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PRELIMINARY DRAFT

SUMMARY

HERBICIDE ORANGE SITE TREATMENT AND ENVIRONMENTAL MONITORING:
SUMMARY REPORT AND RECOMMENDATIONS FOR THE
NAVAL CONSTRUCTION BATTALION CENTER, GULFPORT MS

Prepared For

AIR FORCE LOGISTICS COMMAND
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November 1979

USAF OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY
AEROSPACE MEDICAL DIVISION (AFSC)
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SUMMARY

This report was prepared by members of the Aerospace Medical Division (AFSC) and the United States Air Force Academy for the Air Force Logistics Command (AFLC). The purpose of the report is to document the past and present interest and concern in environmental monitoring studies of a storage area on the Naval Construction Battalion Center (NCBC), Gulfport MS. The area of concern had been used for the long-term storage of 840,000 gallons of Herbicide Orange from mid-1968 to mid-1977.

Since 1970, various Air Force laboratories have been conducting environmental surveys of the soils, plants, and aquatic system in and around the Herbicide Orange Storage Area. As the drums of herbicide began to deteriorate, and as more information became available on the toxic contaminant 2,3,7,8-tetrachlorodibenzo- ρ -dioxin (TCDD) contained in the herbicide, more extensive monitoring programs were conducted. In the summer of 1977, the entire inventory was dedrummed at NCBC, transferred to a specially equipped ship and destroyed by at-sea incineration during Project PACER HO. The AFLC programming plan and the EPA permits for the disposal of the herbicide, committed the USAF to a subsequent storage site reclamation and environmental monitoring program. The major objectives of this program were to (1) determine the magnitude of Herbicide Orange contamination on the Storage Area; (2) determine fate of the phenoxy herbicides 2,4-D and 2,4,5-T, their phenolic degradation products and TCDD in soils of the Storage Area; (3) monitor movements of residues from the Storage Area into adjacent water, sediments and biological organisms; and (4) recommend managerial techniques for minimizing the impact of the herbicides and TCDD residues on the ecology and human populations adjacent or near the Storage Area.

The basic protocol used in the present study consisted of selecting 42 sites within the Storage Area and sampling the soil. Previous studies had shown that the residue did not appreciably move within the acid soil and, in addition, an impervious concrete-stabilized hardpan is located approximately 6 inches below the soil surface. The sites selected for monitoring of herbicides, phenol and TCDD residues were determined by whether a spill had occurred or not occurred at a specific location. In addition to residue analyses, each soil sample was analyzed for microorganisms. The results of these on-site soil studies indicated that approximately 1-2 acres of the 12 acre area are significantly contaminated with Herbicide Orange and TCDD. Levels of 2,4-D and 2,4,5-T herbicides in selected samples were greater than 100,000 ppm (mean 78,040 ppm) in July 1977, but rapidly decreased to one-third that level in 18 months. No accurate estimate of the persistence time of TCDD are obtained from these studies. However, data from spill sites monitored for 18 months suggested that TCDD levels are decreasing. The soil penetration of the herbicides was low while penetration of TCDD was very low but measurable. Soil sterilization of the soil did not occur; indeed, certain microflora proliferated under high levels of herbicides.

As data became available indicating that high levels of TCDD (e.g., 100-200 ppb) were associated with spill sites on the Herbicide Storage Area, studies on the fate of TCDD into the drainage system were initiated. Frozen archived biological samples, collected and frozen from the stream adjacent to the Storage Area, were analyzed and reported January 1979 and found positive for TCDD residues (0.14-3.5 ppb TCDD). Thereafter, additional environmental

samples were collected in January, February and June 1979. Sediment and biological samples collected in 1979 from the stream immediately adjacent to the Storage Area confirmed that movement of TCDD from the Storage Area occurred through erosion of the soil into the stream (sediment levels of 2.7 to 3.6 ppb and biological levels of 0.14 to 7.2 ppb). Water samples collected in the same area were negative for TCDD at a detection level of 0.02 ppb. Samples taken progressively downstream at 3,000, 7,000, 9,000 and 12,000 feet indicated that significant reductions in residue occurred. Only two off-base samples (samples collected in February 1979 beyond the 7,000-foot station) were positive for TCDD and then at levels of only 20 parts per trillion. Although these samples are considered positive, they are so near the detection limit of the present "state-of-the-art" instrumentation (gas chromatography-mass spectrometry).

The specific recommendations for the 12 acre Herbicide Orange Storage Area are (1) continue to leave the area undisturbed and restricted to vehicular traffic; (2) prevent movement of soil and silt from the area by stabilizing the ditch bank, constructing silt catchments within the ditches, and constructing a silt-retaining pond prior to the stream leaving the NCBC; and initiate a research effort to:

- a. decontminate TCDD-laden soils.
- b. increase TCDD degradation rates.
- c. characterize the uptake and distribution of TCDD in the aquatic environment.

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biodegradation of TCDD	environmental monitoring	phenoxy herbicides
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Environmental surveys of the soils, plants and the aquatic system in and around a 12-acre Herbicide Orange Storage Area at Gulfport MS were conducted from 1970 through 1979. The major objectives of the surveys were to (1) determine the magnitude of Herbicide Orange contamination on the storage area (2) determine the fate of the phenoxy herbicides 2,4-D and 2,4,5-T, their phenolic degradation products and TCDD in soils of the storage area (3) monitor movements of residues from the storage area into adjacent water, sediments and biological organisms; and (4) recommend managerial techniques for minimizing the impact		

19.

soil microbial studies

TCDD

2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

2,4,5-trichlorophenoxyacetic acid (2,4,5-T)

20.

of the herbicides and TCDD residues on the ecology and human populations adjacent or near the storage area. High levels of TCDD (e.g., 100-200 parts per billion [ppb]) were associated with spill sites on the herbicide storage area. Sediment samples from the storage area contained 2.7 to 3.6 ppb TCDD and biological organisms closely associated with the sediment contained 0.14 to 7.2 ppb TCDD. Water samples collected in the same area were negative for TCDD at a detection level of 0.02 ppb. Two of five off-base samples were positive for TCDD (a crayfish and a sediment sample both contained 0.02 ppb TCDD). The primary recommendation is that the 12-acre Herbicide Orange storage area be left undisturbed permitting the continuation of "natural" degradation of the herbicides and TCDD. If the area remains undisturbed, it is recommended that the area be restricted and that efforts be immediately undertaken to minimize future erosion of contaminated soil into the ditches. The prevention of soil and silt movement from the area may be accomplished by stabilizing the ditch banks, constructing silt catchments within the ditches and constructing a silt retaining pond prior to the stream leaving the NCBC.