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OPERATIONAL PLAN

PUBLIC HEALTH AND ENVIRONMENTAL MONITORING  
OF  
ORANGE HERBICIDE TRANSFER OPERATION

Johnston Atoll

Special Project 72-46

December 1974

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## TABLE OF CONTENTS

SECTION	Page
I. INTRODUCTION.....	1
A. Disposal Project Description.....	1
B. Mission and Authorization.....	2
II. MONITORING PROJECT SCOPE AND PERSONNEL.....	4
III. PROJECT ACTIVITIES.....	7
A. Industrial Hygiene and Air Quality Monitoring.....	7
B. Water Quality Monitoring Program.....	10
C. Biomonitoring.....	13
D. Analytical Laboratory.....	18
E. Equipment Cleaning.....	22
IV. SUPPORT REQUIREMENTS/JOHNSTON ISLAND.....	23
A. Analytical Laboratory.....	23
B. Office Space.....	25
C. Preparation Area for Air Monitoring Equipment.....	25
D. Biomonitoring Laboratory.....	26
E. Transportation Requirements.....	26
F. Billeting and Messing.....	26
G. Furniture.....	26
H. Special Requirements.....	26
V. CONTINGENCY PLANNING.....	28
A. Meteorological Problems.....	28
B. Spillage Problems.....	29
C. Catastrophic Events.....	31
APPENDIX	
A. Stack Emissions Testing During Incineration of Orange Herbicide Aboard Vulcanus.....	32
CHARTS	
1. Summary of Field Activities, Incineration at Sea of Orange Herbicide, Johnston Island.....	5
2. Personnel Schedule, Incineration at Sea of Orange Herbicide, Johnston Island.....	6

## TABLE OF CONTENTS (contd)

CHARTS	Page
3. Water Sampling Schedule, Incineration at Sea of Orange Herbicide, Johnston Island.....	11
4. Biomonitoring Schedule, Incineration at Sea of Orange Herbicide, Johnston Island.....	14

## I. INTRODUCTION

### A. DISPOSAL PROJECT DESCRIPTION

1. The disposal project description presented in this section is condensed from the Final Environmental Statement, "Disposition of Orange Herbicide by Incineration" November 1974. The 1.4 million gallons of Orange herbicide presently stored on Johnston Island is to be disposed of via incineration aboard a specially designed incinerator ship at a remote area of the tropical ocean west of Johnston Island. The cargo capacity of the incinerator ship is approximately 0.86 million gallons; therefore, two loadings and incineration voyages will be required.

2. The dedrumming and ship loading rate will be 1,000 drums per day; 15 and 11 days will be required for each load respectively. A dedrum facility will be established at the storage area on Johnston Island. The dedrum facility will include a drum drainage rack where the drums will be opened with a notching device for herbicide drainage into a collection sump. The Orange will be pumped from the sump to the aircraft refuelers which will then transport the Orange to the pier where the Orange will be pumped onto the incinerator ship. The pier transfer area will be configured to contain any spillage, thus preventing Orange from entering the ocean. The drums will be drained for at least 30 minutes. They will then be left to weather (at least one month) after which they will be crushed and stored for disposal. All equipment and refuelers will be flushed with solvent at the completion of the transfer operation, and the solvent will be loaded onto the ship for incineration with the Orange.

## B. MISSION AND AUTHORIZATION

1. Mission: The mission of the Environmental Health Laboratories is to provide health (industrial hygiene) and environmental support to the project. The industrial hygiene will include primarily inspections of work areas to insure that proper personnel protection equipment is being utilized and the utilization of "personnel air samplers" to determine and document worker exposures to Orange vapors. The environmental portion will include; 1) direct sampling of the ocean water and drinking water, soil, and the ambient air, and 2) biomonitoring of the ocean water using selected fish and biomonitoring of the ambient air with selected plants. The analytical laboratory to support this effort will be located at Johnston Island with back up capability by the Naval Environmental Data Base Laboratory, Honolulu, HI. A description of each of the activities noted above, Industrial Hygiene, Ambient Air and Water Quality, Biomonitoring, and Analytical Chemistry will be described in further detail below. In addition, if the EPA should require stack monitoring aboard the ship as part of the ocean dumping permit issued for the incineration of Orange at sea, the stack monitoring program described in Appendix A will be used.

2. Authorization: Requirements for industrial hygiene and environmental monitoring of certain activities have been assumed to be a requirement throughout the long term development of this disposal project. A TDY was made to Johnston Island, from 30 Apr to 3 May 74 by a team headed by Mr. K. Merrill of AFLC/DS to "review herbicide Orange storage facilities and drum maintenance practices; and, to obtain first hand information to evaluate different options for de-druming and moving herbicide to dock and putting on board ship." The above quote is from the trip report of this

TDY; reference AFLC/DS "Visit to Johnston Island, 30 April - 3 May 74". Paragraph 4c of this report, "Medical Support for Herbicide Disposal Operation," is concerned with pre and post project physical examination, protective clothing, respiratory devices, shower facilities and water/air monitoring. The water/air monitoring paragraph states that "The support required for a short term operation, such as the incinerator ship, will be provided by the Air Force for air and water pollution monitoring assisted by the present Holmes and Narver Medical Group." Other documents of major importance to this disposal project are listed below:

(a) AFLC/SGP Ltr 18 Apr 1973, "Development of Environmental Impact Statements for Herbicide Orange Disposal Project", to USAF Environmental Health Lab/CC, Kelly AFB, TX 78241 with 1 atch AFLC/CV Hr 16 Apr 1973 and cy to: USAFEHL, McClellan/CC

Hq USAF/SGPP

SAAMA/SF

USAF Academy/DFLS

AFLC/DS (Mr. Merrill)

This correspondence directed the EHL(K) to be the AFLC OPR for the development of the required Environmental Statements. It further stated that SAAMA/SF will be requested to accomplish certain tasks and will continue as OCR on the project.

(b) Department of the Air Force, Final Environmental Statement "Disposition of Orange Herbicide by Incineration, Nov 1974".

(c) EPA Ocean Dumping Permit for the Incineration at Sea of Orange Herbicide.



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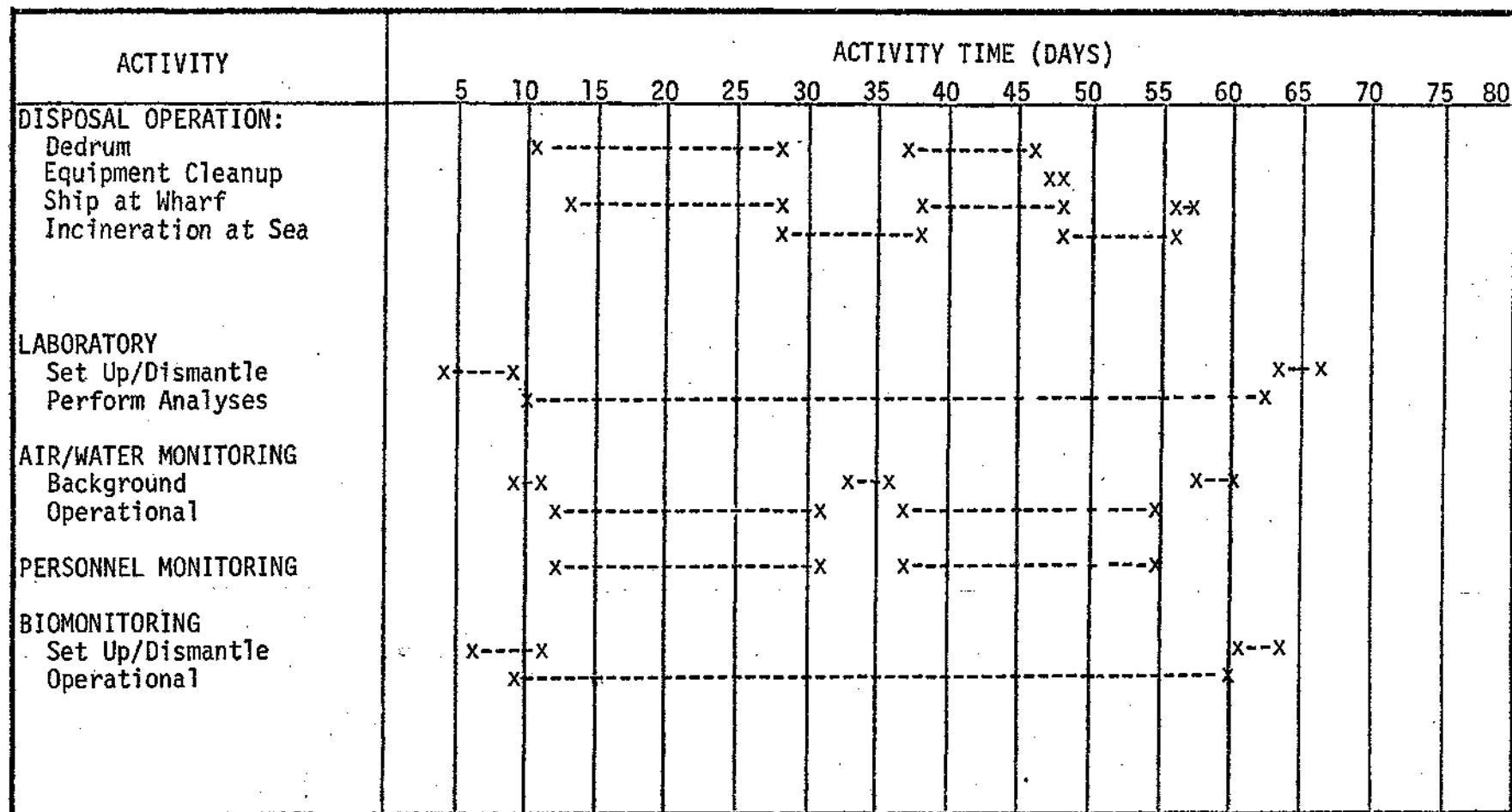
### II. MONITORING PROJECT SCOPE AND PERSONNEL

A. SCOPE: The EHL project will consist of a comprehensive public health and environment monitoring program. Public health aspects will include consideration of exposure of disposal project personnel to Orange herbicide vapor, and a documentation of any effect upon the drinking water system of the island. The environmental quality of the ambient air and the ocean in proximity to the disposal operations will also be monitored and analytical results/observations documented, see Chart 1 for an overview. A daily log of the complete monitoring effort will be maintained by the team leader and a report will be prepared at the conclusion of the project.

B. PERSONNEL: The uncertainty of the project schedule precludes the identification of personnel by name at this time. Approximately 14 and 3 personnel from EHL(K) and EHL(M), respectively, will be involved at one time. See Chart 2 for personnel scheduling.

# CHART 1 SUMMARY OF FIELD ACTIVITIES

## INCINERATION AT SEA OF ORANGE HERBICIDE JOHNSTON ISLAND



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6

\*\* Personnel will remain beyond day 60 only upon the decision of the project officer.

### III. PROJECT ACTIVITIES

#### A. INDUSTRIAL HYGIENE AND AIR QUALITY MONITORING

##### 1. Introduction:

During the transfer of "Orange" Herbicide from drum to bulk hauler a small quantity of liquid will be lost by vaporization. The resulting level of ambient air contamination has been studied theoretically and by experiment and all evidence indicate it will not have environmental or industrial hygiene impact. However, ambient air and worker's breathing zone levels of contamination will be documented for legal purposes.

##### 2. Purpose:

This operations plan outlines ambient air and industrial hygiene sampling activities at the de-druming and transfer site and identified support requirements and support organizations.

##### 3. Background:

Methods and procedures to be used in this operation have been laboratory and field tested. Both methods, ambient air and industrial hygiene, are sensitive at the parts per billion level. In ambient air sampling "Orange" vapors are absorbed in benzene which is contained in a series of two fritted Greenberg-Smith impingers. For industrial hygiene sampling "Orange" vapors are adsorbed on Chromosorb 102.

##### 4. Sampling Activities:

###### a. Placement of Samplers.

(1) Two ambient air samplers will be located at points upwind & downwind at 25 to 50 feet from the de-druming site perimeter.

(2) Industrial hygiene samplers will be placed on all personnel working at the center or downwind de-druming line.

(3) A wind sensor will be placed near the de-druming site.

b. Operation of Samplers:

(1) Ambient air samplers will run continuously during de-druming operations. Samples will be changed each eight hours.

(2) Industrial hygiene samplers will run five hours during each shift for the first three days. The extent of subsequent sampling will be determined from the initial data.

(3) The wind sensor will run and record data continuously.

5. Personnel Requirements:

Three men will be required during the initial phase of sampling. Two men will work a 12 hour day shift and one man will work a 12 hour night shift. Their duties will be as follows:

(1) One officer will conduct ambient air and industrial hygiene sampling.

(2) One technician will operate the laboratory. He will prepare ambient air and industrial hygiene samplers and recover samples (day shift only).

6. Time Requirement:

A three day set-up period at the site will be required prior to commencement of de-druming activities.

7. Transportation Requirement:

a. Transportation for three men (480 lbs), baggage (240 lbs)

and equipment (1000 lbs/110 ft<sup>3</sup>) from McClellan AFB to Johnston Island.

b. One station wagon or covered pickup at the site.

8. Support Requirements:

a. To be provided by USAFEHL-K

(1) Chemicals

(a) Benzene, nanograde - 180 liters

(b) Acetone, nanograde - 150 liters

(c) Ethylene Glycol, nanograde - 25 liters

(2) Activated Carbon - 180 kilograms

(3) Sample containers - 200 with 0.5 liter capacity

b. To be provided by Johnston Island

(1) Life support for two officers and one man

(2) Laboratory area as follows

(a) Floor space - 200 ft<sup>2</sup>

(b) Bench space - 50 ft<sup>2</sup>

(c) Chemical hood

(d) Sink

(e) Three 110 volt power outlets

(3) Electrical power at the de-drumping site - four 110 volt outlets, one at each corner and outside the enclosure.

(4) Mobile electrical power, 110 volts and capable of 24 hour operation.

c. Sample analysis support (lab to be designated by USAFEHL-K).

(1) Ambient air - 120 samples ("Orange" in benzene).

(2) Industrial hygiene - 100 samples ("Orange" adsorbed on Chromosorb 102).

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### B. WATER QUALITY MONITORING PROGRAM

1. Purpose and Scope: The purpose of this program is to monitor the ocean and drinking water for herbicide by analytical chemical techniques during the course of the disposal project. Approximately 100 water samples will be collected and analyzed in support of the dedrum, transport, and ship loading operation. The sample collection location and schedule is shown in Chart 3. The data obtained will be used to both document the impact of the project on the water environment and to evaluate the public health aspect of the drinking water. The disposal project has been designed to prohibit any direct discharge of Orange into the ocean. However, the immediate proximity of the ocean to all of the activities involved dictates that a water monitoring program be established. In particular, the very close proximity of the wharf to the salt water intake for the drinking water distillation plant will require the ship loading operations be observed constantly. Plans will include action to stop any unanticipated spillage on the wharf or ship, contain such spillage, and document the quantity spilled. As noted in Chart 3, sample locations are concentrated around the wharf and salt water intake. Sampling will be increased in these locations should any spillage occur.

2. Background Information: Since the storage of Orange herbicide on Johnston Island in April 1972, a water sampling and analysis program has been in operation at Johnston Island. Both ocean water and drinking water have been routinely tested. The present program, reference the AFLC/DS 17 May 73 trip report mentioned in paragraph I.B. above, consists of 5 ocean samples, one sample at the distillation plant and one from one of the potable water

# CHART. 3 WATER SAMPLING SCHEDULE

## INCINERATION AT SEA OF ORANGE HERBICIDE JOHNSTON ISLAND

ACTIVITY	ACTIVITY TIME (DAYS)															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
DISPOSAL OPERATION:																
Dedrum		x	-----			x		x	-----	x						
Equipment Cleanup										xx						
Ship at Wharf		x	-----			x		x	-----	x						
Incineration at Sea						x	-----	x		x	-----	x				
WATER SAMPLE LOCATIONS*																
Salt Water Intake		xxx	xxxxxxxxxxxxxxx				x	x	xx	xxxxxxx	x	x				
Potable Water System		xxx	x x x x x x x				x	x	x x x x x	x	x					
Wharf		xxx	xxxxxxxxxxxxxxx				x	x	xx	xxxxxxx	x	x				
Downstream of Wharf		x		x		x				x						
Laundry (Sewage Outfall)				x	x											
*All samples are in addition to routine samples which are sent to EHL(M).																

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reservoirs, two distribution system water samples and one sample from a test well in the herbicide storage area. These samples are collected twice per month and forwarded to the EHL/McClellan AFB for analyses. The operation will be continued for a specific time period after completion of the disposal project. Because of the existing large sample data base extensive preliminary base line work will not be required at Johnston Island; however, the initial samples (10) as shown in Chart 3 for the salt water intake, potable water system, wharf and downstream of the wharf will be collected in duplicate and one set forwarded to EHL(M) for comparison with the data generated by the EHL Lab on Johnston Island.

3. Support:

- a. One vehicle
- b. Boat for collecting water samples
- c. Storage space are 4 x 8' x 4
- d. Refrigerator
- e. One desk
- f. Item c, d & e can be in the same room if it's at least 12' x 12'.

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### C. BIOMONITORING:

1. Overview: Biomonitoring refers to the process of using living sentinels for the purpose of detecting the presence of known or unknown toxic substances in the ambient environment. A classic example is the former widespread use of canaries to detect dangerous levels of gas in coal mines. By using a selected spectrum of sensitive living organisms, the presence of one or more toxic compounds at concentrations above known threshold levels can be detected by observable physiological or behavioral changes in the test species. Since these changes will usually occur within a short period of exposure time, biomonitoring can be considered a real-time monitoring system. For instance, Orange herbicide is extremely toxic to healthy, immature, tomato plants. Air concentration in the parts per trillion range will cause rapidly developing, observable, morphological changes in these plants. Thus, strategically located groups of tomato plants can provide one of the most sensitive warning systems available for detection of air contamination around herbicide work areas. Similarly, fish are rapidly poisoned by low concentrations of the herbicide in their environment. Caged fish maintained in the areas of highest potential water contamination will signal any significant release of the material into the aquatic environment.

2. Program: The biomonitoring program and a prepared schedule of the activities to be accomplished at Johnston Island is shown in Chart 4 ; a narrative of the activities follows:

a. Caged fish: Native fish will be captured and used to monitor the aquatic environment. Ten wire cages containing 20 fish each will be positioned and observed twice each day. Seven of these cages will be located

CHART 4 BIOMONITORING SCHEDULE  
INCINERATION AT SEA OF ORANGE HERBICIDE  
JOHNSTON ISLAND

ACTIVITY	ACTIVITY TIME (DAYS)															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
DISPOSAL OPERATION:																
Dedrum		X	-----			X		X	-----	X						
Equipment Cleanup										XX						
Ship at Wharf		X	-----			X		X	-----	X		X-X				
Incineration at Sea						X	-----	X		X	-----	X				
PREPARATION																
Set Up/Baseline Data	X	-----	X													
PLANT AND FISH																
Phase I		X	-----				X									
Phase II								X	-----					X		
SEDIMENT SAMPLES																
Immediate Analysis		X		X						X						
Delayed Analysis		X	X	X	X	X	X	X	X	X						
CORAL MONITORING		X		X		X		X		X						
BIRD MONITORING (Includes Air Samples if indicated)		X		X		X		X		X						

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in areas of highest possible contamination. Three of the cages will be designated as controls and will be located in areas where contamination is considered improbable.

b. Tomato plants: Groups of ten 4-6 inch potted tomato plants will be placed at 25 selected sites around the island. Groups will be concentrated around areas of special concern with at least 5 "control" groups located in areas of least probable contamination. All tomato plants will be observed twice each day.

c. Coral: Prior to the initial dedrumming, an attempt will be made to quantitate the percentage of living coral in several areas near the wharf. These same areas will be routinely inspected during the operation in order to detect any gross effects that may occur.

d. Bird Observations: Careful inspection of the bird population on Johnston, Sand, Akau, and Hikina Islands will be made before operations begin. This inspection will provide a narrative description of the general health, reproductive, and behavioral conditions of these populations. This inspection will be repeated every 5 days during the operation. Although the results will be highly subjective, they should delineate any gross effects upon these populations. Additionally, during these inspections any dead birds found will be necropsied and selected tissues taken for later analysis. Parasites will be collected for later distribution to interested scientists and the skin will be sent to the Smithsonian Institution for their collection.

e. Native plants: Although native plants have an unknown sensitivity to the herbicide constituents, they will be observed daily for any obvious physical or morphological changes. Before operations begin, an index of the dominant species will be made and a map constructed outlining specific

observation areas. These areas will then be inspected daily and any changes noted.

f. Aquatic biomass determination: A fixed volume of water from each of 10 sites (probably the same as used for caged fish) will be poured through a standard plankton net, and the total planktonic biomass will be determined for each site using either ATP photometer analysis or the ash-free dry weight method. The volume of water used will be determined on site and will be based on obtaining a plankton sample sufficient for analysis. Sampling will be done daily. Comparisons of the ratio of control biomass values to biomass values at exposed sites should reflect any unusual fluctuations. A series of comparisons will be made prior to herbicide transfer operations to provide data on the naturally occurring fluctuations between sites.

g. Other activities: Prior to operations, sediment samples will be taken from the ocean floor directly under the ship's berth. Soil samples will be taken in the de-drum area and near the wharf. Similar samples will be taken every 2 days during the loading operation. These samples will be frozen and later analyzed for the herbicide constituents. Each day (or more often if indicated) the direction of currents around the ship will be determined using fluorescent dye. This determination will be used to establish the location of caged fish, areas for collection of water samples, etc.

h. Permits: Required permits for biomonitoring activities will be obtained from the U.S. Fish and Wildlife Service and from the Refuge Manager in Charge of the Northwest Hawaiian Region.

3. Preliminary Activities: To accomplish the biomonitoring the following preliminary activities are required:

- a. Collection and acclimation of bioassay fish
- b. Bioassay fish sensitivity studies.
- c. Plant monitor site selection and plant acclimation.
- d. Aquatic biomass measurements
- e. Dye flow studies
- f. Floral and faunal inspection and evaluation.
- g. Collection of pre-operation soil and sediment samples.

4. Support:

- a. Boat for fish, coral, and bird observation.
- b. Vehicle for plant care and observations.
- c. Room for toxicity studies. At least 10' x 10' with 6' of bench space, running water, and a refrigerator.
- d. Space near the ocean for holding tanks. Preferably upwind from the operation and with readily accessible electricity (110v)
- e. Freezer (8 cu ft) for storing biological, soil and sediment samples.

## D. ANALYTICAL LABORATORY

### 1. Introduction:

a. The laboratory is designed, equipped and staffed to provide an analytical turn around time of twenty-four hours or less for a variety of samples that must be assayed for Orange herbicide. The capability of the laboratory includes the analysis of water, air, soil, materials, biological and botanical samples. The number of samples that can be analyzed within a twenty-four period can be varied over a wide range; based primarily on manpower availability and useable instrumentation time. Analytical time will be decreased to the shortest time possible in order to assure the most responsive surveillance of the Orange removal operation.

b. The following section presents laboratory space requirements, utility connection requirements and the support required from the host organization for installation of the equipment described. Equipment and supplies will be both unpacked at the initiation of the project, and re-packed for shipment at its conclusion by EHL Laboratory personnel.

c. A total of nine people will be associated with the analytical laboratory. It is anticipated that a two shift operation will be required for much of the analytical work.

### 2. Support Requirements:

a. Gas Chromatographic Area: This area will require approximately 200 sq ft., which may be either separate from or within the same area as the sample preparation area. Floor area of 9 linear feet (all depths 30-40 in.) will be required for two free standing gas chromatographs and three gas

cylinders. An additional 8 linear ft (30 in deep) will be required for other instrumentation, plus 8 to 10 linear ft for a clear work area. In addition to floor space, tables (laboratory benches), two laboratory stools or chairs and 6 to 8-110/120 volt wall outlets are required.

b. Sample Preparation Area: The prep area will require approximately 500 sq. ft. For convenience of description, the requirements will be separated into two sections.

(1) Hoods, Fume Exhaust: Unless adequate hood space is available, EHL will supply two six foot fume hoods, along with two fume hood tables and two blowers. Each hood and table will require approximately 6 linear ft with a clearance of 97 inches. Two blower motors require wall mounting and a 230 volt connection for each. Support will be required to connect the motors via 11 in. spiral neoprene ducting to the hoods and to the exterior. Ducting will be supplied by EHL(K), in a length specified by the host organization. Additional material and labor support will be required for connection of: four 110 volt outlets, one light, two switches, and pressurized air for each of the hoods. Total linear floor space required, 16 ft. (34 in D).

(2) Other Laboratory Areas: Bench area must be provided for a variety of equipment. All of these instruments require 115-120 a.c. outlets. Approximately 12 to 14 outlets are required. At least one sink, preferably two, should be provided. The sink should be equipped with hot and cold water, and with faucet fixtures that will permit the attachment of aspirators and nipple nozzles. It is estimated that 15 linear feet of bench space is required for the equipment and about 20 linear feet of bench space for a clear work area. Four lab stools or chairs are required.



c. General Equipment: Additional nearby floor space will be required to house a freezer, refrigerator and three ovens. Four 110 volt outlets and one 240 volt outlet will be required. A total of 40 square feet (approximately 8 linear feet of table area and 6 linear feet of floor space) will be required. If necessary some of the above equipment could be placed in the laboratory, although this alternative is not desirable.

d. Glassware Preparation Area: A general area of 150 sq. ft. should accomodate the wash room. This area must be supplied with a suitable sink and drain boards for dish washing. Hot and cold water should be supplied; and, if possible deionized or distilled water. An additional water outlet should be available for a pipette rinser. Outlets for 110 and 240 volts are both required. Table top space is required for the drying oven (4 linear ft), dirty glassware, cleaned glassware, hot glassware, acid bottles, ultrasonic cleaner and the pipette rinser. One chair will be required.

e. Storage Areas:

(1) Solvents. A separate area is required for the storage of volatile solvents. A storage displacement (actual) of 400 cu ft. (120in W x 120in D x 48in H) will be needed.

(2) Glassware and Reagents: If the laboratory is equipped with the usual laboratory cabinets and shelves, the space will be adequate. If not material will be stored in the metal shipping containers.

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(3) Compressed Gas Cylinders: A storage area for approximately 14 cylinders of either pre-purified nitrogen or argon-5 to 10% methane is needed.

f. Office Space: A desk or work table isolated from the laboratory for calculations, interpretations and report writing will be required.

## DRAFT

E. EQUIPMENT CLEANING: Upon completion of the loading of Orange aboard the incineration ship, the equipment and appropriate structures will be flushed with solvent, and the solvent will be conveyed aboard the incinerator ship for incineration. A continuous program of equipment cleaning should also be incorporated into the day by day activities of the disposal project. That is, the seats, steering wheels, mats, etc of vehicles should not be allowed to become inundated with Orange during the project. Of particular interest is the cleaning of the refuelers since they will be placed back into aircraft refueling service. It is recommended that all appurtenances which can be readily disassembled and changed be so done. Each refueler should be repeatedly flushed with clean JP4 until a visual inspection reveals no Orange. At this time the refuelers should be steam cleaned and then flushed again with JP4. Samples of the finish JP-4 rinse should be analyzed for Orange constituent by the EHL. The liquid from the flushings and steam cleaning should be loaded aboard the incinerator ship for incineration.

#### IV. SUPPORT REQUIREMENTS/JOHNSTON ISLAND

Section III above has listed the support requirements which would be necessary to conduct the monitoring operation. The purpose of this section is to combine those requirements which must be supplied at Johnston Island to conduct the project. This section then serves as a consolidated list of Johnston Island requirements and is intended to avoid any duplications of requirements by the monitoring teams. The most critical activity as regards space, utilities, etc. is the analytical chemical laboratory. The establishment of a pesticide laboratory is a formidable undertaking under any circumstances and, of course, is especially so at a remote area.

##### A. ANALYTICAL LABORATORY

Unless otherwise noted, the areas described below can be combined in the same room.

##### 1. Gas Chromatographic Area

- a. Floor space - 200 sq. ft.
- b. Air conditioned
- c. Tables or counter space - 16 linear ft (30-40 inch depth)
- d. Electrical - 6 to 8 110v outlets: 2 will draw 2200 watts each, 1 will draw 300 watts and the remainder will draw less than 300 watts each.

##### 2. General Equipment Room

Prefer this area not be combined with other areas, but this room should be near the gas chromatographic area.

- a. Floor space - 50 sq. ft.
- b. Table or counter space - 8 linear ft (30-40 inch depth)
- c. Electrical - One 240v outlet (18 amp) Four 110v outlets (total 35 amp)

3. Sample Preparation Area

a. Laboratory Area

- (1) Floor space - approx 350-500 sq. ft.
- (2) Air conditioned
- (3) Compressed air
- (4) Table or counter space - 35 linear ft (30-40 inch depth)
- (5) Electrical - 12 to 14 110v outlets (85 amp total)
- (6) Water - 2 sinks with hot and cold water. The faucet should be threaded to accept male connection (aspirator or nipple). If such faucets are not available EHL(K) will provide faucet for installation.

b. Exhaust hood area: Can be separate or combined with laboratory area above.

- (1) Floor space - 100 sq. ft.
- (2) Table or counter space - 16 linear ft (30-40 inch depth)
- (3) Ceiling height - 97 inch minimum
- (4) Electrical - Hoods supplied by EHL(K) require two 230v single phase outlets (6.5 amp each) and 110v wiring also.
- (5) Other - two wall mounted supports for the two blower/motor units (approx 104 lbs). Minimum 20 inch deep by 15 inch wide. Minimum of 40 inch clearance between support and ceiling. Blowers have 11 inch diameter exhaust tubing (supplied by EHL/K); therefore 2 openings (one for each blower) are required in either window, wall or ceiling.

4. Glassware Preparation Area

- a. Floor space - 150 sq. ft.
- b. Table or counter space - 32 linear ft (30-40 inch depth)
- c. Electrical - One 240v outlet (12 amp) One 110v outlet (3 amp)
- d. Sink - One required with hot and cold water

5. Solvent Storage A separate area will be required for the storage of volatile solvents and 14 compressed gas cylinders. Compressed gases are pre-purified Nitrogen and Argon/5-10% Methane.

B. OFFICE SPACE: These can be combined into one area:

1. Analytical lab office: Should be located near the lab for calculations and report writing, but the area should not be in the same room as the lab.

- a. One desk or work table and a chair.

2. General work area:

- a. 2 desks with chairs
- b. 2 large work tables with chairs
- c. Additional 32 sq. ft. of floor space for storage either in work area or in separate location.

C. PREPARATION AREA FOR AIR MONITORING EQUIPMENT

1. Floor space - 150 sq. ft.
2. Table or counter space - 50 sq. ft.
3. Electrical - 3 110v outlets
4. Sink - one with hot and cold water.
5. Exhaust hood

D. BIOMONITORING LABORATORY

1. Floor space - minimum 100 sq. ft.
2. Table or counter space - 6 linear ft.
3. Refrigerator - One
4. Freezer - One, 8 cu ft for sample storage
5. Sink - Hot and cold water

E. TRANSPORTATION REQUIREMENTS

1. Four vehicles - one must be either a station wagon or a covered pick-up
2. One boat - will have daily usage and routine trips to other islands for birds observations.

F. BILLETING AND MESSING

EHL personnel will be on Johnston Island according to the schedule presented in Chart 2. Replacement personnel will probably overlap with their predecessor.

G. FURNITURE:

This is the overall requirement for chairs or stools:

1. 8 laboratory stools or chairs
2. 5 desk chairs

H. SPECIAL REQUIREMENTS

1. Space near the ocean - This area should be upwind of the Orange transfer operations and will be used for biological holding tanks.

2. Electrical

- (a) Dedrum facility - Four 110v outlets, one at each corner, outside of the facility.

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- (b) Area near the ocean but upwind of the transfer operation-  
Four 110v outlets.
- (c) Mobile electrical power unit, 110 volts and capable of  
24 hour operation.



V. CONTINGENCY PLANNING: Any deviation from the normal conduct of the disposal project as regards health/environment will be immediately reported to the island commander by the EHL team chief. Any activities conducted and resultant recommendations made under a contingency situation will be as members of the island commander's staff. The comments to follow are included to indicate that the EHLs are prepared for certain activities in the event of an Orange spill, etc., and that all personnel involved in the project planning should consider actions to take if an unusual event occurs.

A. METEOROLOGICAL PROBLEMS: Rainfall and wind direction other than the normally prevailing east wind may disrupt the normal disposal project operation and create adverse health/environmental effects. An extremely heavy rainfall may be particularly troublesome. In addition, a wind in the direction of the major populated area may also be troublesome and this situation could be compounded should a fire occur during the period.

1. Rainfall: It is imperative that the project plans include provisions to preclude rainfall from conveying any Orange from the dedrum and transfer facility into the ocean. Also, it is very important that the rainfall not wash any Orange which may have been spilled on the wharf into the ocean. Due to the proximity of the wharf to the drinking water supply, the wharf will need to be kept scrupulously clean of Orange. While the wharf is configured to drain any spilled Orange into a 3,000-gallon collecting tank, it is important that any rainfall cannot flood this drain and cause the flow of Orange into the ocean. Project plans will require a "wharf operation procedure" which will preclude the entry of any Orange from the wharf into the ocean under normal condition and a condition of high rainfall.

2. Wind Conditions: The wind direction and wind speed must be monitored continuously. The location of sensitive plants, i.e. biomonitoring, and the ambient air samplers will be selected largely on the wind situation. Any wind which would carry Orange vapors in an east to northeast direction will be closely monitored to evaluate its impact upon personnel, vegetation and animals, particularly birds. While this wind condition is unfavorable the degree of project disruption cannot be predicted and it will require an on-scene determination and judgment as to the need for a constraint on the disposal operation. The disposal project activities must be designed to eliminate the possibility of any Orange being ignited, thus causing an Orange fire. The major combustion product of Orange which is harmful to personnel is hydrogen chloride (HCl). Fortunately HCl is very irritating to breathe so its presence in very low concentrations is easily detected. In the event of an Orange fire, personnel should avoid inhalation of the smoke and firemen should try to contain the fire by removal of any non-ignited Orange. The use of large quantities of water should be avoided so that spilled Orange will not be washed into the ocean.

B. SPILLAGE PROBLEMS: Although the disposal project is designed to prevent spillage, plans will be required for action in the event of a spill on either land or in the ocean.

1. Land Spill: Spillage should be minimal because, although a large quantity of Orange is to be handled and moved, it will be done in series of relatively small quantity movements. Spills should be adsorbed

with crushed coral and the contaminated coral should be stored in an area where it will not be transported into the ocean by wind or rain. Obviously, such coral cannot be dumped into the ocean nor incinerated by the ship; therefore, it should simply be left in storage in the open for long-term evaporation.

2. Ocean Spillage: If a spill occurs in the ocean near the wharf and there is reason to believe that the salt water intake may be affected, the water plant will be notified to either bypass or shut down, and, immediate action will be taken to: determine the quantity spilled, determine water currents between the spill area and the water intake, collect water and sediment samples in the spill area, collect water and sediment samples at the salt water intake, place caged fish near the salt water intake, and collect samples of the discharge of the salt water distillation unit (if operating). These activities will be continued until it is determined that the drinking water is satisfactory. For a small spill, it is expected that the natural flow of the water in the lagoon would be sufficient to dilute the Orange and transport the Orange from the intake site. During any water plant shut down as a result of concern for the supply, a restricted water-use program should be put into effect. Spillage of Orange into the ocean near the herbicide area will also be monitored closely to determine its impact upon both the environment and the water supply but such spillage is not as critical as that in the wharf area.

C. CATASTROPHIC EVENTS: Plans for activities to be accomplished for events such as: a typhoon, a total destruction of the Orange area by fire, a fire aboard the incinerator ship, sinkage or damage of the ship in the lagoon, refueler accident on the wharf resulting in complete rupture and spillage of Orange into the ocean, etc. cannot be made. Conditions and situations will have to dictate the action to be taken. One positive activity that can be accomplished is the determination of alternate water supply points. Due to local currents a situation may develop which could cause gross contamination at the present water supply point but not at other locations, possibly on the east or southeast side of the island.

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APPENDIX A

Stack Emissions Testing During Incineration of  
Orange Herbicide

Aboard Vulcanus

Introduction:

The Environmental Protection Agency may require monitoring of incinerator stack emissions in their permit to the Air Force for "Orange" Herbicide incineration aboard Vulcanus. In that event this laboratory will provide the monitoring equipment and personnel.

Purpose:

This operations plan outlines sampling activities aboard ship and identifies support requirements and support organizations.

Background:

Methods and procedures to be used in this operation have not been finalized. Two methods have been used in the past, one developed by USAFEHL-M and one by Shell Oil Co. The method to be used will be dependent upon EPA permit requirements.

Sampling Activities:

A tentative sampling schedule calls for six one hour samples. Sampling will commence after the incinerator has reached temperature equilibrium while incinerating "Orange" Herbicide. Three samples will be taken during one day's operation and the three remaining samples the following day.

Time Requirement:

The sampling team will require three days aboard ship prior to incinerator firing to prepare the sampling site. The team will be prepared to depart the ship on the day following the last sampling.

Personnel Requirements:

The sampling team will be comprised of two officers. Both officers will be in addition to those working at the de-druming and transfer site.

Support Requirements:

a. To be provided by USAFEHL-K

(1) Chemicals

(a) Benzene, nanograde - 25 liters

(b) Acetone, nanograde - 25 liters

(c) Ethylene Glycol, nanograde - 10 liters

(2) Activated Carbon - 10 kilograms

(3) Distilled Water - 25 liters

b. Aboard Vulcanus

(1) Welding support

(2) Life support for two officers

(3) Storage for 10 cubic feet of equipment and chemicals

(4) Capability of taking "Orange" sample from input lines to incinerator

c. Sample analysis (lab to be designated by USAFEHL-K) for 48 samples, 24 in benzene medium and 24 in water medium.