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LETTER REGARDING BACKGROUND DOCUMENTATION DESCRIBING THE DECISION TO  
REMEDiate NCBC GULFPORT MS  
7/7/1989  
IDAHO NATIONAL ENGINEERING LABORATORY



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NCBC Gulfport Administrative Record  
Document Index Number

July 7, 1989

39501-ASSOCIATED AO  
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Mr. J. J. Short  
HQ/AF/LEEVO  
Bolling Air Force Base  
Washington, D.C. 20332-5000

BACKGROUND DOCUMENTATION DESCRIBING THE DECISION TO REMEDIATE NCBC HO  
STORAGE SITE - DJH-14-89

Dear Mr. Short:

Per your request, I have reviewed my files searching for information concerning the decisions that led to the commencement of remedial activities at NCBC and the selection of technologies that were demonstrated. That information was needed to complete the draft remedial investigation report that was prepared by Dames and Moore for Oak Ridge National Laboratories.

After re-examining the delisting petition, page 3-3, paragraph 2, I believe the document that describes the decision to remediate is the research proposal submitted to the Secretary of the Air Force/Deputy for Environment and Safety (formerly SAF/MIQ presently SAF/RQ). That proposal was submitted by the Air Force Surgeon General in June 1980. Because that decision was made prior to INEL's involvement, we do not have a copy of it in the project files.

I also carefully reviewed the letters that you gave to me last spring when we met in New Orleans. There are several letters dated prior to June 1980 and several letters dated August 1980 or later. Unfortunately those letters are primarily concerned with which Air Force organization was responsible for the various monitoring activities; the June 1980 research proposal is notably absent. Additionally, those letters do not indicate when the decision was made to remediate the NCBC site nor do they indicate who would have made that decision.

The information contained in the delisting petition was obtained from the NCBC Environmental Assessment (EA). Appropriate pages are provided in the attachment. The EA indicates that the Air Force plan for disposal of the bulk quantities of HO and the associated EPA permits committed the Air Force to a follow-up storage site reclamation and environmental monitoring program. One of the objectives of that program was to "recommend managerial techniques for minimizing any impact of the herbicides and dioxin residue on the ecology and human populations near the storage and test sites." To accomplish that goal, the Air Force entered a research and evaluation demonstration program of selected decontamination technologies.

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EG&G Idaho began assisting the AF in technology demonstration in 1984. Requests for Proposals (RFPs) were mailed to 26 vendors; nine companies responded. The RFP stated that more than one technology demonstration would be funded and demonstrated. EG&G Idaho separated the proposals into three basic categories based upon the general type of technology proposed by the vendor. Those categories were (a) Thermal Destruction, (b) Chemical Destruction, and (c) Physical Destruction.

Thermal Destruction:

Within the Thermal Destruction category, the J. M. Huber and ENSCO systems were rated as the technologies that were most likely to succeed. The J. M. Huber technology is the Advanced Electric Reactor (AER) which subjects the soil to temperatures in excess of 4000°F. That technology previously had been successfully demonstrated at Times Beach, Missouri on dioxin contaminated soils. It was selected for use at NCBC to determine if it could decontaminate the unique soils at those two locations.

The ENSCO MWP-2000 rotary kiln incinerator was also ranked as a technology that was likely to be successful in soil decontamination. That determination was based partly upon ENSCO's previous demonstrations with PCB contaminated soil.

Other technologies evaluated by EG&G Idaho included molten salt chemistry, fluid-wall chemical reaction, and infrared/thermal destruction. Those proposals were rejected primarily because of the companies' lack of hazardous waste permitting experience and lack of demonstrated success on similar contaminated materials, or both.

Chemical Destruction:

Several chemical destruction technologies were also evaluated by EG&G Idaho. One company proposed to use alkali-metal polyglycoxide (KPEG) and additive formulations that would be applied directly to the soil. That proposal was deemed to be technically feasible but not developed sufficiently to warrant field demonstration. Two other companies submitted proposals, however the technical descriptions and proposed work plan were deemed inadequate and their proposals were rejected.

Physical Technology:

IT Corporation submitted two proposals in this category. One proposal was to demonstrate the Thermal Desorption/Ultraviolet Photolysis technology. That technology involved the use of thermally desorbing TCDD from the

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excavated contaminated soil and then using Ultraviolet light to photolytically destroy the TCDD in the off gas. This technology was selected for demonstration at both Johnston Island and NCBC. IT also proposed using a similar technology on in-situ soils. This proposal was rejected as being technically unachievable because this technology would clean only a thin layer of soil at a time. It would therefore not be useful for the cement stabilized soil at NCBC which had known contamination at one foot below the surface.

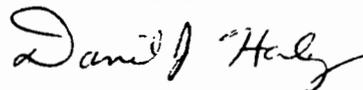
Conclusion:

Two technologies were initially selected. Those technologies were the IT Thermal Desorption/Ultraviolet Photolysis and the J. M. Huber Advanced Electric Reactor. The ENSCO proposal was not initially selected because of funding limitations; the ENSCO unit is substantially larger than the other technologies selected and is therefore substantially more expensive to operate. Subsequently, additional funds became available and the Air Force decided to fund the ENSCO technology to determine if it was feasible to decontaminate large quantities of soil. That data was especially needed because when the decision to fund the ENSCO technology was made, it was apparent that the other two technologies were unsuitable for processing large quantities of soil that would be needed for a full scale site remediation

Also per your request, I am sending high quality figures of the NCBC storage site to Carol Donoghue at Oak Ridge for their incorporation into the NCBC remedial investigation (RI) report.

I hope this information is useful to you in your revisions to the NCBC-RI report. If I can be of further assistance, please don't hesitate to call me at (208) 526-9959.

Very truly yours,



Daniel J. Haley  
Sr. Program Specialist  
Waste Engineering Development

DJH:1a

Attachments:  
As Stated

cc: Carol Donoghue, Oak Ridge

## SECTION I INTRODUCTION

### A. OBJECTIVE

This document assesses the environmental impacts of a proposed research, development, and demonstration project to reduce the level of dioxin contamination in soil at a former Herbicide Orange (HO) storage site. The technology to be demonstrated is soil incineration in a mobile rotary kiln incineration system. The main purpose of the demonstration is to provide data on the reliability and maintainability of a rotary kiln incinerator so that cost-effectiveness may be determined for future restoration efforts at other hazardous waste sites. A secondary goal of the demonstration is to reduce the level of HO-derived dioxin at the former HO storage site to meet criteria established by the Environmental Protection Agency.

The proposed project would be conducted on a former HO storage site at the Naval Construction Battalion Center (NCBC) in Gulfport, Mississippi. HO was used as a defoliant during the Vietnam war. The proposed site was used as a staging area for HO before its shipment to South Vietnam. Although all stored HO was incinerated in 1977, some of the HO spilled onto the ground. That HO contained small quantities of a teratogenic contaminant called 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), commonly known as dioxin.

### B. BACKGROUND

Herbicide Orange is a reddish brown to tan liquid, soluble in diesel fuel and organic solvents, but insoluble in water. One gallon of HO theoretically contained 4.21 pounds of the active ingredient 2,4-dichlorophenoxyacetic acid (2,4-D) and 4.41 pounds of the active ingredient 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). HO was formulated to contain a 50:50 mixture (by weight) of the n-butyl esters of 2,4-D and 2,4,5-T. The percentages of the formulation typically were as follows:

n-butyl ester of 2,4-D	49.49
free acid of 2,4-D	0.13
n-butyl ester of 2,4,5-T	48.75
free acid of 2,4,5-T	1.00
inert ingredients (e.g., butyl alcohol and ester varieties)	0.63

In April 1970, the Secretaries of Agriculture; Health, Education, and Welfare; and the Interior jointly announced the suspension of certain uses of 2,4,5-T. This suspension resulted from published studies indicating that 2,4,5-T was a teratogen. Subsequent studies revealed that the teratogenic effects resulted from a toxic contaminant in the 2,4,5-T identified as TCDD. Subsequently, the Department of Defense (DOD) suspended the use of HO, which contained 2,4,5-T. At the time of suspension, the U.S. Air Force (USAF) had an inventory of 1.37 million gallons of HO in South Vietnam and 0.85 million gallons at NCBC. In September 1971, the DOD directed that the HO in South Vietnam be returned to the United States and that the entire 2.22 million gallons be disposed in an environmentally safe and efficient manner. The 1.37 million gallons were moved to Johnston Island in the central Pacific in April 1972. The average concentration of dioxin in the HO was about 2 parts per million (ppm), with the total amount of TCDD in the entire HO stock estimated at 44.1 pounds.

Various disposal techniques for HO were investigated from 1971 to 1974. Of those techniques investigated, only high-temperature incineration was sufficiently developed to warrant further investigation. Therefore, during the summer of 1977, the USAF disposed of 2.22 million gallons of HO by high-temperature incineration at sea. This operation, Project PACER HO, was accomplished under very stringent U.S. Environmental Protection Agency (EPA) ocean dumping permit requirements.

During storage and handling at the storage sites, some of the HO was spilled onto the surrounding soil. The soil was therefore contaminated with dioxin. Today, the dioxin contamination on the site ranges from 0 to over 500 ppb; the average concentration is estimated as 20 ppb.

The USAF plan for disposal of the bulk quantities of HO and the EPA permits for the disposal of the herbicide committed the USAF to a follow-up storage site reclamation and environmental monitoring program. The major objectives of that required program were to:

1. Determine the magnitude of HO contamination (TCDD) in and around the former HO test storage sites.
2. Determine the rate of natural degradation for the phenoxy herbicides (2,4-D and 2,4,5-T), their phenolic degradation products, and TCDD in soils of the storage and test sites.
3. Monitor for potential movement of residues from the storage and test sites into adjacent water, sediments, and biological organisms.
4. Recommend managerial techniques for minimizing any impact of the herbicides and dioxin residues on the ecology and human populations near the storage and test sites.

Immediately following the at-sea incineration in 1977, the USAF Occupational and Environmental Health Laboratory (OEHL), which is responsible for routine environmental monitoring, initiated site monitoring studies of chemical residues in soil, silt, water, and biological organisms associated with the former HO storage sites at NCBC and Johnston Island.

As a research effort, the Environics Division of the USAF Environmental Sciences Laboratory (ESL) has monitored the natural degradation of HO at the former storage sites since 1980. In 1984, the Environics Division contracted with EG&G Idaho, Inc., to conduct a sampling

and analysis program. The purpose of that effort was to map dioxin concentrations and determine the horizontal and vertical extent of TCDD contamination at NCBC and Johnston Island. The results of those programs will be published in early 1986. Those two groups thus accomplished the first three goals listed above.

To accomplish the fourth goal, and to restore the former HO storage sites to beneficial use, the USAF is conducting research, testing, and evaluation demonstrations of selected decontamination technologies. As part of that research effort, the USAF began conducting pilot-scale demonstration projects in 1985 using several technologies. The object of those demonstrations is to reduce the total isomers of tetra-, penta-, and hexa-chlorodibenzo-p-dioxin and respective isomers of chlorodibenzo furan to concentrations less than 1 ppb in an environmentally safe manner. One of the proposed demonstration technologies is high-temperature incineration of soil using a mobile rotary kiln incinerator. That proposed technology is the subject of this environmental assessment.

Following completion of tests and analysis, data from all proposed technologies, including rotary kiln incineration, will be evaluated for:

1. Meeting the criteria for soil cleanup
2. Determining the efficiency, reliability, and maintainability of the technology.
3. Determining the scale-up factors for remedial action at other sites.
4. Determining the cost-effectiveness of rotary kiln incineration for use in remedial action at other sites.