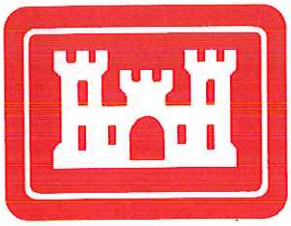

US Army Corps of Engineers

Toxic and Hazardous Materials Agency

HAZARDOUS RANKING SYSTEM (HRS2) FOR FORT STEWART MILITARY RESERVATION

FINAL

September 1992

Prepared For:
U.S. Army Corps of Engineers
Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, MD

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Prepared By:
Advanced Sciences, Inc.
1250 Brass Mill Road
Belcamp, MD 21017

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1.0 INTRODUCTION

The primary purpose of the hazardous ranking score (HRS) is to accurately assess the relative degree of risk to human health and the environment posed by sites and facilities under review. These sources are then evaluated to determine potential listing on the National Priorities List (NPL). The HRS scoring system is based on a review and analysis of data available through the Preliminary Site Assessment. The HRS does not bind the U.S. Environmental Protection Agency (EPA) in its review of the data contained in this report in the context of the NPL candidacy for this facility. The final HRS for the NPL is an EPA determination.

The HRS is a numeric scoring system which evaluates four separate exposure pathways: air, groundwater, surface water and soil exposure. Each pathway is scored based on factors grouped into three factor categories: likelihood of exposure, waste characteristics and targets. The factor categories are multiplied, and then normalized to 100 points to obtain a pathway score. The final HRS score is obtained by combining the pathway scores using a root-mean-square method, resulting in a score that also ranges from 0 to 100. Where site scores exceed 28.50, sites are considered eligible for listing on the NPL.

When performing a HRS evaluation of a site through a Preliminary Site Investigation report, best professional judgement is used to evaluate the available information and data to score the site as accurately as possible. Assumptions made in the scoring utilize reasonable worst-case conditions, which are based on sampling and analysis data. The intent of using worst-case scenarios is to ascertain the potential a site has of being listed on the NPL. The HRS evaluations generated using a Preliminary Site Inspection should be utilized as an indication of the final HRS score evaluated by the EPA.

The purpose of this HRS summary is to identify potential sources of CERCLA hazardous substances at Fort Stewart in Georgia. This summary was formulated based on the information findings contained in the Preliminary Site Inspection Report prepared by Advanced Sciences, Inc. dated July 1992. The scope of this summary does not include any field investigations or site inspection, except where conducted by previous investigations.

Sites which are considered sources for this HRS evaluation include the (1)Post Landfill, (2) Camp Oliver Landfill, (3) Tac-X Landfill, (4) Burn Pits, (5) EOD Areas, (6) Fire Training Pits, (7) DRMO Hazardous Waste Storage Area, (8) Radiator Shop, (9) Battery Shop, (10) DEH Asphalt tanks, and (11) Old Sludge Drying Beds. These sources were chosen to produce the worst-case scenarios.

For purposes of performing an HRS evaluation, all sources are being combined into a single source. This approach is consistent with EPA policy for addressing non-contiguous sources and federal facilities.

The HRS methodology and scoring was done in accordance with the Environmental Protection Agency 40 CFR Part 300 Final Rule, Friday, December 14, 1990. HRS score sheets which this summary is based upon are provided in Appendix A.

2.0 HAZARDOUS CONSTITUENT QUANTITY

Waste quantity is based on sources known to contain hazardous constituents. The quantity is calculated by a tier equation, based on (1) hazardous constituent quantity; (2) hazardous waste quantity; (3) volume; and/or (4) area.

In the case of Fort Stewart, the following areas were used in the waste quantity evaluation:

Source	Area/Quantity	Tier Equation	Value
Post Landfill	89 acres	(D) A/3400	1139.2
Camp Oliver Landfill	2 acres	(D) A/3400	25.6
Tac-X Landfill	5 acres	(D) A/3400	64.0
Burn Pits	15 acres	(D) A/270	2420.0
EOD Areas	17 acres	(D) A/270	211.0
Fire Training Pits	2500 ft^2	(D) A/270	9.3
DRMO Hazardous Waste Storage	1250 ft^2	(D) A/13	96.2
Radiator Shop	400 ft^2	(D) A/13	30.8
Battery Shop	20 lbs. lead	(B) W/5000	.004
DEH Asphalt Tanks	60,000 gal.capacity	(B) W/5000	12.0
Old Sludge Drying Beds	1 acre	(D) A/270	161.3
TOTAL:			4169.4

Based on the total waste quantity value of 4169.4, Fort Stewart is assigned the waste quantity factor value of 100 from HRS Table 2-6.

3.0 SENSITIVE ENVIRONMENTS

Several sensitive environments exist in the study area surrounding Fort Stewart. In the HRS scoring, sensitive environments are assigned values based on their ecological values. The following areas have been rated for this study:

- Ogeechee and Canoochee Rivers and their tributaries.
- Ogeechee River holds status under the National Wild & Scenic River Act
- Habitats for three federally listed endangered species (American alligator, Eastern indigo snake and Red-cockaded woodpecker).
- Wetlands, approximately 69,818 acres.

4.0 GROUNDWATER MIGRATION PATHWAY

The groundwater migration pathway rated a pathway score of 14.5/100. The evaluation of the groundwater pathway is based on the likelihood of substances being released into an aquifer, the waste characteristics of the substances at the site, and the human targets within a four-mile radius of the source. In the four-mile study area of Fort Stewart, potable water is distributed from seven public water supply systems.

Fort Stewart maintains its own potable water distribution system. There are 31 groundwater wells located on the installation. Five of these wells are used to supply water to the distribution system that serves the cantonment area. These wells all produce from the lower Floridian aquifer.

There are four other active groundwater supply wells located elsewhere on the installation that serve as individual water supplies. The remaining 22 wells are distributed across the Post. Of these, two are on standby and the remaining twenty are no longer in use.

4.1 Likelihood of Release

Residents in the study area receive potable water from groundwater sources. The surficial, water table aquifer and the lower artesian (Floridan) aquifer are in hydrologic communication under certain conditions. Thus, for purposes of the HRS evaluation, the two aquifers are treated as a single groundwater unit and all of the production wells in the study area are included within the pathway.

Potential to release is based on four factors: containment, net precipitation, depth to aquifer and travel time. Containment scored a 10 for no functioning leachate collection and removal system. Net precipitation received a 3 from HRS Figure 3-2. Depth to the aquifer is approximately 185 feet, so a value of 3 was assigned. Hydraulic conductivity of fine to medium grained, well sorted, non-indurated sediments with an average 25 foot thickness gave travel time factor a score of 15. Overall score for potential to release is 210.

4.2 Waste Characteristics

Waste characteristics of groundwater migration are evaluated based on the hazardous waste quantity and the human toxicity/mobility factor. Based on the presence of the chromium and lead in groundwater samples of the shallow aquifer near Wright Army Airfield, this factor scored a value of 10.

4.3 Targets

Groundwater targets are based on the nearest drinking water well, total population using that water, groundwater use in the area, and the existence of wellhead protection areas within four miles of the source. The nearest well location is between 1/2 and 1 mile, hence the nearest well factor received a score of 9. Distance-weighted population values were used to assess the potential contamination from drinking water wells within a four-mile region. The population factor was assigned a value of 562.1.

Resources scored a 0. No wellhead protection is designated in this study area. Targets scored a value of 571.1, no maximum value is applicable.

5.0 SURFACE WATER MIGRATION PATHWAY

The surface water migration pathway is evaluated based on two migration components: overland/flood migration to surface water and groundwater to surface water migration. One or both components may be scored, considering their relative importance. If only one component is scored, that score is assigned to the pathway. If both components are scored, the higher of the two scores is selected and assigned to the pathway. Each component is evaluated based on the same three threats, namely, drinking water threat, human food chain threat and environmental threat. Further, each threat involves the evaluation of the three factors: likelihood to release, waste characteristics, and targets. In the Fort Stewart evaluation, only the overland flood component was evaluated, and scored 11.7. Therefore, the surface water migration pathway evaluation was assigned a score of 11.7.

5.1 Overland Flood Migration Component

This sub-pathway evaluates surface water threats that result from overland migration of hazardous substances from a source at the site to surface water. The three threats evaluated consist of drinking water threat, human food chain threat and environmental threat.

5.1.1 Potential to Release

Insufficient data is available to establish an observed release of hazardous substances into the watershed. Consequently, the potential to release was evaluated. The potential to release is evaluated using two components: potential to release by flood and potential to release by overland flow. The scores for these two components are added to obtain the factor value for the watershed.

Potential to release by overland flow is ranked according to containment, runoff, and distance to surface water. In this study, containment scored a 10 for the lack of functioning and maintained run-on control system and runoff management system. Runoff factor attained a score of 3 based on the 50 to 250 acre drainage area which is composed of moderately, fine-textured soils, and the 2-year/24-hour rainfall value of 4.5 inches. The minimum distance to surface water is approximately 500 to 1000 feet, yielding a score of 16 to the distance factor. Potential to release by overland flow scored 190.

Potential to release by flood is the product of two components: containment and flood frequency. Containment ranked a 10 due to the lack of documentation of washout prevention. Fort Stewart is located on the 100-year flood plain which is valued at 25. A score of 250 was assigned to the potential to release by flood, generating a score of 440 for the likelihood to release.

This score is used for all three threats of the overland flood component of surface water migration.

5.1.2 Drinking Water Threat

Waste characteristics were calculated based on the toxicity and persistence of chromium in the soil of the EOD areas and the previously computed hazardous waste quantity, producing a score of 32.

Potential contamination to the population is based on a dilution weighted value. In this study area, there are no drinking water intakes, consequently, this factor scored a 0. Resource factor scored a 5 for recreational use of the watershed. The overall scoring for the drinking water threat is 0.85/100.

5.1.3 Human Food Chain Threat

Waste characteristics scored 32/1000, and was calculated as before with the enhancement of a bioaccumulation factor for lead. The Ogeechee and Canoochee Rivers are used for recreational fisheries. Records for 1989-90 indicate approximately 4000 pounds of fish per year are harvested in the Ogeechee River. Based on the harvest records, the dilution factor of a large stream, and the bioaccumulation of lead, food chain individual factor was assigned a value of 20/50, and the potential to contaminate the human food chain was ranked at 0.0003. Overall scoring for the human food chain threat yields 19.2.

5.1.4 Environmental Threat

The environmental threats scored 0.12. Waste characteristics were calculated using values for lead; for ecosystem toxicity, persistence, and bioaccumulation. The score assigned to waste characteristics is 100. The sensitive environments in this study area include the Ogeechee and Canoochee Rivers and approximately 4 to 8 miles of wetlands. Sensitive environments scored a 0.225.

6.0 SOIL EXPOSURE PATHWAY

Evaluation of the soil exposure pathway is based on two threats: resident population threat and nearby population threat. Both threats are based on the three factor categories of likelihood of exposure, waste characteristics and targets. The soil exposure pathway ranked a score of 6.0/100.

6.1 Resident Population Threat

The resident population threat is evaluated if there is an area of observed contamination within 200 feet of a residence, school, and/or work-place boundary. This sub-pathway is appraised using the likelihood to release along with waste characteristics and targets. Observed release of cadmium, chromium, and selenium in soil samples collected at the EOD Areas ranked a 550 for likelihood of exposure. Within the 200 foot area of contamination, there are no resident individuals, resident population, or resources. There are, however, terrestrial sensitive environments for the Eastern indigo snake within the 200 foot study area. Approximately 24,028 military and civilian personnel on base which are subject to exposure. The resident population threat scored a 495,000.

6.2 Nearby Population Threat

This threat evaluates the nearby population who live, work or attend school within a one mile travel distance of the surficial contamination area. Attractiveness, accessibility and frequency of use, along with the area of contamination, are assessed to determine the likelihood of exposure. This factor is multiplied by the waste characteristics and targets to ascertain the score for this sub-pathway threat.

Attractiveness and accessibility factor was assigned a value of 10/500 for an accessible area with no public usage. The area of contamination is 5000 to 25000 feet, which is assigned a factor value of 20. The likelihood of exposure scored 5/500. The population within one mile is 500, which scored 0.3. The nearby population threat was assigned a value of 6.0

7.0 AIR MIGRATION PATHWAY

An evaluation of the air migration pathway at Fort Stewart yielded a pathway score of 0.17 out of 100. The pathway consists of evaluating the likelihood of release of hazardous substances to the atmosphere, the waste characteristics of potentially airborne contaminants, and the potential human and environmental targets within a four-mile radius of the source.

7.1 Likelihood of Release

Likelihood of release is a measure of the likelihood that a waste has been or may be released into the environment. Insufficient evidence was available to determine an observed release of contaminants into the atmosphere, therefore, the potential to release was evaluated. The potential to release is determined by separately evaluating the gas vapor and particulate migration potential to release based on containment, source type, and mobility. The factor with the highest score is used as the pathway score. Gas potential to release scored 119, and particulate potential to release scored 196. The score for likelihood to release was assigned 196.

7.2 Waste Characteristics

This category is evaluated based on the hazardous waste quantity and the toxicity and mobility of vapors and particulate substances. Hazardous waste quantities are based on sources known to contain hazardous substances. This value is then combined with toxicity and mobility factors to derive a score for the factor. For the air migration pathway in the Fort Stewart study area, waste quantity received a score of 100. The waste constituent, toluene, detected in the soil at Wright Army Airfield, rated the highest values for toxicity, mobility and migration factors to give waste characteristics an assigned value of 3.

7.3 Targets

Human and environmental targets for the air migration pathways were evaluated within four miles of sources at Fort Stewart. To obtain results of a worst-case-scenario, Wright's AAF was used as the source site. Nearest individual received a value of 2, for the residents and workers in a distance of 1/4 to 1/2

mile. Population was evaluated using distance weighted population values. Population received a value of 13.9. There are no resources in the study area, therefore, this factor received a 0. Sensitive environments potentially contaminated include the Ogeechee and Canoochee Rivers and tributaries, and approximately 69,818 acres of wetlands (which are regulated as part of the Coastal Plain-National Wetlands Management System under USFWS). These areas include habitat for several federal and state protected threatened and endangered species of wildlife. This factor received a score of 8.1. Overall, the targets category scored a value of 24.0, no maximum value is applicable.

8.0 SUMMARY

Utilizing the root-square-mean equation with the scores of the four pathways, air migration; groundwater migration; surface water migration; and soil exposure, an overall HRS score of 9.8 out of 100 was computed. The EPA employs a cut off score of 28.5 as a management tool for identifying sites that are candidates for the NPL. Accordingly, this HRS score of Fort Stewart does not indicate potential to score high enough for listing on the NPL.

REFERENCES

ASI (Advanced Sciences, Inc. 1992) "Preliminary Site Inspection for Fort Stewart." Prepared for USATHAMA, Aberdeen Proving Ground, Maryland.

AEHA (U.S. Army Environmental Hygiene Agency 1972) "Air Pollution Engineering General Survey #21-608-73," Hunter Airfield, Savannah, Georgia.

APPENDIX A

GROUNDWATER MIGRATION PATHWAY

OBSERVED RELEASE: 0

POTENTIAL TO RELEASE:

A(B+C+D)

(A) Containment: 10 (No functioning leachate collection and removal system)
(B) Net Precipitation: 3 (HRS Figure 3-2)
(C) Depth to Aquifer: 3 (Approximately 185 feet)
(D) Travel Time: 15 (Fine to medium grained; non-indurated sediments)
Potential to Release: 210

WASTE CHARACTERISTICS:

Toxicity/Mobility: 100 (Superfund Chemical Data Matrix (SCDM) based on chromium.
Hazardous Waste Quantity: 100
Waste Characteristics: 10 (HRS Table 2-7)

TARGETS:

Nearest well: 9 (greater than 1/2 to 1 mile)
Population:
Level I concentration: 0 (No data available)
Level II concentration: 0 (No data available)
Potential contamination:

Distance Category (miles)	# People served by groundwater wells	Distance weighted Population Values
0 - 1/4	0	0
> 1/4 to 1/2	1102	1013
> 1/2 to 1	16600	1669
1 to 2	29000	2939
2 to 3	0	0
Total		5621

$$PC = \frac{1}{10}(5621) = 562.1$$

Resources: 0
Wellhead Protection: 0 (No Data Available)
GROUNDWATER PATHWAY SCORE: 14.5

SURFACE WATER OVERLAND/FLOOD MIGRATION PATHWAY

OBSERVED RELEASE: 0

POTENTIAL TO RELEASE BY OVERLAND FLOW:

A(B+C)

(A) Containment: 10 (No maintained cover or functioning and maintained run-on control system and run-off management system)

(B) Runoff: 3 (2-year, 24-hour rainfall of 4.5"; fine textures soils; 50-250 acres drainage area)

(C) Distance to Surface Water: 16 (500 to 1000 feet)

(D) Potential to Release by Overland Flood: 190

POTENTIAL TO RELEASE BY FLOOD:

A x B

(A) Containment: 10 (Lack of documentation of washout prevention)

(B) Flood Frequency: 25 (100-year floodplain)

(C) Potential to Release by Flood: 250

POTENTIAL TO RELEASE: 446

DRINKING WATER THREAT:

WASTE CHARACTERISTICS:

Toxicity/Persistence: 10,000 (SCDM Based on chromium)

Hazardous Waste Quantity: 100 As previously determined.

Waste Characteristics: 32 (HRS Table 2-7)

TARGETS: 0

There are no surface water intakes within the distance limit.

RESOURCES: 5 (Recreational use of the watershed)

DRINKING WATER THREAT SCORE: 0.85

HUMAN FOOD CHAIN THREAT:

LIKELIHOOD OF RELEASE: 440

WASTE CHARACTERISTICS:

Toxicity/Persistence/Category: 5.0^{E06} (SCDM based on lead)

Hazardous Waste Characteristics: 100 (As previously determined)

Waste Characteristics: 180 (HRS Table 2-7)

TARGETS:

Food Chain Individual: 20

Population:

Level I concentrations: 0 (No data available.)

Level II concentrations: 0 (No data available.)

Potential Human Food Chain Contamination:
Factor value: 3 (Estimated human food chain production 4000 lbs/yr)
Dilution weight 0.001 (Large stream to river)

$$PF=\frac{1}{10}(3)(0.001)=0.0003$$

HUMAN FOOD CHAIN THREAT SCORE: 19.2

ENVIRONMENTAL THREAT:

LIKELIHOOD OF RELEASE: 440

WASTE CHARACTERISTICS:
Ecosystem Toxicity/Persistence/Category 5.0[806] (SCDM based on lead.
Hazardous Waste Quantity: 100 (As previously determined).
Waste Characteristics: 100 (HRS Table 2-7)

TARGETS:
Sensitive Environments:
Level I Concentration: 0 (No data Available.)
Level II Concentration: 0 (No data Available.)
Potential Contamination:
Wetlands:
Factor Value: 150 (Estimated length of wetlands between 4 and 8 miles.)
Sensitive environments:
Factor value: 75 (Habitat for american alligator, red-cockaded woodpecker, and the eastern indigo snake)

$$SP=\frac{1}{10}(150+75)(0.01)=0.225$$

ENVIRONMENTAL THREAT SCORE: 0.12

SURFACE WATER OVERLAND/FLOOD COMPONENT SCORE: 11.7

SOIL EXPOSURE PATHWAY

RESIDENT POPULATION THREAT:

LIKELIHOOD OF RELEASE: 500 (Based on analytical data indicating presence of chromium above background levels in soil samples collected at the EOD areas.)

WASTE CHARACTERISTICS:

Toxicity: 10,000 (SCDM based on chromium)
Hazardous Quantity: 2 (using area of observed contamination)
Waste characteristics: 10

TARGETS:

Resident individual: 0
Resident Population:
Level I concentrations: 0
Level II concentrations: 0
Workers: 15 (24,028 personnel on Post)
Resources: 0
Terrestrial Sensitive Environments: Habitat for the eastern indigo snake

NEARBY POPULATION THREAT:

LIKELIHOOD OF EXPOSURE:

Attractiveness/Accessibility: 10 (Accessible, with no public recreation use)
Area of contamination: 20 (5000 to 25,000 feet)
Likelihood of exposure: 5 (HRS Table 5-8)

WASTE CHARACTERISTICS:

Toxicity: 10,000 (SCDM based on chromium)
Hazardous Waste Quantity: 2 (As previously calculated)
Waste Characteristics: 10 (HRS Table 2-7)

TARGETS:

Nearby Individual: 1 (Less than 1/4 mile)
Population within 1 mile:

Distance Category (miles)	Population	Distance Weighted Population Values
0 to 1/4	0	0
> 1/4 to 1/2	0	0
> 1/2 to 1/4	500	3.0
Total		3.0

$$PC = \frac{1}{10}(3.0) = 0.3$$

SOIL EXPOSURE SCORE: 6.0

AIR MIGRATION

LIKELIHOOD OF RELEASE:
OBSERVED RELEASE: 0 (No data available to establish a release to air.)
POTENTIAL TO RELEASE:

GAS POTENTIAL TO RELEASE: A(B + C)
(A) Gas Containment: 7 (Source vegetated; cover soil type resistant to gas migration)
(B) Source Type: 11 (No evidence of biogas release)
(C) Gas Migration Potential: 6 (Henry's Law = 6.6^{E-03})
Gas Potential to Release: 119

PARTICULATE POTENTIAL TO RELEASE: A(B + C)
(A) Particulate Containment: 7 (Source vegetated; cover soil type resistant to gas migration)
(B) Particulate Source Type: 22 (No evidence of biogas release)
(C) Particulate Migration Potential: 6 (HRS Figure 6-2)
Particulate Potential To Release: 196
LIKELIHOOD OF RELEASE: 196

WASTE CHARACTERISTICS:

Toxicity/Mobility: 10 (SCDM based on toluene detected at 14-33 ug/kg at Wright AAF)
Hazardous Waste Quantity: 100 (As previously determined)
Waste Characteristics: 3 (HRS Table 2-7)

TARGETS:

Nearest Individual: 2 (Greater than 1/4 to 1/2 mile)
Population:
Level I concentration: 0
Level II concentration: 0
Potential Contamination:

Distance Category (miles)	Population	Distance Weighted Population Values
0 to 1/4	0	0
> 1/4-1/2	0	0
> 1/2 to 1	100	0.9
> 1 to 2	5000	27
> 2 to 3	16000	38
> 3 to 4	38300	73
Total		138.9

$$PC = \frac{1}{10}(138.9) = 13.9$$

AIR MIGRATION PATHWAY (CONTINUED)

Resources: 0
Sensitive Environments:
Actual Contamination: 0 No data available.
Potential Contamination:

Distance Category (miles)	Sensitive Environment Value	Distance Weight	Factor Value
0 to 1/4	125 + 75	0.25	50
> 1/4 to 1/2	250 + 75	0.054	17.55
> 1/2 to 1	450 + 75	0.016	8.4
> 1 to 2	500 + 75	0.0057	2.9
> 2 to 3	500 + 75	0.0023	1.3
> 3 to 4	500 + 75 + 75	0.0014	0.9
Total			81.0

$$PC = \frac{1}{10}(81.0) = 8.1$$

AIR MIGRATION SCORE: 0.17