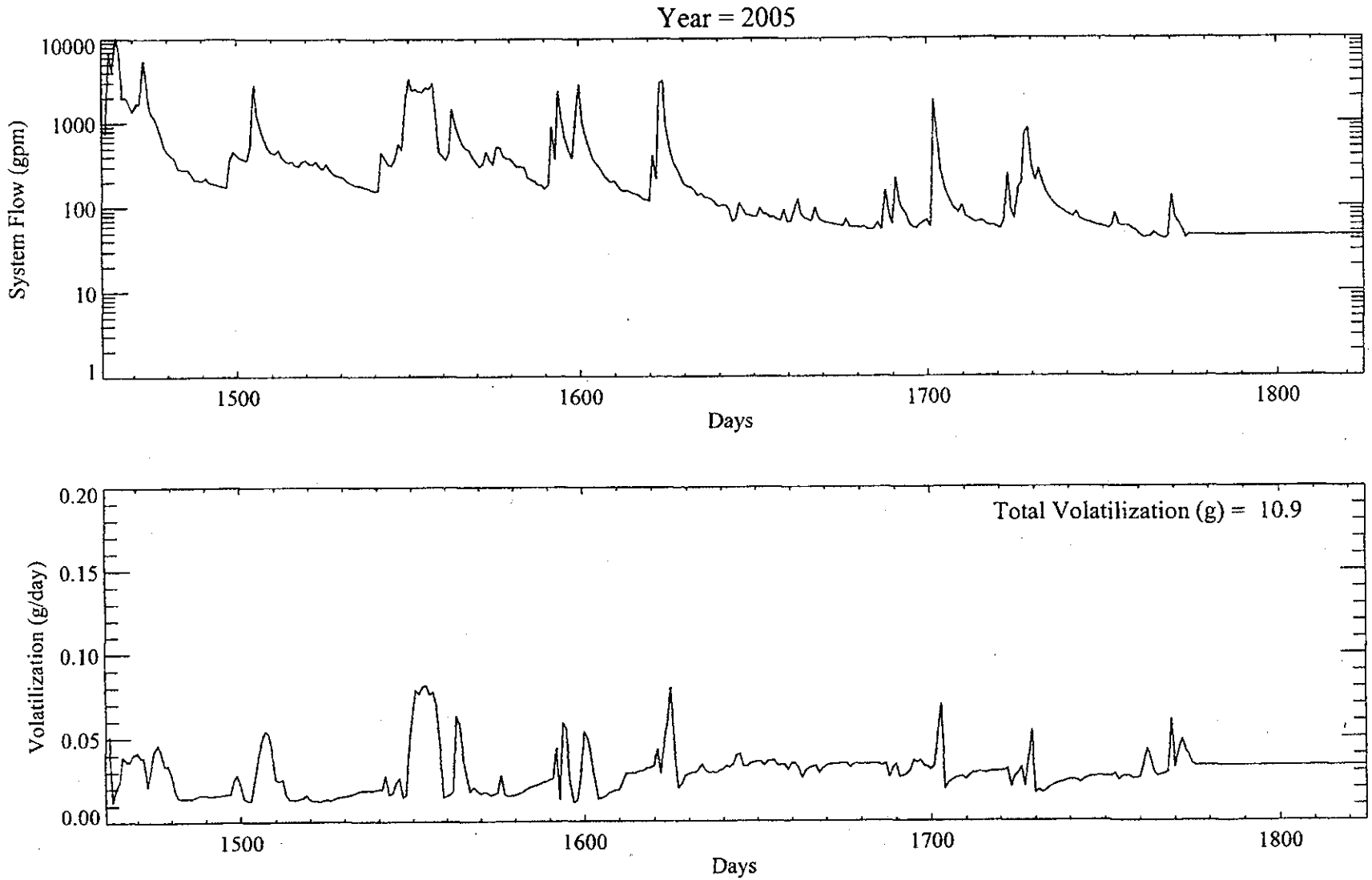

Figure 1e. Temporal profiles of flow and volatilization in Conard's Branch in 2005.

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ATTACHMENT 2

Table 1 – Revised Risk Summary
Table 2 – Revised Risk Summary
EPA's Revised Exposures, Risks, and Hazards
Human Health Risk Assessment
Tables A-1 through Table A-5
Neal's Landfill

TABLE 1

REVISED RISK SUMMARY[a]
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Pathway		Location[b]																	
		Conard's Branch[c]								Richland Creek[d]									
		South Spring		North Spring		Section Pre-A		Section A		Section B		Section C		Section D		Section E		Section F		Section G	
Fish Ingestion[e]	Pelagic	6.7E-06		6.7E-06		6.7E-06		6.7E-06		6.7E-06		6.7E-06		5.1E-06		5.1E-06		--		1.0E-05	
	Benthic	7.4E-06		7.4E-06		7.4E-06		7.4E-06		7.4E-06		7.4E-06		2.0E-06		2.0E-06		2.7E-06		4.6E-06	
Surface Water	Incidental Ingestion	6.3E-09		3.4E-09		4.7E-09		9.6E-10		1.8E-09		1.8E-09		1.1E-09		1.1E-09		--		--	
	Dermal Contact	2.9E-06		1.6E-06		2.7E-06		6.6E-07		2.0E-06		2.0E-06		1.5E-06		1.5E-06		--		--	
Sediment	Incidental Ingestion	6.7E-08		6.7E-08		6.7E-08		6.7E-08		7.3E-09		7.3E-09		4.3E-09		2.7E-09		3.6E-08		2.1E-08	
	Dermal Contact	6.0E-08		6.0E-08		6.0E-08		6.0E-08		6.5E-09		6.5E-09		3.9E-09		2.4E-09		3.2E-08		1.9E-08	
Bank Soil	Incidental Ingestion	8.4E-07		8.4E-07		8.4E-07		1.2E-07		3.6E-09		3.6E-09		2.4E-08		2.4E-08		--		--	
	Dermal Contact	4.7E-07		4.7E-07		4.7E-07		6.7E-08		2.0E-09		2.0E-09		1.3E-08		1.3E-08		--		--	
Floodplain Soil	Incidental Ingestion	3.0E-07		3.0E-07		3.0E-07		1.8E-07		5.6E-08		5.6E-08		--		--		--		--	
	Dermal Contact	1.7E-07		1.7E-07		1.7E-07		1.0E-07		3.1E-08		3.1E-08		--		--		--		--	
TOTALS - All[f]		2E-05	(80)	2E-05	(86)	2E-05	(81)	2E-05	(94)	2E-05	(87)	2E-05	(87)	9E-06	(82)	9E-06	(82)	3E-06	(98)	5E-06	(99)
TOTALS - No Fish		4E-06		2E-06		3E-06		9E-07		2E-06		2E-06		2E-06		2E-06		7E-08		4E-08	

Notes

-- = Not applicable

[a] See Attachment A for detailed receptor- and exposure pathway-specific calculations. All risk values presented are for adult receptors.

[b] See Figures 1, 2 and 3 for locations of Neal' Landfill (including South and North Springs), Conard's Branch (including Sections Pre-A and A), and Richland Creek (including Sections B through G).

[c] For exposure points in and along Conard's Branch (South and North Springs and Sections Pre-A and A), the totals were calculated as follows.

South Spring: Fish ingestion risks from the 1-mile site (Section C), surface water risks from South Spring, bank soil and floodplain soil risks from Section Pre-A, and sediment risks for Section A. Note: sediment, bank soil, and floodplain soil risks are each divided by a factor of 3 prior to summing to eliminate overestimation introduced by allowing 100 milligrams per day of each medium when considering each medium on its own.

North Spring: Fish ingestion risks from the 1-mile site (Section C), surface water risks from North Spring; bank soil and floodplain soil risks from Section Pre-A; and sediment risks for Section A. See note for South Spring.

Section Pre-A: Fish ingestion risks from the 1-mile site (Section C), surface water, bank soil, and floodplain soil risks from Section Pre-A; and sediment risks from Section A. See note for South Spring.

Section A: Fish ingestion risks from the 1-mile site (Section C), surface water, sediment, bank soil, and floodplain soil risks from Section A. See note for South Spring.

[d] For exposure points in Richland Creek (Sections B through G), the totals were calculated as follows.

Section B: Fish ingestion and surface water risks from the 1-mile site (Section C); sediment and floodplain soil risks from Section B; and bank soil risks from Section C. See note for South Spring.

Section C: Fish ingestion and surface water risks from the 1-mile site (Section C); sediment and floodplain soil risks from Section B; and bank soil risks from Section C. See note for South Spring.

Section D: Fish ingestion and surface water risks from the 3-mile site (Section E); sediment risks from Section D, bank soil risks from Section E; floodplain soil risks not evaluated for Section D. Note: sediment and bank soil risks are each divided by a factor of 2 prior to summing to eliminate overestimation introduced by allowing 100 milligrams per day of each medium when considering each medium on its own.

Section E: Fish ingestion and surface water risks from the 3-mile site (Section E); sediment and bank soil risks from Section E; floodplain soil risks not evaluated for Section E. See note for Section

Section F: Fish ingestion risks for the 5.5-mile site and sediment risks for Section F, bank soil, surface water, and floodplain soil risks not evaluated for Section F

Section G: Fish ingestion risks for the 12.7-mile site, sediment risk from Section G; surface water, bank soil, and floodplain soil risks not evaluated for Section G

[e] Risks presented represent polychlorinated biphenyl (PCB) risks calculated based on total PCBs.

[f] Value in parentheses represents the percent of total risk represented by risks associated with fish ingestion.

TABLE 2

REVISED HAZARD SUMMARY[a]
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Pathway		Location[b]																	
		Conard's Branch[c]								Richland Creek[d]									
		South Spring		North Spring		Section Pre-A		Section A		Section B		Section C		Section D		Section E		Section F	Section G
Fish Ingestion[e]	Pelagic	3 9E-01		3 9E-01		3 9E-01		3 9E-01		3 9E-01		3 9E-01		3 0E-01		3 0E-01		--	6 0E-01
	Benthic	4 3E-01		4 3E-01		4 3E-01		4 3E-01		4 3E-01		4 3E-01		1 2E-01		1 2E-01		1.6E-01	2 7E-01
Surface Water	Incidental Ingestion	3 7E-04		2 0E-04		2 7E-04		5 6E-05		1 0E-04		1 0E-04		6 6E-05		6 6E-05		--	--
	Dermal Contact	1 7E-01		9 2E-02		1 6E-01		3 8E-02		1 2E-01		1 2E-01		8 9E-02		8 9E-02		--	--
Sediment	Incidental Ingestion	3 9E-03		3 9E-03		3 9E-03		3 9E-03		4 3E-04		4 3E-04		2 5E-04		1 6E-04		2 1E-03	1 2E-02
	Dermal Contact	3 5E-03		3 5E-03		3 5E-03		3 5E-03		3 8E-04		3 8E-04		2 3E-04		1 4E-04		1 9E-03	2 0E-03
Bank Soil	Incidental Ingestion	4 9E-02		4 9E-02		4 9E-02		7 0E-03		2 1E-04		2.1E-04		1 4E-03		1 4E-03		--	--
	Dermal Contact	2 7E-02		2 7E-02		2 7E-02		3 9E-03		1 2E-04		1 2E-04		7 9E-04		7 9E-04		--	--
Floodplain Soil	Incidental Ingestion	1 8E-02		1 8E-02		1 8E-02		1 1E-02		3 3E-03		3 3E-03		--		--		--	--
	Dermal Contact	9 8E-03		9 8E-03		9 8E-03		5 9E-03		1 8E-03		1 8E-03		--		--		--	--
TOTALS - All[f]		1 0E+00	(80)	9 5E-01	(86)	1 0E+00	(81)	8 7E-01	(94)	9 4E-01	(87)	9 4E-01	(87)	5 1E-01	(82)	5 1E-01	(82)	1.6E-01 (98)	8.9E-01 (98)
TOTALS - No Fish		2 1E-01		1 3E-01		1 9E-01		5 0E-02		1 2E-01		1 2E-01		9 1E-02		9 1E-02		4 0E-03	1 3E-02

Notes

-- = Not calculated

a See Attachment A for detailed receptor- and exposure pathway-specific calculations All hazard values presented are for adult receptors

b See Figures 1, 2 and 3 for locations of Neal' Landfill (including South and North Springs), Conard's Branch (including Sections Pre-A and A), and Richland Creek (including Sections B through G)

c For exposure points in and along Conard's Branch (South and North Springs and Sections Pre-A and A), the totals were calculated as follows

South Spring: Fish ingestion hazards from the 1-mile site (Section C), surface water hazards from South Spring, bank soil and floodplain soil hazards from Section Pre-A, and sediment hazards for Section A Note sediment, bank soil, and floodplain soil hazards are each divided by a factor of 3 prior to summing to eliminate overestimation introduced by allowing 100 milligrams per day of each medium when considering each medium on its own

North Spring: Fish ingestion hazards from the 1-mile site (Section C), surface water hazards from North Spring, bank soil and floodplain soil hazards from Section Pre-A, and sediment hazards for Section A See note for South Spring

Section Pre-A: Fish ingestion hazards from the 1-mile site (Section C), surface water, bank soil, and floodplain soil hazards from Section Pre-A, and sediment hazards from Section A See note for South Spring

Section A: Fish ingestion hazards from the 1-mile site (Section C), and surface water, bank soil, and floodplain soil, and sediment hazards from Section A

d For exposure points in and along Richland Creek (Sections B through G), the totals were calculated as follows

Section B: Fish ingestion and surface water hazards from the 1-mile site (Section C), sediment and floodplain soil hazards from Section B, and bank soil hazards from Section C See note for South Spring

Section C: Fish ingestion and surface water hazards from the 1-mile site (Section C), sediment and floodplain soil hazards from Section B, and bank soil hazards from Section C See note for South Spring

Section D: Fish ingestion and surface water hazards from the 3-mile site (Section E), sediment hazards from Section D, bank soil hazards from Section E, floodplain soil hazards not evaluated for Section D Note sediment and bank soil hazards are each divided by a factor of 2 prior to summing to eliminate overestimation introduced by allowing 100 milligrams per day of each medium when considering each medium on its own

Section E: Fish ingestion and surface water hazards from the 3-mile site (Section E), and sediment and bank soil hazards from Section E, floodplain soil hazards not evaluated for Section E See note for Section D

Section F: Fish ingestion hazards for the 5 5-mile site and sediment hazards for Section F, bank soil, surface water, and floodplain soil hazards not evaluated for Section F

Section G: Fish ingestion hazards for the 12 7-mile site, surface water, sediment, bank soil, and floodplain soil hazards not evaluated for Section G

e Hazards presented represent polychlorinated biphenyl (PCB) hazards calculated based on total PCBs

f Value in parentheses represents the percent of total hazard represented by hazards associated with fish ingestion

TABLE A-1

REVISED GENERAL AND CHEMICAL-SPECIFIC EXPOSURE PARAMETER VALUES
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

General Exposure Parameters					
			Values		
Exposure Parameter	Acronym	Units	Adult (18+)	Youth (7 to 18)	Child (1 to 6)
Exposure Point Concentrations	EPC	varies	Location Specific		
Exposure Frequency (sw, sed, bks, fs) (NS, SS, Pre-A, A)	EF_{bks}, and EF_{fs}	days/year	20	20	20
Exposure Frequency (sw, sed, bks, fs) (Sections B, C, and D)	EF_{sw}		68	68	68
	EF_{sed}		68	68	68
	EF_{bks}		76	76	76
	EF_{fs}	days/year	76	76	76
Exposure Frequency (sw, sed, bks, fs) (Sections E, F, and G)	EF_{sw}, EF_{sed}, EF_{bks}, and EF_{fs}	days/year	30	30	30
Exposure Frequency (aquatic life)	EF_{al}	days/year	365	365	365
Exposure Duration	ED	years	30	12	6
Body Weight	BW	kg	70	47	15
Ingestion Rate (aquatic life)	IR_{al}	kg/day	see below	NA	NA
Ingestion Rate (sediment and soil)	IR_{sed} and IR_{soil}	mg/day	100	100	200
Ingestion Rate (surface water)	IR_{sw}	L/day	7.50E-03	1.50E-02	1.50E-02
Cooking Reaction Factor	CRF	unitless	0.5	0.5	0.5
Skin Surface Area (sediment)	SA_{sed}	cm^2	2129	1640	809
Skin Surface Area (soil)	SA_{soil}	cm^2	5700	4373	2378
Skin Surface Area (surface water)	SA_{sw}	cm^2	Location Specific		
Adherence Factor (sediment)	AF_{sed}	mg/cm^2	0.3	0.3	0.3
Adherence Factor (soil)	AF_{soil}	mg/cm^2	0.07	0.2	0.2
Dermal Absorption	ABS	unitless	Chemical Specific		
Absorbed Dose per Event	DA_{event}	mg/cm^2-event	Chemical Specific		
Exposure Time	ET	hr/day	1	1	1
Event Frequency	EV	event/day	1	1	1
Fraction Contaminated - Soil	FC	unitless	0.5	0.5	0.5
Conversion Factor 1	CF1	mg/ng	1.00E-06	1.00E-06	1.00E-06
Conversion Factor 2	CF2	mg/µg	1.00E-03	1.00E-03	1.00E-03
Conversion Factor 3	CF3	kg/mg	1.00E-06	1.00E-06	1.00E-06
Averaging Time (carcinogens)	AT_c	days	25550	25550	25550
Averaging Time (noncarcinogens)	AT_{nc}	days	10950	4380	2190
Gastrointestinal Absorption	GI	unitless	Chemical Specific		
Chronic Oral Exposure Reference Dose	RfD	mg/kg-day	Chemical Specific		
Oral Slope Factor	SF	$(mg/kg\text{-}day)^{-1}$	Chemical Specific		

TABLE A-1

REVISED GENERAL AND CHEMICAL-SPECIFIC EXPOSURE PARAMETER VALUES
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Chemical Specific Values[a]									
	Values								
Chemical	ABS	FA	K_p	C_w	τ_{event}	t_{event}	GI	RfD[b]	SF[b]
PCB	0.14	0.5	4.30E-01	see note	11.29	2	0.8 to .96	2.00E-05	2
TEQ	--	--	--	--	--	--	0.5 to 0.83	1.00E-09	1.50E+05
$TEQ_{EPA\ alternate}$	--	--	--	--	--	--	--	--	1.00E+06

C_w = This concentration is the EPC_{sw} in units of mg/cm^3.

[a] PCB-specific exposure factors were obtained from EPA's RAGS Part E (EPA 2004a).

[b] PCB-specific toxicity factors were identified as discussed in Sections 4.2.2 and 4.3.2 of the draft HHRA (Tetra Tech 2006).

Ingestion Rate of Aquatic Life					
			Values		
Rate	Fish Type	units	Adult (18+)	Youth (7 to 18)	Child (1 to 6)
1 - Mile	Pelagic	kg/day	0.0060	--	--
	Benthic	kg/day	0.0015	--	--
3 - Mile	Pelagic	kg/day	0.0073	--	--
	Benthic	kg/day	0.0018	--	--
5.5 - Mile	Pelagic	kg/day	0.0092	--	--
	Benthic	kg/day	0.0023	--	--
12.7 - Mile	Pelagic	kg/day	0.0183	--	--
	Benthic	kg/day	0.0046	--	--

Skin Surface Area (surface water) Location Specific Values				
		Values		
Location	units	Adult (18+)	Youth (7 to 18)	Child (1 to 6)
South Spring	cm^2	1225	949	451
North Spring	cm^2	1225	949	451
Pre-A	cm^2	1521	1352	776
A	cm^2	1818	1754	939
B	cm^2	2410	2157	1101
C	cm^2	3595	2559	1101
D	cm^2	3595	2559	1101
E	cm^2	3595	2559	1101
F	cm^2	3595	2559	2284
G	cm^2	--	--	--
1 - Mile	cm^2	3002.5	2358	1101
3 - Mile	cm^2	3595	2559	1101

TABLE A-1

REVISED GENERAL AND CHEMICAL-SPECIFIC EXPOSURE PARAMETER VALUES
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Notes:

ABS	=	Dermal absorption factor (unitless)
Cw	=	Chemical concentration in water - this concentration is equivalent to the location-specific surface water exposure point concentration (EPA) (see Table A-2) in units of milligrams per cubic meter (mg/cm^3).
FA	=	Fraction absorbed water (unitless)
GI	=	Gastrointestinal absorption (unitless)
K_p	=	Dermal permeability coefficient in water (centimeter per hour [cm/hr])
PCB	=	Polychlorinated biphenyl
RfD	=	Oral reference dose (milligram per kilogram - day [mg/kg-day])
SF	=	Oral slope factor $(mg/kg\text{-}day)^{-1}$
T_{event}	=	Lag time per event (hour per event [hr/event])
t_{event}	=	Event duration (hour per event [hr/event])
TEQ	=	Toxicity equivalent

TABLE A-2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATIONS
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Exposure Point Concentrations[a]								
		Values						
Location[b]	Chemical	$EPC_{al(pelagic)}$ (ug/kg-PCB/ng/kg-TEQ)	$EPC_{al(benthic)}$ (ug/kg-PCB/ng/kg-TEQ)	EPC_{sw} (mg/L)	DA_{event} (mg/cm^2-event)	EPC_{sed} (mg/kg)	EPC_{bs} (mg/kg)	EPC_{fs} (mg/kg)
South Spring	PCB	--	--	1.25E-03	3.53E-06	--	--	--
North Spring	PCB	--	--	6.76E-04	1.91E-06	--	--	--
Pre-A	PCB	--	--	9.28E-04	2.62E-06	--	12.5	4.5
A	PCB	--	--	1.91E-04	5.39E-07	1	1.8	2.7
B	PCB	--	--	--	--	3.20E-02	--	2.20E-01
C	PCB	--	--	--	--	--	1.40E-02	--
D	PCB	--	--	--	--	1.90E-02	--	--
E	PCB	--	--	--	--	2.70E-02	2.40E-01	--
F	PCB	--	--	--	--	3.60E-01	--	--
G	PCB	--	--	--	--	2.10E-01	--	--
1 - Mile	PCB	182	808	1.04E-04	2.94E-07	--	--	--
	TEQ	3.0	10.2	--	--	--	--	--
3 - Mile	PCB	114.8	182.8	1.50E-04	4.24E-07	--	--	--
	TEQ	1.0	1.4	--	--	--	--	--
5.5 - Mile	PCB	--	192	--	--	--	--	--
	TEQ	--	2.3	--	--	--	--	--
12.7 - Mile	PCB	92	165	--	--	--	--	--
	TEQ	--	--	--	--	--	--	--

Notes:

--	=	Not applicable
ug/kg	=	Microgram per kilogram
mg/kg	=	Milligram per kilogram
mg/L	=	Milligram per liter
ng/kg	=	Nanogram per kilogram
PCB	=	Polychlorinated biphenyl
TEQ	=	Toxicity equivalent

[a] Medium-specific EPC calculations are discussed in Section 3.3.1 and presented in Appendix A of the draft HHRA (Tetra Tech 2006).

[b] See Figures 1, 2, and 3 in the draft HHRA (Tetra Tech 2006).

TABLE 4-3

REVISED FISH INGESTION RISKS AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Location	Fish	PCB				TCDD TEQ				
		ADD	Hazard	LADD	Risk	ADD	Hazard	LADD	Risk	$Risk_{EPA\ Alt}$
Adult (18 or more years old)										
1 - Mile	Pelagic	7.8E-06	3.9E-01	3.3E-06	6.7E-06	1.3E-10	1.3E-01	5.5E-11	8.3E-06	5.5E-05
	Benthic	8.7E-06	4.3E-01	3.7E-06	7.4E-06	1.1E-10	1.1E-01	4.7E-11	7.0E-06	4.7E-05
3 - Mile	Pelagic	6.0E-06	3.0E-01	2.6E-06	5.1E-06	5.2E-11	5.2E-02	2.2E-11	3.4E-06	2.2E-05
	Benthic	2.4E-06	1.2E-01	1.0E-06	2.0E-06	1.8E-11	1.8E-02	7.7E-12	1.2E-06	7.7E-06
5.5 - Mile	Pelagic	--	--	--	--	--	--	--	--	--
	Benthic	3.2E-06	1.6E-01	1.4E-06	2.7E-06	3.8E-11	3.8E-02	1.6E-11	2.4E-06	1.6E-05
12.7 - Mile	Pelagic	1.2E-05	6.0E-01	5.2E-06	1.0E-05	--	--	--	--	--
	Benthic	5.4E-06	2.7E-01	2.3E-06	4.6E-06	--	--	--	--	--

Notes:

-- = Not calculated
ADD = Average daily dose (mg/kg-day)
LADD = Lifetime average daily dose (mg/kg-day)
mg/kg-day = Milligram per kilogram per day
PCB = Polychlorinated biphenyl
TCDD = Tetrachloro-p-dioxin
TEQ = Toxicity equivalent
$Risk_{EPA\ Alt}$ = U.S. Environmental Protection Agency's alternative TCDD slope factor (see Section 4.2.2).

TABLE A-4

REVISED SURFACE WATER RISKS AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Location	Chemical	Ingestion				Dermal Contact			
		ADD	Hazard	LADD	Risk	ADD	Hazard	LADD	Risk
Adult (18 or more years old)									
South Spring	PCB	7.3E-09	3.7E-04	3.1E-09	6.3E-09	3.4E-06	1.7E-01	1.5E-06	2.9E-06
North Spring	PCB	4.0E-09	2.0E-04	1.7E-09	3.4E-09	1.8E-06	9.2E-02	7.8E-07	1.6E-06
Pre-A	PCB	5.4E-09	2.7E-04	2.3E-09	4.7E-09	3.1E-06	1.6E-01	1.3E-06	2.7E-06
A	PCB	1.1E-09	5.6E-05	4.8E-10	9.6E-10	7.7E-07	3.8E-02	3.3E-07	6.6E-07
B	PCB	--	--	--	--	--	--	--	--
C	PCB	--	--	--	--	--	--	--	--
D	PCB	--	--	--	--	--	--	--	--
E	PCB	--	--	--	--	--	--	--	--
F	PCB	--	--	--	--	--	--	--	--
G	PCB	--	--	--	--	--	--	--	--
1 - Mile	PCB	2.1E-09	1.0E-04	8.9E-10	1.8E-09	2.3E-06	1.2E-01	1.0E-06	2.0E-06
3 - Mile	PCB	1.3E-09	6.6E-05	5.7E-10	1.1E-09	1.8E-06	8.9E-02	7.7E-07	1.5E-06
Youth (7 to 18 years old)									
South Spring	PCB	2.2E-08	1.1E-03	3.7E-09	7.5E-09	3.9E-06	2.0E-01	6.7E-07	1.3E-06
North Spring	PCB	1.2E-08	5.9E-04	2.0E-09	4.1E-09	2.1E-06	1.1E-01	3.6E-07	7.2E-07
Pre-A	PCB	1.6E-08	8.1E-04	2.8E-09	5.6E-09	4.1E-06	2.1E-01	7.1E-07	1.4E-06
A	PCB	3.3E-09	1.7E-04	5.7E-10	1.1E-09	1.1E-06	5.5E-02	1.9E-07	3.8E-07
B	PCB	--	--	--	--	--	--	--	--
C	PCB	--	--	--	--	--	--	--	--
D	PCB	--	--	--	--	--	--	--	--
E	PCB	--	--	--	--	--	--	--	--
F	PCB	--	--	--	--	--	--	--	--
G	PCB	--	--	--	--	--	--	--	--
1 - Mile	PCB	2.7E-09	1.4E-04	4.7E-10	9.4E-10	1.2E-06	6.1E-02	2.1E-07	4.2E-07
3 - Mile	PCB	3.9E-09	2.0E-04	6.7E-10	1.3E-09	1.9E-06	9.5E-02	3.2E-07	6.5E-07
Child (1 to 6 years old)									
South Spring	PCB	6.8E-08	3.4E-03	5.9E-09	1.2E-08	5.8E-06	2.9E-01	5.0E-07	1.0E-06
North Spring	PCB	3.7E-08	1.9E-03	3.2E-09	6.3E-09	3.1E-06	1.6E-01	2.7E-07	5.4E-07
Pre-A	PCB	5.1E-08	2.5E-03	4.4E-09	8.7E-09	7.4E-06	3.7E-01	6.4E-07	1.3E-06
A	PCB	1.0E-08	5.2E-04	9.0E-10	1.8E-09	1.9E-06	9.3E-02	1.6E-07	3.2E-07
B	PCB	--	--	--	--	--	--	--	--
C	PCB	--	--	--	--	--	--	--	--
D	PCB	--	--	--	--	--	--	--	--
E	PCB	--	--	--	--	--	--	--	--
F	PCB	--	--	--	--	--	--	--	--
G	PCB	--	--	--	--	--	--	--	--
1 - Mile	PCB	8.5E-09	4.3E-04	7.3E-10	1.5E-09	1.8E-06	8.9E-02	1.5E-07	3.0E-07
3 - Mile	PCB	1.2E-08	6.2E-04	1.1E-09	2.1E-09	2.6E-06	1.3E-01	2.2E-07	4.4E-07

Notes:

-- = Not calculated
ADD = Average daily dose (mg/kg-day)
LADD = Lifetime average daily dose (mg/kg-day)
mg/kg-day = Milligram per kilogram per day
PCB = Polychlorinated biphenyl

TABLE A-5

REVISED SEDIMENT AND SOIL EXPOSURES, RISKS, AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Location	Type	Chemical	Ingestion				Dermal Contact			
			ADD	Hazard	LADD	Risk	ADD	Hazard	LADD	Risk
Adult (18 or more years old)										
Pre-A	Bank Soil	PCB	9.8E-07	4.9E-02	4.2E-07	8.4E-07	5.5E-07	2.7E-02	2.3E-07	4.7E-07
	Floodplain Soil	PCB	3.5E-07	1.8E-02	1.5E-07	3.0E-07	2.0E-07	9.8E-03	8.4E-08	1.7E-07
A	Sediment	PCB	7.8E-08	3.9E-03	3.4E-08	6.7E-08	7.0E-08	3.5E-03	3.0E-08	6.0E-08
	Bank Soil	PCB	1.4E-07	7.0E-03	6.0E-08	1.2E-07	7.9E-08	3.9E-03	3.4E-08	6.7E-08
	Floodplain Soil	PCB	2.1E-07	1.1E-02	9.1E-08	1.8E-07	1.2E-07	5.9E-03	5.1E-08	1.0E-07
B	Sediment	PCB	8.5E-09	4.3E-04	3.6E-09	7.3E-09	7.6E-09	3.8E-04	3.3E-09	6.5E-09
	Floodplain Soil	PCB	6.5E-08	3.3E-03	2.8E-08	5.6E-08	3.7E-08	1.8E-03	1.6E-08	3.1E-08
C	Sediment	PCB	--	--	--	--	--	--	--	--
	Bank Soil	PCB	4.2E-09	2.1E-04	1.8E-09	3.6E-09	2.3E-09	1.2E-04	1.0E-09	2.0E-09
D	Sediment	PCB	5.1E-09	2.5E-04	2.2E-09	4.3E-09	4.5E-09	2.3E-04	1.9E-09	3.9E-09
	Bank Soil	PCB	--	--	--	--	--	--	--	--
E	Sediment	PCB	3.2E-09	1.6E-04	1.4E-09	2.7E-09	2.8E-09	1.4E-04	1.2E-09	2.4E-09
	Bank Soil	PCB	2.8E-08	1.4E-03	1.2E-08	2.4E-08	1.6E-08	7.9E-04	6.7E-09	1.3E-08
F	Sediment	PCB	4.2E-08	2.1E-03	1.8E-08	3.6E-08	3.8E-08	1.9E-03	1.6E-08	3.2E-08
	Bank Soil	PCB	--	--	--	--	--	--	--	--
G	Sediment	PCB	2.5E-08	1.2E-03	1.1E-08	2.1E-08	2.2E-08	1.1E-03	9.4E-09	1.9E-08
	Bank Soil	PCB	--	--	--	--	--	--	--	--
Youth (7 to 18 years old)										
Pre-A	Bank Soil	PCB	1.5E-06	7.3E-02	2.5E-07	5.0E-07	1.8E-06	8.9E-02	3.1E-07	6.1E-07
	Floodplain Soil	PCB	5.2E-07	2.6E-02	9.0E-08	1.8E-07	6.4E-07	3.2E-02	1.1E-07	2.2E-07
A	Sediment	PCB	1.2E-07	5.8E-03	2.0E-08	4.0E-08	8.0E-08	4.0E-03	1.4E-08	2.8E-08
	Bank Soil	PCB	2.1E-07	1.0E-02	3.6E-08	7.2E-08	2.6E-07	1.3E-02	4.4E-08	8.8E-08
	Floodplain Soil	PCB	3.1E-07	1.6E-02	5.4E-08	1.1E-07	3.9E-07	1.9E-02	6.6E-08	1.3E-07
B	Sediment	PCB	1.3E-08	6.3E-04	2.2E-09	4.3E-09	8.7E-09	4.4E-04	1.5E-09	3.0E-09
	Floodplain Soil	PCB	9.7E-08	4.9E-03	1.7E-08	3.3E-08	1.2E-07	6.0E-03	2.0E-08	4.1E-08
C	Sediment	PCB	--	--	--	--	--	--	--	--
	Bank Soil	PCB	6.2E-09	3.1E-04	1.1E-09	2.1E-09	7.6E-09	3.8E-04	1.3E-09	2.6E-09
D	Sediment	PCB	7.5E-09	3.8E-04	1.3E-09	2.6E-09	5.2E-09	2.6E-04	8.9E-10	1.8E-09
	Bank Soil	PCB	--	--	--	--	--	--	--	--
E	Sediment	PCB	4.7E-09	2.4E-04	8.1E-10	1.6E-09	3.3E-09	1.6E-04	5.6E-10	1.1E-09
	Bank Soil	PCB	4.2E-08	2.1E-03	7.2E-09	1.4E-08	5.1E-08	2.6E-03	8.8E-09	1.8E-08
F	Sediment	PCB	0.0E+00	0.0E+00	1.1E-08	2.2E-08	4.3E-08	2.2E-03	7.4E-09	1.5E-08
	Bank Soil	PCB	--	--	--	--	--	--	--	--
G	Sediment	PCB	3.7E-08	1.8E-03	6.3E-09	1.3E-08	2.5E-08	1.3E-03	4.3E-09	8.7E-09
	Bank Soil	PCB	--	--	--	--	--	--	--	--

REVISED SEDIMENT AND SOIL EXPOSURES, RISKS, AND HAZARDS
HUMAN HEALTH RISK ASSESSMENT
NEAL'S LANDFILL
BLOOMINGTON, MONROE COUNTY, INDIANA

Location	Type	Chemical	Ingestion				Dermal Contact			
			ADD	Hazard	LADD	Risk	ADD	Hazard	LADD	Risk
Child (1 to 6 years old)										
Pre-A	Bank Soil	PCB	9.1E-06	4.6E-01	7.8E-07	1.6E-06	3.0E-06	1.5E-01	2.6E-07	5.2E-07
	Floodplain Soil	PCB	3.3E-06	1.6E-01	2.8E-07	5.6E-07	1.1E-06	5.5E-02	9.4E-08	1.9E-07
A	Sediment	PCB	7.3E-07	3.7E-02	6.3E-08	1.3E-07	1.2E-07	6.2E-03	1.1E-08	2.1E-08
	Bank Soil	PCB	1.3E-06	6.6E-02	1.1E-07	2.3E-07	4.4E-07	2.2E-02	3.8E-08	7.5E-08
	Floodplain Soil	PCB	2.0E-06	9.9E-02	1.7E-07	3.4E-07	6.6E-07	3.3E-02	5.6E-08	1.1E-07
B	Sediment	PCB	7.9E-08	4.0E-03	6.8E-09	1.4E-08	1.4E-08	6.8E-04	1.2E-09	2.3E-09
	Floodplain Soil	PCB	6.1E-07	3.1E-02	5.2E-08	1.0E-07	2.0E-07	1.0E-02	1.7E-08	3.5E-08
C	Sediment	PCB	--	--	--	--	--	--	--	--
	Bank Soil	PCB	3.9E-08	1.9E-03	3.3E-09	6.7E-09	1.3E-08	6.5E-04	1.1E-09	2.2E-09
D	Sediment	PCB	4.7E-08	2.4E-03	4.0E-09	8.1E-09	8.0E-09	4.0E-04	6.9E-10	1.4E-09
	Bank Soil	PCB	--	--	--	--	--	--	--	--
E	Sediment	PCB	3.0E-08	1.5E-03	2.5E-09	5.1E-09	5.0E-09	2.5E-04	4.3E-10	8.6E-10
	Bank Soil	PCB	2.6E-07	1.3E-02	2.3E-08	4.5E-08	8.8E-08	4.4E-03	7.5E-09	1.5E-08
F	Sediment	PCB	3.9E-07	2.0E-02	3.4E-08	6.8E-08	6.7E-08	3.4E-03	5.7E-09	1.1E-08
	Bank Soil	PCB	--	--	--	--	--	--	--	--
G	Sediment	PCB	2.3E-07	1.2E-02	2.0E-08	3.9E-08	3.9E-08	2.0E-03	3.4E-09	6.7E-09
	Bank Soil	PCB	--	--	--	--	--	--	--	--

Notes:

-- = Not calculated
ADD = Average daily dose (mg/kg-day)
LADD = Lifetime average daily dose (mg/kg-day)
mg/kg-day = Milligram per kilogram per day
PCB = Polychlorinated biphenyl

ATTACHMENT 3

Age structure and growth of *Semotilus atromaculatus* (Mitchill) in PCB-contaminated streams

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Age structure and growth of *Semotilus atromaculatus* (Mitchill) in PCB-contaminated streams

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Creek chub *Semotilus atromaculatus* from two PCB contaminated streams (Clear Creek and Richland Creek) at three locations and a reference stream (Little Indian Creek), Indiana, U.S.A., were examined to determine if age class structure and growth variables were correlated with *in-situ* PCB exposure. Approximately five to 15 fish were captured weekly during the spring spawning season and monthly thereafter for a 12 month period. Fish collected ranged from 25 to 267 mm total length (L_T). Throughout the course of this study, no spawning activity was observed at either location in Clear Creek, although some very small young-of-the-year (YOY) creek chub fry were observed at the downstream location by late summer. Creek chub nests were observed in both Richland Creek and Little Indian Creek but YOY were common only in Little Indian Creek. Exposure to PCBs was shown to both enhance and decrease growth in varied laboratory tests; subtle but significant gender-specific differences in the growth of creek chub populations between the sites were observed. Creek chub up to 24 months in age from Clear Creek and Richland Creek were significantly larger (both L_T and mass for males and L_T for females) than reference site creek chub. This trend was reversed for creek chub aged ≥24 months as the reference site fish were consistently larger with reference males weighing significantly more. Older age classes of creek chub were missing in areas of higher PCB contamination. Female population growth rates and individual instantaneous growth rates were consistently higher at the reference site in comparison to the PCB-contaminated sites. Calculation of 'functional *b*' (as a condition factor) did indicate that growth enhancement in young males did occur at the most contaminated site and reductions in growth (mass relative to L_T) occurred in females from all contaminated sites. Furthermore, long-term survivorship for females was reduced in the PCB-contaminated streams. All of these subtle alterations in growth would not have been observed if males and females had not been analysed separately.

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Key words: age structure; growth; PCBs; *Semotilus atromaculatus*; sex differences.

INTRODUCTION

The first decade of laboratory research on the effects of commercial mixtures of polychlorinated biphenyls (PCBs) on aquatic organisms focused on classical toxicity testing (Hansen *et al.*, 1974*a*, *b*, 1975; Nebeker & Puglisi, 1974;

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Nebeker *et al.*, 1974; Schimmel *et al.*, 1974; DeFoe *et al.*, 1978). As part of these studies, both growth enhancement and growth reduction were often observed (Nebeker *et al.*, 1974; Hansen *et al.*, 1976; DeFoe *et al.*, 1978; Mauck *et al.*, 1978; Bengtsson, 1980; Mac & Seelye, 1981*a*, *b*). Growth reduction has been typically identified as 'wasting away' leading to death (Halter & Johnson, 1974; Bengtsson, 1980; Cleland *et al.*, 1988). Bengtsson (1979) stated that artificially stimulated growth is not a benefit, rather it is an adverse effect. Although he did not understand the underlying mechanism of this growth enhancement, Bengtsson (1979) noted that thyroid hormones regulate fish growth. Much research has documented that PCBs alter thyroid hormone (T) levels in a variety of fish species (Mayer *et al.*, 1977; Leatherland *et al.*, 1978; Fingerman & Russell, 1980; Besselink *et al.*, 1996; Palace *et al.*, 2001; Brown *et al.*, 2004) although the pattern of whether T_3 or T_4 is more affected, and the dynamic changes in response to dose and over time seems to be complex and variable by species.

Great strides have been made in understanding the sublethal effects of PCBs in the past 25 years including the relationship between the toxicity of dioxin (Walker *et al.*, 1991, 1994; Wright & Tillitt, 1999) and the dioxin-like properties of some congeners of PCBs (Ankley *et al.*, 1991; Van den Berg *et al.*, 1998). The main focus of this research effort, however, has been on reproductive success and the mode of toxicity of dioxin and dioxin-like PCBs (Cantrell *et al.*, 1998*a*, *b*; Thomas, 1999). Perhaps this is due in part to Niimi (1992) who concluded that there are no acutely toxic problems associated with environmental concentrations of PCBs because fishes do not accumulate lethal concentrations of PCBs anymore. While this generalization may be accurate for most of North America, given the lack of in-depth field studies present in the literature, this position is questionable. More recently, Black *et al.* (1998*a*, *b*) not only documented reproductive effects in mummichog *Fundulus heteroclitus* (L.) from the New Bedford Harbor Superfund site (MA, U.S.A.), but also documented reduced survivorship in older females which correlated with total PCB concentrations. Subtle but serious effects can still be found in field situations and in the laboratory at environmentally relevant PCB concentrations (Monosson *et al.*, 1994). A comprehensive investigation of creek chub *Semotilus atromaculatus* (Mitchell) was initiated because it is common throughout eastern North America and is known to be present in many streams in Indiana that are highly contaminated with PCBs (IDEM, 2004). The objective of the study seek was to determine if age class structure and growth endpoints are sensitive indicators of adverse impacts relative to ambient PCB concentrations.

MATERIALS AND METHODS

SITE DESCRIPTION

Lemon Lane Landfill (LL) and Neal's Landfill (NL) are National Priorities List (Superfund) sites located in Monroe County, Indiana, U.S.A. Creek chub were collected from Clear Creek (CC) at two locations downstream of the primary discharge of PCB-contaminated groundwater emanating from LL. Clear Creek 1

(CC1; drainage area 5·96 km^2; 39° 10′ N; 86° 33′ W) was located 1400 m downstream and CC2 (drainage area 16·32 km^2; 39° 9′ N; 86° 32′ W) was located 3100 m downstream of the LL discharge springs. Conard's Branch and Richland Creek (CB) (drainage area 8·03 km^2; 39° 11′ N; 86° 39′ W) were also sampled *c.* 800 m downstream of the primary discharge of PCB-contaminated groundwater emanating from NL. The reference site for the study was on Little Indian Creek (LI; 39°0 N; 86° 41′ W) just upstream of its confluence with Indian Creek (drainage area 27·45 km^2). All four sites are in the White River drainage, Monroe County, Indiana, U.S.A. (Fig. 1). Some qualitative habitat characteristics for these sites are given in Table I. Over the course of many years, hundreds of samples have been collected from these study sites and chemically analysed for hazardous substances, including PCBs. Sample types included: groundwater at the source spring, ambient surface water at various downstream locations, sediment and whole creek chub (Table II). It was clear from the data collected that PCBs were the only significant bioaccumulating contaminant of concern at CC1, CC2 and CB study sites (ISDH, 1994). Only very low concentrations of PCBs are found in fish at LI, confirming that this site is suitable to represent background conditions for south-western Indiana.

EXPERIMENTAL DESIGN AND FIELD COLLECTION

Monthly collection, of five to 15 individual creek chub were conducted between April 1999 and April 2000 at all sites, usually within 24 h, during daylight hours using a battery back-pack pulsed-DC electrofishing unit capable of 2–3 A output. Fish were collected weekly during reproductive time (April to June) periods and semi-monthly during non-reproductive periods (July to March). Fish were collected and placed into a live well until the conclusion of the sampling zone. Creek chub were preserved in 10% formalin for future laboratory work.

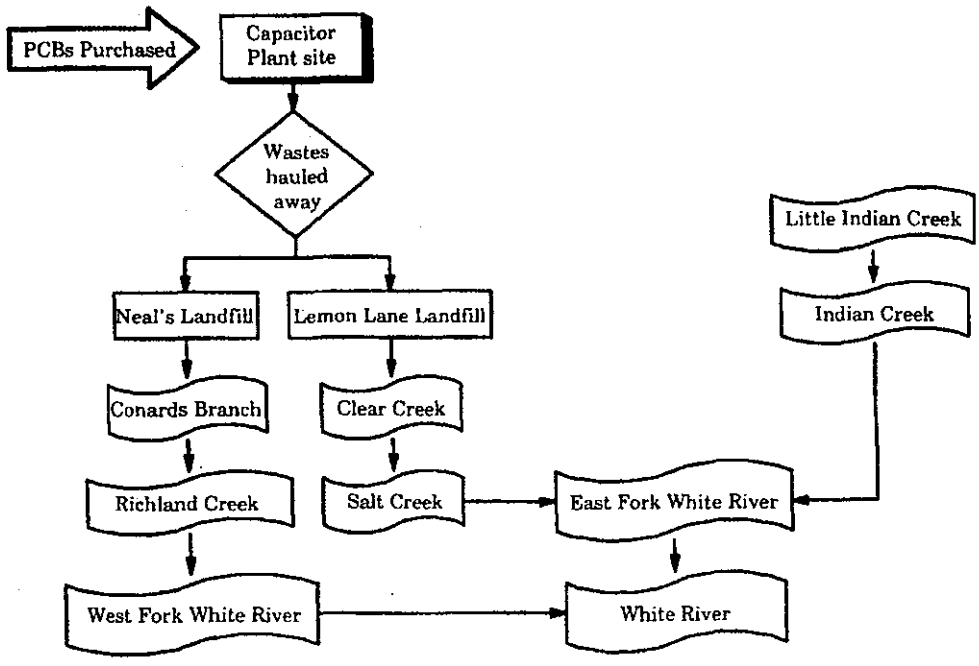

FIG. 1. Schematic of PCB study sites, Monroe County, IN, U.S.A.

TABLE I. Habitat characteristics of the study sites

	CC1	CB	CC2	LI
Source of PCBs	Lemon Lane LF	Neal's LF	Lemon Lane LF	Reference site
Drainage area (ha)	600	800	1600	2700
Substratum types (%)	Sand (40), gravel (35), cobble (20), boulder (5)	Silt (25), gravel (25), cobble (20), bedrock (30)	Sand (35), gravel (30), cobble (15), boulder (15)	Sand (5), gravel (20), cobble (60), boulder (5), bedrock (10)
Land use	Urban and residential	Agricultural	Urban and industrial	Agricultural
Habitat	Forested corridor	Forested corridor	Pasture and forested corridor	Forested corridor
Stream width (m)	2	4	3	6·5

CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; LI, Little Indian Creek.

AGE AND GROWTH METHODOLOGY

Preserved creek chub were rinsed in tap water, blotted dry, and whole masses (M_B) were measured to the nearest 0·1 μg. Total length (L_T) was measured to the nearest 0·1 mm from the anterior most part of the fish to the longest caudal fin ray length by depressing the caudal lobe dorso-ventrally (Anderson & Gutreuter, 1989). A scale sample was obtained above the lateral line, anterior to the base of the dorsal fin for ageing by counting annuli (Jearld, 1989) using a Leica MZ12·5 stereomicroscope equipped with an ocular micrometer and transmitted light using dark field lighting. The age of 586 fish from all sites, including age 0 year fish, was determined. The Dahl-Lea method (a direct proportion basis) was used to determine backcalculated L_T-at-age (Lagler, 1956). A total of 474 creek chub were ≥ age 1 years and were included in the backcalculation of size at successive annuli (Ricker, 1975). Ordinary and functional b (slope, condition factor) regressions were calculated (Ricker, 1975) according to the following formulae: $M_B = aL_T^b$ or $\log_{10} M_B = \log_{10} a + b \log_{10} L_T$, where M_B is in g, L_T in cm and a = the intercept. Ricker (1975) states that 'usually the best available estimate of the growth rate of individual fish (G) comes from the back-calculation of their length at the last two annuli on the scales.' Individual instantaneous growth rate of length increase was

TABLE II. PCB concentrations (ranges and means ± S.D.) in various media at the study sites

	CC1	CB	CC2	LI
PCB groundwater concentrations at source (ppb)	5 470 (Tetra Tech, 2001)	0·1 8·7 (Tetra Tech, 2000)	5 470 (Tetra Tech, 2001)	NA
Ambient water at study area (ppb)	1·1 (USEPA, 1992)	0·46 (CBS, 1998)	<1·0 (USEPA, 1992)	NA
Sediments (ppm)	1·0 (USEPA, 1992) 4·3 (Normandeau, 1995) 2·17 ± 0·26, n = 3 (Westinghouse, 1997)	1·87 ± 0·93, n = 5 (CBS, 1998)	0·29 (USEPA, 1992) 0·58 (Normandeau, 1995) 0·56 ± 0·14, n = 5 (Westinghouse, 1997)	NA
Creek chub (whole body, ppm)	19·2 ± 3·2, n = 9 (Westinghouse, 1997)	12·1 ± 3·1, n = 8 (CBS, 1998)	2·1 ± 0·2, n = 9 (Westinghouse, 1997)	0·01 ± 0·00, n = 6 (USFWS, unpubl. data)

CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; LI, Little Indian Creek; ppb, parts per billion; NA, not analysed; ppm, parts per million; n, number of samples analysed.

calculated for each age class interval available at the study sites (Ricker, 1975) according to the following formula: $G = b(\ln L_{T_2} - \ln L_{T_1})$, where G = individual instantaneous growth rate of L_T increase, b = is the calculated functional b for that age class, L_{T_1} = the backcalculated L_T of the fish at the second to last annuli, and L_{T_2} = the backcalculated L_T of the fish at its last annuli. Population instantaneous growth rate of L_T increase (G_x) was obtained by comparing the mean size of surviving fish at successive ages in the same manner (Ricker, 1975). All calculations were initially conducted with males and females together, a common practice despite the fact that creek chub are sexually dimorphic. When it was determined that there were differences in survivorship between the sexes, all analyses were redone separately for both males and females.

STATISTICS

All statistical analyses were done using SAS (SAS Institute Inc, Cary, NC, U.S.A.). Total length and M_B were correlated to age (determined by year and by month) using PROC REG, a general purpose procedure for linear regression. PROC GLM (accepting an imbalanced design for the ANOVA) was used to evaluate significant differences between the sites. For the data determined by year, a variable for season collected (SEASON; April to June, spawning; July to September, postspawning; October to December, autumn; January to March, prespawning) was also included in the ANOVA. For this analysis 1 April of each year was assumed to be the estimated hatching date of creek chub. In addition to statistically analysing these data using age derived in years, age was also determined in months and the seasonality was then represented by Julian calendar date collected (JDATECOL). All graphs were created in Excel (Microsoft Corp.).

RESULTS

Equations for M_B and L_T regressed on age (in years) are presented for males and females for the study sites in Table III. The slope (b) of the mass and age equations for both males and females decreased with increasing mean PCB concentration in fish previously collected at these sites (Table III). The older age classes, especially females, were missing from the contaminated sites as evidenced by L_T-at-age and M_B-at-age figures (Fig. 2). For males, both L_T and M_B were significantly increased at the PCB sites for creek chub <24 months in age (L_T, $P < 0{\cdot}001$–$0{\cdot}05$; M_B, $P < 0{\cdot}02$–$0{\cdot}04$). Only L_T was significantly increased for females <24 months of age ($P < 0{\cdot}001$–$0{\cdot}03$). By age 2 years, there were no significant differences between the size of creek chub between these sites. By age 3 and 4 years, the male creek chubs from the reference site (LI) weighed significantly more than fish from the PCB-contaminated sites ($P < 0{\cdot}001$–$0{\cdot}04$). Age 3 years females also followed this trend, however these differences were not statistically significant (Fig. 2). At the reference site, males weighed significantly more than females in years 2 ($P = 0{\cdot}06$), 3 ($P = 0{\cdot}05$) and 4 ($P < 0{\cdot}001$). There were no significant differences in M_B between males and females in any age class from the PCB contaminated sites.

Fish <40 mm in size (representing early age 0 year fish) were below expected frequencies in the PCB-contaminated streams (Fig. 3). This was not based on electrofishing gear bias because complete coverage was achieved in these streams during sampling. The sites were thoroughly examined for spawning activity. Creek chub successfully spawned at LI and CB, but not at CCl. Although

TABLE III. Regression equations for body mass (M_B, g) and total length (L_T, mm) with age (x, years) by site and sex

Site	Sex	M_B		L_T	
LI	F	$13{\cdot}24\,x - 7{\cdot}08$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}74$)	$31{\cdot}97\,x + 39{\cdot}24$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}82$)
CC1	F	$6{\cdot}72\,x + 0{\cdot}40$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}65$)	$26{\cdot}91\,x + 51{\cdot}80$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}69$)
CB	F	$9{\cdot}42\,x - 2{\cdot}93$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}57$)	$36{\cdot}81\,x + 36{\cdot}44$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}60$)
CC2	F	$10{\cdot}68\,x - 2{\cdot}94$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}58$)	$34{\cdot}59\,x + 44{\cdot}42$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}70$)
LI	M	$21{\cdot}62\,x - 13{\cdot}12$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}52$)	$38{\cdot}52\,x + 37{\cdot}26$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}80$)
CC1	M	$12{\cdot}66\,x - 3{\cdot}77$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}54$)	$30{\cdot}17\,x + 50{\cdot}16$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}62$)
CB	M	$14{\cdot}19\,x - 5{\cdot}18$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}67$)	$36{\cdot}46\,x + 39{\cdot}41$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}71$)
CC2	M	$21{\cdot}44\,x - 14{\cdot}26$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}72$)	$35{\cdot}43\,x + 46{\cdot}35$	($P < 0{\cdot}001$, $r^2 = 0{\cdot}83$)

LI, Little Indian Creek; CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; F, female; M, male.

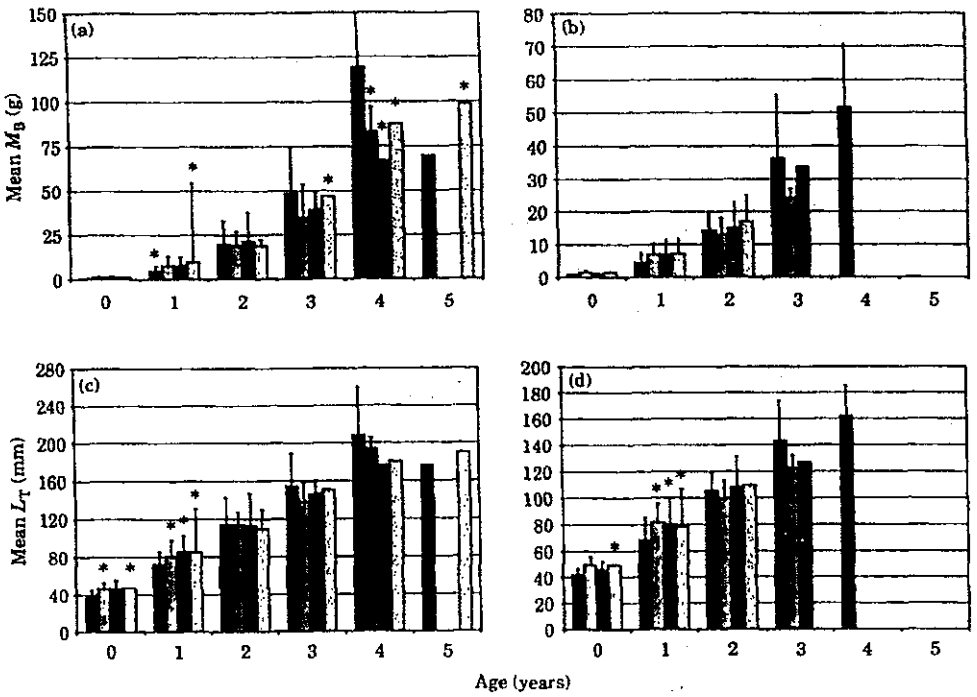

FIG. 2. Creek chub mean (a) male and (b) female masses, and (c) male and (d) female total length at Little Indian Creek (■), upper Clear Creek (□), Conards Branch and Richland Creek (▩) and lower Clear Creek (▨). *, significant differences from reference site (Little Indian Creek) at $P < 0{\cdot}05$.

creek chub spawning was not specifically observed at CC2, juveniles were observed in this location by mid-summer. The reduced numbers of larger fish at the PCB contaminated sites are also indicated in Fig. 4.

Instantaneous growth rates and mean calculated L_T at successive annuli are given in Tables IV and V. Within all of the age classes of females, both population and mean individual G were higher for the reference site (LI) fish. For males, G did not appear to have clear trends.

Mass and L_T relationships are shown in Tables VI and VII. Based on functional b values, it appears that growth enhancement (*i.e.* high mass relative to L_T) was occurring in CC1 males, the most contaminated site studied. For females at CC1, the exact opposite was true (*i.e.* reduced mass relative to L_T). Reference females from LI exhibited an increased mass relative to L_T when compared to females from all other sites.

DISCUSSION

Carlander (1969) presented summaries of published creek chub data from many sites in North America and stated that creek chub grow most rapidly in the mid-west. Overall, the L_T and M_B of creek chub from these four study sites were similar to the calculated mean M_B for creek chub age classes from MN, IA, NY, AL, MD and OH (Carlander, 1969) although sexes were combined for this

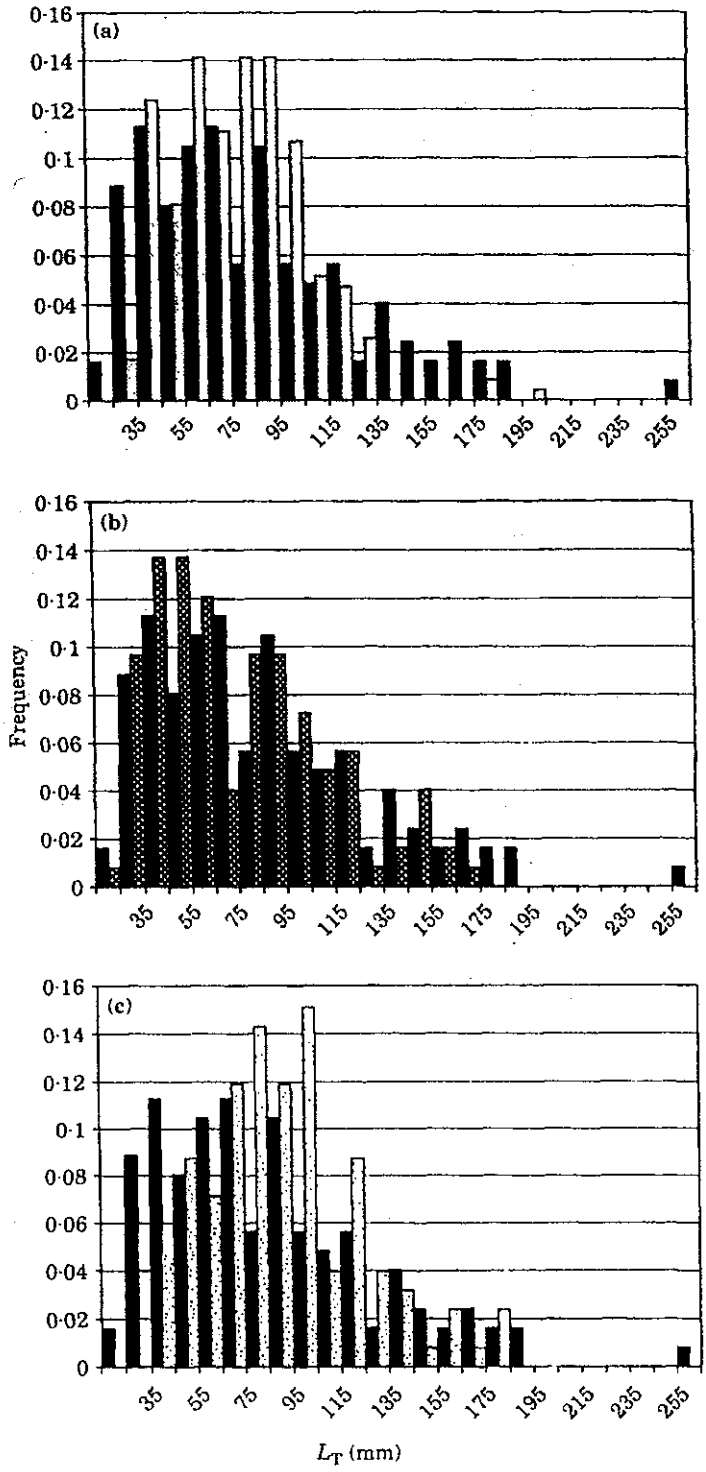

FIG. 3. Creek chub total length frequency comparisons for Little Indian Creek (■) and (a) upper Clear Creek (□), (b) Conards Branch and Richland Creek (▩) and (c) lower Clear Creek (▦).

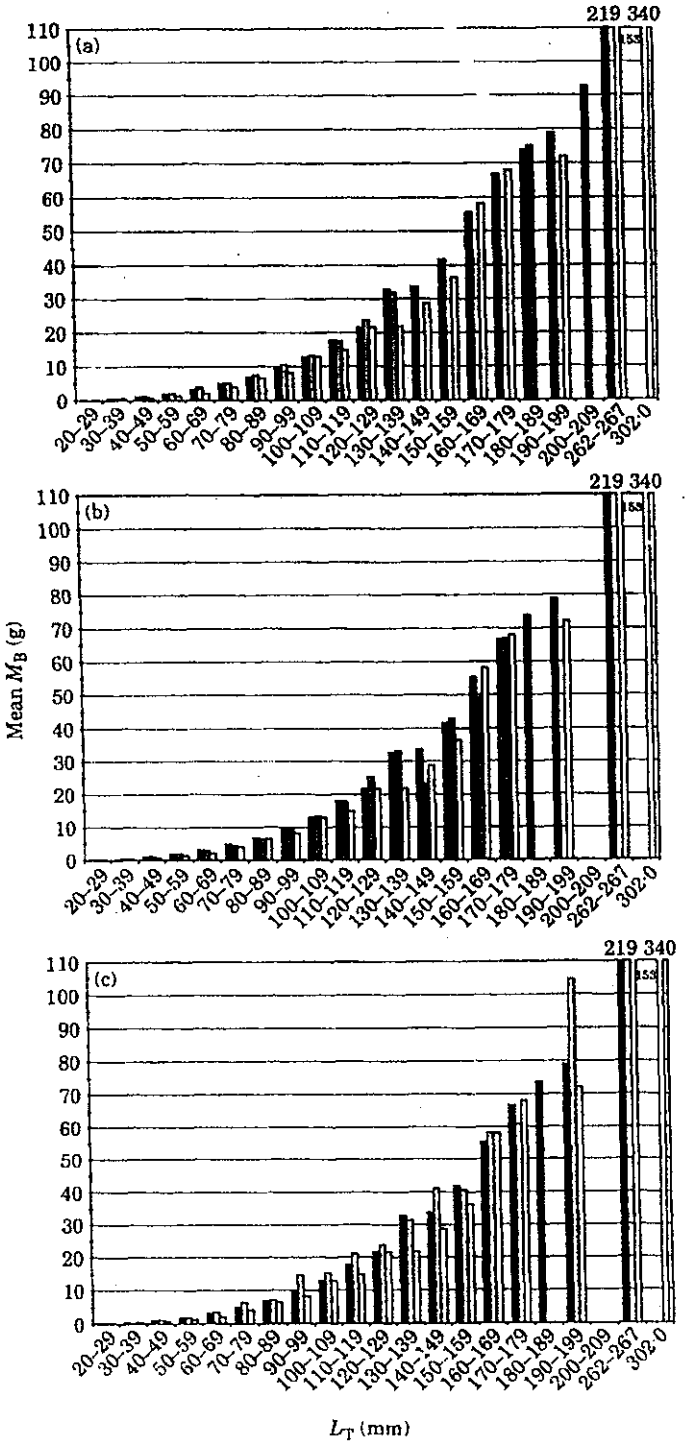

FIG. 4. Comparison of creek chub mean mass at 10 mm total length intervals between a North American mean (Carlander, 1969) (□). Little Indian Creek (■) and (a) upper Clear Creek (□). (b) Conards Branch and Richland Creek (▩) and (c) lower Clear Creek (▩).

TABLE IV. Male mean calculated total length at successive annuli and instantaneous growth rates by age class

Site	Age (years)	n	Mean L_T at capture (mm)	Mean calculated L_T at successive annuli (mm) 1	2	3	4	5	Age interval (years)	Population growth: Length interval (mm)	Population growth: G_X	Individual growth: Length interval (mm)	Individual growth: G
LI	0	13	37·3										
LI	1	20	72·3	52·0									
LI	2	15	118·4	62·5	107·5				1–2	52–107·5	2·20	62·5–107·5	1·64
LI	3	5	154·2	53·0	90·9	142·0			2–3	107·5–142	0·85	90·9–142	1·36
LI	4	3	208·0	56·7	105·3	152·2	195·0		3–4	142–195	0·95	152–195	0·75
LI	5	1	176·0	32·7	85·7	112·1	119·9	140·2					
CC1	0	16	46·9										
CC1	1	54	82·0	52·9									
CC1	2	18	113·7	46·5	85·3				1–2	52·9–85·3	1·53	46·5–85·3	1·71
CC1	3	7	138·0	38·9	81·3	121·1			2–3	85·3–121·1	1·20	81·3–121	1·09
CC1	4	2	193·5	59·3	101·6	155·7	193·5		3–4	121·1–193·5	1·54	155·7–193·5	0·71
CC1	5	0											
CB	0	23	46·4										
CB	1	17	85·8	56·5									
CB	2	15	113·3	51·7	92·7				1–2	56·5–92·7	1·48	51·7–92·7	1·79
CB	3	5	145·9	47·4	87·5	137·7			2–3	92·7–137·7	1·25	87·5–137·7	1·29
CB	4	1	176·0	34·9	58·7	103·1	142·7		3–4	137·7–142·7	0·09	103·1–142·7	1·02
CB	5	0											
CC2	0	6	47·8										
CC2	1	31	85·2	53·4									
CC2	2	21	109·6	43·2	89·1				1–2	53·4–89·1	1·59	43·2–89·1	2·25
CC2	3	12	150·6	46·6	94·5	136·9			2–3	89·1–136·9	1·30	94·5–136·9	1·12
CC2	4	2	180·5	37·6	64·3	104·6	142·6		3–4	136·9–142·6	0·12	104·6–142·6	0·89
CC2	5	1	190·0	34·8	72·8	96·6	142·5	169·4					

LI, Little Indian Creek; CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; n, number; L_T, total length; G_X, population instantaneous growth rate; G, individual instantaneous growth rate.

TABLE V. Female mean calculated total length at successive annuli and instantaneous growth rates by age class

Site	Age (years)	n	Mean L_T at capture (mm)	Mean calculated L_T at successive annuli (mm) 1	2	3	4	Age interval (years)	Population growth: Length interval (mm)	Population growth: G_X	Individual growth: Length interval (mm)	Individual growth: G
LI	0	8	42·1									
LI	1	33	68·3	49·6								
LI	2	13	105·2	46·8	93·7			1–2	49·6–93·7	1·97	46·8–93·7	2·15
LI	3	4	143·1	52·7	100·8	137·9		2–3	93·7–137·9	1·26	100·8–137·9	1·02
LI	4	7	161·9	44·9	80·7	113·9	141·6	3–4	137·9–141·6	0·09	113·9–141·6	0·71
CC1	0	22	49·8									
CC1	1	67	81·8	52·7								
CC1	2	27	99·7	46·6	84·0			1–2	52·7–84	1·33	46·6–84	1·68
CC1	3	3	122·3	32·7	77·6	105·0		2–3	84–105	0·64	77·6–105	0·87
CC1	4	0						3–4				
CB	0	20	45·6									
CB	1	29	80·0	56·0								
CB	2	12	108·1	53·6	96·5			1–2	56–96·5	1·69	53–94	1·82
CB	3	1	127·0	52·9	99·5	124·9		2–3	96·5–124·9	0·72	90–136	0·63
CB	4	0						3–4				
CC2	0	5	49·6									
CC2	1	32	78·5	51·1								
CC2	2	13	109·5	47·6	87·6			1–2	51·1–87·6	1·63	47·6–87·6	1·85
CC2	3	0						2–3				
CC2	4	0						3–4				

LI, Little Indian Creek; CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; n, number; L_T, total length; G_X, population instantaneous growth rate; G, individual instantaneous growth rate.

TABLE VI. Male mass and total length regressions by age class

Site	Age (years)	n	Means $\log_{10} L_T$	Means $\log_{10} M_B$	Regression slope (b) Ordinary	Regression slope (b) Functional	s.d.	Functional intercept $\log_{10} a$
LI	1	20	1·85	0·62	3·00	3·03	0·22	−5·00
LI	2	15	2·07	1·25	3·02	3·04	0·22	−5·04
LI	3	5	2·18	1·61	2·98	3·01	0·28	−4·95
LI	4	3	2·31	2·01	2·87	2·87	0·29	−4·61
LI	5	1	2·25	1·84				
LI all 1+ years unweighted			2·00	1·07	3·02	3·03	0·44	−5·00
LI all 1+ years weighted			2·13	1·46	3·05	3·06	0·49	−5·05
CC1	1	54	1·91	0·82	2·72	3·20	0·24	−5·28
CC1	2	18	2·05	1·25	3·26	3·43	0·15	−5·80
CC1	3	7	2·14	1·50	3·13	3·28	0·16	−5·51
CC1	4	2	2·29	1·92	2·68	2·68		−4·21
CC1	5	0						
CC1 all 1+ years unweighted			1·97	1·00	2·86	2·93	0·31	−4·96
CC1 all 1+ years weighted			2·10	1·37	2·88	2·94	0·43	−4·67
CB	1	17	1·93	0·83	2·97	3·00	0·22	−5·10
CB	2	15	2·04	1·17	3·14	3·16	0·36	−5·10
CB	3	5	2·16	1·58	2·66	2·66	0·10	−3·44
CB	4	1	2·25	1·83				
CB	5	0						
CB all 1+ years unweighted			2·08	1·33	3·10	3·12	0·35	−5·17
CB all 1+ years weighted			1·97	0·97	3·12	3·12	0·42	−5·17
CC2	1	31	1·92	0·89	2·90	3·11	0·27	−5·08
CC2	2	21	2·03	1·23	2·97	3·03	0·18	−4·93
CC2	3	12	2·17	1·64	2·81	2·87	0·13	−4·59
CC2	4	2	2·25	1·92	3·70	3·70		−6·43
CC2	5	1	2·28	1·99				
CC2 all 1+ years unweighted			2·01	1·18	2·95	3·01	0·33	−4·90
CC2 all 1+ years weighted			2·13	1·53	3·06	3·07	0·41	−5·01

LI, Little Indian Creek; CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; n, number of individuals; M_B, mass (g); L_T, total length (mm); s.d., from the predictive regression line of $\log_{10} M_B$ on $\log_{10} L_T$.

TABLE VII. Female mass and total length regressions by age class

Site	Age (years)	n	Means $\log_{10} L_T$	Means $\log_{10} M_B$	Regression slope (b) Ordinary	Regression slope (b) Functional	s.d.	Functional intercept $\log_{10} a$
LI	1	33	1·82	0·53	3·08	3·10	0·31	−5·12
LI	2	13	2·02	1·12	3·18	3·25	0·16	−5·44
LI	3	4	2·15	1·48	3·24	3·26	0·33	−5·53
LI	4	7	2·21	1·69	2·56	2·68	0·12	−4·22
LI all 1+ years unweighted			1·97	0·96	3·01	3·02	0·45	−4·97
LI all 1+ years weighted			2·05	1·20	2·97	2·97	0·49	−4·88
CC1	1	67	1·91	0·79	2·77	2·85	0·18	−4·64
CC1	2	27	1·99	1·08	2·75	2·88	0·15	−4·66
CC1	3	3	2·09	1·38	1·12	1·48	0·05	−1·70
CC1	4	0						
CC1 all 1+ years unweighted			0·89	1·94	2·91	2·98	0·22	−4·88
CC1 all 1+ years weighted			2·00	1·08	3·25	3·25	0·34	−5·41
CB	1	29	1·89	0·72	3·05	3·10	0·29	−5·14
CB	2	12	2·02	1·11	2·48	2·79	0·23	−4·53
CB	3	1	2·10	1·53				
CB	4	0						
CB all 1+ years unweighted			1·93	0·85	2·96	3·05	0·32	−5·04
CB all 1+ years weighted			2·01	1·12	3·69	3·74	0·49	−6·39
CC2	1	32	1·88	0·89	2·90	3·03	0·24	−4·93
CC2	2	13	2·03	1·23	2·28	3·50	0·24	−5·96
CC2	3	0						
CC2	4	0						
CC2 all 1+ years unweighted			1·93	0·89	2·71	2·93	0·28	−4·77
CC2 all 1+ years weighted			1·96	0·97	2·60	2·60		−4·12

LI, Little Indian Creek; CC1, upper Clear Creek; CB, Conards Branch and Richland Creek; CC2, lower Clear Creek; n, number of individuals; M_B, mass (g); L_T, length (mm); s.d., from the predictive regression line of $\log_{10} M_B$ on $\log_{10} L_T$.

comparison (Fig. 4). Creek chub from Manitoba grew slower than in the present study but perhaps lived slightly longer (Moshenko & Gee, 1973). Creek chub are sexually dimorphic, so combining male and female creek chub data for routine fish population analysis can make it impossible to detect subtle adverse effects, especially if the contaminant in question impacts the sexes differently as PCBs appear to do.

In ideal conditions, male creek chub continue to grow in L_T and M_B as they age, although the rate of mass gain outpaces gains in L_T as fish age. Although female creek chub continued to gain mass as they aged, gains in L_T were not as pronounced as they were in males. This was probably due to the physiological energy demands of egg production. When the M_B and L_T relationships were examined with the sexes combined, no trends in the data were observed. The relationships for males and females analysed separately, however, indicated the possibility of differences between PCB contaminated creek chub and reference site creek chub. Generally, a functional regression value of b equal to 3·0 indicates isometric growth. Higher values of b indicate better 'condition' or a more rotund fish (Ricker, 1975; Anderson & Gutreuter, 1989). Lower values of b would indicate less mass being added by the fish as length increased. In extreme cases, low b values would indicate emaciation. In this study, functional b for reference site males within age classes 1+ to 3+ years, was *c.* 3·0 (range: 3·01–3·04), whereas for reference females within age classes 1+ to 3+ years, the functional b range was somewhat higher (3·10–3·26). Combining these clearly different mass and length relationships gives ample opportunity for masking subtle growth changes. At the most contaminated site (CC1), male fish in age classes 1+ up to 3+ years were heavier for the same L_T than reference males (b range: 3·20–3·43). Not only was this indicative of a growth enhancement, but it also appeared to obscure the sexual dimorphism in creek chub. By contrast, female fish in age classes 1+ up to 3+ years at CC1 had a decreased M_B and L_T relationship (b range: 1·48–2·88) compared to 1+ up to 3+ year females at the reference site, or any other site, or even compared to males of those age classes at any other site. In older age classes (3+ and 4+ years) functional b appeared to decline more quickly at the most PCB contaminated sites, especially in females. This appears to be a subtle indicator of the 'wasting' syndrome reported by others (Halter & Johnson, 1974; Bengtsson, 1980; Cleland *et al.*, 1988). The year to year growth comparison is made more difficult by the loss of the older age classes at the contaminated sites [loss of age 5 years in males, and ages 4 and 5 years (and even age 3 years at CC2) in females].

Although the data show a trend toward larger size of the 1 year old fish from the PCB-exposed populations, this trend disappears beyond 2 years of age. Beyond age 2 years, both L_T and M_B of male creek chub were reduced at the contaminated sites when compared to males from the reference site. Several studies have shown that growth of larvae and juvenile fishes can be enhanced at low doses of PCBs (Bengtsson, 1979, 1980). The lower growth rate in younger age class males at the LI reference site compared to the males at the contaminated sites (CC1 in particular), however, could possibly be related to increased competition due to species diversity and the presence of piscivorous fishes. Katz & Howard (1955) documented that creek chub grew better in a polluted but recovering zone of Lytle Creek, OH, U.S.A. rather than upstream of the sewage

discharge. Although the types of contaminants present were not specified, nutrient enrichment and a lack of competition and predators probably contributed to this increased growth. No fish larvae were ever observed at CC1, and no creek chub spawning activities were ever observed at either Clear Creek site (unpubl. obs.). It is notable that the loss of the older age classes was more pronounced for females compared to males. Thus, while PCB contamination seemed to affect both ends of the age spectrum (reduced or no spawning, enhanced growth at early ages, wasting and loss in the older age classes), the severity of the impact for each part of the age spectrum was gender-specific.

The creek chub makes an excellent field study species since it is relatively abundant and present in many PCB contaminated streams. Laboratory studies have shown growth to be a sensitive endpoint in PCB feeding studies of fish, but these effects are not as easily observed in field studies. Despite the large sample size, many other variables may obscure the subtle effects of PCBs on growth. Even though no spawning was observed at CC1, creek chub were probably present due to in-migration from nearby uncontaminated tributaries. Creek chub have been observed to rapidly repopulate areas (Olmsted & Cloutman, 1974). The immigration of young fish does complicate the interpretation of these field observations. Nevertheless, it is expected that most of the fish captured within these study areas had spent the majority of their lives at these locations. Another complicating factor is that rarely has an attempt been made to compare current fish densities of streams to what is expected. Larimore (1955) documented the presence of >28 kg ha^{-1} of four minnow species [*Campostoma anomalum* (Rafinesque), *Ericymba buccata* cope, *Pimephales notatus* (Rafinesque) and *Semotilus atromaculum* (Mitchill)] from a small stream in Illinois, U.S.A. This equates to *c.* 17 000 fish from a 500 m stretch of stream. There was no attempt to evaluate fish densities. Unless there is widespread indiscriminate mortality that either significantly alters fish species diversity in a stream or destroys the population, subtle adverse effects may be hard to document.

Despite the difficulty in detecting contaminant effects using classic fish ecology methods, trends are apparent in the PCB growth enhancing effects in fish prior to 24 months of age and the ultimate reduction of growth and survival in creek chub when sexes are analysed separately. These PCB study areas have reduced age 0 and > age 3 years fish which is consistent with Bengtsson's (1979) observation that juveniles are more durable than older and younger fishes (larvae and fry). The early mortality of older females from the PCB-contaminated sites is also consistent with observations made by Black *et al.* (1998*b*) in mummichog from New Bedford Harbor. Even though the present results on age structure and growth variables at these PCB-contaminated sites are consistent with other laboratory and field research, these routine field evaluation methodologies do not indicate what may be happening in the environment. To determine the effects of PCBs on native fish populations more fully, an in-depth investigation into physiological health of individuals of the population is imperative.

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References

Anderson, R. O. & Gutreuter, S. J. (1989). Length, weight, and associated structual indicies. In *Fisheries Techniques* (Nielson, L. A. & Johnson, D. L., eds.), pp. 283–300. Blacksburg, VA: Southern Printing Company, Inc.

Ankley, G. T., Tillitt, D. E., Giesy, J. P., Jones, P. D. & Verbrugge, D. A. (1991). Bioassay-derived 2,3,7,8-tetrachlorodibenzo-p-dioxin equivalents in PCB-containing extracts from the flesh and eggs of Lake Michigan chinook salmon (*Oncorhynchus tshawytscha*) and possible implications for reproduction. *Canadian Journal of Fisheries and Aquatic Sciences* **48,** 1685–1690.

Bengtsson, B. E. (1979). Increased growth in minnows exposed to PCBs. *Ambio* **8,** 169–170.

Bengtsson, B. E. (1980). Long term effects of PCB (Clophen A50) on growth, reproduction and swimming performance in the minnow *Phoxinus phoxinus*. *Water Research* **14,** 681–687.

Besselink, H. T., van Beusekom, S., Roex, E., Vethaak, A. D., Koeman, J. H. & Boouwer, A. (1996). Low hepatic 7-ethoxyresorufin-*O*-deethylase (EROD) activity and minor alterations in retinoid and thyroid hormone levels in flounder (*Platichthys flesus*) exposed to the polychlorinated biphenyl (PCB) mixture, Clophen A50. *Environmental Pollution* **92,** 267–274.

Black, D. E., Gutjahr-Gobell, R., Pruell, R. J., Bergen, B., Mills, L. & McElroy, A. E. (1998*a*). Effects of a mixture of non-ortho- and mono-ortho-polychlorinated biphenyls on reproduction in *Fundulus heteroclitus* (Linnaeus). *Environmental Toxicology and Chemistry* **17,** 1396–1404.

Black, D. E., Gutjahr-Gobell, R., Pruell, R. J., Bergen, B., Mills, L. & McElroy, A. E. (1998*b*). Reproduction and polychlorinated biphenyls in *Fundulus heteroclitus* (Linnaeus) from New Bedford Harbor, Massachusetts, USA. *Environmental Toxicology and Chemistry* **17,** 1405–1414.

Brown, S. B., Evans, R. E., Vandenbyllardt, L., Finnson, K. W., Palace, V. P., Kane, A. S., Yarechewski, A. Y. & Muir, D. C. G. (2004). Altered thyroid status in lake trout (*Salvelinus namaycush*) exposed to co-planar 3,3′,4,4′,5-pentachlorobiphenyl. *Aquatic Toxicology* **67,** 75–85.

Cantrell, S. M., Joy-Schlezinger, J., Stegeman, J. J., Tillitt, D. E. & Hannink, M. (1998*a*). Correlation of 2,3,7,8-tetrachlorodibenzo-p-dioxin-induced apoptotic cell death in the embryonic vasculature with embryotoxicity. *Toxicology and Applied Pharmacology* **148,** 24–34.

Cantrell, S. M., Lutz, L. H., Tillitt, D. E. & Hannink, M. (1998*b*). Embryotoxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD): the embryonic vasculature is a physiological target for TCDD-induced DNA damage and apoptotic cell death in medaka (*Orizias latipes*). *Toxicology and Applied Pharmacology* **141,** 23–34.

Carlander, K. D. (1969). *Handbook of Freshwater Fishery Biology*. Vol. 1. Ames, IA: Iowa State University Press.

Cleland, G. B., McElroy, P. J. & Sonstegard, R. A. (1988). The effect of dietary exposure to Arochlor 1254 and/or mirex on humoral immune expression of rainbow trout (*Salmo gairdneri*). *Aquatic Toxicology* **12,** 141–146.

DeFoe, D. L., Veith, G. D. & Carlson, R. W. (1978). Effects of Arochlor 1248 and 1260 on the fathead minnow (*Pimephales promelas*). *Journal of the Fisheries Research Board of Canada* **35,** 997–1002.

Fingerman, S. & Russell, L. C. (1980). Effects of the polychlorinated biphenyl Aroclor 1242 on locomotor activity and on the neurotransmitters dopamine and norepinephrine in the brain of the gulf killifish, *Fundulus grandis*. *Bulletin of Evironmental Contamination and Toxicology* **25,** 682–687.

Halter, M. T. & Johnson, H. E. (1974). Acute toxicities of a polychlorinated biphenyl(PCB) and DDT alone and in combination to early lifestages of coho salmon (*Orcorhynchus kisutch*). *Journal of the Fisheries Research Board of Canada* **31,** 1543–1547.

Hansen, D. J., Parrish, P. R. & Forester, J. (1974*a*). Arochlor 1016: toxicity to and uptake by estuarine animals. *Environmental Research* **7,** 363–373.

Hansen, D. J., Schimmel, S. C. & Forester, J. (1974*b*). Aroclor 1254 in eggs of sheepshead minnows: effects on fertilization success and survival of embryos and fry. *Proceedings of the Southeastern Association of Game and Fisheries Commissioners* **28,** 805–812.

Hansen, D. J., Schimmel, S. C. & Forester, J. (1975). Effects of Arochlor 1016 on embryos, fry, juveniles and adults of sheepshead minnows (*Cyprinodon variegatus*). *Transactions of the American Fisheries Society* **3,** 584–588.

Hansen, G. L., Wiekhorst, W. B. & Simon, J. (1976). Effects of dietary Aroclor 1242 on channel catfish (*Ictalurus punctatus*) and the selective accumulation of PCB components. *Journal of the Fisheries Research Board of Canada* **33,** 1343–1352.

Jearld, A. (1989). Age determination. In *Fisheries Techniques* (Nielson, L. A. & Johnson, D. L. eds) pp. 301–324. Blacksburg, VA: Southern Printing Company, Inc.

Katz, M. & Howard, W. C. (1955). The length and growth of 0-year class creek chubs in relation to domestic pollution. *Transactions of the American Fisheries Society* **84,** 228–238.

Lagler, K. F. (1956). Age and growth. In *Freshwater Fishery Biology*, 2nd edn. (Lagler, K. F., ed.), pp. 131–166. Dubuque, IA: Wm C. Brown Co. Publishers.

Larimore, R. W. (1955). Minnow productivity in a small Illinois stream. *Transactions of the American Fisheries Society* **84,** 110–116.

Leatherland, J. F. & Sonstegard, R. A. (1978). Lowering of serum thyroxine and triidothyronine levels in yearling coho salmon, *Oncorhynchus kisutch*, by dietary mirex and PCBs. *Journal of the Fisheries Research Board of Canada* **35,** 1285–1289.

Mac, M. J. & Seelye, J. G. (1981*a*). Potential influence of acetone in aquatic bioassays testing the dynamics and effects of PCBs. *Bulletin of Environmental Contamination and Toxicology* **27,** 359–367.

Mac, M. J. & Seelye, J. G. (1981*b*). Patterns of PCB accumulation by fry of lake trout. *Bulletin of Environmental Contamination and Toxicology* **27,** 368–375.

Mauck, W. L., Mehrle, P. M. & Mayer, F. L. (1978). Effects of the polychlorinated biphenyl Arochlor 1254 on growth, survival, and bone development in brook trout (*Salvenlinus fontinalis*). *Journal of the Fisheries Research Board of Canada* **35,** 1084–1088.

Mayer, F. J., Mehrle, P. M. & Sanders, H. O. (1977). Residue dynamics and biological effects of polychlorinated biphenyls in aquatic organisms. *Archives of Environmental Toxicology and Chemistry* **5,** 501–511.

Monosson, E., Fleming, W. J. & Sullivan, C. V. (1994). Effects of the planar PCB 3,3′4,4′5-tetrachlorobiphenyl (TCB) on ovarian development, plasma levels of sex steroid hormones and vitellogenin and progeny survival in white perch (*Morone americana*). *Aquatic Toxicology* **29,** 1–19.

Moshenko, R. W. & Gee, J. H. (1973). Diet, time and place of spawning, and environments occupied by creek chub (*Semotilus atromaculatus*) in the Mink River, Manitoba. *Journal of the Fisheries Research Board of Canada* **30,** 357–362.

Nebeker, A. V. & Puglisi F. A. (1974). Effect of polychlorinated biphenyls (PCBs) on survival and reproduction of *Daphnia*, *Gammarus*, and *Tanytarus*. *Transactions of the American Fisheries Society* **103,** 722–728.

Nebeker, A. V., Puglisi, F. A. & DeFoe, D. L. (1974). Effect of polychlorinated biphenyl compounds on survival and reproduction of the fathead minnow and flagfish. *Transactions of the American Fisheries Society* **103,** 562–568.

Niimi, A. J. (1992). PCBs in Aquatic organisms. In *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations* (Beyer, W. N., Heinz, G. H. & Redmon-Norwood, A. W., eds), pp. 117–163. Boca Raton, FL: Lewis Publishers.

Olmsted, L. L. & Cloutman, D. G. (1974). Repopulation after a fish kill in Mud Creek, Washington County, Arkansas following pesticide pollution. *Transactions of the American Fisheries Society* **103,** 79–87.

Palace, V. P., Allen-Gil, S. M., Brown, S. B., Evans, R. E., Metner, D. A., Landers, D. H., Curtis, L. R., Klaverkamp, J. F., Baron, C. L. & Lockhart, W. L. (2001). Vitamin and thyroid status in arctic grayling (*Thymallus arcticus*) exposed to doses of 3,3′,4,4′-tetrachlorobiphenyl that induce the phase I enzyme system. *Chemosphere* **45,** 185–193.

Ricker, W. E. (1975). Computation and interpretation of biological statistics of fish populations. *Bulletin of the Fisheries Research Board of Canada* **191,** 1–382.

Schimmel, S. C., Hansen, D. J. & Forester, J. (1974). Effects of Aroclor 1254 on laboratory-reared embryos and fry of sheepshead minnows (*Cyprinodon variegatus*). *Transactions of the American Fisheries Society* **103,** 582–586.

Thomas, P. (1999). Disruption of the endocrine control of final oocyte maturation in teleosts by xenobiotic chemicals. In *Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disruption and Environmental Assessment: Eighth Volume* (Henshel, D. S., Black, M. C. & Harrass, M. C, eds), pp. 165–181. West Conshohocken, PA: ASTM.

Van den Berg, M., Birnbaum, L., Bosveld, A. T. C., Brunstrom, B., Cook, P., Freeley, M., Giesy, J. P., Hanberg, A., Hasegawa, R., Kennedy, S. W., Kubiak, T., Larson, J. C., van Leeuwen, F. X., Liem, A. K., Nolt, C., Peterson, R. E., Poellinger, L., Safe, S., Schrenk, D., Tillitt, D., Tysklind, M., Younes, M., Waern, F. & Zacharewski, T. (1998). Toxic equivelency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. *Environmental Health Perspectives* **106,** 775–792.

Walker, M. K. & Peterson, R. E. (1991). Potencies of polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyl congeners for producing early life stage mortality in rainbow trout (*Oncorhynus mykiss*). *Aquatic Toxicology* **21,** 229–238.

Walker, M. K., Cook, P., Batterman, A., Butterworth, B., Berini, C., Libal, J., Hufnagle, L. & Peterson, R. E. (1994). Translocation of 2,3,7,8-Tetrachlorodibenzo-p-dioxin from adult female lake trout (*Salvelinus namaycush*) to oocytes: effects on early life stage development and sac fry survival. *Canadian Journal of Fisheries and Aquatic Sciences* **51,** 1410–1417.

Wright, P. J. & Tillitt, D. E. (1999). Embryotoxicity of Great Lakes lake trout extracts to developing rainbow trout. *Aquatic Toxicology* **47,** 77–92.

Electronic References

CBS (1998). *Letter regarding preliminary data for sampling performed under Bloomington Project Quality Assurance Project Plan Volume IX, Neal's Landfill stream sampling plan. From Dorothy M. Alke, Project Director, to Distribution List. June 29, 1998.* Available at: www.copa.org

IDEM *Angling Indiana - 2004 Fish Consumption Advisory*. http://fn.cfs.purdue.edu Indianapolis, IN: Indiana Department of Environmental Management. Available at: http://fn.cfs.purdue.edu

ISDH (1994). *Preliminary Data Evaluation and Pathway Analysis Report for Consent Decree PCB Sites*. Indianapolis, IN: Indiana State Department of Health. Available at http://www.spea.indiana.edu/reserves/pcb/index.html#Sites

Normandeau (1995). *Ecological Assessment of Illinois Central/Quarry Springs System and Clear Creek 1994*. Spring City, PA: Normandeau Associates Available at http://www.spea.indiana.edu/reserves/pcb/index.html#Sites

Tetra Tech (2000). *Revised Current Status Report for Groundwater, Surface Water, Sediment and Fish Data: Neal's Landfill Site, Monroe County, Indiana*. Chicago, IL: Tetra Tech EM Inc. Available at www.copa.org

Tetra Tech (2001). *Draft Current Status Report for Groundwater, Surface Water, Soil, Sediment and Fish Data: Lemon Lane Landfill Site, Monroe County, Indiana*. Chicago, IL: Tetra Tech EM Inc. Available at www.copa.org

USEPA (1992). *Ecological Assessment Report for ICS/Quarry Springs Complex, Lemon Lane Landfill Bloomington, Indiana.* Chicago, IL: Office of Superfund, U.S. Environmental Protection Agency. Available at: http://www.spea.indiana.edu/reserves/pcb/index.html#Sites

Westinghouse Electric Corporation (1997). *Final Data Transmittal for Ecological/Human Health Risk Assessment Samples Taken in November 1996, under the October 1996 Field Sampling Plan to the Ecological Risk Assessment of the Lemon Lane Landfill – IC/QS site.* From Dorothy M. Alke, Project Director, to Distribution List. May 19, 1997. Westinghouse Electric Corporation Available at: www.copa.org

ATTACHMENT 4

Neal's Landfill Fish Sampling Data
November 2005

TABLE 1
Neal's Landfill
Fish Sample Data
November 2005
FINAL

CBS SAMPLE ID	LAB SAMPLE ID	LOCATION	SAMPLE DATE	FISH TYPE	Total PCB Congeners	Validation Flags	dilution factor	% LIPIDS	LENGTH	WEIGHT	NUMBER	TYPE	COMMENTS	Gender	Age	QA/QC
NL-0001	G532-6-1	NL-2, Richland Creek	11/09/05	Longear Sunfish	**878,433**		50	2.20	125	39	1	Whole Body		M		
NL-0002	-2	NL-2, Richland Creek	"	Longear Sunfish	**631,035**		50	1.47	112	30	1	Whole Body		M		
NL-0003	-3	NL-2, Richland Creek	"	Longear Sunfish	**249,901**		20	1.70	137	47	1	Whole Body		M	5+	
NL-0004	-4	NL-2, Richland Creek	"	Longear Sunfish	**1,429,500**		100	2.79	125	41	1	Whole Body		M		
NL-0005	-5	NL-2, Richland Creek	"	Creek Chubs	**238,082**		20	1.00	156	36	4	Whole Body	Composite	4M		TT Split
NL-0005 DUP	-6				**242,687**		20	0.84								
NL-0006	-7	NL-2, Richland Creek	"	Creek Chubs	**76,708**		10	0.78	161	37	1	Whole Body		F		
NL-0007	-8	NL-2, Richland Creek	"	Creek Chubs	**115,573**		10	0.90	168	50	1	Whole Body		F	2+	
NL-0008	-9	NL-2, Richland Creek	"	Creek Chubs	**89,378**		10	0.80	149	30	1	Whole Body		M		
NL-0009	-10	NL-2, Richland Creek	"	Creek Chubs	**244,821**		20	1.34	153	39	1	Whole Body		M		
NL-0010	-11	NL-2, Richland Creek	"	Creek Chubs	**670,404**		50	1.58	147	30	1	Whole Body		M		
NL-0011	-12	NL-2, Richland Creek	"	Creek Chubs	**339,025**		10	0.94	147	30	1	Whole Body		M		
NL-0013	-13	NL-2, Richland Creek	11/10/05	Creek Chubs	**218,136**		20	1.10	177	58	1	Whole Body		F	2+	
NL-0013 DUP	-14				**209,509**		20	0.93								
NL-0014	-15	NL-2, Richland Creek	"	Creek Chubs	**324,378**		20	0.76	151	33	1	Whole Body		M		
NL-0015	-16	NL-2, Richland Creek	"	Creek Chubs	**214,507**		20	0.58	148	30	1	Whole Body		F		
NL-0016	-17	NL-2, Richland Creek	"	Longear Sunfish	**621,348**		50	1.05	111	30	1	Whole Body		M		
NL-0017	-18	NL-2, Richland Creek	"	Longear Sunfish	**591,967**		50	1.03	121	33	1	Whole Body		M		
NL-0018	-19	NL-2, Richland Creek	"	Longear Sunfish	**210,490**		20	1.03	118	31	1	Whole Body		M		
NL-0019	-20	NL-2, Richland Creek	"	Longear Sunfish	**237,290**		20	0.38	132	44	1	Whole Body		M	5+	
NL-0020	-21	NL-2, Richland Creek	"	Longear Sunfish	**92,288**		10	0.34	114	30	1	Whole Body		F		
NL-0021	-22	NL-2, Richland Creek	"	Longear Sunfish	**657,998**		50	1.30	106	23	4	Whole Body	Composite	3M / 1F		TT Split
NL-0021 DUP	-23				**522,359**		50	1.19								
NL-0022	-24	NL-1, Conard's Branch	11/10/05	Creek Chubs	**1,981,867**		100	0.54	150	30	1	Whole Body		F		
NL-0023	-25	NL-1, Conard's Branch	"	Creek Chubs	**1,924,949**		100	0.38	157	34	1	Whole Body		M	2+	
NL-0024	-26	NL-1, Conard's Branch	"	Creek Chubs	**1,611,173**		100	0.44	165	36	1	Whole Body		M	2+	
NL-0025	-27	NL-1, Conard's Branch	"	Creek Chubs	**1,132,426**		50	0.40	139	27	1	Whole Body		F		
NL-0026	-28	NL-1, Conard's Branch	"	Creek Chubs	**1,035,380**		50	0.73	127	21	1	Whole Body		M		
NL-0027	-29	NL-1, Conard's Branch	"	Creek Chubs	**1,615,779**		100	0.55	130	22	1	Whole Body		M		
NL-0028	-30	NL-1, Conard's Branch	"	Creek Chubs	**5,287,822**		200	0.67	132	21	1	Whole Body		M		
NL-0029	-31	NL-1, Conard's Branch	"	Creek Chubs	**2,923,426**	J	100	0.51	129	20	1	Whole Body		M		
NL-0030	-32	NL-1, Conard's Branch	"	Creek Chubs	**1,730,340**		100	0.51	132	20	1	Whole Body		F		
NL-0031	-33	NL-1, Conard's Branch	"	Creek Chubs	**3,505,322**	J	100	0.47	125	18	4	Whole Body	Composite	4M		TT Split

Notes:
PCBs in pg/g wet weight
Lipids in % wet weight
length in mm
weight in grams
For composite samples, the length and weight listed is the mean
nm = not measured
J=estimate due to QC issues
Dilutions of 50x, 100x and 200x were externally diluted
Total Congener results for externally diluted analyses are NOT adjusted for extraction standard recovery

TABLE 1a
Neal's Landfill Fish Sampling
November 2005
WHO Congener Data
FINAL

Sample Date	Fish Type	Stream Reach	Sample Number	WHO Congener (pg/g)											
				77	81	105	114	118	123	126	156/157	167	169	189	Mammalian
		Mammalian TEF:		0.0001	0.0001	0.0001	0.0005	0.0001	0.0001	0.1	0.0005	0.00001	0.01	0.0001	WHO-TEQ
11/09/05	Longear Sunfish	NL-2, Richland Creek	NL-0001	5070	265	37100	3050	74600	2580	116	2480	980	24.7	99.5	26.6
11/09/05	Longear Sunfish	NL-2, Richland Creek	NL-0002	3990	252	29700	2380	52400	2030	84.4	1950	675	4.8	66.6	19.5
11/09/05	Longear Sunfish	NL-2, Richland Creek	NL-0003	749	51.2	12600	1110	25100	996	38.8	1150	440	9.65	62.3	9.1
11/09/05	Longear Sunfish	NL-2, Richland Creek	NL-0004	9570	438	45200	3430	78500	2380	127	2220	769	19.65	77.2	29.6
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0005	1490	95.7	10200	763	18100	687	34.6	669	273	9.85	34.8	7.3
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0005 DUP	1510	91.6	9420	714	18300	558	42.5	671	275	9.8	36.6	8.0
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0006	442	26.6	3170	250	5650	210	13.8	250	110	14.1	15.7	2.7
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0007	643	37.1	6470	520	11300	352	28.2	595	235	24	33.5	5.5
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0008	481	26.6	4090	325	6790	261	20.2	329	140	0.4905	16.2	3.5
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0009	1040	75	7720	643	13600	532	29.5	609	237	9.45	26.9	6.0
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0010	5550	272	17800	1300	31300	1290	76.7	968	363	24.6	41.3	14.7
11/09/05	Creek Chubs	NL-2, Richland Creek	NL-0011	2050	119	14500	1200	25600	1160	57.1	1050	383	24.75	41.8	11.4
11/10/05	Creek Chubs	NL-2, Richland Creek	NL-0013	1500	80	7940	787	16700	663	41.9	725	309	19.6	43.1	7.8
11/10/05	Creek Chubs	NL-2, Richland Creek	NL-0013 DUP	1400	83.4	7050	725	15900	633	42.4	681	294	9.6	35.3	7.6
11/10/05	Creek Chubs	NL-2, Richland Creek	NL-0014	2080	126	13800	999	26100	883	62.2	953	363	9.55	44.7	11.6
11/10/05	Creek Chubs	NL-2, Richland Creek	NL-0015	1370	108	8280	616	14400	577	35.8	549	237	9.8	28.7	6.7
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0016	4450	247	30100	2280	46300	1840	103	1820	643	51.8	70.5	21.2
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0017	3210	110	31900	2770	46000	2800	54.9	2240	797	58.6	91.9	17.0
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0018	914	52.4	10200	918	20600	857	26.4	855	381	30.1	44.8	7.1
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0019	891	42.4	17700	1470	31000	1290	27.3	1580	530	32.8	65	9.7
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0020	826	35.9	3290	255	5460	218	10.0	227	93.4	0.4905	10.7	2.2
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0021	5660	344	29700	2590	49400	2110	119	2010	676	51	69.7	23.0
11/10/05	Longear Sunfish	NL-2, Richland Creek	NL-0021 DUP	4440	288	24100	2160	42300	1640	98.1	1660	561	0.555	64.1	19.0
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0022	12000	889	78400	5140	153000	3540	248	3670	1690	84.3	126	54.9
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0023	17100	1330	87700	7590	162000	4460	339	4890	1820	49.2	171	67.9
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0024	11300	409	71100	5710	129000	3750	261	3520	1330	4.95	116	52.3
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0025	8000	508	42900	4550	77800	3330	126	2460	863	10.9	70.3	29.4
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0026	6300	377	16600	1240	29000	1180	90.3	819	330	5.55	35.8	15.5
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0027	11100	842	67700	4880	130000	4050	251	3540	1340	4.44	124	50.8
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0028	29900	2360	111000	8520	201000	6550	439	4050	1710	0.535	159	85.3
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0029	20100	1340	84200	5580	144000	4230	341	3660	1240	60.51	106	64.7
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0030	9920	898	70100	5310	135000	4020	223	4050	1510	4.60	121	49.6
11/10/05	Creek Chubs	NL-1, Conard's Branch	NL-0031	19800	1180	75300	5860	149000	3360	313	3630	1410	4.58	119	61.0

Appendix I

STATEMENT OF WORK
FOR REMEDIAL DESIGN AND REMEDIAL ACTION
OF OPERABLE UNITS TWO AND THREE
AT
NEAL'S LANDFILL
BLOOMINGTON, INDIANA

I. PURPOSE

The purpose of the Statement of Work ("SOW") is to set forth requirements for implementation of the Remedial Action selected by the U.S. Environmental Protection Agency ("U.S. EPA") to address polychlorinated biphenyl ("PCB") contamination in the groundwater, surface water and sediment at Neal's Landfill (the "Site"). This Remedial Action was selected by U.S. EPA in the Neal's Landfill Record of Decision ("ROD") Amendment for Operable Units 2 and 3 ("NL RODA OU2/3"), which was signed by the Superfund Division Director of U.S. EPA Region V on September 25, 2007. CBS Corporation shall perform the Work in the NL RODA OU2/3, the Consent Decree, this SOW, and in all plans and schedules reviewed and approved by U.S. EPA under this SOW after reasonable opportunity to review and comment by other Government Parties -- all of which are part of the Amendment to the Consent Decree signed by CBS Corporation ("CBS"), and by the United States (including U.S. EPA), the State of Indiana (including the Indiana Department of Environmental Management ("IDEM")), the City of Bloomington (including City of Bloomington Utilities)("City"), and Monroe County (County"), which collectively are referred to as the "Parties." For purposes of this SOW, United States (including U.S. EPA), the State of Indiana (including the Indiana Department of Environmental Management ("IDEM")), the City (including City of Bloomington Utilities), and County are referred to as the "Governmental Parties." In performing this Work, CBS shall refer to U.S. EPA guidance in preparing all deliverables for designing and implementing the Remedial Action to address PCB contamination in groundwater, surface water, and sediment.

II. DESCRIPTION OF THE REMEDIAL ACTION/PERFORMANCE STANDARDS

CBS shall design and implement the Remedial Action and Operation and Maintenance ("O&M") activities to meet the Performance Standards and specifications set forth in the NL RODA OU2/3 and this SOW, and all plans developed by CBS and approved by U.S. EPA under this SOW. Performance Standards shall include cleanup standards, standards of control, quality criteria, and other substantive requirements, criteria or limitations as described in the NL RODA OU2/3, this SOW, and in all plans developed by CBS and approved by U.S. EPA under this SOW. These shall include Applicable or Relevant and Appropriate Requirements ("ARARs") identified in the NL RODA OU2/3, except to the extent that such ARARs were subject to the Technical Impracticability Waiver issued by U.S. EPA on September 25, 2007. Notwithstanding the designation of 327 IAC 2-1-6,

Table 1 and IAC 5-2-11.1(h) as ARARs in the NL RODA OU2/3, the only limitation that will apply to the discharge of pollutants from any water treatment plant operated pursuant to this SOW will be 0.3 parts per billion ("ppb') for PCBs. The Performance Standards for the Neal's Landfill site include target concentrations for PCBs in fish, which are set forth in Paragraph A.a of the Remedy Confirmation Clause ("RCC") at Section IX of the Amendment to the Consent Decree. The fate and transport model used to predict future PCB levels in fish tissue indicates that the selected remedy for Neal's Landfill will achieve the fish tissue PCB target concentrations in 10 years or less. To measure progress toward achieving the target concentrations for PCBs in fish, the RCC requires CBS to conduct fish sampling in accordance with a sampling plan approved by U.S. EPA under Paragraph IX.H of the RCC in the Amendment to the Consent Decree. The RCC also specifies certain parameters that shall be used by CBS in collecting fish tissue samples and the statistical method to determine whether the fish tissue target concentrations have been achieved.

The Remedial Action selected by U.S. EPA in the NL RODA OU2/3 is intended to protect human health and the environment from unacceptably high risks posed by PCB contamination in groundwater, surface water, and sediment at the Site. The remedial action for Source Control Operable Unit 1 was completed in 1999 and addressed the principal threat waste through the excavation and off-site disposal and off-site incineration of high concentrations of PCB waste, including PCB oil-filled capacitors.

A. Definitions

Whenever terms listed below are used in this SOW, or in plans and reports submitted in accordance with this SOW, the following definitions shall apply.

1. The term "Conard's Branch" shall mean the surface stream shown on Figure 1 that originates near the northwestern side of Neal's Landfill and flows into Richland Creek.

2. The term "existing water treatment plant" shall refer to the water treatment plant that CBS constructed at Conard's Branch prior to this Amendment to the Consent Decree. The term "existing NPDES permit" shall refer to the National Pollutant Discharge Elimination System permit applicable to discharges from the existing water treatment prior to this Amendment to the Consent Decree.

3. The term "existing collection system" or "existing spring water collection system" shall refer to the collection system that, prior to the entry of this Amendment to the Consent Decree, was in operation at Conard's Branch for the purpose of capturing water from North Spring, South Spring and Overflow Springs and conveying this water to the existing water treatment plant.

4. "North Spring" shall mean the groundwater spring that emerges from the ground at the location shown on Figure 1.

5. The term "Overflow Springs" shall mean the groundwater springs near South Spring that emerge from the ground at the location shown on Figure 1.

6. The term "Richland Creek" shall mean the surface stream that flows generally in a southwesterly direction and intersects with Conard's Branch downstream from Neal's landfill.

7. The term "South Spring" shall mean the groundwater spring that emerges from the ground at the location shown on Figure 1.

8. The term "Springs and Seeps" shall refer to North Spring, South Spring, the Overflow Springs and North Spring Bypass Water.

9. The term "North Spring Bypass Water" shall mean groundwater springs and seeps that emerge to surface water within and along the banks of Conard's Branch near North Spring.

10. The term "Site" shall refer to the area within the geographic boundaries shown on the maps at Appendix C to the Amendment to the Consent Decree.

11. The term "Remedy Confirmation Clause" or "RCC" shall refer to the Remedy Confirmation Clause at Section IX of the Amendment to the Consent Decree.

B. Performance Standards

CBS shall meet the following performance standards with respect to the remedial components selected in the NL RODA OU2/3:

Remedial Component	**Performance Standard**
Design, construct, and operate a new spring water collection system to supplement the existing collection system by capturing water from Springs and Seeps downstream of the existing collection system and conveying this water to the existing water treatment plant.	The new spring water collection system, in combination with the existing collection system, shall capture water emerging from Springs and Seeps up to 450 gallons per minute ("gpm").

Remedial Component	Performance Standard
Treat groundwater emerging from Springs and Seeps in Conard's Branch using the existing water treatment plant.	1) Treat up to 450 gpm of groundwater released from the Spring and Seeps and conveyed to the existing water treatment plant by the existing and new collection systems. 2) Effluent from the existing water treatment plant shall not exceed a daily maximum concentration of .3 ppb for PCBs. Notwithstanding the designation of 327 IAC 2-1-6, Table 1 as an ARAR, only the discharge limit of 0.3 ppb for PCBs is designated as a Performance Standard. 3) Comply with substantive requirements in existing NPDES permit until the State of Indiana issues new substantive requirements, at which time CBS shall comply with the new substantive requirements, subject to CBS's right to dispute such substantive requirements before the Court as arbitrary and capricious or otherwise not in accordance with law, as specified in Paragraph II.D.7, below. 4) Maintain the maximum treatment capacity of existing water treatment capacity, which is capable of treating up to 500 gpm. 5) Achieve PCB target concentrations in fish in accordance with the RCC. 6) Comply with Shut-Off Criteria at Paragraph III.D.6, below.
Design and install new effluent line for existing water treatment plant.	Effluent line shall convey all treated water from the existing water treatment plant to a discharge point in Conard's Branch downstream of the new collection system.
Cleanup of the PCB-contaminated soil and sediment for in-stream sediments, bank soils and floodplain soils in and along Conard's Branch.	1) Remove in-stream sediments and bank soils to achieve an average PCB concentration of 1 part per million ("ppm") or less with a not-to-exceed concentration of 5 ppm.

Remedial Component	Performance Standard
	2) Remove floodplain soils to achieve an average PCB-concentration of 5 ppm or less with a not-to-exceed concentration of 10 ppm.

C. Major Remedial Action Components

The present Remedial Action addresses PCBs that have migrated and are migrating from the Site through groundwater conduits that are hydraulically connected to nearby Springs and Seeps. CBS shall implement the Remedial Action selected by U.S. EPA in the NL RODA OU2/3 by performing the following:

1) CBS shall continue to operate the existing water collection system which collects water from South Spring and the Overflow Springs (See Figure 1) and design, construct, and operate a new spring water collection system in Conard's Branch to capture water emerging from Springs and Seeps downstream of the current collection systems. If water continues to flow from North Spring, CBS shall collect water at North Spring either through the existing or the new water collection system. Together, the new and existing systems shall be capable of capturing up to a combined flow of 450 gpm and convey this water to the existing water treatment plant for treatment.

2) CBS shall install a new effluent line at the existing water treatment facility in order to extend the outfall to a discharge point in Conard's Branch downstream of the newly constructed spring water collection system.

3) CBS shall continue to operate the existing water treatment plant, which is capable of treating up to 500 gpm. The daily maximum concentration of PCBs in the effluent from the existing water treatment plant shall not exceed 0.3 ppb.

4) CBS shall implement a soil and sediment cleanup for in-stream sediments, bank soils and floodplain soils in Conard's Branch. The cleanup criteria are 1 ppm on average with a not-to-exceed concentration of 5 ppm for PCBs located in stream sediments and bank soils and 5 ppm on average with a not-to-exceed concentration of 10 ppm PCBs for floodplain soils.

5) CBS shall use best efforts to put into place deed restrictions to prevent further residential development and placement of drinking water wells on the Site, and any activities that may damage or impair the remedial measures performed in accordance with this SOW.

6) CBS shall revise the current Long-term Groundwater Monitoring Plan to monitor the long-term effectiveness of the remedy in achieving the Remedial

Action objectives set forth in the NL RODA OU2/3 and fish tissue target concentrations set forth in Paragraph 1.a of the RCC.

7) CBS shall maintain fencing around the water treatment plant.

8) CBS shall use best efforts to put into place agreements to ensure long-term access to the Site for itself, its contractors, and the Governmental Parties.

D. Remedy Components

1. Site Security

CBS shall maintain the current site security around the landfill perimeter to restrict access to the landfill cap. CBS shall also maintain security around the water treatment plant and associated structures to prevent vandalism.

2. Site Access

To the extent that the Site or any other property to which access is required for the implementation of the Neal's Landfill ROD Amendments and this SOW is owned or controlled by persons other than CBS, and to the extent that access to such properties has not yet been secured through agreements with the property owners, CBS shall use its best efforts to secure from such persons access for CBS, as well as for the Governmental Parties and their representatives, including, but not limited to, their contractors, as necessary to effectuate the NL RODA OU2/3 and this SOW. If any access required to complete the Remedial Action is not obtained within 30 days after the date U.S. EPA notifies CBS in writing that additional access beyond that previously secured is necessary, then CBS shall promptly notify the United States in writing, and shall include in that notification a summary of the steps CBS has taken to attempt to obtain access. The Parties all remain subject to the requirements of Paragraph 88 of the Original Consent Decree, provided that nothing herein or in the Original Consent Decree shall require the United States to violate the Anti-Deficiency Act, 31. U.S.C. 1341 *et seq.*

3. Institutional Controls

a) Pursuant to the schedule in Section VI, CBS shall submit an Institutional Controls ("ICs") Work Plan for review and approval by U.S. EPA. The IC Work Plan shall include the following:

i) A map that identifies the current boundaries of the restricted areas, boundaries of the Site, property ownership, streets, easements, encumbrances, assessor's parcel number, or other recorded plat or survey information.

ii) A legal description of each restricted area prepared according to current ALTA Survey guidelines.

iii) The draft restrictive covenants and easements for the restricted areas that are enforceable under the laws of the State of Indiana and are substantially in the form set forth in Attachment A.

iv) A current title insurance commitment in the form of ALTA Commitment form -1982 (as amended) from a title company, which shows title to the restricted areas to be free and clear of all prior liens and encumbrances.

v) Copies of encumbrances referenced in the Title commitment. Identification of encumbrances that negatively impact the restricted areas. Copies of requests for subrogation agreements for such encumbrances. Identification of the encumbrances on paper and maps that depict parcel numbers and the area impacted by the encumbrance.

b) The institutional controls shall set forth the following, unless the parties mutually agree otherwise:

i) The area within the existing fence around the Neal's Landfill cap shall not be disturbed by residential or commercial development.

ii) The area outside of the fence surrounding the landfill cap shall not be used in a manner inconsistent with the final cleanup levels for this area, nor shall this area be used in a manner that impairs or disturbs the Remedial Actions performed under this SOW.

iii) Development shall be prohibited or restricted in the southeast portion of the site and floodplain area of Conard's Branch based upon final cleanup levels and protection of remedial components. See Figure 1. Future land use that is not consistent with the final cleanup levels or components of the remedy shall be prohibited.

iv) Groundwater usage shall be prevented on the Site.

v) Give access rights to U.S. EPA, IDEM, CBS and their successors.

vi) Give rights to U.S. EPA, IDEM and CBS to enforce land use restrictions and access rights.

c) Pursuant to the schedule in Section VI, CBS shall arrange for the execution of such restrictive covenants and recording of such executed restrictive

covenants with the Monroe County recorder. CBS shall use best efforts to secure the execution of the restrictive covenants from such owners. The United States and the State of Indiana may consider, in their unreviewable discretion, using their enforcement authorities (including condemnation) to assist CBS in obtaining implementation of restrictive covenants in appropriate circumstances. In the event that any such use of enforcement authorities (including condemnation) results in an obligation to pay just compensation, CBS shall reimburse the United States or the State of Indiana, as applicable, for just compensation. Such payment shall be made in accordance with the procedures provided to CBS by the United States or the State of Indiana, as applicable. If both the United States and the State of Indiana decide not to use their enforcement authorities (including condemnation) to obtain a restrictive covenant from a property owner, and CBS has not been able to reach agreement with the property owner to obtain the restrictive covenant after exerting its best efforts, CBS shall not be required to take any further action to obtain the restrictive covenant.

4. Interim Groundwater Monitoring Program for Remedial Design and Remedial Action

CBS shall continue to complete surface water, flow, and water level monitoring as outlined in the April 2002 Long-term Groundwater Monitoring Plan until U.S. EPA approves a revised and updated version of this plan, at which point CBS shall comply with the requirements of the revised and updated plan. CBS may choose to eliminate the storm event sampling during this interim period. In addition, CBS may request additional modifications to the interim monitoring program.

5. Long-term Monitoring Plan

Pursuant to the schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and approval a revised and updated version of the April 2002 Long-term Monitoring Plan, supplementing the current requirements for the source control operable unit with new requirements for the groundwater and sediment operable units. As part of this plan, CBS shall conduct a well water user survey as described below. Upon approval by U.S. EPA, CBS shall implement the approved Long-term Monitoring Plan.

In the well water survey, CBS shall identify well-water users within a 5,000-foot radius and within the hydrogeological zone of influence of the Site. The survey shall identify the name of the property owner, the address of the property, and the primary use of the well. Once the survey is complete, the U.S. EPA may determine in its unreviewable discretion that identified wells require sampling and testing for PCBs. If U.S. EPA makes such a determination, CBS shall conduct the sampling and testing in accordance with an EPA-approved plan and schedule. As part of its 5-year review of the Remedial Action, U.S. EPA may determine that CBS shall update the well survey and conduct further sampling and testing of wells within a 5,000-foot radius of the Site and within the

hydrogeological zone of influence. In the event that U.S. EPA makes such a determination, CBS shall implement the well survey and conduct the sampling and testing, subject to CBS's right to challenge U.S. EPA's determination under Section XXIV (Disputes Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law. In the event that domestic wells within the 5,000-foot radius of the Site contain detectable concentrations of PCBs, CBS shall supply an alternative water supply or provide for treatment to ensure that the user is not consuming/using water containing PCBs in concentrations greater than the Maximum Contaminant Level.

The Long-term Monitoring Plan shall also describe the sampling requirements for fish tissue analysis after the requirements of the RCC have been met.

6. Sampling and Analysis Plan for the Remedy Confirmation Clause

Pursuant to the schedule in Section VI of this SOW and Paragraph IX.H of the RCC in the Amendment to the Consent Decree, CBS shall submit to U.S. EPA for review and approval a Sampling and Analysis Plan for Enhanced Fish Monitoring which shall describe the sampling requirements for the statistical evaluation of PCB concentrations in fish tissue.

7. National Pollution Discharge Elimination System Substantive Requirements

Based upon correspondence from IDEM at the time of the NL RODA OU2/3, the effluent limit for PCBs discharged by the water treatment plant is set at a daily maximum concentration of 0.3 ppb, and discharge criteria for constituents other than PCBs are not required. After IDEM develops other substantive National Pollutant Discharge Elimination System ("NPDES") requirements pursuant to the ARARs described in the NL RODA OU2/3, CBS shall modify the Operation & Maintenance Plan for the treatment plant to include the new requirements identified by IDEM, except that CBS may challenge IDEM's determination under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that new substantive requirements are arbitrary and capricious or otherwise not in accordance with the law.

III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION

CBS shall implement the Remedial Design and Remedial Action ("RD/RA") for the groundwater and sediment operable in accordance with the plans approved by U.S. EPA, after reasonable opportunity for review and comment by the other Governmental Parties, and the schedules set forth in Section VI.

A. RD/RA Work Plan

In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a Draft RD/RA Work Plan for the groundwater and sediment operable units describing in detail the implementation of the RD/RA required by this SOW. The Draft RD/RA Work Plan shall describe the general construction approach to complete the site environmental controls, additional data collection, cleanup confirmation methods, and proposed schedule of activities. After receipt of U.S. EPA's comments, CBS shall submit to U.S. EPA for review and approval a Final RD/RA Work Plan for review and approval in accordance with the schedule set forth in Section VI. Following approval, CBS shall implement the Final RD/RA Work Plan in accordance with the approved schedule.

B. Remediation Approach

1. Sediment Operable Unit

a. Sampling and Analysis to Delineate PCB contamination in Soils and Sediment

i) In accordance with the schedule set forth in Section VI, CBS shall develop and submit to U.S. EPA for review and comment a Draft Sampling and Analysis Plan ("SAP") for the delineation of PCB contamination in sediment in Conard's Branch, bank soils in Conard's Branch and soils in Conard's Branch floodplain. The SAP shall describe the sampling methodology for fully delineating all areas of Conard's Branch, including its banks and floodplain. The SAP shall require both surface sampling and borings.

ii. After receipt of U.S. EPA's comments on the draft SAP, CBS shall submit a final SAP to U.S. EPA for review and approval in accordance with the schedule set forth in Section VI.

iii. Upon receipt of U.S. EPA's approval of the final SAP, CBS shall implement the approved SAP in accordance with the schedules therein. In accordance with the schedule set forth in Section VI, CBS shall submit to U.S. EPA for review and approval a final report presenting details on the sampling event and the validated sampling results.

b. Excavation and Disposal of contaminated soil and sediment

i) In accordance with the schedule set forth in Section VI, CBS shall prepare and submit to U.S. EPA for review and comment a Draft Excavation Plan for contaminated sediment in Conard's Branch, bank soils in Conard's

Branch, and soils in Conard's Branch floodplain. The plan shall require CBS to remove PCB-contaminated soil and sediment in those areas delineated in the SAP investigation and shall require CBS to achieve a cleanup standard of 1 ppm PCBs on average with a not-to-exceed concentration of 5 ppm for in-stream sediment and bank soils and a cleanup standard of 5 ppm PCBs with a not-to-exceed concentration of 10 ppm on average for floodplain soils.

ii) Upon receipt of U.S. EPA's comments on the Draft Excavation Plan, CBS shall submit to U.S. EPA for review and approval a final Excavation Plan in accordance with the schedule in Section VI. The plan shall require that, pursuant to the Toxic Substances Control Act ("TSCA") - 40 CFR § 761.60 and CERCLA off-site policy, 40 CFR § 300.440, all excavated soils and sediments containing concentrations greater than or equal to 50 ppm PCBs shall be disposed of by CBS off-site in a licensed chemical waste landfill selected by CBS and compliant with the CERCLA off-site policy (40 CFR § 300.440). Further, the plan shall require that, pursuant to TSCA – 40 CFR § 761.60, all excavated soils and sediments contaminated with less than 50 ppm PCBs shall be disposed of by CBS off-site in a licensed special waste landfill selected by CBS and compliant with the CERCLA off-site policy (40 CFR § 300.440). At its option, CBS may propose to dispose of all soils and sediments contaminated with PCBs, regardless of concentration, at a chemical waste landfill, approved and compliant with 40 CFR § 761.75.

iii) Upon approval of the final Excavation Plan, CBS shall implement the plan in accordance with the schedule set forth therein and in Section VI and submit the verification sampling results to U.S. EPA for review and approval.

2. Groundwater Operable Unit

a) <u>Construction of the New Spring Water Collection System within Conard's Branch</u>

i) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and comment a preliminary design of a new spring water collection system to supplement the existing water collection system. The new spring water collection system shall capture Springs and Seeps in Conard's Branch downstream from the existing water collection system. The new spring water collection system, in combination with the existing collection system, shall capture up to 450 gpm of spring water, including water from South Spring, North Spring, Overflow Springs and North Spring Bypass. CBS shall operate the new spring water collection system to prevent all water from the above specified areas from bypassing the existing water treatment plant at flows less than 450 gpm (other than new springs shown to have an insignificant contribution to PCB loading in fish).

ii) In accordance with the schedule set forth in Section VI, CBS shall submit for review and approval by U.S. EPA a final design for the new spring water collection system.

iii) Upon U.S. EPA approval of the final design, CBS shall proceed to implement the design in accordance with the schedule set forth in the approved design plan and Section VI.

b. Extension of Effluent Line

i) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and comment a preliminary design plan (50% design completion) for a new effluent line to carry at least 450 gpm of treated water from the water treatment plant to Conard's Branch, discharging the water in Conard's branch at a point downstream from the new collection system. The purpose of the new effluent line is to prevent treated water from being collected in the new additional spring water collection system.

ii) In accordance with the schedule in Section VI, CBS shall submit to U.S. EPA for review and approval a final design for the new effluent line.

iii) Upon U.S. EPA approval of the final design for the effluent line, CBS shall implement the design in accordance with the schedule set forth in Section VI.

C. Submittal of Preliminary and Final Designs

As required under Subparagraph B (Remediation Phases), CBS shall submit a Preliminary Design (50% complete) and a Final Design (100% complete) documents for (1) the new spring water collection system and (2) the extension of the effluent line.

The Preliminary Design shall include the following:

- Preliminary drawings and sketches
- Design assumptions and parameters, including design restrictions
- Design calculations
- Results of additional field sampling or tests
- Compliance with ARARs

- Technical Specifications
- Proposed siting/locations of processes/construction activities
- Real estate, easement, and substantive permit requirements

CBS shall resolve with U.S. EPA, after reasonable opportunity to review and comment by other Government Parties, all comments on the Preliminary Design for the design submittals described above. The Final Design shall include construction details, project schedules, and bid specifications, and shall be subject to the approval process set forth in Section V.

D. Remedial Action

1. Remedial Action Construction

Upon approval of any final design for the installation of the new collection system and the new effluent line, and upon approval of the Final Excavation Plan, CBS shall implement the construction activities in accordance with the approved final designs and the schedule in Section VI. During the construction activities, weekly construction meetings shall be held to discuss the construction progress, future activities, and proposed changes. CBS may modify the frequency of these meetings with agreement of the Governmental Parties. Telephone calls may be substituted for a meeting if agreed upon between CBS and U.S. EPA.

2. Final Construction Inspection

Within 45 days after completion of the soil/sediment cleanup, installation of the new spring water collection system and the effluent line extension, CBS shall notify U.S. EPA for the purpose of conducting a final construction inspection. The purpose of the inspection is to determine if the construction is complete and consistent with the approved design and plans, this SOW, and the NL RODA OU2/3. A final construction inspection report, which CBS shall submit to U.S. EPA for approval after reasonable opportunity for review and comment by other Governmental Parties, will document any items of non-compliance, and actions required to resolve them, along with a schedule to complete such work.

3. Completion of Construction Report

Within 33 months after entry of the Amendment to the Consent Decree or 30 days after completion of the final construction inspection, whichever is later, CBS shall submit a Completion of Construction Report which documents the installation of the new collection system, installation of the new effluent line, and the soil/sediment cleanup.

The report shall document that, with the exception of the achievement of the target PCB concentrations for fish set forth in paragraph 1.a of the RCC, the Remedial Action has been fully performed and the Performance Standards have been attained. The report shall include a chronology of events, description of construction activities, final inspection documentation, a certification that the remedy is operational and functional, and a summary of project costs.

4. Completion of Remedial Action Report

Within 90 days after CBS concludes that the Remedial Action has been fully performed and the Performance Standards have been attained, CBS shall schedule and conduct a pre-certification inspection to be attended by CBS, U.S. EPA, the City, the County and the State of Indiana. If, after the pre-certification inspection, CBS still believes that the Remedial Action has been fully performed and the Performance Standards have been attained, it shall, within 30 days of the inspection, submit to U.S. EPA for approval (with a copy to the State of Indiana) a written report requesting certification. In the report, a registered professional engineer and CBS shall state that the Remedial Action has been completed in full satisfaction of the requirements of the Amendment to the Consent Decree and this SOW. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of CBS or CBS's project Coordinator:

> "To the best of my knowledge after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after completion of the pre-certification inspection and receipt and review of the written report, U.S. EPA, after reasonable opportunity to review and comment by the Governmental Parties, determines that the Remedial Action or any portion thereof has not been completed in accordance with the Amendment to the Consent Decree or this SOW, or that the Performance Standards have not been achieved, U.S. EPA will notify CBS in writing of the activities that must be undertaken by CBS to complete the Remedial Action and achieve the Performance Standards, provided, however, that U.S. EPA may only require CBS to perform such activities consistent with this SOW, the NL RODA OU2/3 and the Amendment to the Consent Decree. The U.S. EPA will set forth in the notice a schedule for performance of such activities consistent with the Amendment to the Consent Decree, the NL RODA OU2/3 and SOW or require CBS to submit a schedule to U.S. EPA for approval. CBS shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge the activities described in the notice. CBS shall bear the burden of

demonstrating that its position or actions complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

If U.S. EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by the Governmental Parties, that the Remedial Action has been performed in accordance with the Amendment to the Consent Decree and this SOW and that the Performance Standards have been achieved, U.S. EPA will so certify in writing to CBS. Certification of Completion of the Remedial Action shall not affect CBS's uncompleted obligations under previously-approved design documents and work plans.

5. Operation and Maintenance Plan

In accordance with the schedule in Section VI, CBS shall submit a revised Operation and Maintenance ("O&M") Plan for the Neal's Landfill water treatment plant, including the new collection system and the new effluent line, addressing the requirements of the groundwater operable unit. The format shall be similar to the previously approved O&M Plan for the treatment plant and will be modified to include the State of Indiana NPDES substantive requirements. The revised O&M Plan will be submitted in accordance with the schedule in Section VI for review and approval by U.S. EPA, after reasonable opportunity to review and comment by the Governmental Parties. Upon approval by the U.S. EPA, CBS shall implement the O & M Plan for the water treatment plant in accordance with the schedules therein.

The O&M Plan shall also provide for maintaining the soil and sediment cleanup levels after the cleanup levels have been achieved. In the event that (1) the soil and/or sediment becomes recontaminated with PCBs at a concentration greater than the cleanup criteria and the mean concentration of PCBs in fish exceeds the target concentrations in fish and (2) CBS is unable to demonstrate that the recontamination of the sediment is not contributing to the mean concentration of PCBs in fish exceeding the target concentrations for PCBs in fish, CBS shall conduct an additional soil and sediment removal to restore contaminated soils or sediment to the cleanup levels set forth in this SOW. In the event that U.S. EPA determines that CBS has been unable to demonstrate that the recontamination of sediments is not contributing to the mean concentration of PCBs in fish exceeding the target concentrations for PCBs in fish, CBS may challenge U.S. EPA's determination under Section XXIV (Dispute Resolution) of the Original Consent Decree on the grounds that U.S. EPA's determination is arbitrary and capricious or otherwise not in accordance with law.

6 Water Treatment Plant Shut-off Criteria

CBS shall continue to operate the Neal's Landfill water treatment plant until concentration of PCBs in the water emerging from the Springs and Seeps in and along

Conard's Branch is less than or equal to 0.3 ppb PCBs for a 12-month period. CBS may petition U.S. EPA to use the combined influent to the water treatment plant (i.e., the combined flow from Springs and Seeps) as the basis for determining whether the 0.3 ppb PCBs shut-off criteria for a 12-month period has been met. In the event that CBS submits such a petition, CBS must demonstrate that, based upon the combined influent into the water treatment plant, the shut down of the water treatment plant will not result in the mean concentration of PCBs in fish at any sampling location set forth in the RCC exceeding the target concentration set forth in the RCC for PCBs in fish at that sampling location. In response to CBS's petition, U.S. EPA may decide to approve the petition or, alternatively, may decide that the treatment plant cannot be shut down until the PCB concentrations in each Spring or Seep, or in a combination of Springs and Seeps, meets the shut-off criteria. In either event, CBS shall comply with U.S. EPA's determination, subject to CBS's right under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination on the grounds that it is arbitrary and capricious or otherwise not in accordance with law.

In addition, CBS may propose an alternative shut-off criteria and, if U.S. EPA determines that the alternative shut-off criteria provides a standard that is protective of human health and the environment, U.S. EPA shall propose to amend the NL RODA OU2/3 consistent with the substantive and procedure requirements of CERCLA and the National Contingency Plan. In the event that U.S. EPA amends the NL RODA OU2/3 to include the new shut-off criteria, the parties shall petition the Court to modify the Consent Decree to include the new shut-off criteria.

Regardless of whether the shut-off criteria in this Paragraph III.D.6 remains the unchanged or whether it is superseded by an alternative shut-off criteria, any dispute about whether the shut-off criteria has been achieved will be resolved in accordance with Section XXIV (Dispute Resolution) of the Original Consent Decree. CBS shall bear the burden of demonstrating that its position complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

7. Completion of Work

Within 90 days after CBS concludes that all phases of the Work (including O & M) have been fully performed and all Performance Standards have been achieved by CBS or been waived by U.S. EPA as technically impracticable, CBS shall schedule and conduct a pre-certification inspection to be attended by CBS, U.S. EPA, the City, the County and the State of Indiana. For the purposes of this Paragraph III.D.7, the term "Work" shall include all Work relating to Neal's Landfill, including Work relating to the Source Control Operable Unit required under Paragraph IV.C.1 of the Amendment to the Consent Decree.

If, after the pre-certification inspection, CBS still believes that the Work has been fully

performed and that all Performance Standards have been achieved by CBS, CBS shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of the Consent Decree and this SOW. The report shall contain the following statement, signed by a responsible corporate official of CBS or CBS's Project Coordinator:

> "To the best of my knowledge after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after review of the written report, U.S. EPA, after reasonable opportunity to review and comment by the other Governmental Parties, determines that (1) any portion of the Work has not been completed in accordance with the Amendment to the Consent Decree, the NL RODA OU2.3, this SOW, or any document incorporated by reference under Paragraph IV.C.1 of the Amendment to the Consent Decree or (2) the Performance Standards in this SOW have not been achieved by CBS, U.S. EPA will notify CBS in writing of the activities that must be undertaken by CBS to complete the Remedial Action and achieve the Performance Standards, provided, however, that U.S. EPA may only require CBS to perform such activities consistent with the Amendment to the Consent Decree, the NL RODA OU2/3, this SOW and any document incorporated by reference under Paragraph IV.C.1. U.S. EPA will set forth in the notice a schedule for performance of such activities consistent with the Amendment to the Consent Decree, the NL RODA OU2/3, this SOW and any document incorporated by reference under Paragraph IV.C.1 of the Amendment to the Consent Decree or require CBS to submit a schedule to U.S. EPA for approval. CBS shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to CBS's right under Section XXIV (Dispute Resolution) of the Original Consent Decree to challenge the activities described in the notice. CBS shall bear the burden of demonstrating that its position or actions complies with the Amendment to the Consent Decree, and that CBS is entitled to relief under applicable principles of law.

If U.S. EPA concludes, based on the initial or any subsequent request for Certification of Completion by CBS, and after a reasonable opportunity for review and comment by the Governmental Parties, that the Work has been performed in accordance with the Consent Decree, U.S. EPA will so notify CBS in writing.

E. Closure

No later than 30 days after receipt of U.S. EPA's certification of completion of Work, CBS shall submit to U.S. EPA for review and approval a proposed plan for the closure of the portion of the Site relating to operable units 2 and 3. The closure plan shall detail

closure activities, post-closure activities, and schedules of implementation. Upon approval of the closure plan, CBS shall implement the plan in accordance with the approved schedule.

IV. CONTENT OF SUPPORTING PLANS

In accordance with the schedules in Section VI, CBS shall develop and submit to U.S. EPA for review and comment, after reasonable opportunity to review and comment by other Governmental Parties, a Health and Safety Plan. Likewise, in accordance with the schedule in Section VI, CBS shall develop and submit to U.S. EPA for review and approval, after reasonable opportunity for review and comment by the other Governmental Parties, a draft and final Quality Assurance Project Plan. The following section describes the required contents of each of these supporting plans. During all Work performed pursuant to this SOW, CBS shall implement and comply with the approved Health and Safety Plan and approved Quality Assurance Project Plan.

A. Health and Safety Plan

CBS shall develop a Health and Safety Plan which is designed to protect on-site personnel and area residents from physical, chemical, and all other hazards posed by this Remedial Action. The Health and Safety Plan shall develop the performance levels and criteria necessary to address the following areas:

- Facility Description
- Personnel
- Levels of Protection
- Safe work practices and safeguards
- Medical surveillance
- Personal and environmental air monitoring
- Personal protective equipment
- Personal hygiene
- Decontamination
- Site work zones

- Contaminant control
- Contingency and emergency planning
- Logs, reports and record keeping

B. Quality Assurance Project Plan

CBS shall develop any necessary amendments to the existing CBS Quality Assurance Project Plan ("QAPP") to address sampling and analysis along with data handling for samples collected in all phases of future Site work. CBS shall follow the latest U.S. EPA guidance on the development of QAPPs (Instructions on the preparation of a Superfund Division Quality Assurance Project Plan, revision 0, June 2000).

V. APPROVAL OF DELIVERABLES

CBS shall provide to the other Governmental Parties a copy of any plan, report, or other item that CBS is required to submit to U.S. EPA for approval pursuant to this SOW. After review of any plan, report, or other item that is required to be submitted for approval pursuant to this SOW, U.S. EPA, after a reasonable opportunity for review and comment by the other Governmental Parties, shall, in writing: (i) approve the submission; (ii) approve the submission upon specified conditions; (iii) approve part of the submission and disapprove the remainder; or (iv) disapprove the submission.

If the submission is approved, then CBS shall take all actions required by the plan, report, or other document, in accordance with the schedules and requirements of the plan, report, or other document, as approved. If the submission is conditionally approved, then CBS shall, upon written direction of U.S. EPA, take all actions required by the approved plan, report or other item, subject to CBS's right to dispute under Section XXIV (Disputes Resolution) of the Original Consent Decree the conditions upon which U.S. EPA based its approval. If the submission is approved only in part, then CBS shall, upon written direction of U.S. EPA, take all actions required by the approved plan, report, or other item that U.S. EPA determines are technically severable from any disapproved portions, subject to CBS's right to dispute under Section XXIV (Disputes Resolution) of the Original Consent Decree to challenge U.S. EPA's determination as to the severability of the approved submission. CBS may dispute before the Court U.S. EPA's disapproval of part or all of any submission as arbitrary and capricious or otherwise not in accordance with law.

Within 45 days of U.S. EPA's disapproval of any submission (or such longer time as the parties may agree to in writing), CBS shall correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval, unless CBS has timely invoked dispute resolution under Section XXIV (Dispute Resolution) of the Original

Consent Decree. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole or in part, U.S. EPA may again require CBS to correct any deficiencies, in accordance with the preceding paragraphs, or may itself correct any deficiencies, subject to CBS's right to dispute U.S. EPA's decisions under Section XXIV (Dispute Resolution) of the Original Consent Decree as arbitrary and capricious or otherwise not in accordance with law.

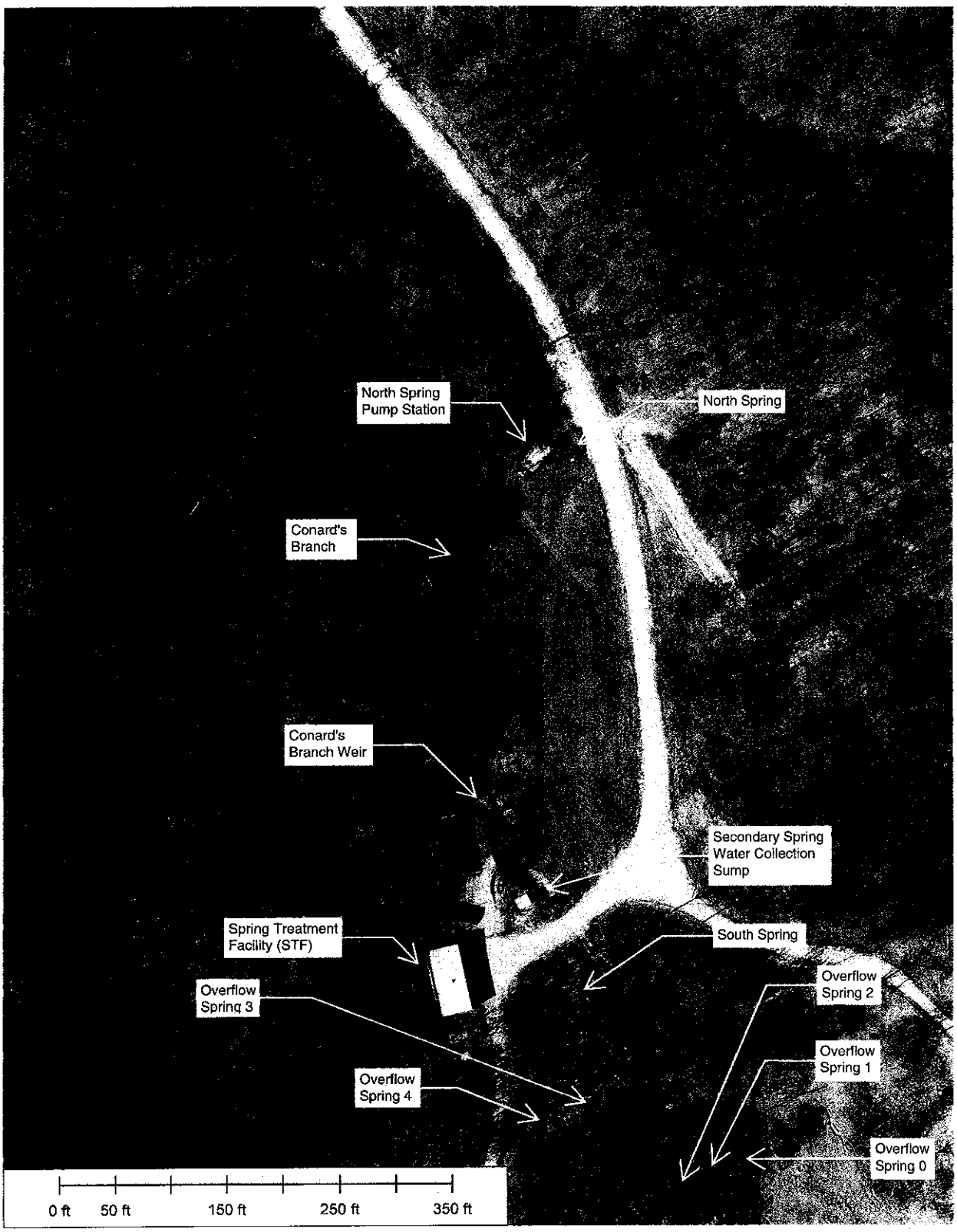
VI. SUMMARY OF MAJOR DELIVERABLES/SCHEDULES

The following schedule shall be followed unless the parties agree otherwise:

Submission	**Submittal Date**
Draft Remedial Design/Remedial Action Work Plan	90 days after entry of the Amendment to the Consent Decree
Final Remedial Design/Remedial Action Work Plan	30 days after receipt of comments from the Governmental Parties
Revised Quality Assurance Project Plan and Draft Health & Safety Plan	30 days after entry of the Amendment to the Consent Decree
Final Quality Assurance Project Plan And Health & Safety Plan	30 days after receipt of comments from the Governmental Parties
Draft Sampling and Analysis Plan for the Delineation of PCB Contaminated Soils and Sediments	13 months after entry of the Amendment to the Consent Decree
Final Sampling and Analysis Plan for the Delineation of PCB Contaminated Soils and Sediments	30 days after receipt of comments from the Governmental Parties
Complete Soil and Sediment Sampling and report results of sampling Analysis	90 days after approval of Final Sampling and Analysis Plan

Preliminary Excavation Plan for Soils and Sediments	18 months after entry of the Amendment to the Consent Decree
Final Excavation Plan for Soils and Sediments	30 days after receipt of comments from the Governmental Parties
Preliminary Design for New Effluent Line and New Spring Water Collection System	18 months after entry of the Amendment to the Consent Decree
Final Design for New Effluent Line and New Spring Water Collection System	30 days after receipt of comments from the Governmental Parties
Completion of Construction of Soils and Sediment Cleanup, New Effluent Line and New Spring Water Collection System	28 months after entry of the Amendment to the Consent Decree
Draft Operation and Maintenance Plan	27 months after entry of the Amendment to the Consent Decree
Final Operation and Maintenance Plan	30 days after receipt of comments from the Governmental Parties
Revised Long-term Monitoring Plan	24 months after entry of the Amendment to the Consent Decree
Final Long-term Monitoring Plan	30 days after receipt of comments from the Governmental Parties
Institutional Controls Work Plan	28 months after entry of the Amendment to the Consent Decree
Implementation of Institutional Control	33 months after entry of the Amendment to the Consent Decree

Draft Sampling and Analysis Plan for the Remedy Confirmation Clause	27 months after entry of the Amendment to the Consent Decree
Final Sampling and Analysis Plan for the Remedy Confirmation Clause	30 days after receipt of comments from the Governmental Parties
Completion of Construction Report	35 months after entry of the Amendment to the Consent Decree
Completion of Remedial Action Report	90 days after Remedial Action fully performed and Performance Standards have been attained
Completion of Work Report	30 days after pre-certification Inspection
Closure Plan	No later than 30 days after receipt of U.S. EPA's notification of Completion of Work



NEAL'S LANDFILL
BLOOMINGTON, INDIANA

FIGURE 1
NEAL'S LANDFILL
OPERABLE UNITS 2 AND 3 SOW

ATTACHMENT A

ENVIRONMENTAL PROTECTION EASEMENT
AND
DECLARATION OF RESTRICTIVE COVENANTS
NEAL'S LANDFILL

This Environmental Protection Easement and Declaration of Restrictive Covenants is made this ____ day of _____, 20___, by and between _____, ("Grantor"), having an address of _____, and _____ _____ ("Grantee"), having an address of _____ _____.

[Note: Grantor and Grantee cannot be the same entity. Grantee may be a State agency other than IDEM or a local authority]

WITNESSETH:

WHEREAS, Grantor is the owner of a parcel of land located in the County of Monroe, State of Indiana, more particularly described on Exhibit A attached hereto and made a part hereof (the "Property");

[Note: Exhibit A is to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of the Environmental Protection Easement and Restrictive Covenant.]

WHEREAS, the Property is part of and/or relates to the Neal's Landfill Superfund Site ("Site"), which the U.S. Environmental Protection Agency ("EPA"), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9605, placed on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 8, 1983;

WHEREAS, in two Record of Decision Amendments, dated March 29, 1999 and September 25, 2007 respectively, (collectively the "ROD Amendments"), the EPA Region Five (5) Regional Administrator selected a Remedial Action for the Site, which provides, in part, for the following actions: removal of PCB contaminated material from the landfill, capping of the landfill, cleanup of soil and sediment contaminated with PCBs, and treatment of PCB contaminated spring water from the Northwest Spring system. With the exception of the matters identified in Exhibit B, the Remedial Action has been implemented at the Site;

[Note: Exhibit B is to be prepared and customized to fit the facts and circumstances that exist at the time that the Environmental Protection Easement and Restrictive Covenant is prepared and executed.]

WHEREAS, the areas of the Property where hazardous substances remain above levels allowing for unrestricted use and unlimited exposure are depicted in Exhibit C and described in Exhibits D and E, attached thereto.

[Note: Exhibits C, D and E are to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of Environmental Protection Easement and Restrictive Covenant. Exhibit C shall be a map of the Property depicting the different areas where restrictions on uses of Property shall apply. Exhibit D shall be a legal description of the remedy components on the Property – e.g., cap, monitoring well, etc. Finally, Exhibit E shall be a legal description of the areas of restricted uses.]

WHEREAS, the remedial action for the Site is being conducted pursuant to CERCLA;

WHEREAS, the Grantor hereto has agreed to grant a permanent right of access over the Property to the Grantee for purposes of implementing, facilitating and monitoring the remedial action;

WHEREAS, the parties hereto have agreed to impose on the Property use restrictions as covenants that will run with the land for the purpose of protecting human health and the environment;

WHEREAS, Grantor wishes to cooperate fully with the Grantee in the implementation of all response actions at the Site;

WHEREAS, the Grantor and Grantee intend that the provisions of this Environmental Protection Easement and Declaration of Restrictive Covenants also be for the benefit of the United States and the Indiana Department of Environmental Management ("IDEM") as third party beneficiaries ("Third Party Beneficiaries"); and

WHEREAS, the Commissioner of IDEM has approved of this instrument and Grantor and Grantee intend this instrument to be a restrictive covenant pursuant to Indiana Code (IC) 13-11-2-193.5 that IDEM may enforce in a court action pursuant to IC 13-14-2-6(5).

NOW, THEREFORE:

1. Grant: Grantor, on behalf of itself, its successors and assigns, in consideration of the Remedial Action performed at the Site by the Grantee, IDEM or the EPA under the Consent Decree in the case of United States of America v. CBS Corporation, No. 1:81-cv-0448-RLY-KPF (S.D. Ind.), does hereby covenant and declare that the Property shall be subject to the restrictions on use set forth below, and does give, grant and convey to the Grantee, and its assigns, with general warranties of title, 1) the perpetual right to enforce said use restrictions,

and 2) an environmental protection easement of the nature and character, and for the purposes hereinafter set forth, with respect to the Property.

2. Purpose: It is the purpose of this instrument to convey to the Grantee real property rights, which will run with the land, to facilitate remediation of past environmental contamination and to protect human health and the environment by reducing the risk of exposure to contaminants. It is also the purpose of this instrument that the EPA and IDEM and each of their successors and assigns as Third Party Beneficiaries shall have the right to enforce the terms of this instrument and that IDEM shall also have the authority to enforce this instrument pursuant to IC 13-14-2-6(5).

3. EPA and IDEM as Third Party Beneficiaries: Grantor on behalf of itself and its successors, transferees, and assigns and the Grantee on behalf of itself and its successors, transferees and assigns hereby agree that the EPA and IDEM and their successors and assigns shall be Third Party Beneficiaries under this instrument.

4. Restrictions on use: The following covenants, conditions, and restrictions apply to the use of the Property, run with the land for the benefit of the Grantee and are binding upon the Grantor including its successors, transferees, assigns or other persons acquiring an interest in the Property and their authorized agents, employees, or persons acting under their direction and control.

[Note: Restrictions on use shall be developed in accordance with the ROD Amendments, the Neal's Landfill Statement of Work for Operable Units 1, 2 and 3, and the facts and circumstances relating to Property that is the subject of the Environmental Protection Easement and Restrictive Covenant.]

5. Modification or Recission of restrictions: Any request for modification or rescission of this instrument or of provisions of this instrument shall be made to the Grantee, IDEM and EPA at the addresses given below. This instrument may be modified or rescinded only with the prior written approval of EPA, IDEM and the Grantee. Grantor on behalf of its successors, transferees, assigns or other persons acquiring an interest in the Property agrees to file any modification to or rescission of this Environmental Protection Easement and Declaration of Restrictive Covenants approved by EPA, IDEM and the Grantee with the appropriate Registrar of Deeds and a certified copy shall be returned to the EPA, IDEM and the Grantee at the addresses listed below.

6. Environmental Protection Easement: Grantor hereby grants to the Grantee for its use an irrevocable, permanent and continuing right of access unless rescinded pursuant to paragraph 5 at all reasonable times to the Property for purposes of:

a) Implementing, operating and maintaining the response actions in the ROD Amendments, including but not limited to those actions generally described herein;

b) Verifying any data or information submitted to EPA or IDEM;

c) Verifying that no action is being taken on the Property in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

d) Monitoring response actions on the Site and conducting investigations relating to contamination on or near the Site, including, without limitation, sampling of air, water, sediments, soils, and specifically, without limitation, obtaining split or duplicate samples;

e) Conducting periodic reviews of the remedial action, including but not limited to, reviews required by applicable statutes and/or regulations; and

f) Implementing additional or new response actions that the EPA or IDEM determine that such actions are necessary to protect public health or the environment because (i) either the original remedial action has proven to be ineffective or (ii) that new technology has been developed which will accomplish the purposes of the remedial action in a significantly more efficient or cost effective manner; and will not impose any significantly greater burden on the Property or unduly interfere with the then existing uses of the Property.

7. Reserved rights of Grantor: Grantor hereby reserves unto itself, its successors, and assigns, all rights and privileges in and to the use of the Property which are not incompatible with the restrictions, rights and easements granted herein.

8. EPA and IDEM Entry, Access, and Response Authority: Nothing in this document shall limit or otherwise affect EPA and IDEM's rights of entry and access or EPA's and IDEM's authority to take response actions under CERCLA, the National Contingency Plan ("NCP"), or other federal and state law. The Grantor and Grantee consent to officers, employees, contractors, and authorized representatives of the EPA and IDEM entering and having continued access to this property for the purposes described in paragraph 6.

9. No Public Access and Use: No right of access or use by the general public to any portion of the Property is conveyed by this instrument.

10. Notice requirement: Grantor agrees to include in any future instrument conveying any interest in any portion of the Property, including but not limited to deeds, leases and mortgages, a notice which is in substantially the following form:

NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS, DATED _____, 20__, RECORDED IN THE PUBLIC LAND RECORDS ON _____, 20___, IN BOOK _____, PAGE _____, IN FAVOR OF, AND ENFORCEABLE BY _____ AS GRANTEE, AND IN FAVOR OF AND ENFORCEABLE BY THE UNITED STATES OF AMERICA AND THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT AS THIRD PARTY BENEFICIARIES.

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor must provide Grantee with a certified true copy of said instrument and, if it has been recorded in the public land records, its recording reference.

11. Enforcement: The Grantee, and the EPA and IDEM as Third Party Beneficiaries shall be entitled to enforce, individually or jointly, the terms of this instrument by resort to specific performance or legal process. IDEM shall be entitled to enforce this document pursuant to IC 13-14-2-6(5). All remedies available hereunder shall be in addition to any and all other remedies at law or in equity, including CERCLA. Enforcement of the terms of this instrument shall be at the discretion of the Grantee, the EPA and IDEM and any forbearance, delay or omission to exercise its rights under this instrument in the event of a breach of any term of this instrument shall not be deemed to be a waiver by the Grantee, EPA or IDEM of such term or of any subsequent breach of the same or any other term, or of any of the rights of the Grantee, the EPA or IDEM.

12. Waiver of certain defenses: Grantor hereby waives any defense of laches, estoppel, or prescription.

13. Covenants: Grantor hereby covenants to and with the Grantee and its assigns, that the Grantor is lawfully seized in fee simple of the Property, that the Grantor has a good and lawful right and power to sell and convey it or any interest therein, that the Property is free and clear of encumbrances, except those noted on Exhibit F attached hereto, and that the Grantor will forever warrant and defend the title thereto and the quiet possession thereof.

[Note: Exhibit F is to be prepared and customized to fit the facts and circumstances relating to Property that is the subject of Environmental Protection Easement and Restrictive Covenant.]

14. Recordation: Unless this Instrument is rescinded under Paragraph 5, the Grantor, its successors or assigns shall re-record this Instrument including any subsequent modifications and amendments forty-nine (49) years from the date of first recording, or any subsequent recordings, to insure its continued applicability under the Marketable Title for Real Property Act found in IC 32-20.

15. Notices: Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and shall either be served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantor:

_____
_____
_____

To Grantee:

_____
_____
_____

To Third Party Beneficiary:

U.S. Environmental Protection Agency
Superfund Division Director
77 West Jackson Boulevard
Chicago, IL 60604

To Third Party Beneficiary:

Indiana Department of Environmental Management
Office of Land Quality
100 N. Senate Avenue
Mail Code – 66-31 IGCN 1101
Indianapolis, IN 46204-2251

16. General provisions:

a) Controlling law: The interpretation and performance of this instrument shall be governed by the laws of the United States or, if there are no applicable federal laws, by the law of the State of Indiana.

b) Liberal construction: Any general rule of construction to the contrary notwithstanding, this instrument shall be liberally construed in favor of the grant to effect the purpose of this instrument and the policy and purpose of CERCLA. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this

instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability: If any provision of this instrument, or the application of it to any person or circumstance, is found to be invalid, the remainder of the provisions of this instrument, or the application of such provisions to persons or circumstances other than those to which it is found to be invalid, as the case may be, shall not be affected thereby.

d) Entire Agreement: This instrument sets forth the entire agreement of the parties with respect to rights and restrictions created hereby, and supersedes all prior discussions, negotiations, understandings, or agreements relating thereto, all of which are merged herein.

e) No Forfeiture: Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

f) Joint Obligation: If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

g) Successors: The covenants, terms, conditions, and restrictions of this instrument shall be binding upon, and inure to the benefit of the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property. The term "Grantor", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantor" and their personal representatives, heirs, successors, and assigns. The term "Grantee", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantee" and their personal representatives, heirs, successors, and assigns. The rights of the Grantee and Grantor under this instrument are assignable, subject to the notice provisions hereof.

h) Termination of Rights and Obligations: A party's rights and obligations under this instrument terminate upon transfer of the party's interest in the Easement or Property, except that liability for acts or omissions occurring prior to transfer shall survive transfer.

i) Captions: The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

j) Counterparts: The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the Grantee and its assigns forever.

IN WITNESS WHEREOF, Grantor has caused this Environmental Protection Easement and Declaration of Restrictive Covenant to be signed in its name.

Executed this _____ day of _____, 20__.

NAME OF GRANTOR

By: _____

STATE OF INDIANA

) ss

COUNTY OF MONROE

On this __ day of _____, 20__, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____, known to be the _____ of _____, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they are authorized to execute said instrument.

Witness my hand and official seal hereto affixed the day and year written above.

_____

Notary Public in and for the
State of _____

My Commission Expires: _____.

This Environmental Protection Easement and Declaration of Restrictive Covenant is accepted this ____ day of _____ , 20__.

NAME OF GRANTEE

By: _____

_____

Attachments:	Exhibit A	-	legal description of the Property
	Exhibit B	-	Remedial Actions to be completed
	Exhibit C	-	map of Property depicting the different areas of restrictions
	Exhibit D	-	legal description of the remedy components on the Property
	Exhibit E	-	legal description of the areas of restricted uses
	Exhibit F	-	list of recorded encumbrances