MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: SSAB Members
Ex Officio Members

FROM: Mark Donham
Vicki Jones

DATE: October 1, 1997

SUBJECT: **MEETING REMINDER**

The next SSAB meeting will be October 16, 1997, at 6:00 p.m. in the Heath High School. The following is the tentative agenda and action items:

Tentative Agenda

Minutes
Information (Handouts)
EMEF Project Updates
Review of the Water Policy
Review of the SSAB Draft Work Plan
An update on the new members
Administrative Plans for the board

Action Items

DOE will provide Ray McLennan with an updated map showing the present location of the groundwater plumes.
Membership committee will review application and present a draft modified application to the board for consideration.
Nola Courtney will contact the three board members whose terms are up and see if they are still interested in participating.
Mark Donham and Vicki Jones will perform the annual evaluation.
Bill Tanner will check into cost estimates for providing clerical help.

PADUCAH GASEOUS DIFFUSION PLANT
SITE SPECIFIC ADVISORY BOARD

Chartered under the Federal Advisory Committee Act

CO-CHAIRS

Mark Donham
Route 1
Brookport, Illinois 62910
mdonham@igc.org

Vicki Jones
1131 Hamburg Road
Kevil, Kentucky 42053
jonesvw@ornl.gov

BOARD MEMBERS

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Paducah, KY, 42003

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Rev. W.G. Harvey, Sr.
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Connie J. Sykes
705 N. 24th Street
Paducah, Kentucky 42001

Bill Tanner
6072 Rosebud Road
Metropolis, Illinois 62960

Rev. Gregory Waldrop
4141 Buckner Lane
Paducah, Kentucky 42001

Meeting Minutes

October 16, 1997

The October 16, 1997, Site Specific Advisory Board (SSAB) meeting took place at Heath High School at 6:00 p.m.

The following board members were present: Nola Courtney, Mark Donham, Vicki Jones, Ronald Lamb, Linda Long, Ray McLennan, Craig Rhodes, Bill Tanner and Gregory Waldrop. Ex Officio members present were: Wayne Davis, Jimmie Hodges and John Volpe. Facilitator Present: Steve Kay. Also present were: Todd Adams, Carlos Alvarado, Rich Bonczek, Teresa Fields, Pat Gourieux, Dennis Hill, Craig Jones, Charlie Logsdon, Jimmy Massey, Scott McMurry, Dwight Mitchell, Todd Mullins, Phil Smith and Jana White.

The agenda was modified to include an Update on the Drum and an Update on the Small Mammal Study. The modified agenda was approved by consensus.

Steve Kay asked for approval of the September 18, 1997, meeting minutes. Mark Donham proposed that the minutes be amended to include a statement by Jimmie Hodges that small amounts of transuranics were recovered at Paducah. He felt that this was significant. He stated that this was the first time he had heard this information. The amended minutes were approved by consensus.

The next item on the agenda was the Environmental Management and Enrichment Facilities (EMEF) updates. Mark suggested that November's agenda include the EM Evaluation Matrix Ranking.

The update on the drum incident was the next item on the agenda. Pat Gourieux gave a presentation on what had happened and what actions have been taken. Movement of similar drums has been suspended. Craig Rhodes asked how the contents would be neutralized. Pat explained that some form of base would be used. The acid would be neutralized. The intent is to make the waste not volatile. The waste will still contain the radionuclides. Questions were asked about worker exposure and clean up processes. It was stated that the radionuclide is not the problem, it is the nitric acid. The area is cordoned off, signs are posted and entry is minimized. Vicki Jones asked if the Department of Energy (DOE) is looking at what caused the incident. Jimmie Hodges stated that they had looked at that and their intent is to look into what led to the incident. DOE is looking at better ways of communicating complex wide. Record keeping from the 1960's was not as good as it is now. There is a lot of waste that has not been characterized yet. The importance of getting this waste characterized has been brought forward. This incident has caused Lockheed Martin Energy Systems, Inc. (LMES) to issue a new procedure on overpacking liquids. The entire storage system is being looked at. All operations are suspended in the building at this time.

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Mark Donham asked if the contract would only cover the remaining 16 drums. Pat stated that the number was approximately double. Mark asked if the 16 barrels of waste are the 13 or 15 cubic meters of transuranic waste identified in the Waste Management Environmental Impact Statement (EIS). Pat stated that part of them will be, but they will not be disposed of. Some of the 16 drums are classified as transuranic waste but they will only be treated not disposed of. The waste in the rest of these drums has been classified as mixed waste. It is possible that in the treatment process that they might be re-classified as mixed low-level waste. Mark asked if the board could get a copy of the characterization data. He also asked if the investigation team had completed their report. Jimmie Hodges stated that the report was not final. The board asked to be kept informed. It will be put on the agenda when the report is complete. The Executive Summary will be presented to the board when the report is final.

The Small Mammal Study was the next item on the agenda. Craig Jones gave a brief presentation on the study. Phil Smith and Dr. Scott McMurry of Texas Tech showed slides and presented their report to the board. John Volpe emphasized that one has to be very careful when interpreting such small data sets. There were 67 animals trapped. Forty one white footed mice and 19 rice rats. Craig Rhodes asked about shrews. He asked if they had considered testing domestic cats. Phil Smith stated that although feral cats would represent a good sentinel species, such a study would not have been a good public relations move. There were two cats on the reference site and they were fat. Charlie Logsdon stated that it would be very difficult to prove where the cats had come from and how long they had been there. Charlie Logsdon questioned the substitution of the rice rat for the shrews. Shrews are a much better choice but shrews at the West Kentucky Wildlife Management Area (WKWMA) were scarce. Craig Jones concluded the presentation by discussing ecological/human health impacts and future activities.

The next item on the agenda was the Water Policy. Dennis Hill discussed the Water Policy and presented some slides. DOE initially established a five year review of the water policy and is in the process of revising and renewing the Water Policies at this time. There are approximately 100 families that are on the city water. People who chose not to participate in the past will be revisited to see if they are interested in receiving the city water.

The draft SSAB Workplan was the next item on the agenda. Bill Tanner presented what he had found out on alternating locations. He had proposed this in the October meeting. Bill proposed that the away meetings be tailored to the community the meeting was in. Vicki Jones and Ronnie Lamb had suggested a meeting on groundwater contamination be held at the Wildlife Area. Also he suggested bringing in a water expert. Mark Donham is interested in the air monitoring and Bill suggested a meeting in Metropolis along with an air expert. Meetings based in the permanent meeting place could be administrative based. Mark stated that it would take several months to get the data to the experts and for them to review it. Bill suggested that the board be divided into groups of three by interest. This would give a broader look at the interests. The proposal was made to have 3-6 meetings each year that are away from the home base that deal with specific issues that are of a broader interest to the community. The proposal was agreed to by consensus. The proposal was made that committees be set up to determine topics of discussion, sites for the meeting and people (experts) to participate in the meetings. The proposal was agreed to by consensus. The proposed topics for discussion were groundwater, small mammals, air pollution, elected officials contact, and economic development. Two committees were formed as follows: Elected Officials Contact Committee: Ronnie Lamb, Mark Donham and Ray McLennan. Ray will serve as committee chairman. Wildlife Area Committee: Gregory Waldrop, Nola Courtney, and

Vicki Jones. Gregory Waldrop will serve as committee chairman. In the Al Alm conference call budget issues were discussed and there was supposed to be a follow up. Carlos Alvarado stated that the Dallas meeting would be a good time to discuss these issues with Al Alm.

Steve Kay asked the board about the December meeting. Steve felt that a re-orientation meeting would be appropriate for the new members coming on board. Steve asked if there was any interest in having a meeting to discuss reorientation. Greg Waldrop suggested a pairing on new members with the members already on the board. It was proposed that the December meeting be canceled. It was approved by consensus.

Membership status was the next item for discussion. Carlos Alvarado stated that all the new members should have received a letter and package. There are four new members. Two of the current board members' (Tommy Fletcher and Bill Kressenberg) appointments had expired and they did not want to be reappointed. Greg Waldrop's appointment had expired and he asked to be reconsidered for the board. The proposal was made that he be appointed for a three year period. The proposal was approved by consensus. All terms will run from October 1 through September 30. The membership applications require further work. Needs to be placed on agenda for January.

The next item for discussion was the Dallas meeting. Connie Sykes will be attending from Paducah. Mark Donham stated that each board would give a 10 minute talk on the top three issues. Mark felt that she needed some guidance. The three issues that were suggested for Connie to speak on were: Groundwater, Polychlorinated biphenyl (PCB) and Heavy Metal Contamination in Land and Effects on Small Mammals, and Management of Legacy Waste. Nola stated she had some notes from the Knoxville trip and would get them to Connie. Vicki Jones will get Connie the information from this meeting.

The next items on the agenda were administrative duties. Changes to the mission/scope will be discussed at the November meeting. Information on the office space and on clerical help will be discussed at the next meeting. There was some discussion on combining the upcoming DUF6 Workshop with the November meeting but due to the large amount of agenda items already scheduled, it was suggested that the workshop be held in December.

The next meeting will be held on November 20, 1997, at the Heath High School at 6:00 p.m. The meeting was adjourned.

Tentative Agenda for the November 20, 1997, meeting:

Minutes
Information (Handouts)
EMEF Project Updates
Administrative Plans for the board
EM Evaluation Matrix Ranking
Drum Update
Waste Management Report
Strategies for Effective & Meaningful Public Input Report
Review of the SSAB Draft Work Plan
Media Contact Discussion
WAG 22

Action Items
Provide board with copies of the characterization data on drum.

MEMORANDUM
SITE SPECIFIC ADVISORY BOARD

TO: Distribution

FROM: Mark Donham
Vicki Jones

DATE: November 4, 1997

SUBJECT: **OCTOBER 16, 1997, MEETING MINUTES**

Attached are the subject meeting minutes. The next meeting will be held November 20, 1997, at the Heath High School at 6:00 p.m. Please review and provide comments or changes at the November meeting.

SSAB Distribution List
Nola Courtney
Mark Donham
Edward Duff
David Fuller
Eddie Gray II
W. G. Harvey, Sr.
Vicki Jones
Ronald Lamb
Lynn Lane
Linda Long
Ray McLennan
Craig Rhodes
Connie J. Sykes
Bill Tanner
Gregory Waldrop

Ex Officio Distribution List
Wayne Davis
Carl Froede, Jr.
Jimmie C. Hodges
Tuss Taylor
John A. Volpe

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Metropolis, Illinois 62960

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Meeting Minutes

October 16, 1997

DRAFT

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Strategies for Effective & Meaningful Public Input Report
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Media Contact Discussion
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Action Items
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SSAB Sign In Sheet 10/16/97

Dennis Hill	LMES
Teresa Fields	EASI/DOE
Carlos Alvarado	DOE
Vicki Joker	SSAB
Steve Kay	RKI
Scott McMurry	Texas Tech (Clemson)
Phil Smith	Texas Tech Univ (Clemson)
Linda Lang	SSAB
[illegible]	SSAB
Rich Bonczek	LMER/ORNL
Jerry Massey	LMES
Craig S Jones	LMES
Mark Durham	SSAB
[illegible]	KY Rad Control
Todd Adams	KY Rad Control
Jimmie C Hodges	DOE
Nala Courtney	SSAB
Wayne Davis	KDFWR
Pat Bourneux	LMES
Charlie Logsdon	KDFWR
Dwight Mitchell	KDFWR
Craig Rhodes	SSAB

Gregory Waldrop SSAB

Ray McL[illegible] SSAB

Paducah Gaseous Diffusion Plant (PGDP)
Site Specific Advisory Board (SSAB)
1997/1998 Work Plan

ISSUE	EXPECTED ACTIONS	STATUS/APPROACH	Nov. 97	Dec. 97	Jan. 98	Feb. 98	March 98	April 98	May 98	June 98	July 98	August 98	Sept. 98	Oct. 98
Waste Management	Review documents	Monitor & provide suggestions as appropriate	XX		XX			XX			XX			
Waste Minimization/ Pollution Prevention	Review documents	Monitor & provide suggestions as appropriate	XX		XX			XX			XX			
Transportation of wastes/ hazardous materials	Review documents	Monitor & provide suggestions as appropriate	XX		XX			XX			XX			
Decontamination & Decommissioning	Review documents	Monitor & provide suggestions as appropriate				XX	XX							
Economic Impact on Community	Monitor	Monitor & provide suggestions as appropriate			XX									
Protection/ Restoration of Natural Resources & Ecological Values	Review documents	Monitor & provide suggestions as appropriate												
Protection of Workers, Public Health and Safety	Monitor Projects	Monitor & provide suggestions as appropriate												
Technology Development and Transfer	Review documents	Monitor & provide suggestions as appropriate												
Strategies for effective and meaningful Public Input	Work 2 DOE/ Community Relations Plan	Monitor & provide suggestions as appropriate	XX											
Cost Effectiveness	Review documents	Monitor & provide suggestions as appropriate				XX								
WAG 6	Review documents	Continue monitoring				XX						XX RI Rpt.		
WAG 22 (7 & 30)	Comment on D1 RI					XX D1FS						XX D1PP		

Paducah Gaseous Diffusion Plant (PGDP)
Site Specific Advisory Board (SSAB)
1997/1998 Work Plan

ISSUE	EXPECTED ACTIONS	STATUS/APPROACH	Nov. 97	Dec. 97	Jan. 98	Feb. 98	March 98	April 98	May 98	June 98	July 98	August 98	Sept. 98	Oct. 98
WAG 22 (2 & 3)	Comment on D1 FS		XX D1FS						XX D1PP					
WAGs 9 & 11 Preliminary Assessment/Site Inspection (PA/SI) process Site Evaluation Report								XX SE Rpt.						
WAG 17		Record of Decision (ROD) signed 9/29/97												
LASAGNA					XX D1PP							XX D1 ROD		
Drum Mountain (WAG 24)	Review documents	Provide recommendations												
Site Treatment Plan Annual Report							XX STP Annual Update							
Federal Facilities Agreement (FFA)														
Integrated Waste Management (IWMP)		IWMP Yearly Update Completed 12/15/97			XX									
Vortec							XX						XX	
Board Evaluation						XX								

PADUCAH GASEOUS DIFFUSION PLANT SITE SPECIFIC ADVISORY BOARD
U.S. DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT & ENRICHMENT FACILITIES
PROJECT UPDATE
OCTOBER 16, 1997

ENVIRONMENTAL RESTORATION

Northwest Plume Interim Remedial Action Pilot Plant

More than 205 million gallons of water have been treated at the Northwest Plume Groundwater Treatment Facility since operations began Sept. 1, 1995. The facility operates to contain a high contamination zone of the degreaser trichloroethylene and the man-made radionuclide technetium-99.

Northeast Plume Interim Containment System

The Northeast Plume project includes extraction wells in the northeast quadrant of DOE property with an underground pipeline running to the existing PGDP cooling towers as part of the containment system.

Routine operations began in March 1997, with more than 54 million gallons of groundwater treated to date.

Lasagna demonstration

The Lasagna soil remediation technology tested at PGDP works by using buried electrodes to move water through contaminated soil. Applied current drives the water an inch a day from a positive to a negative electrode. Along the way, the water picks up contaminants from the soil which are removed by treatment zones containing iron filings.

Phase IIA installation was completed in August 1996 and the process was operational through Feb. 26, 1997, with post-demonstration sampling completed the week of March 3, 1997.

DOE EM-50 granted the Lasagna consortium another extension of the Phase IIA project, allowing it to operate through August 1997. The DOE now plans to propose its preferred remedial measures for SWMU 91, which is advancement into Phase IIB, full-scale remediation.

The project now includes a revised Feasibility Evaluation rather than the earlier proposed Feasibility Study. The proposed public comment period for the Proposed Remedial Action Plan is Jan. 15-March 3, 1998. The following have been tentatively scheduled around those dates:

Jan. 14 — Public notice of availability published in Paducah Sun.

Feb. 12 — Public meeting if requested by Feb. 4

Feb. 10 — Notice of meeting cancellation in Paducah Sun if not requested.

If full-scale remediation is undertaken, the remediation will be funded by EM-40 (the office of the Deputy Assistant Secretary for Environmental Restoration), which funds the remainder of Paducah's Environmental Restoration and Waste Management program.

Waste Area Groups 1 & 7/C-746-K Landfill, Kentucky Ordnance Works

WAG 1 consists of a fire training area, the plant sewage treatment facility and a known trichloroethylene spill site inside the PGDP security fence. WAG 7 consists of five underground storage tanks at the plant water treatment facility, and an inactive sanitary landfill outside the security fence. Three SWMUs are connected with the former Kentucky Ordnance Works (KOW) and are located on the DOE reservation. They are the KOW sewage treatment facility, a known

Toluene spill site and a burn area.

The current proposed plan includes continued controlled access, groundwater monitoring and deed restrictions in the preferred alternative. Field work to make riprap repairs at the landfill was completed Aug. 12, 1997.

The current tentative schedule has DOE signing the Record of Decision in mid-October, with regulator signings projected for early to mid-November 1997.

Waste Area Group 3/burial grounds
WAG 3 is composed of three burial grounds within the PGDP security fence. The FY 97 scope of this project include the development of a work plan scoping document and work plan. The draft scoping document was submitted to the regulators on March 27, 1997.

The D0 Remedial Investigation/Work Plan was issued Sept. 2.

Waste Area Group 6/Trichloroethylene spill site
The C-400 TCE spill site is a major source of TCE in the groundwater and soil. The Industrial Hydrogeologic Study focused on piping, utilities and building foundations in the C-400 building area to determine how these man-made structures and systems influence groundwater infiltration and flow.

The data from this investigation was used to prepare a WAG 6 Remedial Investigation Work Plan which focuses on contaminant distribution and movement. Treatability studies to get data necessary to remediate contaminants expected to be found during the investigation have been completed.

To date, 177 of 200 borings for the remedial investigation have been completed. Following completion of the RI/FS, a Proposed Plan and Record of Decision for the preferred remedial action will be developed. The selected action will be designed and implemented following the signing of the ROD.

Waste Area Groups 9 & 11
WAGs 9 & 11 are composed of seven below ground liquid containment vessels.

The scope of work for this project includes development of an SAP, field sampling and development of a Site Evaluation Report. Historical analytical data was transmitted electronically to the Kentucky Division for Waste Management, and the data assessment report completed and delivered to DOE and KDEP.

Waste Area Group 17/Rubble piles
The piles of concrete rubble that make up Waste Area Grouping 17 have been investigated for contamination. The rubble, derived from demolition of sidewalks, parking lots and other concrete structures at PGDP during the 1970s, was used as construction material in the Ballard County Wildlife Management area, McCracken County Wildlife Management Area and on Department of Energy property.

A small amount of contaminated material was removed from SWMU 124 in 1996. After further sampling, an additional removal action at this SWMU took place in April 1997. Following that removal action, the state's Radiation Control Branch verified that no further action was needed at SWMU 124, and has issued a letter to that effect.

An Aug. 26 public meeting at the Lockheed Martin Energy Systems facility in the West Kentucky Technology Park in Kevil, Ky. was attended by five members of the general public. Comments included concern that removal of the rubble and placement in a waste storage area would be

contributing to risk by adding to the inventory of waste already stored at PGDP. DOE's immediate concern, however, was to remove all risk to members of the general public by bringing the material inside the PGDP security fence.

The Record of Decision (ROD) for the selected action being prepared by DOE has been approved and signed by the regulatory agencies. The Proposed Remedial Action Plan is available at the U.S. Department of Energy Environmental Information Center and the Paducah Public Library.

Waste Area Group 22/Burial grounds
This project includes the investigation of burial grounds in the northwest corner of the plant (SWMUs 7 & 30) and in the west-central portion of the plant (SWMU 2). Original plans included installation of a cap at SWMU 2, the C-749 Uranium Burial Ground, but investigation activities have determined that the buried material was saturated in the water table, indicating a cap would have limited effect.

The development of a Remedial Investigation Report is ongoing at SWMUs 7 & 30 (the C-747-A Uranium Burial Ground and C-747-A Burn Area). This RI report was submitted to the regulatory agencies in July 1997, with comments due October 1997.

Waste Area Group 23/Polychlorinated Biphenyls (PCBs) Spill Sites
Past use of PCBs and subsequent accidental spills and leaks of oils that contain PCBs caused surface soil contamination at several Solid Waste Management Units inside the PGDP security fence.

The preferred option in the original Proposed Plan was the excavation and treatment of the soil containing PCBs greater than 25 ppm using a thermal treatment technology known as vitrification. This process destroys organics, such as PCBs, and produces a glass which will bind any radioactive compounds.

The DOE recently sought public comment on an Engineering Evaluation/Cost Analysis Summary (EE/CA Summary) for the cleanup of PCB sites. The summary describes the Non-Time-Critical Removal Action that DOE is considering — the excavation and temporary on-site storage of the contaminated soil. The focus of this removal action is the elimination of risk to workers from contact with soil. The final disposition of the soil would be determined at a later date, consistent with applicable laws and regulations.

Following incorporation of public comments, DOE issued an Action Memorandum for the selected action on Sept. 8, 1997, with the reveiw period extended to Sept. 15, 1997. The Action Memo was transmitted to EPA for their information, but will not be signed by the agency. DOE signed the Action Memo on Sept. 12, 1997. LMES has submitted the Statement of Work for the removal action to Oak Ridge procurement, and proposals are expected back by Sept. 29, 1997.

LMES has submitted the Statement of Work for the removal action to procurement. Proposals have been received and are under review.

A continuing issue is the disagreement between the Commonwealth and DOE on the PCB clean-up level.

Waste Area Group 27/Potential trichloroethylene sources
WAG 27 consists of potential or known sources of TCE on the west side of the Paducah Gaseous Diffusion Plant. A second draft Remedial Investigation/Feasibility Study Work Plan is being developed for submittal to regulatory agencies on June 2, 1997.

The Remedial Investigation/Feasibility Study was transmitted to regulators June 30, 1997.

Appendix H of this document is the first draft Sampling and Analysis Plan for the C-720 building. The EPA granted its approval of both on July 22. KDWM comments were received Aug. 11, 1997, and a comment response summary was prepared for KDWM. A comment resolution teleconference with University of Kentucky Agreement in Principle personnel is scheduled for Sept. 23.

The team is now working to reevaluate the drilling methodology to drilling 50 feet into the McNairy Formation.

Vortec Vitrification Project
DOE is currently conducting an Environmental Assessment before continuing construction on the project.

Drum Mountain Scrap Removal
Due to a funding shortfall, this project has been postponed indefinitely.

Drum Mountain must be moved from its present location before Remedial Action activities can take place at the Northwest Corner burial yards.

PGDP 1997 Small Mammals Study Presentation (SSAB 10/16/97)

- Introduction: Brief History
- Small Mammals Data
- Ecological/Human Health Impacts
- Future Activities

PGDP 1997 Small Mammals Study Presentation (SSAB 10/16/97)

- Introduction: Brief History of Biological Monitoring Program
  - Collected deer samples for metals and PCBs since 1988
  - Monitored fish populations since 1988
  - Monitored PCBs in Fish since 1988
  - Toxicity sampling performed since 1992 as directed by KPDES Permit
  - Recent PCB results found in Hawk/Bobcat/Coyote by UKFFOU through the Agreement in Principle with the DOE Site Office prompted additional sampling to determine risk and other possible action

PGDP 1997 Small Mammals Study Presentation (SSAB 10/16/97)

- Small Mammals Data (Clemson University)
  - Sample locations
  - Mammals included
  - Sample methods
  - Data

PGDP 1997 Small Mammals Study Presentation (SSAB 10/16/97)

- Ecological/Human Health Impacts
  - Ecological
    - PCBs and metals in soil and sediment may result in low to moderate risk to predators
    - Greatest risk appears to be from PCBs, however, current effects upon predators are unknown at this time
  - Human Impacts
    - No increased risk to human health above background from consumption of deer taken at PGDP
    - PCBs in fish may result in risk to humans, therefore institutional controls such as fencing and postings have been previously established
  - Conclusion
    - Prudent to continue to monitor PCB concentrations in fish and some terrestrial biota

PGDP 1997 Small Mammals Study Presentation (SSAB 10/16/97)

- FUTURE ACTIVITIES
  - Continue monitoring PCBs in fish
  - Continue monitoring fish populations
  - Continue to collect deer samples for metals and PCBs
  - Add terrestrial (small mammals) surveillance monitoring program
    - Determine program through brainstorming session(s) utilizing a team to include DOE, LMES, UKFFOU, and the Kentucky Department of Fish and Wildlife
    - Program may include a literature search of other similar studies and/or collection of additional data
    - Program should include small mammals potentially impacted to determine if any action should be taken
    - Implement program January - September of 1998

PCB and Metals Contamination in Offsite Soils and Sediment at PGDP
Ecological Impacts on Small Mammals and Predator Species and Implications for Human Health

Ecological Impacts on Small Mammals and Predator Species

Results of evaluations indicate that the PCB and metals contamination in offsite soil and sediment at PGDP may result in low to moderate risk to wildlife. The greatest risks appear to be from PCBs in the creek sediments through fish to fish-eating predators (e.g., kingfisher and mink). Terrestrial mammalian predators (i.e., bobcat) may also be at risk as indicated by the concentration of PCBs in their liver; however, available data are limited, and the uncertainty in this conclusion is high. The risk to these predators may arise from tissue concentrations of some metals and PCBs in their prey. However, the uncertainty in this conclusion is also high because whole body tissue concentrations were estimated in the evaluation using liver concentrations alone. Terrestrial avian predators (i.e., red-tailed hawk) do not appear to be at risk either from the concentrations of PCBs found in their liver or the concentrations of PCBs and metals detected in their prey. Finally, deer do not appear to be at risk as indicated by the liver tissue concentrations of metals and PCBs.

Human Health Impacts

Results of evaluations indicate that PCB contamination in sediment in creeks at PGDP may lead to marked carcinogenic risks to recreational users; however, these evaluations also indicate that risks from consumption of deer muscle are at background levels. Therefore, unacceptable risks appear to be limited to fish consumption. The result for fish consumption is consistent with previous evaluations of PCB contamination in creeks at PGDP (i.e., *Preliminary Risk Calculation, Paducah Gaseous Diffusion Plant, Big Bayou Creek and Little Bayou Creek, PCB Sediment Evaluation*, FMSM Engineers, January 1996 and *Results of Public Health and Ecological Assessment, Phase II*, KY/SUB/13B-97777C P-03/1991, December 1991). In these previous reports, carcinogenic risks to recreational users from consumption of fish caught in Big Bayou Creek ranged from 1×10^{-3} to 2×10^{-3}. Risks from consumption of fish caught in Little Bayou Creek were reported to be higher in earlier reports; however, as noted in the FMSM Engineers report, fishing may not be a valid pathway of exposure for Little Bayou Creek due to a limited fish population and poor habitat for sports fish in this creek. The result for consumption of deer is not consistent with the previous evaluation or risk from consumption of deer at taken at PGDP (i.e., *Results of Public Health and Ecological Assessment, Phase II*, KY/SUB/13B-97777C P-03/1991, December 1991). In this earlier report, the risk from consumption of deer muscle was found to be related to metals contamination (As and Be) and not from PCB contamination. The conclusion in the earlier report concerning PCBs agrees with the results of the 1996 Deer Harvest Data. In these data, PCB concentration in all samples are reported to be below the samples' quantitation limit. However, the result concerning metals in the previous report disagrees with the harvest data. In the harvest data, only the concentrations of phosphorus, magnesium, and sodium in muscle from deer collected at PGDP are seen to significantly exceed the concentrations in muscle samples from deer collected at the background location. Therefore, there is no increased risk to human health above background risk from consumption of deer taken near PGDP.

Conclusion

PCB and metals contamination of the creeks surrounding PGDP is a source of concern because the contamination in these creeks is an important route of exposure to both humans and predator species. Generally, the summary indicates that the primary contaminant of concern is PCBs and that this contaminant is being transferred from sediments in creeks to prey species and ultimately to the surrounding terrestrial environment and potentially humans. At this time, the rate of transfer to terrestrial environment is unknown and cannot be estimated from available data. However, the real impact on human health should be minimal given the restrictions on fishing near PGDP.

It is encouraging to note that PCB concentrations in fish show downward trends (see observation made in the July 18, 1997 memorandum from J. L. White to C. S. Jones, *et al.*) indicating that the risk impacts to both human health and predator species should also be decreasing. However, it would be prudent to continue to monitor PCB concentrations in fish and some terrestrial biota to determine if the decrease in PCB concentrations continues. These data would also be useful when the remedial investigation for the surface water integrator unit is completed.

10/10/97

Polychlorinated Biphenyl and Metal Exposure of Small Mammals at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky

Final Report

Presented to:

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Introduction:

In an effort to quantify polychlorinated biphenyl (PCBs) and heavy metal exposure of small mammals inhabiting areas surrounding the Paducah Gaseous Diffusion Plant (PGDP), a study was initiated to determine residue levels of these compounds in white-footed mice (*Peromyscus leucopus*) and marsh rice rats (*Oryzomys palustris*). Recent evidence indicated that red-tailed hawks (*Buteo jamaicensis*) and bobcats (*Felis rufus*) were exposed to PCBs on or near this site causing concern that bioaccumulation was occurring in predators. To better understand the potential for movement of contaminants through the food chain, we examined probable prey items of these two species for PCB residues and heavy metals. White-footed mice and rice rats are omnivorous species which are known to inhabit the upland and riparian zones of the West Kentucky Wildlife Management Area (WKWMA) which surrounds the PGDP (Phil Smith, data on file). These organisms represent a plentiful prey item resource for many predators including red-tailed hawks, bobcats, coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*) and gray foxes (*Urocyon cinereoargenteus*). While white-footed mice are quite common in most local habitats, rice rats are concentrated on or near lowlands and creek bottoms. Since much of the contamination at PGDP is thought to be centered around watersheds, it was felt that these organisms would be suitable sentinels for PCB and metal exposure.

Small mammals have been shown to be exposed to and affected by heavy metals, PCBs, and mixtures of both contaminants. Smith and Rongstad (1982) examined metal concentrations in *Peromyscus* spp. on an active zinc-copper mining site and reference sites. They found that mice from the mining site had consistently higher levels of metals than reference animals, and cadmium and lead levels were age dependent in *Peromyscus*. Concentrations of nickel, mercury, and arsenic in mice from both sites were not found to be significantly different. Ma (1989) showed high concentrations of lead in kidneys, livers, and bones of small mammals inhabiting a shooting range polluted with lead pellets. In addition, Ma showed that lead exposure resulted in effects such as increased relative kidney weights.

PCB exposure has also been shown to have adverse effects on populations of white-footed mice (Batty et al., 1990). In this study, mice inhabiting areas surrounding a pond contaminated with PCBs showed higher whole body PCB concentrations (0.42-4.17 ppm) and increased liver, kidney, spleen, and adrenal weights than reference animals. Testicular weights were lower from mice on reference sites and it was noted that there was significantly fewer subadults and juveniles on the contaminated site. Linzey and Grant (1994) studied population dynamics of white-footed mice inhabiting a woodland contaminated with low levels of PCBs and found that although PCB-contaminated sites resembled sub-optimal habitat in terms of population demographics, there was no "unequivocal detection of demographic effects." PCB levels in this study were thought to be insufficient to cause noticeable population dynamic alterations.

Often PCBs and metals are found together on contaminated sites, usually the products of industrial waste. Clark et al. (1992) examined exposure and effects of PCBs and heavy metals in several species of small mammals in Pickleweed habitat adjacent to San Francisco Bay, California. They noted an absence of one or more species in areas where mercury and/or PCB levels were elevated and suggested that these contaminants may have been responsible for alterations in community structure. The purpose of the present study was to assess PCB and

heavy metal concentrations in small mammals inhabiting contaminated sites at the PGDP.

Study Site:

Five areas were selected for collection of small mammals based on data provided by the Environmental Information Center (EIC) in Kevil, KY. Maps containing data on PCB concentrations throughout the PGDP were used in selection of sampling locations. All sampling was limited to areas outside of the main security fence at PGDP. Below is a listing of the areas sampled and the three letter codes that will be used to refer to each site throughout the remainder of this report. A reference site, with no history of PCB usage, metal refinement, or mining, was established in Ballard County, 12 miles south of PGDP.

Table 1: Codes and descriptions for the six sites sampled.

Code	Description of Area
DMR	Along Little Bayou Creek branch east of Dyke Road and south of McCaw Road
BBA	Near the convergence of Little Bayou Creek and Anderson Road Northeast of PGDP
NSD	Areas surrounding the North-South Diversion ditch to the North of PGDP
NEC	Areas near the Northwest Corner of the PGDP security fence
WWK	Portions of the Big bayou Creek along the West side of PGDP including areas north of Water Works Road
REF	Reference site located approximately 12 miles south of PGDP in Ballard County

All areas sampled contained creeks of varying size and flow rate. Trapping of small mammals occurred within close proximity to these areas. Although microhabitat differed slightly among sites, bottomland hardwood habitats were the dominant feature of each sampling area.

Materials and Methods:

All trapping occurred between July 7 and July 18, 1997. Approximately 10-14 Sherman live-traps were baited with a grain-peanut butter mixture and placed among ground cover along banks of creeks and streams of each area to be sampled. Five pitfall traps were also set in each area and baited with dog food and the grain-peanut butter mixture. Traps were set each evening (1800 hr) and checked the next morning (0630 hr). White-footed mice and rice rats were necropsied the day of capture.

Necropsy

Small mammals were placed in an anesthesia chamber containing isoflurane (saturated atmosphere). When unconscious, the animal was removed and euthanized via cervical dislocation. The animal was then sexed, weighed ($\pm$0.5g) and a blood smear obtained by cardiac

puncture. Kidneys and livers were removed and placed in acid-washed microcentrifuge tubes and acetone-washed tin foil, respectively, and labeled with date, project number, capture location, tissue type, species, and a unique identification number. Kidney and liver samples were stored in liquid nitrogen in the field and a -80°C freezer after transport to The Institute of Wildlife and Environmental Toxicology (TIWET), Clemson University. Carcasses were stored in whirl-pack bags and placed on ice in the field until transported to a -20°C freezer at the end of each day.

Metal Analysis

Arsenic analysis was conducted according to a modified method described by Sands (1995). Analysis of other metals were conducted according to University of Georgia SOP 6010-EX. Briefly, kidneys were thawed, weighed (±0.1mg), then dried at 105°C in a drying oven for 24 hours and re-weighed to obtain dry weights. Kidneys were then wetted with approximately 400μl of Milli-Q water and allowed to rehydrate. Kidneys were then digested overnight in 2 ml of 1:1 (vol.:vol.) concentrated sulfuric and nitric acids and then placed in an 90°C water bath for approximately 2 hours. Two hundred μl of a 30% hydrogen peroxide solution was added to each kidney digesta to remove lipid matter. Kidney samples were placed in the water bath for approximately 2 hours to complete all peroxidation of lipids and remove excess nitric acid vapor. Finally, samples were filtered, combined with 1 ml of ammonium hydroxide to partially neutralize remaining acids, and then brought to volume (10 ml) with Milli-Q water. A 1.5 ml aliquot was used for Arsenic analysis at TIWET and the remainder transported to the Agricultural Cooperative Extension Laboratory at the University of Georgia, Athens for analysis of antimony, barium, beryllium, cadmium, chromium, copper, lead, nickel, thallium, silver, aluminum, and iron on an Inductively Coupled Plasma Atomic Absorption Spectrometer. Arsenic analysis was performed on a Graphite Furnace Atomic Absorption Spectrometer at TIWET, Clemson University. Arsenic concentrations were determined in rodent kidneys because this metal can be considered toxic at high concentrations. All other metals were chosen for analysis because they are included in generalized EPA metal screens for environmental samples. A blank and spike check was analyzed for each of ten kidney samples.

PCB analysis

PCB analysis was conducted according to TIWET SOP 401-60-02 and supporting SOP's. Briefly, livers were weighed and minced in anhydrous sodium sulfide to remove water and extracted for 16-24 hours in 1:1 (vol.:vol.) acetone and hexane. Extracts were then filtered through anhydrous sodium sulfide, roto-evaporated to remove acetone/hexane, and brought to volume (5 ml) in dimethylchloride. Samples were purified by Gel Permeation Chromatography. Remaining sample was then converted into 1 ml of hexane for analysis of PCBs on a Hewlett Packard GC-ECD.

Eleven different congener (5, 12, 28, 44, 66, 110, 118, 153, 138, 180, and 170) concentrations were determined in each liver sampled. These congeners are representative of a wide spectrum of congeners contained within many of the Arochlor mixtures used throughout the world. Also, these congeners were chosen because they do not co-elute with other PCB congeners on chromatographs, therefore allowing accurate determination of specific congener

concentrations.

A PCB-spiked sample and blank containing only xylene and decachlorobiphenyl (not found in environmental samples) was analyzed with each group of ten livers.

Results:

Trapping

Pitfall traps were intended to capture short-tailed shrews (*Blarina* spp.) which were to be used as a sentinel species. However, very few were captured during this study unlike previous sampling efforts occurring within the WKWMA in October and November of 1996. In the present study, five shrews were captured on the reference site compared with only two individuals captured on five contaminated sites. One of the shrews captured on the contaminated site was collected, but has not yet been identified.

Forty-one white-footed mice (26 male, 14 female, 1 unknown) were collected for possible analysis, but many others were captured and released. Twenty rice rats (13 male, 7 female) were collected for possible analysis. Other species captured but released included prairie voles (*Microtus ochrogaster*), pine voles (*M. pinetorum*), and house mouse (*Mus musculus*). Several meadow jumping mice (*Zapus hundsonicus*), and one unidentified rodent species were caught during trapping. A single chipmunk (*Tamias striatus*) was captured and released on the reference site. Five white-footed mice were infected with botfly larvae parasites and all five came from contaminated sites (two on NSD, two on BBA, and one on DMR).

Metals Analysis

Comparison between PDGP and reference site

Beryllium and silver were not detected in any animals. Concentrations of arsenic, copper, nickel, and iron were similar for both rodent species and all sites (Table 2). Reference animals (white-footed mice only) had higher concentrations of antimony, barium, chromium, thallium, and aluminum (Table 2) than white-footed mice from the PGDP sites. Cadmium was not detected in white-footed mice from the reference site, but was detected in white-footed mice from the PGDP. Lead concentrations were approximately 40% higher in white-footed mice collected on the PGDP than the reference site.

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Comparison between PDGP white-footed mice and rice rats

Although we observed several instances of apparent differences in heavy metal concentrations between white-footed mice and rice rats, concentrations of heavy metals among individuals exhibited a high degree of variability (Table 2). Nonetheless, white-footed mice tended to have higher concentrations of beryllium, chromium, copper, aluminum, and lead than rice rats. Conversely, rice rats tended to have higher concentrations of nickel, iron and cadmium than white-footed mice, although differences were not as apparent. Concentrations of arsenic antimony, barium, thallium, and silver were similar in both species (Table 2).

Comparisons among collection sites for white-footed mice

In general, concentrations of heavy metals were similar in white-footed mice collected

from all sites (Table 3). However, we noted some exceptions. Cadmium concentrations in kidneys of white-footed mice collected from DMR (1.035 ± S.E. 0.635) were approximately double that of mice from other PDGP sites. No cadmium was detected in reference animal tissues (Table 3). Lead levels in white-footed mouse samples collected from NSD and WWK were approximately twice that of all other sites including the reference site.

Comparison among collection sites for rice rats

As with white-footed mice, concentrations of most heavy metals in rice rats were similar among all sites (Table 4). Arsenic, barium and chromium concentrations tended to be higher in rice rats collected at the DMR site. Cadmium concentration in rice rat kidneys tended to be highest in animals collected from the BBA and NSD sites. Lead concentrations were highest in rats collected from the NEC and NSD sites (Table 4).

Comparison among collection sites for white-footed mice and rice rats pooled

Arsenic, cadmium, and lead concentrations for both small mammal species combined tended to be higher in animals collected from the DMR, BBA, and NSD sites, respectively (Table 5). Concentrations of all other heavy metals were similar among sites when all animals from PGDP were combined.

PCB Analysis

Congeners 5, 12, 28, 44, 66, 110, 118, 180, and 170 were not detected in any white-footed mice collected from the reference site (Table 6). Congener 5 was detected in a single rice rat from DMR and congener 12 was detected in a single white-footed mouse and rice rat from the DMR site. Congener 66 was detected in a single white-footed mouse liver from the BBA and DMR sites.

Comparison between PGDP and reference site

Of the selected highly chlorinated PCB congeners (118, 153, 138, 180, and 170), only congeners 153 and 138 were detected in white-footed mice from the reference site, and at concentrations below 1 ppb (Table 6). Congeners 118, 153, 138, 180, and 170 were detected in some animals from all PGDP sites, and congener 180 was detected in every white-footed mouse collected from the PGDP. PCB concentrations for total selected highly chlorinated congeners ranged from 2.55 to 70.49 ppb in white-footed mice collected at the PGDP.

Comparison between PGDP white-footed mice and rice rats

Overall, PCB concentrations were higher in white-footed mice than rice rats (Table 6). This apparent difference was especially true for congeners 180 and 170. Total selected highly chlorinated PCB concentrations were approximately two-fold greater in white-footed mice than rice rats. However, there was a considerable degree of variability in concentrations among individuals for each species.

Comparison among collection sites for white-footed mice

In general, total selected highly chlorinated PCB concentrations were highest in white-

footed mice collected from the NSD site due in large part to a single mouse which contained 0.34, 1.14, and 0.50 ppm of congeners 153, 180, and 170 respectively and had 2.03 ppm total PCBs in the liver (Table 7). Likewise, white-footed mouse livers from NSD contained the highest levels of total selected highly chlorinated PCBs, approximately 625 times those of reference livers although means were certainly affected by the one NSD animal with extremely high concentrations. Total selected highly chlorinated PCB concentrations in white-footed mice from all other PGDP sites were similar, ranging from 32.7 to 63.3 ppb. Livers from white-footed mice collected at the PGDP contained 177 times more total selected highly chlorinated PCBs than reference mice. Generally, congener 180 was detected at higher concentrations than all other congeners in animals collected at the PGDP. Exceptions included the BBA and WWK sites where congener 153 was highest.

Comparison among collection sites for rice rats

As with white-footed mice, total selected highly chlorinated PCB concentrations were highest in the rice rats collected from the NSD site (Table 8). Total selected highly chlorinated PCB concentrations were lowest in rice rats collected from the WWK site (31.9 ppb) and similar among the remaining sites (range 60 to 72.6 ppb; Table 8). Congener 180 was consistently detected at higher concentrations than all other congeners in animals collected at the PGDP. The exception was the WWK sites where congener 153 was highest.

Comparison among collection sites for white-footed mice and rice rats pooled

With all animals combined by site, it is evident that NSD and DMR had small mammals with the highest total selected highly chlorinated PCB concentrations (67.9 to 344.6 ppb), though it should be noted that all sites harbored rodents with detectable PCB concentrations (range 32.3 to 48.3 ppb; Table 9).

Relative liver weights

Relative liver weights were calculated for all PDGP and reference white-footed mice. No relative liver weights were calculated for rice rats because total body weights were not obtained due to the limited capacity of the Pesola scales used during trapping. Pooled PGDP relative liver weights tended to be higher than those of reference animals (reference mean=0.0515±S.E. 0.0026, n=8 versus PGDP mean=0.05507±S.E. 0.014, n=23). Relative liver weights from all PGDP sites were higher than reference. BBA had the highest relative liver weights (mean=0.0623±S.E. 0.0042, n=4).

Recoveries for all analytical procedures were calculated and are shown in Tables 10 and 11. No corrections to the data were made for percentage recovery.

Discussion:

Overall, we observed no apparent gross abnormalities in any of the small mammals collected. In addition, we observed elevated levels of a number of heavy metals and PCB congeners in a number of animals collected from the PGDP. However, there was a high degree of variability in heavy metal and PCB concentrations in small mammals collected at all PGDP sites. This variability is probably due in large part to a combination of the heterogeneity of the contaminant distribution and the spatial distribution and habitat use patterns of the small

mammals sampled in this study.

Residue analysis of white-footed mouse and rice rat tissues collected from areas surrounding PGDP indicates that exposure to heavy metals and PCBs is occurring. While heavy metal concentrations in kidneys were higher at the reference site than PGDP for several metals, arsenic, cadmium, chromium, and lead appeared to be slightly to moderately elevated in PGDP animals. These metals have been shown to be toxic to a wide variety of organisms although, residue levels below acutely lethal levels are difficult to interpret as to their significance. Species to species variability, natural stressors, and synergism with other contaminants make tissue residue levels difficult to classify as either toxic or non-toxic and without effects data, relevance of these findings is unclear.

Poor trapping success for shrews was attributed to abundant natural food sources available during the trapping period, however there appeared to be more shrews captured on the reference site than the PGDP sites given the differences in trapping effort. Differences in shrew numbers could be attributed to differing qualities of shrew habitat between reference and PGDP sites. However, it should not be discounted that high contaminant levels could have adverse effects on shrew populations since these organisms have been shown to accumulate heavy metal and organochlorine contaminants such as PCBs to a higher extent than other small mammals due to the trophic level they occupy (Talmage and Walton, 1991; Johnson et al., 1996). Shrews are aggressive foragers feeding on a variety of invertebrates as well as some vertebrate species living within the top layers of soil and woodland/field debris. Therefore, they are higher on the food chain than the two sentinel species chosen for this study and may be among the first species to be adversely affected by environmental contaminants.

Commonly used Arochlors contain mixtures of individual polychlorinated biphenyls of which there are 209 possible congeners. Persistence in the environment, bioaccumulation potential, and resultant toxicity differs for each congener. We analyzed small mammal livers for 11 different congeners representing the spectrum of the possible chlorine-biphenyl combinations. Also, determination of concentrations of these congeners permits identification of what Arochlor mixtures may be present in the environment. For purposes of this study, congeners 5, 12, 28, 44, 66, 110, 118, 153, 138, 180, and 170 were quantified in the livers of small mammals. This does not, however, represent all potential PCBs which may be present on this site, rather only those which were selected for analysis. Total selected highly chlorinated PCBs for purposes of this report refers to the sum of the highly chlorinated congeners (118, 153, 138, 180, and 170). Highly chlorinated congeners resist degradation to a higher degree than less chlorinated congeners and are thus more persistent in the environment, therefore having greater potential for bioaccumulation.

PCBs were present in some animals from all sites sampled. However, reference white-footed mice contained very small quantities of only two congeners. Conversely, PGDP white-footed mice and rice rats contained detectable quantities of several congeners, specifically the more highly chlorinated compounds which would be most likely to persist in the environment and potentially more toxic. Total selected highly chlorinated PCBs from each site showed that NSD and DMR animals contained the highest concentrations of PCBs.

Five white-footed mice collected at PGDP had parasitic infestations of botfly larvae whereas no reference mice contained these parasites. Many environmental contaminants including heavy metals and PCBs have been shown to be immunotoxic. Immune function of exposed organisms can be decreased allowing opportunities for infections and parasites.

Relative liver weights from PGDP were elevated above reference for all sites, and all animals combined. PCBs and some metals can cause enlarged livers, and could conceivably be affecting small mammals inhabiting the PDGP site.

Research Needs:

It is evident that small mammals on the PDGP site have been exposed to PCBs and some metals above background levels. However, little is known as to the effects of these contaminants on small mammal physiology, behavior, reproduction, or population dynamics. In addition, the bioaccumulation potential of PCBs in the food chain is high given the large number of predators that use these small mammals as food resources. PCB levels above 3-4 ppm in the liver of mammals has been linked to reproductive failure in mink and certain marine mammals (Kamrin and Ringer, 1996). Lead concentrations of 25 ppm in kidneys appear to be associated with clinical signs of lead poisoning in mammals (Ma, 1996).

Field experiments designed to measure contaminant exposure through food chain transport and effects of exposure on physiological, biochemical, reproductive, and population health are necessary to adequately quantify the risk of environmental contaminants to resident wildlife populations. Predators positioned high in the food chain are considered excellent candidates as sentinel species because of their potential to encounter dangerously high doses of contaminants. Also, higher trophic level organisms tend to have relatively high social value and thus are important to the lay public. Results of this study indicates movement of metals and PCBs into the food chain and also an undetermined amount of contaminant movement out of the creeks where most of the contaminants reside. Evaluation of contaminant movement up the food chain and contaminant effects on higher level consumers is the next logical step in determining the extent of contaminant exposure and effects in wildlife at the PGDP.

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Table 2. Mean (+ S.E.) concentrations (PPM dry wt.) of selected heavy metals in kidneys of White-footed mice (*Peromyscus leucopus*) and Marsh rice rats (*Oryzomys palustris*) from reference and contaminated sites at PGDP.

Metal	Reference *P. leucopus* n=8	PGDP *P. leucopus* n=28	PGDP *O. palustris* n=19	PGDP *P. leucopus* and *O. palustris* n=47
As	0.098(0.049)	0.084(0.030)	0.082(0.025)	0.083(0.020)
Sb	2.739(1.793)	0.267(0.267)	0.212(0.212)	0.245(0.179)
Ba	12.388(0.983)	9.226(0.409)	5.850(0.532)	7.861(0.404)
Be	0	0	0	0
Cd	0	0.562(0.158)	0.893(0.355)	0.695(0.171)
Cr	2.674(0.482)	1.429(0.137)	0.891(0.084)	1.211(0.096)
Cu	11.119(0.926)	13.492(0.405)	11.195(0.757)	12.563(0.419)
Pb	3.974(2.191)	5.570(1.185)	1.929(1.001)	4.098(0.848)
Ni	1.128(0.744)	0.938(0.243)	1.316(0.481)	1.091(0.241)
Tl	4.752(3.286)	0.777(0.777)	0	0.463(0.463)
Ag	0	0	0	0
Al	103.652(9.232)	70.341(2.808)	51.324(4.734)	62.653(2.863)
Fe	247.510(12.375)	243.142(6.426)	316.276(19.167)	272.707(10.028)

Table 3. Mean (± S.E.) concentrations (PPM dry wt.) of selected heavy metals in kidneys of White-footed mice (*Peromyscus leucopus*) from reference and contaminated sites at PGDP.

	Site					
Metal	BBA n=6	DMR n=5	NEC n=6	NSD n=6	REF n=8	WWK n=5
As	0.046(0.030)	0.135(0.068)	0.059(0.039)	0.125(0.117)	0.098(0.049)	0.057(0.057)
Sb	0	1.493(1.493)	0	0	2.739(1.793)	0
Ba	10.716(0.776)	8.613(0.613)	9.691(1.351)	8.250(0.769)	12.388(0.983)	8.662(0.487)
Be	0	0	0	0	0	0
Cd	0.474(0.301)	1.035(0.635)	0.480(0.305)	0.346(0.224)	0	0.549(0.341)
Cr	1.941(0.288)	1.620(0.297)	1.275(0.294)	1.227(0.303)	2.674(0.482)	1.049(0.301)
Cu	11.915(0.485)	13.356(0.728)	13.873(1.220)	14.495(0.935)	11.119(0.926)	13.859(0.728)
Pb	3.388(2.491)	4.974(3.083)	4.112(2.231)	8.283(2.014)	3.974(2.191)	7.280(3.951)
Ni	0.454(0.454)	1.322(0.856)	1.166(0.474)	1.255(0.522)	1.128(0.744)	0.480(0.480)
Tl	0	0	0	3.628(3.628)	4.752(3.286)	0
Ag	0	0	0	0	0	0
Al	63.630(6.757)	74.684(4.294)	64.661(3.900)	71.291(7.724)	103.652(9.232)	79.727(6.976)
Fe	230.724(20.836)	249.994(16.281)	242.460(8.374)	239.513(13.387)	247.510(12.375)	256.363(12.846)

Table 4. Mean (± S.E.) concentrations (PPM dry wt.) of selected heavy metals in kidneys of Marsh rice rats (*Oryzomys palustris*) contaminated sites at PGDP. (Note, no reference animals captured)

	Site				
Metal	BBA n=2	DMR n=5	NEC n=3	NSD n=4	WWK n=5
As	0.032(0.032)	0.166(0.077)	0.054(0.054)	0.035(0.025)	0.075(0.031)
Sb	0	0.806(0.806)	0	0	0
Ba	5.118(0.010)	7.743(1.397)	5.554(0.943)	5.183(0.906)	4.963(0.943)
Be	0	0	0	0	0
Cd	4.095(2.356)	0.519(0.346)	0.229(0.229)	1.186(0.525)	0.150(0.150)
Cr	0.706(0.010)	1.055(0.197)	0.983(0.359)	0.850(0.098)	0.777(0.151)
Cu	11.311(0.876)	11.793(0.230)	11.716(0.901)	10.878(0.915)	10.493(2.939)
Pb	0	0.483(0.483)	3.025(1.530)	4.625(4.625)	1.332(0.861)
Ni	1.304(1.304)	1.931(1.737)	1.108(0.723)	1.345(0.492)	0.809(0.555)
Tl	0	0	0	0	0
Ag	0	0	0	0	0
Al	47.111(4.502)	62.262(10.260)	60.200(13.283)	35.879(7.289)	49.103(9.936)
Fe	413.527(30.918)	318.704(20.490)	312.255(60.972)	297.421(13.182)	292.446(58.175)

Table 5. Mean (± S.E.) concentrations (PPM dry wt.) of selected heavy metals in kidneys of White-footed mice (*Peromyscus leucopus*) and Marsh rice rats (*Oryzomys palustris*) (pooled) from reference and contaminated sites at PGDP. (Note, no Rice rats were captured on the reference site)

	Site				
Metal	BBA n=8	DMR n=10	NEC n=9	NSD n=10	WWK n=10
As	0.042(0.023)	0.150(0.048)	0.058(0.030)	0.089(0.070)	0.066(0.031)
Sb	0	1.149(0.808)	0	0	0
Ba	9.316(1.078)	8.178(0.733)	8.312(1.145)	7.023(0.746)	6.812(0.794)
Be	0	0	0	0	0
Cd	1.379(0.773)	0.777(0.352)	0.396(0.212)	0.682(0.269)	0.349(0.187)
Cr	1.632(0.292)	1.337(0.193)	1.178(0.222)	1.076(0.189)	0.913(0.165)
Cu	11.764(0.404)	12.574(0.474)	13.154(0.904)	13.048(0.867)	12.176(1.534)
Pb	2.541(1.906)	2.729(1.651)	3.750(1.517)	6.820(2.134)	4.306(2.149)
Ni	0.666(0.436)	1.627(0.918)	1.147(0.371)	1.291(0.351)	0.644(0.350)
Tl	0	0	0	2.177(2.177)	0
Ag	0	0	0	0	0
Al	59.500(5.700)	68.473(5.637)	63.174(4.647)	57.126(7.773)	64.415(7.668)
Fe	276.425(34.085)	284.349(16.833)	265.725(21.779)	262.676(13.127)	274.405(28.721)

Table 6. Mean (+ S.E.) concentrations (PPB) of selected polychlorinated biphenyl congeners in livers of White-footed mice (*Peromyscus leucopus*) and Marsh rice rats (*Oryzomys palustris*) from reference and contaminated sites at PGDP.

Congener	Reference *P. leucopus* n=8	PGDP *P. leucopus* n=23	PGDP *O. palustris* n=19	PGDP *P. leucopus* and *O. palustris* n=42
5	0	0	0.43(0.43)	0.20(0.20)
12	0	1.72(1.72)	1.88(1.88)	1.79(1.25)
28	0	0	0	0
44	0	0	0	0
66	0	0.49(0.34)	0	0.27(0.19)
110	0	0	0	0
118	0	2.55(0.82)	2.97(1.03)	2.74(0.64)
153	0.61(0.41)	34.45(14.44)	24.12(4.94)	29.78(8.17)
138	0.20(0.20)	8.75(2.12)	9.62(2.29)	9.14(1.54)
180	0	70.49(49.32)	35.58(11.78)	55.16(28.00)
170	0	27.33(21.43)	3.82(1.10)	16.69(11.77)
Tot. PCB*	0.81(0.54)	143.57(86.87)	74.24 (18.61)	112.21(48.12)

* denotes sum of congeners 118, 153, 138, 180, and 170

Table 7. Mean (+ S.E.) concentrations (PPB) of selected polychlorinated biphenyl congeners in livers of White-footed mice (*Peromyscus leucopus*) from reference and contaminated sites at PGDP.

	Site					
Congener	BBA n=4	DMR n=5	NEC n=5	NSD n=5	REF n=8	WWK n=4
5	0	0	0	0	0	0
12	0	7.90(7.90)	0	0	0	0
28	0	0	0	0	0	0
44	0	0	0	0	0	0
66	1.37(1.37)	1.14(1.14)	0	0	0	0
110	0	0	0	0	0	0
118	3.03(2.31)	4.31(2.73)	0	3.12(0.81)	0	2.37(2.37)
153	19.26(4.29)	20.87(4.30)	12.78(1.92)	99.63(62.13)	0.61(0.41)	12.23(4.50)
138	2.43(2.08)	7.51(2.74)	5.25(1.80)	19.95(7.28)	0.20(0.20)	7.00(2.39)
180	7.06(3.00)	23.23(6.53)	15.07(2.82)	274.45(219.42)	0	7.34(2.85)
170	1.86(1.09)	7.37(1.55)	3.54(0.53)	110.27(97.00)	0	3.80(1.85)
Tot. PCB*	33.63(7.26)	63.29(12.21)	36.64(4.50)	507.41(385.03)	0.81(0.54)	32.73(8.00)

* denotes sum of congeners 118, 153, 138, 180, and 170

Table 8. Mean (+ S.E.) concentrations (PPB) of selected polychlorinated biphenyl congeners in livers of Marsh rice rats (*Oryzomys palustris*) from contaminated sites at PGDP as shown by capture site.

	Site				
Congener	BBA n=2	DMR n=5	NEC n=3	NSD n=4	WWK n=5
5	0	1.65(1.65)	0	0	0
12	0	7.15(7.15)	0	0	0
28	0	0	0	0	0
44	0	0	0	0	0
66	0	0	0	0	0
110	0	0	0	0	0
118	0	3.96(1.99)	0.64(0.64)	7.12(3.35)	1.24(1.03)
153	16.33(10.07)	25.79(7.86)	17.06(12.62)	43.24(13.59)	14.51(8.76)
138	3.98(1.25)	11.35(3.53)	7.67(5.16)	16.40(7.66)	5.89(4.10)
180	34.97(31.94)	26.01(10.17)	36.88(35.66)	71.30(43.02)	11.16(6.97)
170	4.71(2.49)	5.47(2.36)	5.55(4.83)	3.08(2.38)	1.37(1.11)
Tot. PCB*	60.00(40.77)	72.58(24.49)	67.81(58.81)	141.14(62.16)	31.95(20.74)

* denotes sum of congeners 118, 153, 138, 180, and 170

Table 9. Mean (+ S.E.) concentrations (PPB) of selected polychlorinated biphenyls in livers of White-footed mice (*Peromyscus leucopus*) and Marsh rice rats (*Oryzomys palustris*) (pooled) from reference and contaminated sites at PGDP. (Note, no Rice rats were captured on the reference site)

	Site				
Congener	BBA n=6	DMR n=10	NEC n=8	NSD n=9	WWK n=9
5	0	0.82(0.82)	0	0	0
12	0	7.52(5.02)	0	0	0
28	0	0	0	0	0
44	0	0	0	0	0
66	0.91(0.91)	0.57(0.57)	0	0	0
110	0	0	0	0	0
118	2.02(1.59)	4.13(1.59)	0.24(0.24)	4.90(1.60)	1.74(1.13)
153	18.28(3.81)	23.33(4.30)	14.38(4.36)	74.57(34.66)	13.50(4.98)
138	2.94(1.39)	9.43(2.20)	6.16(2.051)	18.37(4.99)	6.39(2.38)
180	16.36(10.31)	24.62(5.72)	23.25(12.45)	184.16(122.30)	9.25(3.56)
170	2.81(1.12)	6.42(1.37)	4.29(1.66)	62.62(54.49)	2.45(1.05)
Tot. PCB*	42.42(12.76)	67.93(12.99)	48.33(20.26)	344.62(214.39)	32.30(11.41)

* denotes sum of congeners 118, 153, 138, 180, and 170

Table 10. Recoveries (ppm) from samples spiked with reference standard preparation (ERA PriorityPollutnT™/CLP lot 219) and mean values (and approx. 95% conf. int.) for reference material metal concentrations as determined by round-robin interlaboratory analysis.

Metal	Recov.	Ref. Mean value
As	30.18	72.1 (35-110)
Sb	27.31	75 (32-350)
Ba	22.40	64.8 (45-88)
Be	24.59	26.7 (17-37)
Cd	48.99	61.5 (36-86)
Cr	35.67	44.1 (28-61)
Cu	59.54	78.1 (48-110)
Pb	25.74	50.9 (27-71)
Ni	90.67	110 (65-157)
Tl	22.90	64.1 (31-98)
Ag	14.10	71.7 (29-105)
Al	2739.43	3850 (1930-5580)
Fe	4681.40	7360 (4930-11000)

Table 11. Mean % recovery of spiked samples for PCB analysis.

PCB congeners

5	12	28	44	66	110	118	153	138	180	170	DCBP
76.2	79.8	80.8	70.2	77.4	75.2	91.0	69.6	77.6	86.6	85.4	81.75

APPENDIX

Heavy Metals in Kidneys of Small Mammals
Project TIWET 09741

Animal ID			PPM Metals (dry wt.)												
Site	Species	Number	As	Sb	Ba	Be	Cd	Cr	Cu	Pb	Ni	Tl	Ag	Al	Fe
BBA	OP	1	0.0000	0.0000	5.0179	0.0000	6.4516	0.7168	12.1864	0.0000	0.0000	0.0000	0.0000	51.6129	444.4444
BBA	OP	2	0.0635	0.0000	5.2174	0.0000	1.7391	0.6957	10.4348	0.0000	2.6087	0.0000	0.0000	42.6087	382.6087
BBA	PL	1	0.0068	0.0000	13.6054	0.0000	0.0000	1.3605	10.8844	0.0000	2.7211	0.0000	0.0000	57.1429	312.9252
BBA	PL	2	0.0000	0.0000	11.6959	0.0000	0.0000	1.4620	11.6959	0.0000	0.0000	0.0000	0.0000	43.8596	204.6784
BBA	PL	4	0.0000	0.0000	10.5581	0.0000	0.0000	1.5083	13.5747	15.0830	0.0000	0.0000	0.0000	84.4646	211.1614
BBA	PL	5	0.1791	0.0000	10.6222	0.0000	1.5175	3.0349	10.6222	0.0000	0.0000	0.0000	0.0000	48.5584	227.6176
BBA	PL	6	0.0000	0.0000	7.8637	0.0000	0.0000	2.6212	13.1062	5.2425	0.0000	0.0000	0.0000	68.1520	262.1232
BBA	PL	7	0.0896	0.0000	9.9502	0.0000	1.3267	1.6584	11.6086	0.0000	0.0000	0.0000	0.0000	79.6020	165.8375
DMR	OP	1	0.1491	0.0000	6.0852	0.0000	0.0000	1.0142	12.1704	0.0000	0.0000	0.0000	0.0000	54.7667	283.9757
DMR	OP	3	0.0151	0.0000	7.5512	0.0000	0.8630	1.0787	11.8662	0.0000	0.0000	0.0000	0.0000	57.1737	345.1996
DMR	OP	4	0.0000	0.0000	8.6580	0.0000	1.7316	0.6061	11.2554	0.0000	0.0000	0.0000	0.0000	46.7532	294.3723
DMR	OP	5	0.4077	4.0290	4.0290	0.0000	0.0000	0.8058	11.2812	2.4174	0.8058	0.0000	0.0000	49.9597	386.7849
DMR	OP	6	0.2566	0.0000	12.3894	0.0000	0.0000	1.7699	12.3894	0.0000	8.8496	0.0000	0.0000	102.6549	283.1858
DMR	PL	1	0.2319	0.0000	10.5422	0.0000	0.0000	1.5060	13.5542	0.0000	0.0000	0.0000	0.0000	90.3614	225.9036
DMR	PL	2	0.0981	0.0000	9.4086	0.0000	2.6882	1.3441	16.1290	0.0000	0.0000	0.0000	0.0000	73.9247	309.1398
DMR	PL	3	0.3458	7.4627	7.4627	0.0000	2.4876	1.2438	11.1940	0.0000	0.0000	0.0000	0.0000	70.8955	261.1940
DMR	PL	4	0.0000	0.0000	7.2816	0.0000	0.0000	1.2136	13.3495	10.9223	2.4272	0.0000	0.0000	64.3204	230.5825
DMR	PL	6	0.0000	0.0000	8.3682	0.0000	0.0000	2.7894	12.5523	13.9470	4.1841	0.0000	0.0000	73.9191	223.1520
NEC	OP	1	0.0000	0.0000	4.2918	0.0000	0.6867	0.4292	12.8755	0.0000	0.8584	0.0000	0.0000	42.9185	420.6009
NEC	OP	2	0.0000	0.0000	7.3983	0.0000	0.0000	0.8631	12.3305	4.9322	2.4661	0.0000	0.0000	86.3132	209.6178
NEC	OP	3	0.1632	0.0000	4.9710	0.0000	0.0000	1.6570	9.9420	4.1425	0.0000	0.0000	0.0000	51.3670	306.5452
NEC	PL	1	0.0000	0.0000	6.5531	0.0000	1.3106	1.3106	18.3486	13.1062	0.0000	0.0000	0.0000	76.0157	249.0170
NEC	PL	3	0.0000	0.0000	8.2418	0.0000	0.0000	1.3736	15.1099	8.2418	0.0000	0.0000	0.0000	63.1868	247.2527
NEC	PL	4	0.0000	0.0000	6.6519	0.0000	0.0000	2.2173	14.4124	3.3259	1.1086	0.0000	0.0000	56.5410	266.0754
NEC	PL	5	0.1277	0.0000	13.3820	0.0000	0.0000	1.2165	12.1655	0.0000	1.2165	0.0000	0.0000	51.0949	243.3090
NEC	PL	6	0.0000	0.0000	14.1287	0.0000	1.5699	0.0000	9.4192	0.0000	3.1397	0.0000	0.0000	72.2135	204.0816
NEC	PL	7	0.2266	0.0000	9.1884	0.0000	0.0000	1.5314	13.7825	0.0000	1.5314	0.0000	0.0000	68.9127	245.0230
NSD	OP	1	0.0000	0.0000	3.8241	0.0000	0.6373	0.6373	8.9229	0.0000	1.2747	0.0000	0.0000	21.0325	286.8069
NSD	OP	2	0.1045	0.0000	7.6170	0.0000	0.0000	1.0881	9.7933	18.4984	0.0000	0.0000	0.0000	55.4951	326.4418
NSD	OP	3	0.0340	0.0000	5.5096	0.0000	1.8365	0.9183	11.9376	0.0000	1.8365	0.0000	0.0000	36.7309	266.2994
NSD	OP	4	0.0000	0.0000	3.7821	0.0000	2.2693	0.7564	12.8593	0.0000	2.2693	0.0000	0.0000	30.2572	310.1362
NSD	PL	1	0.0000	0.0000	7.6503	0.0000	0.0000	2.1858	15.3005	8.7432	1.0929	0.0000	0.0000	59.0164	229.5082
NSD	PL	3	0.0410	0.0000	8.9629	0.0000	0.0000	1.2804	11.5237	0.0000	2.5608	21.7670	0.0000	52.4968	192.0615
NSD	PL	4	0.0000	0.0000	7.9727	0.0000	0.0000	0.0000	13.6674	5.6948	0.0000	0.0000	0.0000	69.4761	250.5695
NSD	PL	5	0.0000	0.0000	5.1020	0.0000	0.8503	0.8503	14.4558	9.3537	0.8503	0.0000	0.0000	57.8231	246.5986
NSD	PL	6	0.7071	0.0000	10.7362	0.0000	1.2270	1.5337	18.4049	13.8037	0.0000	0.0000	0.0000	98.1595	291.4110
NSD	PL	7	0.0000	0.0000	9.0772	0.0000	0.0000	1.5129	13.6157	12.1029	3.0257	0.0000	0.0000	90.7716	226.9289
REF	PL	1	0.0000	0.0000	8.3682	0.0000	0.0000	1.3947	13.9470	0.0000	0.0000	0.0000	0.0000	76.7085	223.1520
REF	PL	2	0.0000	0.0000	11.1732	0.0000	0.0000	3.7244	9.3110	16.7598	0.0000	0.0000	0.0000	115.4562	297.9516
REF	PL	3	0.1583	0.0000	11.6667	0.0000	0.0000	1.3333	10.0000	8.3333	5.0000	0.0000	0.0000	96.6667	283.3333

all mass units are in grams (g), metal concentrations in PPM

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REF	PL	4	0.0000	0.0000	12.3839	0.0000	0.0000	1.2384	12.3839	0.0000	0.0000	0.0000	0.0000	72.7554	232.1981
REF	PL	5	0.0285	0.0000	15.3509	0.0000	0.0000	4.3860	6.5789	0.0000	0.0000	0.0000	0.0000	142.5439	219.2982
REF	PL	6	0.3490	11.1857	15.6600	0.0000	0.0000	4.4743	11.1857	0.0000	0.0000	24.6085	0.0000	118.5682	196.8680
REF	PL	7	0.0000	10.7239	9.3834	0.0000	0.0000	2.6810	14.7453	6.7024	4.0214	13.4048	0.0000	79.0885	268.0965
REF	PL	8	0.2505	0.0000	15.1188	0.0000	0.0000	2.1598	10.7991	0.0000	0.0000	0.0000	0.0000	127.4298	259.1793
WWK	OP	1	0.0000	0.0000	6.2959	0.0000	0.0000	0.7345	8.3945	4.1973	0.0000	0.0000	0.0000	56.6632	440.7135
WWK	OP	2	0.0126	0.0000	7.5853	0.0000	0.0000	1.2642	21.4918	0.0000	0.0000	0.0000	0.0000	80.9102	391.9090
WWK	OP	3	0.1607	0.0000	4.1966	0.0000	0.0000	0.5396	5.9952	0.0000	0.0000	0.0000	0.0000	31.7746	143.8849
WWK	OP	4	0.0735	0.0000	2.0517	0.0000	0.0000	0.4103	5.3344	2.4620	1.2310	0.0000	0.0000	24.6204	176.4465
WWK	OP	5	0.1265	0.0000	4.6860	0.0000	0.7498	0.9372	11.2465	0.0000	2.8116	0.0000	0.0000	51.5464	309.2784
WWK	PL	2	0.2855	0.0000	7.8947	0.0000	0.0000	1.3158	13.1579	0.0000	0.0000	0.0000	0.0000	78.9474	250.0000
WWK	PL	3	0.0000	0.0000	7.1942	0.0000	1.1990	0.0000	15.5875	7.1942	2.3981	0.0000	0.0000	57.5540	215.8273
WWK	PL	4	0.0000	0.0000	9.2736	0.0000	1.5456	0.7728	13.9104	21.6383	0.0000	0.0000	0.0000	74.1886	262.7512
WWK	PL	5	0.0000	0.0000	9.0772	0.0000	0.0000	1.5129	15.1286	7.5643	0.0000	0.0000	0.0000	89.2587	257.1861
WWK	PL	6	0.0000	0.0000	9.8684	0.0000	0.0000	1.6447	11.5132	0.0000	0.0000	0.0000	0.0000	98.6842	296.0526

all mass units are in grams (g), metal concentrations in PPM

Levels of PCB's in Livers of Small Mammals
Project: TIWET 09741

										PPM					
Site	Sp.	#	Liv. Wt.	CNG 1	CNG 5	CNG 12	CNG 28	CNG 44	CNG 66	CNG 110	CNG 118	CNG 153	CNG 138	CNG 180	CNG 170
BBA	OP	1	1.78950	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0264	0.0052	0.0669	0.0022
BBA	OP	2	2.19510	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0063	0.0027	0.0030	0.0072
BBA	PL	1	1.33390	0.0678	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0257	0.0086	0.0141	0.0042
BBA	PL	2	1.09900	0.0000	0.0000	0.0000	0.0000	0.0000	0.0055	0.0000	0.0000	0.0068	0.0011	0.0095	0.0000
BBA	PL	5	1.06580	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0098	0.0239	0.0000	0.0004	0.0000
BBA	PL	7	1.34230	0.0220	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0023	0.0207	0.0000	0.0042	0.0033
DMR	OP	1	1.42640	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0044	0.0014	0.0015	0.0011
DMR	OP	3	1.86060	0.0000	0.0082	0.0357	0.0000	0.0000	0.0000	0.0000	0.0024	0.0146	0.0048	0.0094	0.0012
DMR	OP	4	2.40170	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0092	0.0376	0.0163	0.0396	0.0105
DMR	OP	5	2.67690	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0082	0.0484	0.0144	0.0575	0.0119
DMR	OP	6	0.82870	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0240	0.0199	0.0221	0.0027
DMR	PL	1	0.93880	0.0860	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0048	0.0232	0.0034	0.0179	0.0116
DMR	PL	2	1.11010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0021	0.0302	0.0073	0.0401	0.0078
DMR	PL	3	1.30870	0.0443	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0171	0.0117	0.0374	0.0094
DMR	PL	4	1.29120	0.0000	0.0000	0.0395	0.0000	0.0000	0.0057	0.0000	0.0146	0.0277	0.0152	0.0122	0.0053
DMR	PL	6	1.18650	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0062	0.0000	0.0085	0.0027
NEC	OP	1	2.75010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0019	0.0421	0.0178	0.1082	0.0152
NEC	OP	2	1.69510	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0074	0.0042	0.0025	0.0015
NEC	OP	3	1.87960	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0017	0.0010	0.0000	0.0000
NEC	PL	1	1.32370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0078	0.0000	0.0114	0.0040
NEC	PL	4	1.41090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110	0.0078	0.0195	0.0023
NEC	PL	5	0.98600	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0108	0.0099	0.0110	0.0044
NEC	PL	6	0.90360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0160	0.0024	0.0095	0.0047
NEC	PL	7	0.91530	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0183	0.0061	0.0239	0.0022
NSD	OP	1	2.84400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0156	0.0586	0.0378	0.1969	0.0000
NSD	OP	2	1.77640	0.0314	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0126	0.0035	0.0019	0.0000
NSD	OP	3	2.14210	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0087	0.0294	0.0074	0.0392	0.0023
NSD	OP	4	1.98650	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0041	0.0724	0.0169	0.0472	0.0100
NSD	PL	3	1.32970	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0042	0.0887	0.0263	0.1647	0.0342
NSD	PL	4	1.26430	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0044	0.0273	0.0045	0.0208	0.0075
NSD	PL	5	1.69310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0031	0.0229	0.0148	0.0335	0.0090
NSD	PL	6	0.98310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0166	0.0090	0.0084	0.0029
NSD	PL	7	0.91930	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0040	0.3427	0.0451	1.1449	0.4977
REF	PL	1	0.96470	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF	PL	2	0.89090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF	PL	3	0.89580	0.1937	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

weights are in grams, PCB levels are in PPM

REF	PL	4	0.89130	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF	PL	5	0.54040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF	PL	6	0.66160	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF	PL	7	1.32120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020	0.0016	0.0000	0.0000
REF	PL	8	0.62810	0.1075	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0029	0.0000	0.0000	0.0000
WWK	OP	1	1.69800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0053	0.0489	0.0222	0.0319	0.0057
WWK	OP	2	1.90440	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0071	0.0014	0.0061	0.0000
WWK	OP	3	1.79970	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0113	0.0028	0.0038	0.0011
WWK	OP	4	1.90070	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0010	0.0010	nd	0.0000
WWK	OP	5	1.70850	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0043	0.0020	0.0028	0.0000
WWK	PL	2	1.09270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0145	0.0105	0.0156	0.0089
WWK	PL	3	1.32990	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0128	0.0080	0.0059	0.0029
WWK	PL	4	0.79940	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0216	0.0095	0.0053	0.0034
WWK	PL	6	0.98250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0095	0.0000	0.0000	0.0026	0.0000

weights are in grams, PCB levels are in PPM

Levels of PCB's in Livers of Small Mammals					
Project: TIWET 09741					
				PPM	
Site	Sp.	#	Liv. Wt.	Tot. PCB's	Tot. High Cl PCB's
BBA	OP	1	1.7895	0.1008	0.1008
BBA	OP	2	2.1951	0.0192	0.0192
BBA	PL	1	1.3339	0.1204	0.0526
BBA	PL	2	1.0990	0.0228	0.0174
BBA	PL	5	1.0658	0.0341	0.0341
BBA	PL	7	1.3423	0.0525	0.0305
DMR	OP	1	1.4264	0.0084	0.0084
DMR	OP	3	1.8606	0.0764	0.0324
DMR	OP	4	2.4017	0.1131	0.1131
DMR	OP	5	2.6769	0.1404	0.1404
DMR	OP	6	0.8287	0.0686	0.0686
DMR	PL	1	0.9388	0.1470	0.0610
DMR	PL	2	1.1101	0.0874	0.0874
DMR	PL	3	1.3087	0.1200	0.0757
DMR	PL	4	1.2912	0.1202	0.0750
DMR	PL	6	1.1865	0.0174	0.0174
NEC	OP	1	2.7501	0.1852	0.1852
NEC	OP	2	1.6951	0.0156	0.0156
NEC	OP	3	1.8796	0.0026	0.0026
NEC	PL	1	1.3237	0.0232	0.0232
NEC	PL	4	1.4109	0.0406	0.0406
NEC	PL	5	0.9860	0.0362	0.0362
NEC	PL	6	0.9036	0.0327	0.0327
NEC	PL	7	0.9153	0.0505	0.0505
NSD	OP	1	2.8440	0.3090	0.3090
NSD	OP	2	1.7764	0.0493	0.0179
NSD	OP	3	2.1421	0.0870	0.0870
NSD	OP	4	1.9865	0.1506	0.1506
NSD	PL	3	1.3297	0.3182	0.3182
NSD	PL	4	1.2643	0.0644	0.0644
NSD	PL	5	1.6931	0.0832	0.0832
NSD	PL	6	0.9831	0.0369	0.0369
NSD	PL	7	0.9193	2.0343	2.0343
REF	PL	1	0.9647	0.0000	0.0000
REF	PL	2	0.8909	0.0000	0.0000
REF	PL	3	0.8958	0.1937	0.0000
REF	PL	4	0.8913	0.0000	0.0000
REF	PL	5	0.5404	0.0000	0.0000
REF	PL	6	0.6616	0.0000	0.0000
REF	PL	7	1.3212	0.0036	0.0036
REF	PL	8	0.6281	0.1104	0.0029
WWK	OP	1	1.6980	0.1141	0.1141
WWK	OP	2	1.9044	0.0155	0.0155
WWK	OP	3	1.7997	0.0190	0.0190
WWK	OP	4	1.9007	0.0020	0.0020
WWK	OP	5	1.7085	0.0091	0.0091
WWK	PL	2	1.0927	0.0495	0.0495
WWK	PL	3	1.3299	0.0296	0.0296
WWK	PL	4	0.7994	0.0398	0.0398
WWK	PL	6	0.9825	0.0120	0.0120

weights are in grams, PCB levels are in PPM

TIWET PROJECT: 09741

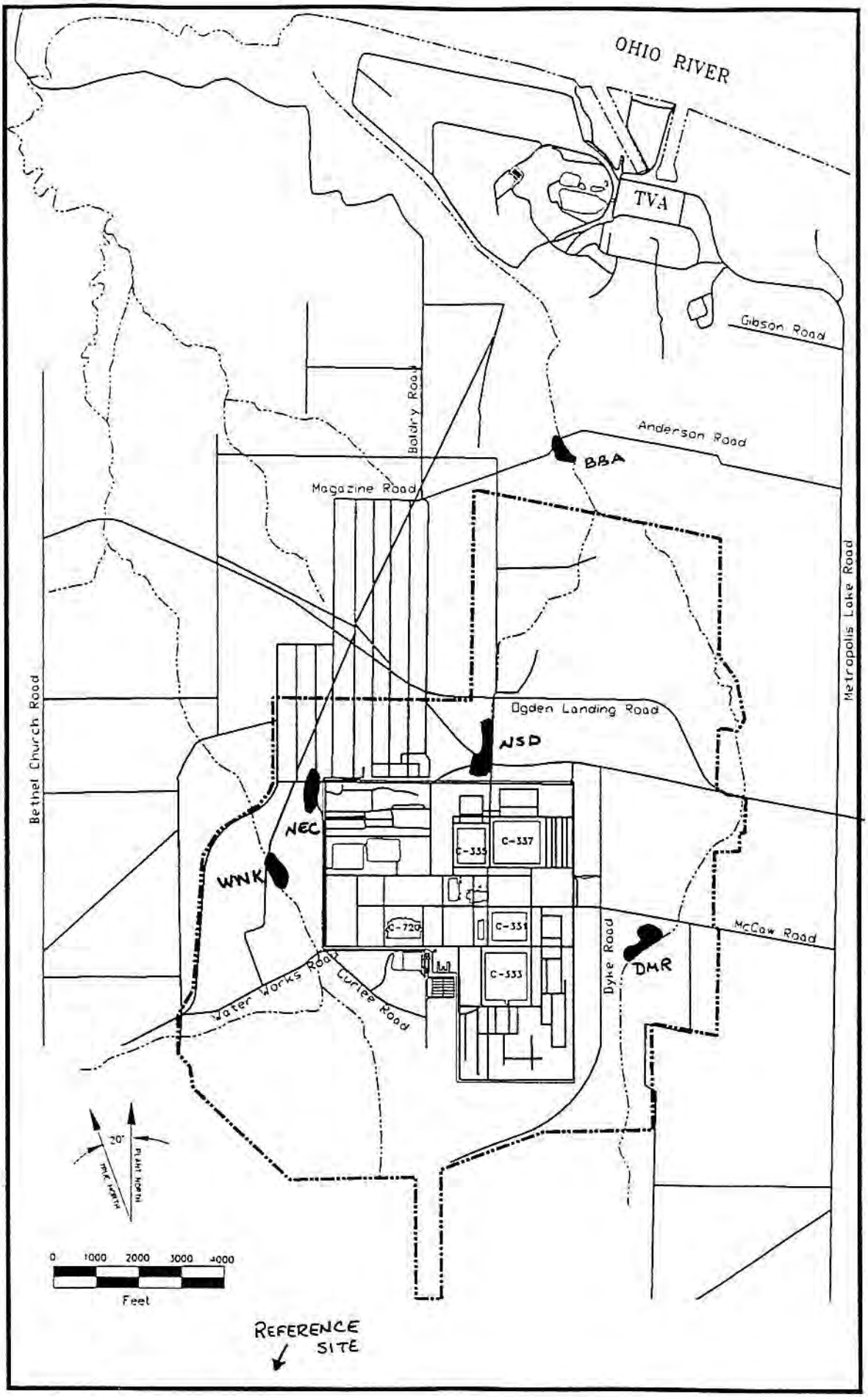
Small Mammal Study at WKWMA/PGDP Project # 09741					
Capture Site	Species	Number	Sex	Weight	Capt. Date
BBA	OP	1	M	>50	970711
BBA	OP	2	M	>50	970716
BBA	PL	1	M	20.5	970709
BBA	PL	2	F	19.5	970709
BBA	PL	3	F	17	970709
BBA	PL	4	F	17.25	970709
BBA	PL	5	F	19.5	970709
BBA	PL	6		22	970716
BBA	PL	7	M	18.5	970716
DMR	OP	1	F	41	970712
DMR	OP	2	M	>50	970712
DMR	OP	3	M	46	970715
DMR	OP	4	F	>50	970715
DMR	OP	5	M	>50	970715
DMR	OP	6	F	25.5	970716
DMR	PL	1	F	16.5	970708
DMR	PL	2	M	22	970711
DMR	PL	3	M	25	970711
DMR	PL	4	F	26.25	970711
DMR	PL	5	M	18.5	970718
DMR	PL	6	M	22	970718
NEC	OP	1	M	>50	970712
NEC	OP	2	F	39.5	970713
NEC	OP	3	M	44	970714
NEC	PL	1	M	24.5	970709
NEC	PL	2	M	15.5	970709
NEC	PL	3	M	17.5	970709
NEC	PL	4	M	23	970710
NEC	PL	5	F	18.5	970710
NEC	PL	6	F	18.5	970716
NEC	PL	7	M	20	970716
NSD	CP	D01	U	3	970709
NSD	OP	1	M	>50	970711
NSD	OP	2	F	41.5	970712
NSD	OP	3	M	>50	970714
NSD	OP	4	F	>50	970715
NSD	PL	1	M	21	970708
NSD	PL	2	M	21	970708
NSD	PL	3	M	23.5	970708
NSD	PL	4	M	23.75	970709
NSD	PL	5	M	26	970711
NSD	PL	6	F	18	970711
NSD	PL	7	F	20	970716
REF	BB	1	U	NC	970717
REF	BB	2	F	8.5	970718
REF	BB	3	M	10	970718
REF	BB	D01	U	7.5	970708
REF	BB	D02	U	NC	970717
REF	PL	1	M	20	970709
REF	PL	2	M	17	970710
REF	PL	3	M	18	970712
REF	PL	4	M	17	970713
REF	PL	5	F	13.5	970714
REF	PL	6	M	12.5	970714
REF	PL	7	F	20	970714
REF	PL	8	M	13.5	970716

all mass units are in grams (g)

TIWET PROJECT: 09741

WWK	BB	1	M	7.5	970713
WWK	OP	1	M	43.5	970712
WWK	OP	2	M	>50	970713
WWK	OP	3	F	41.5	970715
WWK	OP	4	M	>50	970715
WWK	OP	5	M	41	970716
WWK	PL	1	F	21.25	970708
WWK	PL	2	M	20	970708
WWK	PL	3	M	21	970708
WWK	PL	4	F	16	970708
WWK	PL	5	M	15.5	970711
WWK	PL	6	M	20.25	970716

all mass units are in grams (g)



Trapping Sites

DOE NEWS

MEDIA CONTACT:
Jeannie Brandstetter, 441-5105

FOR IMMEDIATE RELEASE
Nov. 3, 1997

DOE ADVISORY BOARD HOSTING MONTHLY MEETING

The U.S. Department of Energy's Site Specific Advisory Board (SSAB) will meet at 6 p.m. Thursday, Nov. 20 at Heath High School.

Agenda items include administrative plans for the board, the DOE project prioritization ranking system, an update on the ruptured waste drum discovered Sept. 15 at the site, an overview of waste management activities, strategies for effective public input, a review of the board's work plan and an investigation of Waste Area Group 22 (uranium burial grounds).

The board is comprised of 20 representatives from local communities as well as governing bodies and other interested groups potentially affected by cleanup decisions at the Paducah Gaseous Diffusion Plant.

The SSAB meets monthly to discuss and develop recommendations on high-level policy issues, including cleanup strategies, technology development, and long-term waste management issues. Board meetings are open to the public.

For more information, please contact Carlos Alvarado at 441-6804.

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