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White Paper
Ravenna Army Ammunition Plant (RVAAP)
Facility-Wide Human Health Cleanup Goal Development

Ravenna Army Ammunition Plant
Ravenna, Ohio

February 2008

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This draft concept paper (aka "white paper") describes the planned technical approach for developing facility-wide risk-based cleanup goals for environmental media and human receptors at the Ravenna Army Ammunition Plant.

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BRACO – Base Realignment and Closure Technical Support Office.
RTLS-ENV – Ravenna Training and Logistics Site Environmental Specialists.
RVAAP – Ravenna Army Ammunition Plant.
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USACE – U.S. Army Corps of Engineers – Louisville District.
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Ohio EPA-NEDO – Ohio Environmental Protection Agency – Northeast District Office.
Ohio EPA-OFFO – Ohio Environmental Protection Agency – Office of Federal Facilities Oversight.

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contributed to the preparation of this document and should not be considered an eligible contractor for its review.

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Preliminary Draft White Paper for Facility-Wide Human Health Cleanup Goal Development at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

Samantha Pack — 1/30/08

Samantha Pack
Study/Design Team Leader — Date

David King — 1/30/08

David King
Independent Technical Review Team Leader — Date

Significant concerns and the explanation of the resolution are as follows:

Internal SAIC Independent Technical Review comments are recorded on a Document Review Record per SAIC quality assurance procedure QAAP 3.1. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader. As noted above, all concerns resulting from independent technical review of the project have been considered.

W. [illegible] — 1-30-08

Principal w/ A-E firm — Date

DRAFT
WHITE PAPER
RVAAP FACILITY-WIDE HUMAN HEALTH CLEANUP GOAL DEVELOPMENT

February 2008

1.0 FORWARD

The *Ravenna Army Ammunition Plant Facility-Wide Human Health Risk Assessor Manual, Amendment 1* (USACE 2005), herein referred to as the Risk Manual, requires that prior to commencing any risk assessment activities at the Ravenna Army Ammunition Plant (RVAAP), a White Paper be developed to ensure regulatory agreement with the processes proposed. This White Paper has been developed to comply with this requirement as the U. S. Army Corps of Engineers, Louisville District prepares to develop facility-wide risk-based cleanup goals.

2.0 INTRODUCTION

RVAAP utilizes an Installation Action Plan (IAP) to cover remedial investigations (RIs) and cleanup needed for closure of RVAAP. The purpose of the IAP is to outline the total multi-year restoration program for an Installation. The IAP defines Installation Restoration Program (IRP) requirements and proposes a comprehensive approach to investigation and cleanup of each area of concern (AOC) at the Installation. This effort to develop facility-wide cleanup goals is part of the path forward for identifying cleanup requirements for remaining AOCs. These goals will not be used to re-evaluate past decisions.

The purpose of this White Paper includes the following:

- Clarify technical issues related to developing facility-wide human health cleanup goals for RVAAP. Most of the technical requirements for performing this work have been clearly defined in the RVAAP Risk Manual. However, a few issues specific to developing cleanup goals must be agreed to prior to calculating these goals.

- Define the exposure pathways and parameters pertinent to two newly identified future land uses: the Engineering School use and the Small Arms Range use.

Following RVAAP stakeholder input, this White Paper will be incorporated in its final form into a subsequent report that presents the final assumptions, methods, and calculated facility-wide cleanup goals.

3.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN FOR CLEANUP GOAL DEVELOPMENT

The first step in developing facility-wide cleanup goals is to define the universe of chemicals at RVAAP that may be encountered and may require a numeric cleanup goal. Two possible methods for identifying the universe of contaminants at the Installation were evaluated:

1. Consolidate the lists of chemicals of potential concern (COPCs) from completed RI reports.

2. Perform a new COPC screen against all chemicals in the Ravenna Environmental Information Management System.

Option 2 was selected as the best option for identifying a facility-wide list of COPCs for the following reasons:

- Identifying COPCs in previous RIs may not have been performed in a consistent manner because they were performed by different contractors under changing regulatory guidance. A new screening effort can eliminate this likely inconsistency.

- Risk assessment requirements for RVAAP and risk model information (e.g., toxicity factors, chemical-specific factors, etc.) may have changed since the earliest RIs and a new COPC screen can accommodate any guidance updates and information changes.

The facility-wide COPC screen will follow the general guidance of the RVAAP Risk Manual (Sections 3.4 and 3.5) with few exceptions:

1. Because the facility-wide data set is likely to be large, chemicals meeting the <5% detection rule will not be screened out per Section 3.4.1 of the Risk Manual (5% of the large data set could represent a valid contamination issue).

2. No background screen will be used to eliminate a chemical from the facility-wide COPC list. The calculated cleanup goals and background values will be presented for naturally occurring chemicals.

3. Chemicals will be screened against the U. S. Environmental Protection Agency (EPA) Region 9 preliminary remediation goals (PRGs). Any chemical for which the maximum detected value exceeds the PRG will be retained as a facility-wide COPC unless there is evidence that a single detection is a true anomaly. An explanation of the chemical anomaly will be presented for review.

4. Consistent with the Risk Manual, chemicals identified as essential nutrients will be screened out. Chemicals that are considered essential nutrients (e.g., calcium, chloride, iodine, iron, magnesium, potassium, phosphorous, and sodium) are an integral part of the human food supply and are often added to foods as supplements. EPA recommends that these chemicals not be evaluated as COPCs as long as they are: (1) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (2) toxic at very high doses (i.e., much higher than those that could be associated with contact at an AOC).

4.0 EXPOSURE ASSESSMENT CONSIDERATIONS IN CLEANUP GOAL DEVELOPMENT

When the RVAAP IRP began in 1989, RVAAP was identified as a 21,419-acre installation. The property boundary was resurveyed by the Ohio Army National Guard (OHARNG) over a 2-year period (2002 and

2003) and the actual total acreage of the property was found to be 21,683.289 acres. As of February 2006, a total of 20,403 acres of the former 21,683-acre RVAAP have been transferred to the National Guard Bureau (NGB) and subsequently licensed to OHARNG for use as a military training site [Ravenna Training and Logistics Site (RTLS)]. When RVAAP was operational, RTLS did not exist and the entire 21,683-acre parcel was a government-owned, contractor-operated industrial facility. The RVAAP IRP encompasses investigation and cleanup of contamination from past activities over the entire 21,683 acres of the former RVAAP. The current RVAAP consists of 1,280 acres in various parcels (including AOCs) throughout the OHARNG RTLS. At present, workers infrequently visit the RVAAP AOCs for maintenance purposes, such as mowing; to conduct environmental investigations; and to perform remediation activities. As cleanup of AOCs is completed, they will also be transferred to NGB.

Under these current and future planned land use scenarios, the Risk Manual identified human receptors and exposure pathways that must be evaluated in RVAAP risk assessments. The identified receptors include:

- Security and Maintenance Personnel,
- National Guard – Fire/Dust Suppression Worker,
- National Guard Trainee,
- Resident Farmer,
- Trespasser Adult/Juvenile, and
- Recreators – Hunter/Trapper/Fisher.

A full set of exposure pathways and exposure factors has been developed for each of these receptors, as documented in the Risk Manual. These assumptions will be carried into the development of the cleanup goals.

As planning for OHARNG training activities has progressed, two specific training activities have been identified that may not be adequately covered under the above receptor assumptions. These activities include:

- National Guard Engineering School, and
- National Guard Small Arms Range.

4.1 LAND USE AND POTENTIAL RECEPTORS

The objective of this section is to define the exposure assessment considerations (i.e., magnitude, frequency, and duration of potential human exposure to COPCs) for the two new training activities, keeping in mind that the current receptor scenarios may be adequate for one or both of the these two new land uses. The three primary steps in defining the considerations are listed below.

1. Identify the exposure setting for the proposed Engineering School and Small Arms Range and the human receptors associated with these land uses.

2. Identify exposure pathways associated with the land uses.

3. Quantify the receptor's potential intake of each COPC.

4.1.1 Engineering School

To obtain information needed to quantify potential exposures for Engineering School land use, members of OHARNG were interviewed, and the detailed "Program of Instruction" (TRADOC 2007, Course 052-21E10(R), "Heavy Construction Equipment Operators Course," Engineering School) that defines the detailed processes for each training activities was reviewed. The purpose of the Engineering School is to train personnel in construction engineering, carpentry, and combat engineering. Activities resulting in a "reasonable maximum exposure" include dirt excavation during which trainees would move dirt down to 36 to 42 in. deep for 10 to 12 hr/day (minus breaks) and would be trained on using heavy excavation equipment. The training sessions would typically last 2 weeks (10 to 14 days in the field, with 14 days representing a conservative maximum time in the field). For example, the Program of Instruction for the "Heavy Construction Equipment Operators Course" requires three, 40-hr training sessions (120 hr) on a Scoop Loader, a Small Emplacement Excavator, and a Hydraulic Excavator. These sessions are broken up into four primary parts: classroom, demonstration, hands-on, and testing, with 60 to 80% of the time in hands-on training [POI 052-21E10(R)]. Trainees could have follow-up training if they fail to meet course requirements for graduation, with a maximum three attempts to pass the course of instruction. Discussion with OHARNG on a reasonable number of years that a single trainee may serve in this type of training resulted in an estimate of three, 14-day training sessions.

The receptor of primary concern under this land use scenario is the training instructor. The instructor is assumed to be in the field at all times when excavation activities are taking place. Current plans include 10, 2-week classes per year, resulting in a maximum number of days in the field of 140 days/year. Discussion with OHARNG on a reasonable number of years that a soldier would be qualified and participate as a trainer resulted in an estimate of 12 to 13 years maximum, assuming that the soldier would be qualified to serve as a trainer for one-half of the 25-year service.

Therefore, a National Guard Engineering School Instructor is considered to be the relevant receptor for this land use:

- This receptor is responsible for overseeing all excavation training activities in the field.
- The soldier performs these duties using a combination of walking through the field or driving in an all-terrain-vehicle-style vehicle to provide continuous instruction and driving the heavy equipment excavators to demonstrate their use. This soldier may also be responsible for returning the dirt moved during exercises to its original location.
- At a minimum, the soldier wears a short-sleeved shirt, long pants, and boots.
- The receptor is present at the Engineering School field site for a total of 180 days/year: 140 days/year for 10, 2-week training sessions; 20 days of site refurbishing and maintenance work (1 day prior to and after each session); plus 20 additional days representing 2 work weeks of mobilization and demobilization activities prior to and after the annual training season.
- During training, it is assumed that the instructor is in the field 10 hr/day. During maintenance and mobilization work, it is assumed the instructor is in the field 8 hr/day. The total hours over the 180-day period totals 1,730, or an average of 9.5 hr/day.
- This scenario assumes the same soldier performs these duties for half of his 25-year enlistment (12 years).

- For the dust inhalation exposure, the Engineering School Instructor is assumed to have an inhalation rate of 19.8 m^3/day. This assumes the receptor spends 49% of their day in light activities, 5% of their day in moderate activities, 3% of their day in heavy activities, and 43% of their day at rest. The inhalation rate is a weighted average that accounts for the 49% of the day spent doing light activities at an inhalation rate of 1.0 m^3/hr, 5% of the day spent doing moderate activities in the field at an inhalation rate of 1.6 m^3/hr, 3% of the time doing heavy excavation activities at an inhalation rate of 3.2 m^3/hr, and 43% of the day at rest at an inhalation rate of 0.4 m^3/hr. This results in an estimated point value of 0.83 m^3/hr, which converts to a daily inhalation rate of 0.83 m^3/hr × 24 hr/day = 19.8 m^3/day (see Figure 1). This breathing rate is a conservative daily inhalation rate compared to a recommendation rate of 15.2 m^3/day for normal activities (EPA 1997).

- To ensure that the various exposure factors do not multiply into an overly conservative scenario, the fact that, for a portion of the year, there is no dust loading due to precipitation is accounted for. In an interview with OHARNG staff, they indicated that during much of the training time there is mud present. It is recommended that the particulate emission factor be modified to account for the fact that, 32% of the time, there is precipitation >1 mm, the soil is wet, and there is no dust loading (National Oceanic and Atmospheric Administration lists the mean precipitation days with precipitation >1 mm for the Cleveland area as 115 days/year). The exposure days have been adjusted by 68% (0.68) to indicate that only 250 days/year are dry enough for fugitive dusts.

- This scenario will be protective of the Engineering School trainees and part-time instructors who will be present for a much shorter time periods.

Engineering School Instructor						
	Hours Off Duty	**Hours On Duty**	**Total**	**% of Day in Activity**	**Breathing Rate**	**Breathing Volume**
Rest	8	2.4	10.4	0.43	0.4	0.17
Light	4	7.8	11.8	0.49	1	0.49
Moderate		1.2	1.2	0.05	1.6	0.08
Heavy		0.6	0.6	0.03	3.2	0.08
Total	12	12	24	1.00		0.83 m^3/h
						19.8 m^3/day
Range Maintenance Soldier						
	Hours in Office/Home	**Hours in Field**	**Total**	**% of Day in Activity**	**Breathing Rate**	**Breathing Volume**
Rest	8	1.2	9.2	0.38	0.4	0.15
Light	10	3.9	13.9	0.58	1	0.58
Moderate		0.6	0.6	0.03	1.6	0.04
Heavy		0.3	0.3	0.01	3.2	0.04
Total	18	6	24	1.00		0.81 m^3/h
						19.5 m^3/day

Figure 1. Process for Developing Inhalation Rates for the Engineering School Instructor and the Range Maintenance Soldier

4.1.2 Small Arms Range

Plans for the development of small arms ranges at the Ravenna Training and Logistics Site (RTLS) are currently underway. These ranges will utilize practice rounds, which will be 40 mm or less. There are no plans to utilize high-explosive rounds.

A Mark 19 range land use scenario was developed and evaluated in the *Winklepeck Burning Ground Focused Feasibility Study* (USACE 2004). The Mark 19 is a belt-fed, automatic, 40-mm grenade launcher or grenade machine gun. In the process of developing the receptor exposure scenario for this land use, it was determined that the relevant receptor was a National Guard Range Maintenance Soldier, or the maintenance personnel responsible for maintaining the range throughout the training year. The Range Maintenance Soldier activities would include target maintenance, range maintenance, and controlled burns to clear the range impact area of woody growth and burn-off grasses.

Several additional receptors were considered including a National Guard Trainee and the Range Construction receptor; however, the exposure duration and frequency associated with these potential receptors was a small fraction of the time that the Range Maintenance Soldier would be exposed.

For the facility-wide cleanup goal development, the National Guard Range Maintenance Soldier with a revised inhalation value (see below) is adopted:

- This receptor is assumed to be responsible for both routine maintenance of the range and targets and annual clearance of practice rounds.

- The soldier performs these duties using a combination of walking over the range, driving over the range in an all-terrain-vehicle-style vehicle, and driving on access roads in a closed vehicle, such as a pickup truck.

- At a minimum, the soldier wears a short-sleeved shirt, long pants, and boots.

- The receptor is assumed to be present at the range 85 days/year, for 6 hr/day (i.e., 42 weekends per year, 4 hr before use and 8 hr after use, plus 1 day for annual clearance). This equates to 12 hr over 2 days (4 hr 1 day before use, plus 8 hr 1 day after use = 12 hr) or an average of 6 hr/day. The Range Maintenance Soldier spends the rest of the workday performing other duties at the RTLS. This scenario assumes the same soldier (or soldiers) performs these duties all year for a 25-year enlistment.

- For the small arms range, it is assumed that the receptor spends 58% of their time in light activities, 3% of their time in moderate activities, 1% of their time in heavy activities, and 38% of their time at rest. This results in an estimated point value of 0.81 m^3/hr and converts to a daily inhalation rate of 19.5 m^3/day (see Figure 1). This is a conservative daily inhalation rate compared to a recommendation rate of 15.2 m^3/day for normal activities (EPA 1997).

- This scenario will be protective of users of the range who are present for a much shorter time.

4.2 IDENTIFY EXPOSURE PATHWAYS

The exposure pathways associated with the Engineering School Instructor and the National Guard Range Maintenance Soldier are shown in Table 1.

Table 1. Conceptual Exposure Model for the Revised National Guard Range Maintenance Soldier at Winklepeck Burning Grounds

Pathway	Engineering School Instructor	National Guard Range Maintenance Soldier
Surface Soils Only (0 to 4 ft BGS)		
Incidental soil ingestion	-	X
Dermal contact with soil	-	X
Inhalation of VOCs and dust	-	X
Surface and Deep Soils (0 to 13 ft BGS)		
Incidental soil ingestion	X	-
Dermal contact with soil	X	-
Inhalation of VOCs and dust	X	-

BGS = Below ground surface.
VOC = Volatile organic compound.
- = Pathway is not evaluated for cleanup goal development.
X = Pathway is evaluated for cleanup goal development.

4.3 QUANTIFY EXPOSURE PARAMETERS

Exposure parameters used to calculate intake for the Engineering School Instructor and the National Guard Range Maintenance Soldier are listed in Tables 2 and 3, respectively.

5.0 DEVELOP CLEANUP GOALS

Cleanup goals will be developed for each of the land use/receptor scenarios identified in the Risk Manual and for the Engineering School and Small Arms Range uses. These will be "back-calculated" using the equations presented in the Risk Manual, starting with the following remedial action objectives:

- cleanup of carcinogenic contaminants will be consistent with achieving a target risk of 1×10^{-4}, 1×10^{-5}, and 1×10^{-6}, respectively; and

- cleanup of non-carcinogenic contaminants will be consistent with achieving a target hazard index of 0.1, 1, and 3, respectively.

Once facility-wide cleanup goals have been developed, they will be tabulated to show cleanup goals for all land-use/receptor scenarios along with naturally occurring background values.

Table 2. Exposure Parameters for the Engineering School Instructor

Parameter	Units	Value	Source
Incidental Ingestion			
Soil ingestion rate	kg/day	0.0001	RAGS Part B (EPA 1991)[a]
Exposure time	hr/day	9.5	Activity/land use-specific per OHARNG [b]
Exposure frequency	days/year	180	Activity/land use-specific per OHARNG[b]
Exposure duration	years	25	Assumed enlistment period[a]
Body weight	kg	70	RAGS Part B (EPA 1991)[a]
Carcinogen averaging time	days	25,550	RAGS Part B (EPA 1991)[a]
Non-carcinogen averaging time	days	9,125	RAGS Part B (EPA 1991)[a]
Fraction ingested	unitless	1	Conservative assumption[a]
Conversion factor	days/hr	0.042	
Dermal Contact			
Skin area	m^2/event	0.33	Head, hands, and forearms, *Exposure Factors Handbook* (EPA 1997)[a]
Adherence factor	mg/cm^2	0.3	Value for construction worker (95^{th} percentile); values from RAGS Part E (EPA 2004)[a]
Absorption fraction	unitless	chemical-specific	Chemical-specific absorption fraction values from RAGS Part E (EPA 2004) or default values from the FWHHRAM (USACE 2005): SVOCs = 10%; VOCs = 1%; and inorganics = 0.1[a]
Exposure frequency	events/year	180	Activity/land use-specific per OHARNG[b]
Exposure duration	years	25	Assumed enlistment period[a]
Body weight	kg	70	RAGS Part B (EPA 1991)[a]
Carcinogen averaging time	days	25,550	RAGS Part B (EPA 1991)[a]
Non-carcinogen averaging time	days	9,125	RAGS Part B (EPA 1991)[a]
Conversion factor	$(kg\text{-}cm^2)/(mg\text{-}m^2)$	0.01	
Inhalation of VOCs and Dust			
Inhalation rate	m^3/day	19.8	Activity/land use-specific[c]
Exposure time	hr/day	9.5	Activity-specific per OHARNG[b]
Exposure frequency	days/year	180	Activity-specific per OHARNG[b]
Precipitation modifying factor	unitless	.68	Per NOAA, 250 days precipitation <1 mm/365 total days
Exposure duration	years	25	Assumed enlistment period[a]
Body weight	kg	70	RAGS Part B (EPA 1991)[a]
Carcinogen averaging time	days	25,550	RAGS Part B (EPA 1991)[a]
Non-carcinogen averaging time	days	9,125	RAGS Part B (EPA 1991)[a]
Particulate emission factor	m^3/kg	1.67E+06	Default value for Cleveland, Ohio, assuming a 0.5-acre source area[d]
Conversion factor	days/hr	0.042	

[a] Value is the same as that cited in the FWHHRAM for the National Guard Trainee.
[b] Per OHARNG staff interviews and the detailed training "Programs of Instruction."
[c] The receptor spends 49% of their day in light activities, 5% of their day in moderate activities, 3% of their day in heavy activities, and 43% at rest.
[d] A smaller particulate emission factor (PEF) value (1.67×10^6) is used for the Engineering School because the activities of this receptor are assumed to generate more dust. This PEF value was calculated from a dust loading factor (DLF) of 600 $\mu g/m^3$ (DOE 1993) as: PEF = 1/(DLF × Conversion Factor) = 1/(600 $\mu g/m^3$ × 1E-09 kg/µg) = 1.67E+06 m^3/kg.
FWHHRAM = *RVAAP Facility-Wide Human Health Risk Assessor's Manual* (USACE 2005).
NOAA = National Oceanic and Atmospheric Administration.
OHARNG = Ohio Army National Guard.
RAGS = Risk Assessment Guidance for Superfund.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Table 3. Exposure Parameters for the National Guard Range Maintenance Soldier

Parameter	Units	Value	Source
Incidental Ingestion			
Soil ingestion rate	kg/day	0.0001	RAGS Part B (EPA 1991)[a]
Exposure time	hr/day	6	Site-specific per LTC Tadsen[b]
Exposure frequency	days/year	85	Site-specific per LTC Tadsen[b]
Exposure duration	years	25	Assumed enlistment period[a]
Body weight	kg	70	RAGS Part B (EPA 1991)[a]
Carcinogen averaging time	days	25,550	RAGS Part B (EPA 1991)[a]
Non-carcinogen averaging time	days	9,125	RAGS Part B (EPA 1991)[a]
Fraction ingested	unitless	1	Conservative assumption[a]
Conversion factor	days/hr	0.042	
Dermal Contact			
Skin area	m^2/event	0.33	Head, hands, and forearms, *Exposure Factors Handbook* (EPA 1997)[a]
Adherence factor	mg/cm^2	0.3	Value for construction worker (95^{th} percentile); values from RAGS Part E (EPA 2004)[a]
Absorption fraction	unitless	chemical-specific	Chemical-specific absorption fraction values from RAGS Part E (EPA 2004) or default values from the FWHHRAM (USACE 2005): SVOCs = 10%; VOCs = 1%; and inorganics = 0.1[a]
Exposure frequency	events/year	85	Site-specific per LTC Tadsen[b]
Exposure duration	years	25	Assumed enlistment period[a]
Body weight	kg	70	RAGS Part B (EPA 1991)[a]
Carcinogen averaging time	days	25,550	RAGS Part B (EPA 1991)[a]
Non-carcinogen averaging time	days	9,125	RAGS Part B (EPA 1991)[a]
Conversion factor	$(kg\text{-}cm^2)/(mg\text{-}m^2)$	0.01	
Inhalation of VOCs and Dust			
Inhalation rate	m^3/day	19.5	Activity/land use-specific[c]
Exposure time	hr/day	6	Site-specific per LTC Tadsen[b]
Exposure frequency	days/year	85	Site-specific per LTC Tadsen[b]
Exposure duration	years	25	Assumed enlistment period[a]
Body weight	kg	70	RAGS Part B (EPA 1991)[a]
Carcinogen averaging time	days	25,550	RAGS Part B (EPA 1991)[a]
Non-carcinogen averaging time	days	9,125	RAGS Part B (EPA 1991)[a]
Particulate emission factor	m^3/kg	9.24E+08	Default value for Cleveland, Ohio, assuming a 0.5-acre source area[d]
Conversion factor	days/hr	0.042	

[a] Value is the same as that cited in the FWHHRAM for the National Guard Trainee.
[b] Personal communication, LTC Tom Tadsen, Ohio Army National Guard - Ravenna Training and Logistics Site.
[c] The receptor spends 58% of their time in light activities, 3% of their time in moderate activities, 1% of their time in heavy activities, and 38% of their time at rest.
[d] Value is the same as that cited in FWHHRAM for all receptors except the National Guard Trainee. The lower National Guard Trainee value is not used because the Range Maintenance Soldier will not be generating large quantities of dust (i.e., there will be no tanks).
FWHHRAM = *RVAAP's Facility-Wide Human Health Risk Assessor's Manual* (USACE 2005).
RAGS = Risk Assessment Guidance for Superfund.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

6.0 REFERENCES

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