UNITED STATES ARMY
ENVIRONMENTAL HYGIENE
AGENCY
ABERDEEN PROVING GROUND, MD 21010

PESTICIDE SPECIAL STUDY NO. 20-44-0933-79
INVESTIGATION OF POSSIBLE POLYCHLORINATED BIPHENYL (PCB) LEAKAGE
FROM ELECTRICAL TRANSFORMERS DUE TO STORM DAMAGE
WHITE SANDS MISSILE RANGE, NEW MEXICO

Approved for public release; distribution unlimited.
Results of analyses of environmental samples (i.e., sediment, soil, water, air) collected in and around Bldg 1530, indicated that the flash flood at WSMR in August 1978 caused very little leakage (with no subsequent movement) of PCB's from transformers housed in the basement of Bldg 1530. Detectable levels of Aroclor 1260 (the specific PCB involved in this study) were noted only in a single sediment sample collected from transformer vault room 9A. The level of Aroclor 1260 (124 ppm) noted in the sample was below current EPA standards defining hazardous PCB spills or wastes. A summary of results, conclusions,
and recommendations were dispatched on 28 August 1978 via message, 281700Z Aug 78. Since PCB levels found in Bldg 1530 were not determined to be hazardous to human health, specific recommendations and corrective measures were not required.
SUBJECT: Pesticide Special Study No. 20-44-0933-79, Investigation of Possible Polychlorinated Biphenyl (PCB) Leakage from Electrical Transformers Due to Storm Damage, White Sands Missile Range, New Mexico, August 1978

Commander
USA Material Development and Readiness Command
ATTN: DRCSP
5001 Eisenhower Avenue
Alexandria, VA 22333

A summary of the pertinent findings and recommendations of the enclosed report follows:

a. Findings.

(1) Results of analyses of environmental samples (i.e., sediment, soil, water, air) collected in and around Building 1530, indicated that the flash flood at WSMR in August 1978 caused very little leakage (with no subsequent movement) of PCB's from transformers housed in the basement of Building 1530.

(2) Detectable levels of Aroclor 1260 (the specific PCB involved in this study) were noted only in a single sediment sample collected from transformer vault room 9A. The level of Aroclor 1260 (124 ppm) noted in the sample was below current EPA standards defining hazardous PCB spills or wastes.

b. Recommendations.

(1) A summary of results, conclusions, and recommendations were dispatched on 28 August 1978 via message, 2817002 Aug 78.

(2) Since PCB levels found in Building 1530 were not determined to be hazardous to human health, specific recommendations and corrective measures were not required.

FOR THE COMMANDER:

[Signature]

[Name]
Director, Radiation and Environmental Sciences

CF:
HQDA (DASG-PSP)
Cdr, HSC (HSPA-P)
Supt, AHS (HSA-IHE)
Cdr, WSMR (2 cy)
Cdr, WBAMC (2 cy)
C, USAFHA-Rgn Div West
Cdr, TECOM

1 Incl
as (10 cy)
PESTICIDE SPECIAL STUDY NO. 20-44-0933-79
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AUGUST 1978

1. AUTHORITY.

2. REFERENCES.
   b. Message, 281700Z Aug 78, HSE-RP, this Agency, subject as above.
   c. Message, 291730Z Aug 78, HSE-RP, this Agency, subject as above.

3. PURPOSE. To assess the extent and possible impact of leakage of PCB's (Askarels) from electrical transformers as a result of storm damage.

4. GENERAL.
   a. Background.

   (1) On 23 August 1978 a request was received by this Agency from WSMR for assistance in the analysis and evaluation of environmental samples for polychlorinated biphenyls (Askarels). Analysis of these environmental samples was requested in order to determine the extent and possible impact of leakage of PCB's from two electrical transformers located in Building 1530 at WSMR. Leakage of PCB's from the transformers was suspected as a result of extensive flash flooding which occurred in the basement of Building 1530 from rains received earlier in the week. Before the upper 1st and 2d floors of Building 1530 could be re-occupied and before a full-scale cleanup of the basement area could commence, a determination of the extent of PCB leakage and an evaluation of any resulting PCB health hazards were essential. Due to the important nature of WSMR operations performed in Building 1530, a timely determination as to whether or not the building could be safely re-occupied was urgently required.
Pesticide Sp Study No. 20-44-0933-79, WSMR, NM, Aug 78

(2) The following types and numbers of environmental samples were collected from within and outside Building 1530:

(a) Seven sediment samples (soil from outside that was washed in during the flooding) from the two transformer vault rooms and other locations in the basement of Building 1530.

(b) Five soil samples collected outside Building 1530 from the general area where flood waters pumped from the basement were discharged.

(c) Three water samples from wells uphill and downhill from Building 1530 and from the tap within the building.

(d) Nine air samples collected from the two transformers vault rooms, other rooms located in the basement, 1st floor and 2d floor of Building 1530 and from a manhole behind Building 1530.

(3) In addition to the environmental samples described above, samples of the actual PCB transformer fluid (Askarel) from the transformers located in vault rooms 57A and 9A were also collected.

b. Sample Extraction and Cleanup.

(1) Air Samples. Due to an unavailability of Florisil®, air samples were collected on charcoal tubes. The charcoal tubes were extracted using a National Institute for Occupational Safety and Health (NIOSH) method designed for PCB extraction from Florisil tubes. To increase detection limits, 2 ml of desorption solvent instead of the 5 ml described in the NIOSH method was used. The front portion and back portion of the charcoal tube were extracted separately. Three replicates each of charcoal tube spiked at 1 µg/tube and 5 µg/tube with Aroclor® 1260 were extracted and analyzed in the same manner as the WSMR air samples to determine PCB extraction efficiency from charcoal tubes. Results of these recovery studies are presented in Appendix A.

(2) Water Samples. The water samples were extracted using an EPA procedure designed for extraction and analysis of PCB's in industrial effluents. Duplicate water samples (laboratory distilled water) spiked with

® Florisil is a registered trademark of Floridin Company, PO Box 989, Tallahassee, FL.
® Aroclor is a registered trademark of Monsanto Chemical Co., 800 N. Lindberg Boulevard, St Louis, MO.
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Aroclor 1260 at the analytical detection limit of 0.8 ppb were extracted and analyzed in the same manner as the WSMR water samples. Results of these recovery studies are presented in Appendix A.

(3) Soil Samples. Extraction and cleanup procedures for the soil samples were essentially identical to those described in a previous report by this Agency.\(^3\) Florisil column elution with the 50 percent ethyl ether (petroleum ether mixture) was not carried out on WSMR soil samples since PCB's do not normally elute in this fraction.

(4) Sediment Samples. Two different extractions and cleanup procedures were employed with the sediment samples depending on the suspected levels of PCB's in the samples.

(a) Those sediment samples suspected as having only moderate levels of PCB's were subject to routine extraction and cleanup procedures which have been described in a previous USAEHA report.\(^3\)

(b) Those sediment samples suspected of containing possible high levels of PCB's (i.e., samples from transformer vaults 57A and 9A and from areas immediately outside these vault rooms) were processed using a modification of the routine procedures cited in the above paragraph. After extraction of 150 g of sediment with 300 ml of hexane: acetone (3:1) mixture in the routine manner, 2 ml of extract (representing 1 g of sediment) rather than the usual 100 ml (representing 50 g of sediment), was carried through the Florisil column cleanup procedure. The above-described modifications in effect raised the PCB analytical detection limit fiftyfold.

(c) As is the case of the soil samples, a 50 percent ethyl ether/petroleum ether Florisil elution was not performed with any of the sediment samples.

(5) PCB Transformer Fluid. These samples were tested in the same manner as technical standards. Twenty milligrams of PCB transformer fluid was weighed into a 100 ml volumetric flask and diluted to volume with benzene. The solution was then serially diluted with isooctane to the approximate PCB electron-capture detection working range (i.e., 200 to 400 pg/μl).

c. Sample Analysis and Quantitation. PCB determinations and quantitations on all samples were made by gas-liquid chromatography using electron-capture detection. Instruments used, analysis parameters used, and quantitation techniques employed were basically similar to those described in a previous USAEHA report.\(^3\)

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5. RESULTS AND DISCUSSION.

a. Results of PCB analyses of samples collected from WSMR are shown in Appendix B. Analysis of the transformer fluid from transformers located in vault rooms 9A and 57A indicated that the fluid consisted of approximately 70 percent Aroclor 1260. Based on the analysis of the transformer fluid, it was evident that Aroclor 1260 was the specific PCB of concern in the investigation.

b. Appendix C gives the analytical limits of detectability for Aroclor 1260 in the environmental samples collected from WSMR. The relatively high limits of detectability for Aroclor 1260 in air (i.e., 100-200 µg/cm³) are attributable to extremely poor (2 percent) recovery efficiency of this Aroclor from charcoal tubes.

c. Positive findings of Aroclor 1260 were noted in only one of the environmental samples analyzed. A sediment sample collected from transformer vault room 9A was the lone positive sample; the sample contained Aroclor 1260 at level of 124 ppm. A level of 124 ppm Aroclor 1260 in an environmental sample such as soil or sediment, although considerably above expected ambient environmental levels, is not considered by current EPA PCB standards to constitute a hazardous spill or waste problem.

d. Not unexpectedly, residues of the insecticides DDT and chlordane were noted in six of the sediment samples and three of the soil samples. The multiresidue methodology used for extraction, cleanup, and analysis of PCB's is also applicable for the determination of residues of a number of insecticides and their metabolites. The residues of p,p'-DDT (with its metabolite p,p'-DDE) and chlordane found in the basement sediment most likely resulted from the washing in of soil from the proximity of Building 1530 which had been previously treated with DDT and chlordane (possible for termite protection). The residues of DDT and chlordane noted in the sediment and soil samples were consistent with levels expected from usual pest management activities.

6. CONCLUSIONS.

a. Based on the results of analyses of the environmental samples collected in and around Building 1530, it can be concluded that the flash flood at WSMR fortunately caused very little leakage (with no subsequent movement) of Aroclor 1260 (the specific PCB involved in this study) from transformers housed in the basement of Building 1530.

b. Detectable levels of Aroclor 1260 were noted only in a single sediment sample collected from transformer vault room 9A. The level of Aroclor 1260 (124 ppm) noted in the sample was below current EPA standards defining hazardous PCB spills or wastes.
7. RECOMMENDATIONS. A summary of analytical results, conclusions, and recommendations pertaining to the present study was dispatched on 28 August 1978 via reference message 2b.

   a. Due to the lack of any significant positive findings regarding PCB leakage from transformers located in Building 1530, specific recommendations and corrective measures were not required. It was suggested as a matter of good practice that the PCB-contaminated sediment (124 ppm Aroclor 1260) from transformer vault room 9A be disposed of in the WSMR sanitary landfill.

   b. In the event that the PCB transformer fluid from the transformer located in vault room 9A requires replacement, it is recommended that the Solid Waste Management Division of this Agency be contacted regarding proper disposal procedures for this material.

   Clifford Rosen

   J. HOWARD VINOPAL, Ph.D., R.P.E.
   Entomologist
   Pest Management & Pesticide
   Monitoring Division

APPROVED:

   Clifford Rosen

   JOSEPH T. WHITLAW, JR.
   LTC, MSC
   Chief, Pest Management and Pesticide
   Monitoring Division
APPENDIX A

RESULTS OF RECOVERY STUDIES FOR EVALUATION OF EXTRATION EFFICIENCY OF AROCLOR 1260 FROM WATER AND AIR SAMPLES

<table>
<thead>
<tr>
<th>Type of Sample</th>
<th>Fortification Level (Aroclor 1260)</th>
<th>Percent Recovery (Aroclor 1260)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>0.8 ppb</td>
<td>Rep 1 95.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rep 2 99.5</td>
</tr>
<tr>
<td>Air</td>
<td>1 µg/charcoal tube</td>
<td>Rep 1 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rep 2 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rep 3 2.0</td>
</tr>
<tr>
<td></td>
<td>5 µg/charcoal tube</td>
<td>Rep 1 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rep 2 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rep 3 2.0</td>
</tr>
</tbody>
</table>
### APPENDIX B

RESULTS OF ANALYSIS OF SAMPLES COLLECTED
FROM WHITE SANDS MISSILE RANGE, NEW MEXICO

<table>
<thead>
<tr>
<th>USAEHA Sample No.</th>
<th>WSMR Sample Description</th>
<th>Type of Sample</th>
<th>PCB's and/or Pesticides Detected and Their Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 2517</td>
<td>Sample #1, Transformer Vault Room 9A</td>
<td>Sediment</td>
<td>Aroclor 1260-124.34 ppm</td>
</tr>
<tr>
<td>SP 2518</td>
<td>Sample #2, Area Immediately Outside Transformer Vault Room 9A</td>
<td>Sediment</td>
<td>p,p'-DDE - 0.84 ppm; chlordane - 2.68 ppm</td>
</tr>
<tr>
<td>SP 2519</td>
<td>Sample #3, Transformer Vault Room 57A</td>
<td>Sediment</td>
<td>p,p'-DDE - 0.52 ppm; chlordane - 1.66 ppm</td>
</tr>
<tr>
<td>SP 2520</td>
<td>Sample #4, Area Immediately Outside Transformer Vault Room 57A</td>
<td>Sediment</td>
<td>p,p'-DDE - 0.66 ppm; chlordane - 1.19 ppm</td>
</tr>
<tr>
<td>SP 2521</td>
<td>Sample #5, Basement Corridor Outside Room 15</td>
<td>Sediment</td>
<td>p,p'-DDE - 0.53 ppm; p,p'-DDT - 0.92 ppm; chlordane - 2.99 ppm</td>
</tr>
<tr>
<td>SP 2522</td>
<td>Sample #6, Basement Corridor Outside Room 28A and B</td>
<td>Sediment</td>
<td>p,p' DDE - 1.05 ppm; p,p'-DDT - 0.52 ppm; chlordane - 3.00 ppm</td>
</tr>
<tr>
<td>SP 2523</td>
<td>Sample #7, Basement Corridor Outside Room 50</td>
<td>Sediment</td>
<td>p,p'-DDE - 0.70 ppm; p,p'-DDT - 0.48 ppm; chlordane - 2.82 ppm</td>
</tr>
<tr>
<td>SP 2524</td>
<td>Sample #8, Outside Bldg 1530 where water from basement was pumped</td>
<td>Soil</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2525</td>
<td>Sample #9, Outside Bldg 1530 where water from basement was pumped</td>
<td>Soil</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2526</td>
<td>Sample #10, Outside Bldg 1530 where water from basement was pumped</td>
<td>Soil</td>
<td>p,p'-DDE - 0.18 ppm; p,p'-DDT - 0.14 ppm; chlordane - 0.61 ppm</td>
</tr>
<tr>
<td>SP 2527</td>
<td>Sample #11, Outside Bldg 1530 where water from basement was pumped</td>
<td>Soil</td>
<td>p,p'-DDE - 0.02 ppm; p,p'-DDT - 0.04 ppm; chlordane - 0.10 ppm</td>
</tr>
<tr>
<td>USAHA Sample No.</td>
<td>WSMR Sample Description</td>
<td>Type of Sample</td>
<td>PCB's and/or Pesticides Detected and Their Concentration</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------</td>
<td>----------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>SP 2528</td>
<td>Sample #12, Outside Bldg 1530 where water from basement was pumped</td>
<td>Soil</td>
<td>p,p'DDE - 0.37 ppm, p,p'-DDT - 0.29 ppm, chlordane - 0.53 ppm</td>
</tr>
<tr>
<td>SP 2529</td>
<td>Sample #1, Well 21, downhill from Bldg 1530</td>
<td>Water</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2530</td>
<td>Sample #2, Well Site, uphill from Bldg 1530</td>
<td>Water</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2531</td>
<td>Sample #3, Water Tap Inside Bldg 1530</td>
<td>Water</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2532</td>
<td>Transformer Fluid from Transformer in vault room 9A</td>
<td>Transformer Fluid</td>
<td>Aroclor 1260 - approx. 70.0%</td>
</tr>
<tr>
<td>SP 2533</td>
<td>Transformer Fluid from Transformer in vault room 57A</td>
<td>Transformer Fluid</td>
<td>Aroclor 1260 - approx. 70.0%</td>
</tr>
<tr>
<td>SP 2534</td>
<td>Sample #1, Basement Corridor Outside Room 15</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2535</td>
<td>Sample #2, Basement Corridor Outside Room 50</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2536</td>
<td>Sample #3, Basement Corridor Outside Room 28</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2537</td>
<td>Sample #4, Transformer Vault Room 9A</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2538</td>
<td>Sample #5, 1st Floor Corridor Outside Room 174</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2539</td>
<td>Sample #6, 1st Floor Corridor Outside Room 118</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2540</td>
<td>Sample #7, 2nd Floor Corridor Outside Room 248</td>
<td>Air</td>
<td>None Detected</td>
</tr>
<tr>
<td>SP 2541</td>
<td>Sample #8, Manhole Outside Back of Bldg 1530</td>
<td>Air</td>
<td>Invalid Sample (Collection tube not opened)</td>
</tr>
<tr>
<td>SP 2542</td>
<td>Sample #9, Transformer Vault Room 57A</td>
<td>Air</td>
<td>None Detected</td>
</tr>
</tbody>
</table>
APPENDIX C

ANALYTICAL LIMITS OF DETECTABILITY FOR AROCLOR 1260
IN ENVIRONMENTAL SAMPLES COLLECTED FROM
WHITE SANDS MISSILE RANGE, NM

<table>
<thead>
<tr>
<th>Type of Sample</th>
<th>Limit of Detectability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>100-200 µg/cm³</td>
</tr>
<tr>
<td>Water</td>
<td>0.80 ppb</td>
</tr>
<tr>
<td>Soil</td>
<td>0.40 ppm</td>
</tr>
<tr>
<td>Sediment (routine procedure)</td>
<td>0.40 ppm</td>
</tr>
<tr>
<td>Sediment (modified procedure)</td>
<td>20.0 ppm</td>
</tr>
</tbody>
</table>
APPENDIX D

ACKNOWLEDGEMENTS

The assistance and recommendations of the USAEHA personnel listed below in the preparation of this report is acknowledged:

CPT Jeremiah McCarthy, Water Quality Engineering Division
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