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U.S. Army Center for Health Promotion  
and Preventive Medicine

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**TRAINING MUNITIONS HEALTH RISK  
ASSESSMENT  
NO. 39-EJ-1485-00  
RESIDENTIAL EXPOSURE FROM INHALATION OF  
AIR EMISSIONS FROM THE  
M918 40-MM PRACTICE CARTRIDGE OR THE  
M781 40-MM PRACTICE CARTRIDGE  
DEPARTMENT OF DEFENSE IDENTIFICATION CODES:  
B584 AND B519**

Prepared by:

Environmental Health Risk Assessment Program

Prepared for:

U.S. Army Environmental Center

Published date:

15 June 2001

Approved for public release; distribution unlimited



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## ***U.S. Army Center for Health Promotion and Preventive Medicine***

*The lineage of the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) can be traced back over 50 years. This organization began as the U.S. Army Industrial Hygiene Laboratory, established during the industrial buildup for World War II, under the direct supervision of the Army Surgeon General. Its original location was at the Johns Hopkins School of Hygiene and Public Health. Its mission was to conduct occupational health surveys and investigations within the Department of Defense's (DOD's) industrial production base. It was staffed with three personnel and had a limited annual operating budget of three thousand dollars.*

*Most recently, it became internationally known as the U.S. Army Environmental Hygiene Agency (AEHA). Its mission expanded to support worldwide preventive medicine programs of the Army, DOD, and other Federal agencies as directed by the Army Medical Command or the Office of The Surgeon General, through consultations, support services, investigations, on-site visits, and training.*

*On 1 August 1994, AEHA was redesignated the U.S. Army Center for Health Promotion and Preventive Medicine with a provisional status and a commanding general officer. On 1 October 1995, the nonprovisional status was approved with a mission of providing preventive medicine and health promotion leadership, direction, and services for America's Army.*

*The organization's quest has always been one of excellence and the provision of quality service. Today, its goal is to be an established world-class center of excellence for achieving and maintaining a fit, healthy, and ready force. To achieve that end, the CHPPM holds firmly to its values which are steeped in rich military heritage:*

★ *Integrity is the foundation*

★ *Excellence is the standard*

★ *Customer satisfaction is the focus*

★ *Its people are the most valued resource*

★ *Continuous quality improvement is the pathway*

*This organization stands on the threshold of even greater challenges and responsibilities. It has been reorganized and reengineered to support the Army of the future. The CHPPM now has three direct support activities located in Fort Meade, Maryland; Fort McPherson, Georgia; and Fitzsimons Army Medical Center, Aurora, Colorado; to provide responsive regional health promotion and preventive medicine support across the U.S. There are also two CHPPM overseas commands in Landstuhl, Germany and Camp Zama, Japan who contribute to the success of CHPPM's increasing global mission. As CHPPM moves into the 21st Century, new programs relating to fitness, health promotion, wellness, and disease surveillance are being added. As always, CHPPM stands firm in its commitment to Army readiness. It is an organization proud of its fine history, yet equally excited about its challenging future.*

| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                                    |                            |                                                                                 | Form Approved<br>OMB No. 0704-0188                        |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------|----------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------|--|
| <p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p><b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                    |             |                                    |                            |                                                                                 |                                                           |  |
| 1. REPORT DATE (DD-MM-YYYY)<br>06/15/2001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             | 2. REPORT TYPE<br>Technical Report |                            | 3. DATES COVERED (From - To)<br>March 1999-August 2001                          |                                                           |  |
| 4. TITLE AND SUBTITLE<br>Training Munitions Health Risk Assessment No.39-EJ-1485-00<br>Residential Exposure from Inhalation of the Air Emissions from the M918 40mm Practice Cartridge or the M781 40mm Practice Cartridge, Department of Defense Identification Codes: B584 / B 519                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |                                    |                            | 5a. CONTRACT NUMBER                                                             |                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    |                            | 5b. GRANT NUMBER                                                                |                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    |                            | 5c. PROGRAM ELEMENT NUMBER                                                      |                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    |                            | 5d. PROJECT NUMBER                                                              |                                                           |  |
| 6. AUTHOR(S)<br>Hsieng-Ye Chang, Stafford D.F.R.Coakley, Joleen Mobley                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |                                    |                            | 5e. TASK NUMBER                                                                 |                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    |                            | 5f. WORK UNIT NUMBER                                                            |                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    |                            |                                                                                 |                                                           |  |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>U.S. Army Center for Health Promotion and Preventive Medicine<br>5158 Blackhawk Road<br>Aberdeen Proving Ground, Maryland 21010-5422                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |                                    |                            | 8. PERFORMING ORGANIZATION REPORT NUMBER<br><br>Risk Assessment # 39-EJ-1485-00 |                                                           |  |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)<br>U.S. Army Environmental Center<br>ATTN: SFIM-AEC-ETD<br>Aberdeen Proving Ground, MD 21010-5401                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                                    |                            | 10. SPONSOR/MONITOR'S ACRONYM(S)<br>USAEC                                       |                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    |                            | 11. SPONSOR/MONITOR'S REPORT NUMBER(S)<br>SFIM-AEC-PC-CR-200146                 |                                                           |  |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT<br>Distribution Unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |                                    |                            |                                                                                 |                                                           |  |
| 13. SUPPLEMENTARY NOTES<br>Point of Contact: Tamera -Rush 410-436-6849                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |                                    |                            |                                                                                 |                                                           |  |
| 14. ABSTRACT<br>This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following use of the 40 mm Practice Cartridges. This document present the evaluation of the potential for adverse human health effects to the offsite residents breathing air emissions following the use of military firing ranges during training exercises. Study results showed no potential for health risks to the hypothetical resident from inhalation of air emissions from the 40mm Cartridge. To conduct this study, air emissions from the 40mm Cartridge were collected in a test chamber ( at Aberdeen Test Center, Aberdeen, MD). This information was then used in an air dispersion model to determine ambient air concentrations at a location downwind from the site where the item was activated. Modeled air concentrations were combined with exposure information to estimate the amount of substances the hypothetical resident breathes. This intake was combined with the substance's health information, to determine if there is a potential for health risks from inhalation of these substances. The health risk included both long-term and short term exposures to the modeled substance concentrations. Study results showed no potential for health risks from inhalation of air emissions from the 40mm Practice Cartridges. |             |                                    |                            |                                                                                 |                                                           |  |
| 15. SUBJECT TERMS<br>emissions, aberdeen test center, characterization, health risk, munitions, firing point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |                                    |                            |                                                                                 |                                                           |  |
| 16. SECURITY CLASSIFICATION OF:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                                    | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES                                                             | 19a. NAME OF RESPONSIBLE PERSON                           |  |
| a. REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | b. ABSTRACT | c. THIS PAGE                       |                            |                                                                                 | Tamera Rush                                               |  |
| U                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | U           | U                                  | UU                         |                                                                                 | 19b. TELEPHONE NUMBER (include area code)<br>410-436-6849 |  |



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
**U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE**  
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**ABERDEEN PROVING GROUND, MARYLAND 21010-5403**

MCHB-TS-EHR

**TRAINING MUNITIONS HEALTH RISK ASSESSMENT NO. 39-EJ-1485-00**  
**RESIDENTIAL EXPOSURE FROM INHALATION OF AIR EMISSIONS**  
**FROM THE M918 40-MM PRACTICE CARTRIDGE OR THE**  
**M781 40-MM PRACTICE CARTRIDGE**

**EXECUTIVE SUMMARY**

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This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following use of the M918 40-mm Practice Cartridge (M918) or the M781 40-mm Practice Cartridge (M781) during training exercises. The M918 and M781 were evaluated separately and the results of both analyses are presented in this report.

To conduct this assessment, air emissions from the M918 and the M781 were collected in a test chamber at the U.S. Army Aberdeen Test Center, Maryland. The data collected from the Firing Point Emission Study provided the amount and types of substances released from the M918 and the M781. This information was then used in an air dispersion model to determine ambient air concentrations at a location 100 meters (328 feet) downwind from a site where the M918 or the M781 may be used. Since the training facility in this assessment is hypothetical, the air model used assumptions that provided conservative estimates of air concentrations.

Modeled air concentrations were combined with exposure information (e.g., number of cartridges used per year) to estimate the amount of each substance the hypothetical offsite resident breathes. This estimate was then compared with the substance's health information, which was obtained from agencies such as the U.S. Environmental Protection Agency, to determine if there is a potential for health risks from inhalation.

The health risk assessment included both long-term (30 years) and short-term (15-minute or 1-hour) exposures to modeled substance concentrations. Assessment results, generated using conservative methods, showed that the hypothetical offsite resident breathing air as close as 100 meters from either the M918 or the M781 firing locations, is safe from these emissions. It should be noted that at most training installations, training areas are over 1,000 meters (over half a mile) away from populated areas.

*Readiness thru Health*

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## LIST OF ACRONYMS

|                  |                                                               |
|------------------|---------------------------------------------------------------|
| AEC              | U.S. Army Environmental Center                                |
| AEGL             | Acute Exposure Guideline Levels                               |
| AIHA             | American Industrial Hygiene Association                       |
| ATC              | U.S. Army Aberdeen Test Center                                |
| ATV              | Acute Toxicity Value                                          |
| DODIC            | Department of Defense Identification Code                     |
| DOE              | U.S. Department of Energy                                     |
| EPA              | U.S. Environmental Protection Agency                          |
| ERPG             | Emergency Response Planning Guidelines                        |
| HBSL             | Health-Based Screening Level                                  |
| HCl              | Hydrogen Chloride                                             |
| INPUFF           | Integrated PUFF Model                                         |
| NAAQS            | National Ambient Air Quality Standards                        |
| NEW              | Net Explosive Weight                                          |
| OEL              | Occupational Exposure Limit                                   |
| PM <sub>10</sub> | Particulate Matter under 10 microns in size                   |
| PRG              | Preliminary Remediation Goals                                 |
| RBC              | Risk-Based Concentration                                      |
| RfC              | Reference Concentration                                       |
| TEEL             | Temporary Emergency Exposure Limits                           |
| TPH              | Total Petroleum Hydrocarbons                                  |
| TSP              | Total Suspended Particulates                                  |
| USACHPPM         | U.S. Army Center for Health Promotion and Preventive Medicine |

TRAINING MUNITIONS HEALTH RISK ASSESSMENT NO. 39-EJ-1485-00  
RESIDENTIAL EXPOSURE FROM INHALATION OF AIR EMISSIONS FROM THE  
M918 40-MM PRACTICE CARTRIDGE OR THE M781 40-MM PRACTICE  
CARTRIDGE

## 1. PURPOSE

This document presents the assessment of the potential for human health effects to offsite residents breathing air emissions following use of the M918 40-mm Practice Cartridge (M918) or the M781 40-mm Practice Cartridge (M781) during training exercises. The M918 and M781 were evaluated separately and the results of both analyses are presented in this report.

## 2. AUTHORITY

Memorandum, U.S. Army Environmental Center, 4 June 1999, Subject: Pyrotechnics Risk Assessment.

## 3. REFERENCES

See Appendix A for a list of references.

## 4. BACKGROUND

### 4.1 CARTRIDGES AND THEIR USE

Cartridges are cases that contain a primer, propelling charge, and projectile. The primer is needed to activate the propelling charge, which provides the force to send the projectile to a target. Examples of projectiles include bullets, rockets, and missiles. Cartridges are also referred to as "rounds" and are fired from weapons such as pistols or rifles.

### 4.2 WHAT ARE THE M918 AND THE M781?

The M918 is a practice cartridge used only in training. It mimics the appearance and behavior of the M430 cartridge used in combat (Reference 1). The M918 can be identified by its blue and brown color with black markings.

The M781 is a practice cartridge that is fired from a 40-mm Grenade Launcher, M203. It can be identified by its blue casing with white marking (Reference 1). Both the M918 and M781 are about the length of a soda can.

### 4.3 USE OF THE M918 AND THE M781

The M918 is most commonly used with the 40-mm Grenade Machine Gun (Mark 19). Multiple cartridges are linked together and fired consecutively at targets at varying

distances. The M918 can reach a target up to 2,200 meters (1.4 miles) away (Reference 2).

The M781 is used during practice to train soldiers to use the M203. The M203 is like a sliding barrel that is attached to the M16 series rifle. When launched, the M781 can reach a maximum distance of up to 400 meters (0.25 miles) away. Upon impact, the M781 releases a bright yellow-orange smoke that can be used to determine the distance from the target (Reference 3).

#### 4.4 ASSESSMENT SUMMARY

The M918 and the M781 were evaluated separately using the same approach. This approach consisted of two main parts: air dispersion modeling and exposure assessment, which are briefly discussed in the paragraphs below. Sections 5 through 7 present a discussion of the methodology used for this assessment.

Emissions data used in the air dispersion modeling were obtained from the Firing Point Emission Study, conducted by the U.S. Army Aberdeen Test Center (ATC), at Aberdeen Proving Ground, Maryland (Reference 4). This study was funded by the U.S. Army Environmental Center (AEC) with the purpose of identifying and quantifying emissions from weapons firing. Data from this study were generated by firing munitions in a test chamber using weapons that are representative of those used by the U.S. Army during training operations. Emissions data for the M918 and M781 were generated by firing them from the Mark 19 machine gun and the M203 40-mm Grenade Launcher, respectively.

The emissions data for the M918 and M781 were used with an atmospheric dispersion model to estimate the average concentrations that might be experienced by an offsite resident. Since this assessment is designed to provide results that would be applicable to most Army training facilities, the training area used in this assessment was a hypothetical one. While most training areas are at least 1,000 meters away from populated areas, as a conservative distance, it was assumed that a person could reside 100 meters downwind from the firing point (location where the weapon is positioned). In addition, air-modeling parameters were selected to mimic worst-case conditions.

The exposure assessment included calculations of time-averaged concentrations for both long-term (chronic) and short-term (acute) exposures. For the purpose of this assessment, air concentrations were averaged over 30 years for chronic exposures and 1-hour or 15 minutes for acute exposures. Using a screening approach, a substance's estimated time-averaged concentration was then compared to chronic health-based screening levels (HBSLs) established by the U.S. Environmental Protection Agency (EPA) or acute toxicity values (ATVs) established by selected agencies depending on the exposure duration (i.e., 30 years versus 1-hour or 15 minutes). The comparison was made using the ratio of the HBSL or ATV to the estimated air concentration for each of the substances evaluated. If this ratio was less than one, no further evaluation was needed. This approach is conservative because the exposure assumptions used by the agencies, to establish HBSLs and ATVs, are likely to overestimate the exposures experienced by offsite residents living near firing ranges. If the chronic or acute

averaged concentrations ( $C_{\text{chronic}}$  and  $C_{\text{acute}}$ ) were greater than these screening levels, further analysis would be warranted to determine the potential for health effects. Note that concentrations greater than the screening levels do not indicate an onset of health effects, but rather the potential for such.

## 5. DATA COLLECTION AND AIR MODELING

### 5.1 EMISSION FACTORS

Emission factors, used to derive the air modeling emission rates used in this assessment, were generated from the Firing Point Emission Study conducted by the ATC (Reference 4). The data included the net explosive weight (NEW) of the item, the substances sampled, and substance-specific emission factors. Emissions data from the Firing Point Emission Study are included in the first four columns of the table located in Appendix B.

### 5.2 BACKGROUND AND DESCRIPTION

Air dispersion models are available to mathematically simulate plume behavior and to estimate downwind concentrations of substances emitted from various sources. However, specific models are not available to determine the dispersion of emissions from munitions used during training. Estimating the magnitude and location of these concentrations depends on many factors including the amount and type of emissions, the behavior of the source, and meteorological conditions. Since a specific model is not available for modeling the use of munitions during training, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) evaluated numerous air models to determine which would be suitable for use with munitions used during training. The USACHPPM recommended using the Integrated PUFF (INPUFF) model to estimate the dispersion of emissions from various munitions sources (Reference 5).

The INPUFF model (Reference 6) was developed to simulate dispersion from instantaneous or semi-continuous point sources. This Gaussian-integrated puff model is capable of addressing a cloud type release over short periods of time, and computations can be performed for a single point source for multiple receptors. The algorithms used to calculate concentrations assume a vertically uniform wind direction (with no chemical reaction) to compute the contribution of each cloud at a receptor for each time step/interval.

### 5.3 MODEL ASSUMPTIONS

Some assumptions were made to best represent the firing of the M918 and M781 cartridges. These assumptions were as follows:

- Typically, with conventional point sources, the cloud rise and formation are determined by characterizing flue gas exit velocity, temperature, and stack diameter. However, the 40-mm cartridges are used in conjunction with the Mark 19 and the M203 guns. For unconventional sources with no real physical stack dimensions, such as the Mark 19 and the M203, the stack

height and diameter were determined to be equal to the height of the barrel and the bore diameter. No exit velocity was used with these sources because the emission rates generated from the test data were obtained from sampling a stabilized cloud with no exit velocity. Table 1 includes the source parameters used to model the M918 and the M781 cartridges.

**TABLE 1: SOURCE PARAMETERS**

| Parameter                                                | 40 -mm Practice Cartridges         |                 |
|----------------------------------------------------------|------------------------------------|-----------------|
|                                                          | M918                               | M781            |
| Source/Stack Diameter                                    | 0.040 meters                       | 0.040 meters    |
| Source/Stack Height                                      | 1 meter                            | 1 meter         |
| Source Exit Temperature                                  | 293 degrees Kelvin (°K) (or 68 °F) |                 |
| Exit Velocity                                            | 0 meters/second                    | 0 meters/second |
| Initial horizontal dispersion coefficient ( $\sigma_y$ ) | 2.29 meters                        | 0.96 meters     |
| Initial vertical dispersion coefficient ( $\sigma_z$ )   | 1.07 meters                        | 1.07 meters     |

- Initial cloud dimensions are preferred to model the air emissions from these types of releases. This information was not measured during the Firing Point Emission Study; therefore, the cloud dimensions were based on the test chamber dimensions and the volume of air sampled. The cloud dimensions were used to define the initial horizontal and vertical dispersion values ( $\sigma_y$  and  $\sigma_z$ ) of the released cloud. The cloud exit temperature was assumed to be equal to the test chamber temperature. The cloud dimensions were calculated using the following equation:

$$h = \frac{V}{\pi r^2} \quad \text{Equation 1}$$

Where:

$h$  = length of the test chamber (ft)  
 $V$  = Volume of air sampled (ft<sup>3</sup>)  
 $r$  = inner radius of the test chamber (ft)

Note: The length of the test chamber was adjusted with removable interior partitions to accommodate the physical size of weapon tested and the quantity of emissions to be generated.

Example 1 provides a sample calculation for the clouds produced by the M781 used with the M203 gun.

**Example 1**  
**Sample Calculation Using Equation 1:**

$$h = \frac{240}{\pi(3.5)^2} = 6.24 \text{ ft}$$

Note: Assuming an elliptical cloud with the prevailing wind direction being perpendicular to the launcher muzzle when fired,  $r$  is equal to the initial vertical dispersion,  $\sigma_z$  and the initial horizontal dispersion,  $\sigma_y$  is equal to one half the length of the test chamber.

- For the purposes of this assessment, a hypothetical offsite resident was assumed to be located 100 meters directly downwind from the source. The meander of the cloud is a major factor when estimating concentrations at given locations downwind from the source. Assuming that the offsite resident is directly downwind from the source is the same as assuming that there is no cloud meander and the center of the cloud migrates directly over the hypothetical offsite resident. This assumption provides the most conservative modeled concentrations.
- Since this assessment does not look at a specific training site, generic, worst-case meteorological data were used. To determine the worst-case meteorological conditions that would result in the highest air emission concentrations, the modeling was performed using the EPA Risk Management Program Guidance (Reference 7). This guidance includes tables for estimating the footprint of chemical releases and is intended to inform emergency responders of potential accidental releases. The EPA has defined most default conditions for meteorological modeling parameters. Table 2 lists the meteorological parameters that were used in the air models for the M918 and the M781.

**TABLE 2: WORST-CASE METEOROLOGICAL PARAMETERS**

| Parameter             | Input Value                        |
|-----------------------|------------------------------------|
| Wind Speed            | 1 meter/second                     |
| Atmospheric Stability | Category F                         |
| Wind Direction        | 270°                               |
| Ambient Temperature   | 293 degrees Kelvin (°K) (or 68 °F) |

#### 5.4 GENERAL METHODOLOGY

The model was run for a total calculation time of 200 seconds (3.33 minutes) to simulate a single cartridge being fired and to ensure that the total mass of the cloud had passed the worst-case receptor location. Concentrations were calculated every 2

seconds. The model results indicated that the initial cloud reached the hypothetical offsite resident within 76 seconds and dissipated below the lowest concentration the model calculated, which in this instance ( $1 \times 10^{-11} \text{ g/m}^3$ ) occurred within 148 seconds. Table 3 contains the air model input parameters used in this assessment.

**TABLE 3: AIR MODEL INPUT PARAMETERS**

| Parameter                                                             | Input Value |
|-----------------------------------------------------------------------|-------------|
| Number of meteorological periods (NTIME)                              | 1           |
| Duration of each meteorological period (ITIME)                        | 200 seconds |
| Number of updates to the source (NSRCDS)                              | 100         |
| Duration/time step between each source update (ISUPDT)                | 2 seconds   |
| Total time modeled/Simulation Period (NTIME)(ITIME)= (NSRCDS)(ISUPDT) | 200 seconds |

## 5.5 USE OF MODEL OUTPUT

The concentrations provided by the INPUFF model were based on a unit emission rate of 1 gram/second from an emission source and did not represent any substance-specific concentrations from the use of any weapons system. This unit emission rate is typically used for ease of modeling purposes. The relationship between the emission rate and predicted concentration is linear. Therefore, the ratio of the predicted concentration to the unit emission rate was multiplied by each substance-specific emission rate to provide substance-specific concentrations.

## 5.6 DETERMINATION OF SUBSTANCE-SPECIFIC EMISSION RATES

The actual substance emission rate for one item ( $ER_1$ ) for each substance was calculated using Equation 2. Example 2 contains a sample calculation using this equation.

$$ER_1 = \frac{EF \cdot CV}{t} \quad \text{Equation 2}$$

Where:

- $ER_1$  = emission rate for one item (g/sec)
- $EF$  = average adjusted emission factor (lb/item)
- $CV$  = conversion factor (453.59 g/lb)
- $t$  = release duration obtained from the INPUFF model (sec)

**Example 2**

**Sample Calculation Using Equation 2:**

$$ER_1 = \frac{(2.522 \text{ E} - 04) (453.59)}{(2)} \times 1 \text{ item}$$

$$= 5.721 \text{ E} - 02 \text{ g/sec}$$

Calculation provided for Carbon Dioxide (CO<sub>2</sub>) for the M781. Averaged adjusted emission factor of CO<sub>2</sub> in lb/cartridge was obtained from Appendix B.

Substance-specific ambient concentrations for one item (CONC) were calculated using the following equation. A sample calculation using this equation is provided in Example 3.

$$CONC = ER_1 \cdot \frac{UC}{ER_{unit}} \quad \text{Equation 3}$$

Where:

CONC = substance concentration based on one item (g/m<sup>3</sup>)

ER<sub>1</sub> = emission rate for one item (g/sec)

ER<sub>unit</sub> = unit emission rate as used in the model (g/sec)

UC = concentration based on the unit emission rate (g/m<sup>3</sup>)

**Example 3**

**Sample Calculation Using Equation 3:**

$$CONC = (5.721 \text{ E} - 02) \frac{(2.030 \text{ E} - 04)}{(1)}$$

$$= 1.161 \text{ E} - 05 \text{ g/m}^3$$

Calculation provided for CO<sub>2</sub> for the M781.

## 6. RISK ASSESSMENT

### 6.1 EXPOSURE ASSUMPTIONS

Exposure assumptions were selected using a typical use scenario for the M918 and the M781 during training exercises. The use of both types of 40-mm practice cartridges (M918 and M781) was evaluated separately in this assessment. The typical use scenario was provided by the AEC and is based on consultation with their senior training advisor (References 8, 9). The frequency of use for the M918 and M781 was required to determine how much substance an offsite resident would be exposed to in the time period of interest (i.e., acute or chronic exposure). Table 4 summarizes the general use scenario for the M918 and M781.

**TABLE 4: FREQUENCY OF USE FOR THE M918 AND THE M781**

| Parameter                                    | 40-mm Practice Cartridges |        |
|----------------------------------------------|---------------------------|--------|
|                                              | M918                      | M781   |
| Number of cartridges used per year           | 15,432                    | 15,488 |
| Maximum number of cartridges used in 1- hour | 160                       | 144    |

### 6.2 TIME-AVERAGING

For the chronic assessment, time-averaged concentrations were calculated using the EPA's default residential exposure duration of 30 years. This is consistent with the exposure duration used by the EPA, which assumes that the resident spends 30 years at the same residence. By using the same exposure duration, the estimated time-averaged concentrations were compared with the selected HBSLs, which were derived using standard EPA default assumptions.

Using the default residence time established by the EPA, the assumption was made that someone could be exposed to air emissions from 15,432 or 15,488 cartridges per year for 30 years for the M918 and the M781, respectively. Table 5 lists the exposure parameters used to estimate concentrations for the chronic assessment. These parameters are based on the typical use scenario provided by AEC (Table 4) and the assumptions used in the air model run.

**TABLE 5: EXPOSURE PARAMETERS USED TO DETERMINE TIME-AVERAGED CHRONIC AIR CONCENTRATIONS**

| Exposure Parameter                                                                                  | Value Used                       |                                  |
|-----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------|
|                                                                                                     | M918                             | M781                             |
| Exposure Time (ET <sub>ctg</sub> )                                                                  | 3.333 min/cartridge <sup>1</sup> | 3.333 min/cartridge <sup>1</sup> |
| Exposure Frequency (EF <sub>ctg</sub> )                                                             | 15,432 cartridges/year           | 15,488 cartridges/year           |
| Exposure Duration (ED)                                                                              | 30 years <sup>2</sup>            | 30 years <sup>2</sup>            |
| <sup>1</sup> Based on the total model time of 200 seconds (3.33 minutes) used in the air model run. |                                  |                                  |
| <sup>2</sup> EPA default value.                                                                     |                                  |                                  |

Chronic averaged concentrations were calculated using Equation 4. Example 4 shows how this calculation was performed, using the total suspended particulates (TSP) concentration from the M781 as an example. The TSP is classified as a noncarcinogen, as indicated in Appendix C, the averaging time (AT) is the same as the exposure duration.

$$C_{chronic} = \frac{CONC \cdot 10^6 \cdot ET_{ctg} \cdot EF_{ctg} \cdot ED}{525,600 \cdot AT} \quad \text{Equation 4}$$

Where:

$C_{chronic}$  = average chronic concentration ( $\mu\text{g}/\text{m}^3$ )  
 $CONC$  = average modeled concentration for one cartridge ( $\text{g}/\text{m}^3$ )  
 $10^6$  = unit conversion ( $\mu\text{g}/\text{g}$ )  
 $ET_{ctg}$  = exposure time per cartridge (minutes/cartridge)  
 $EF_{ctg}$  = exposure frequency (cartridges/year)  
 $ED$  = exposure duration (years)  
 $525,600$  = unit conversion (minutes/year)  
 $AT$  = averaging time (years)  
           (carcinogenic endpoint:  $AT = 70$  years  
           noncarcinogenic endpoint:  $AT = ED$ )

**Example 4**  
**Sample Calculation Using Equation 4:**

$$C_{\text{chronic}(TSP)} = \frac{(1.565E-06)(10^6)(3.333)(15,488)(30)}{(525,600)(30)}$$

$$= 1.54E-01 \mu\text{g}/\text{m}^3$$

The average modeled concentration for one cartridge (CONC) was obtained from Appendix B. The exposure parameters were obtained from Table 5.

Unlike the chronic assessment, only limited guidance for evaluating acute exposures is currently available. Since many cartridges may be fired in a short period of time, acute exposures cannot be overlooked. For the purpose of this assessment, acute exposure is defined as a 1-hour or 15-minute exposure. The 1-hour or 15-minute acute exposure averaging times allow for comparison with guidelines developed specifically for emergency planning purposes (refer to the discussion on acute toxicity below).

The exposure frequency is based on the number of cartridges used per 1-hour or 15 minutes depending on the guideline used for comparison. This information is based on the use scenario provided in Table 4. To estimate air concentrations for potential acute health effects, it was conservatively assumed that 160 M918s or 144 M781s are fired in 1-hour. The average acute concentrations were computed using Equation 5. Example 5 contains a sample calculation of this equation using the M918. Since TSP does not have an ATV, hydrogen chloride (HCl) is used as the example substance.

$$C_{\text{acute}} = \frac{CONC \cdot 10^6 \cdot ET_{\text{ctg}} \cdot EF_{\text{ctg}}}{60}$$

Equation 5

Where:

- $C_{\text{acute}}$  = average acute concentration ( $\mu\text{g}/\text{m}^3$ )
- CONC = average modeled concentration for one cartridge ( $\text{g}/\text{m}^3$ )
- $10^6$  = unit conversion ( $\mu\text{g}/\text{g}$ )
- $ET_{\text{ctg}}$  = exposure time per cartridge (minutes/cartridge)
- $EF_{\text{ctg}}$  = exposure frequency (cartridges/hour)\*
- 60 = unit conversion (minutes/hour)

\* Based on 1- hour or 15 minute (0.25 hour) acute toxicity value

**Example 6**

**Sample Calculation Using Equation 6:**

$$C_{acute(HCl)} = \frac{(2.411E-08)(10^6)(3.333)(160)}{60}$$
$$= 2.14E-01 \mu\text{g}/\text{m}^3$$

The average modeled concentration for one cartridge (CONC) for HCl for the M918 was obtained from Appendix B. See Appendix C to determine the acute toxicity value used.

### 6.3 TOXICITY ASSESSMENT

The potential for health effects was determined by comparing time-averaged air concentrations to HBSLs and ATVs, which are developed from a substance's known toxicity. These toxicity values typically include different levels of safety factors depending on the level of confidence of the critical study. Appendix C contains a table of screening toxicity values used for the chronic and acute assessments.

#### 6.3.1 CHRONIC ASSESSMENT

The chronic assessment was conducted using a screening approach. Using this method, a substance's estimated time-averaged air concentration was compared to its HBSL by using the ratio of the HBSL to the estimated concentration. If this ratio was less than one, no further analysis was needed. This approach is conservative because the exposure assumptions used by the EPA, to establish HBSLs, assume that the resident is exposed for 350 days per year (assuming 2 weeks vacation per year). In contrast, exposure to air emissions from actual training activities at a firing range is intermittent and is not likely to occur on a daily basis year round.

A hierarchy of sources was developed for selection of the HBSLs to quantitatively evaluate as many of the identified substances as possible. The hierarchy of sources used was as follows:

- Clean Air Act, EPA National Ambient Air Quality Standards (NAAQS) (Reference 13)
- EPA Region 9 Preliminary Remediation Goals (PRGs) (Reference 11)
- EPA Region 3 Risk-Based Concentrations (RBCs) (Reference 10)

Some substances have neither PRGs nor RBCs because they have their own set of regulatory standards. Under the Clean Air Act, the EPA is required to establish NAAQS for several substances considered harmful to public health and the environment. Currently, NAAQS are available for seven substances. The NAAQS for the longer averaging time were used for the chronic assessment. Depending on the substance, this can range from an 8-hour average to an annual average. In addition,

since the majority of the measured TSP was PM<sub>10</sub> (particulate matter under 10 microns in size) (Reference 4), the NAAQS for PM<sub>10</sub> was used to evaluate the potential for health effects from exposure to TSP.

Next on the hierarchy, after the NAAQS, are the EPA Region 9 PRGs and the EPA Region 3 RBCs. Since the methodology used by EPA Region 9 to develop the PRGs generally results in lower values than the EPA Region 3 RBCs, the PRGs were first on the hierarchy of sources. RBCs were used when a PRG was not available. The only exception was for chromium (VI) [Cr (VI)] where Region 9 used a carcinogenic toxicity value that was seven times greater than EPA's recommended value (Reference 12) to develop its screening level for inhalation exposure. Since the EPA does not advocate the application of this multiplication factor, the RBC for Cr (VI) was used instead of the PRG. To ensure that the most recent information was used, the Internet sites of both EPA Regions were checked. The HBSLs used for this assessment are presented in Appendix C.

Although the general approach used by both EPA Region 3 and Region 9 is the same, the exposure assumptions differ enough so that final recommended values can vary to a certain degree. In both methods, a substance's screening concentration was selected using the toxicity endpoint that derives a lower concentration. For example, if a substance has a known systemic toxicity and is a carcinogen, the screening concentration was calculated using both toxicity values. To maintain a conservative approach, EPA then selected the lower screening concentration as the recommended PRG or RBC.

Example 6 shows a sample calculation of how a substance's estimated chronic concentration was compared to its HBSL using the TSP concentration for the M781.

**Example 6**  
**Sample Calculation Comparing a Substance's Estimated Chronic Concentration to Its HBSL:**

$$\frac{C_{\text{chronic(TSP)}}}{\text{HBSL}} = \frac{1.54\text{E} - 01}{5.00\text{E} + 01}$$
$$= 3.08\text{E} - 03 < 1$$

In this case, the resulting ratio is less than one, indicating further evaluation is not necessary.

Many petroleum hydrocarbons were detected but do not have specific screening levels. Therefore, the approach recommended by the Total Petroleum Hydrocarbon Criteria Working Group (Reference 14) was adopted to evaluate petroleum hydrocarbon mixtures. Based on the working group's assessment of various hydrocarbons, it was recommended that mixtures be separated according to a

substance's number of carbons and its chemical class (i.e., aliphatic or aromatic<sup>1</sup>). Generally, as a substance's carbon number increases, its molecular weight increases, and it is, therefore, not a substance of concern via inhalation. The working group also concluded that aromatic hydrocarbons tend to be more toxic than aliphatic hydrocarbons (Reference 14). Table 6 presents the inhalation toxicity values used to evaluate exposure to petroleum mixtures. To be consistent with the methodology used in this assessment, the reference concentrations (RfCs) were converted to PRGs using Region 9 exposure assumptions. The resulting PRGs were used as the HBSLs for the petroleum hydrocarbons in this assessment. These values are presented in Appendix D.

**TABLE 6: SUMMARY OF RfCs USED FOR PETROLEUM HYDROCARBONS<sup>1</sup>**

| Carbon Range                                                                                                           | Aromatic Inhalation RfC (mg/m <sup>3</sup> ) | Aliphatic Inhalation RfC (mg/m <sup>3</sup> ) |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------|
| C <sub>5</sub> – C <sub>6</sub><br>C <sub>&gt;6</sub> – C <sub>8</sub>                                                 |                                              | 18.4                                          |
| C <sub>&gt;7</sub> – C <sub>8</sub>                                                                                    | 0.4                                          |                                               |
| C <sub>&gt;8</sub> – C <sub>10</sub><br>C <sub>&gt;10</sub> – C <sub>12</sub><br>C <sub>&gt;12</sub> – C <sub>16</sub> | 0.2                                          | 1.0                                           |
| C <sub>&gt;16</sub> – C <sub>21</sub><br>C <sub>&gt;21</sub> – C <sub>35</sub>                                         | NA                                           | NA                                            |

<sup>1</sup>Reference 15  
NA = not applicable for high molecular weight TPHs (C<sub>>16</sub>) because substances in this carbon range are not volatile and therefore, inhalation is not a pathway of concern.

### 6.3.2 ACUTE ASSESSMENT

An established method for assessing acute health effects is not currently available. In 1995 the EPA recognized the need for acute exposure guidelines for emergency response purposes and created the National Advisory Committee for Acute Exposure Guideline Levels (AEGs) for Hazardous Substances. Currently, AEGs are available for only a few substances.

To overcome the absence of acute toxicity data for the purposes of human health risk assessment, several state regulatory agencies have suggested that guidelines developed for emergency purposes be used in the interim. Although suggestions have been made to use occupational exposure limits (OELs) by applying additional safety factors (References 16, 17), OELs were not used in this assessment because they introduce even more uncertainty than the use of emergency guidelines. The OELs are designed to protect the workplace environment and assume 8 hours a

<sup>1</sup> Aliphatic hydrocarbons are hydrocarbons in which the carbon atoms are joined by single covalent bonds consisting of two shared electrons (e.g., butane). Aromatic hydrocarbons have ring structures (e.g., benzene) (Reference 15).

day, 5 days a week exposures. By definition, these exposures are more chronic than acute.

In comparison, emergency planning guidelines are more appropriate because they are typically developed for exposures of 1-hour or less. In addition, safety factors are included as part of the guideline development so that the values would be protective of the general population.

Emergency Response Planning Guidelines (ERPGs) published by the American Industrial Hygiene Association (AIHA) (Reference 18) and the Temporary Emergency Exposure Limits (TEELs) developed by the U.S. Department of Energy (DOE) (Reference 19) were used for this assessment, specifically the ERPG-1s and the TEEL-1s. Since TEEL-1s are intended for exposures up to 15-minutes, air concentrations compared to TEELs were averaged over a 15-minute period. Air concentrations compared to ERPGs and AEGLs were averaged over 1-hour, as these values are intended for 1-hour exposures.

For this study, the hierarchy of sources for ATV selection was as follows with each ATV defined below:

- EPA AEGL-1. "AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure."
- AIHA ERPG-1. "The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1- hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor."
- DOE TEEL-1. "The maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor."

AEGLs were used first when available since they are developed specifically for the purpose of acute exposure assessments. The ERPGs were selected next, prior to a substance's TEEL, because they are vigorously reviewed before they are published whereas the TEELs are not.

Example 7 shows a sample calculation of how a substance's estimated acute concentration was compared to its ATV.

**Example 7**

**Sample Calculation of Comparing a Substance's Estimated Acute Concentration to Its Acute Toxicity Value:**

$$\frac{C_{acute(HCl)}}{ATV} = \frac{2.14E-01}{4.50E+03}$$
$$= 4.76E-05 < 1$$

In this example with HCl from the M918, the ratio is less than one, indicating that further analysis is not necessary.

## 7. RISK CHARACTERIZATION

As previously described, the exposure assessment included calculations of time-averaged concentrations for both long-term (chronic) and short-term (acute) exposures. Using a screening approach, a substance's estimated time-averaged air concentration was then compared to chronic HBSLs or ATVs. The comparison was made using the ratio of the HBSL or ATV to the estimated concentration. This approach is conservative because the exposure assumptions used by the EPA, to establish HBSLs and ATVs, are likely to overestimate the exposures experienced by offsite residents living near training areas.

If this ratio was less than one, no further evaluation was needed. If the chronic or acute averaged concentrations ( $C_{chronic}$  and  $C_{acute}$ ) were greater than the screening levels, resulting in a ratio greater than one, further evaluation would be warranted to determine the potential for health effects. Note that concentrations greater than the screening levels do not indicate an onset of health effects, but rather, the potential for such.

The chronic and acute assessments were conducted as outlined in Section 6.3. Appendix D presents results from the M918 and M781 risk characterization.

### 7.1 CHRONIC HEALTH RISK

The outcome of the chronic assessment indicated that no chronic health effects are expected from breathing the air emissions from the M918 or the M781. Since the ratios for all substances were below one, further evaluation was not needed.

### 7.2 ACUTE HEALTH RISK

For the acute assessment, all ratios were below one, indicating that no acute health effects are expected from breathing the air emissions from the M918 or the M781. The ratios for all substances were less than one, indicating further analysis was not necessary.

### 7.3 FACT SHEETS

Appendix E includes a copy of the fact sheets submitted to the AEC. The fact sheets used results from this assessment to address health concerns related to inhalation of M918 and the M781 air emissions.

### 8. UNCERTAINTY DISCUSSION

The limitations inherent in modeling and the added conservatism of the assessment contribute to the uncertainty of the assessment results. The risk assessment methodology typically includes safety factors that are embedded in the toxicity data to ensure adequate protection of the general population, particularly, susceptible individuals such as the sick, elderly, and children. Table 7 identifies areas of uncertainty associated with this assessment.

**TABLE 7: TYPES OF UNCERTAINTY**

| <b>Issue</b>                                                       | <b>Uncertainty</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Direction of Effect</b> |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>Modeling</b>                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |
| Modeled versus real-time sampling                                  | The air concentrations in this assessment were modeled. Actual air concentrations taken from the field may be higher or lower.                                                                                                                                                                                                                                                                                                                           | Varies                     |
| Frequency of use for the M918 and the M781                         | Actual frequency of use for these munitions during training exercises may be different from those stated in this report.                                                                                                                                                                                                                                                                                                                                 | Varies                     |
| Hypothetical resident assumed to be located directly downwind      | Unless the area around the training facility is populated, the chances that a person living directly downwind is low.                                                                                                                                                                                                                                                                                                                                    | Overestimates              |
| Use of worst-case meteorological conditions                        | To ensure that this assessment is applicable to most training areas, worst-case meteorological conditions were used in the air model.                                                                                                                                                                                                                                                                                                                    | Overestimates              |
| <b>Exposure Assessment</b>                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |
| Estimating time-averaged concentrations                            | Actual exposure from the M918 or the M781 is intermittent. If one were to plot a person's exposure profile, the plot would consist of a series of spikes. Since current risk assessment methodology does not allow the evaluation of the potential for health risks as a function of time, a single concentration, averaged over the exposure duration was used. In this assessment, the exposure durations used were 30 years and 1-hour or 15 minutes. | Varies                     |
| Chromium speciation                                                | All chromium was assumed to be present as Cr(VI), which is more toxic than Cr(III).                                                                                                                                                                                                                                                                                                                                                                      | Overestimates              |
| Comparing estimated concentration to established screening levels  | The Region 3 and Region 9 HBSLs were developed using different exposure assumptions than those in this assessment, resulting in more conservative screening levels.                                                                                                                                                                                                                                                                                      | Overestimates              |
| Comparing estimated concentrations to established screening levels | Comparison to screening levels does not account for possible cumulative effects of exposure to more than one substance.                                                                                                                                                                                                                                                                                                                                  | Underestimates             |

**TABLE 7: TYPES OF UNCERTAINTY**

| Issue                                                           | Uncertainty                                                                                                                                                                                                                                                                                      | Direction of Effect |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Screening assessment versus calculating an average daily intake | Calculating an average daily intake allows the use of scenario-specific assumptions. However, unless the ratio of concentration to screening level approaches one, a screening assessment is useful as a first-cut evaluation.                                                                   | Varies              |
| Exposure to other munitions                                     | Other munitions are typically used during the same training exercise. These items may contain similar or different substances from those detected in the M918 or the M781.                                                                                                                       | Underestimates      |
| <b>Toxicity Assessment</b>                                      |                                                                                                                                                                                                                                                                                                  |                     |
| Lack of toxicity data                                           | Some substances were not quantitatively evaluated because they have no known toxicity data.                                                                                                                                                                                                      | Underestimates      |
| Modifying and uncertainty factors for toxicity data             | Modifying factors and uncertainty factors of varying degree are typically applied to toxicological values. These factors are used to conservatively account for extrapolating from animal studies for human health assessment, and to conservatively account for variation in human populations. | Overestimates       |

## 9. CONCLUSION

Using conservative assumptions, the assessment indicated that offsite residents who live as close as 100 meters directly downwind from training areas are safe from breathing air emissions from the M918 or the M781. It is believed that the assumptions contained in this analysis are conservative enough to be protective of all the population including the sick, elderly, and children.

## 10. RECOMMENDATIONS

The results from this assessment are intended for a hypothetical training facility, and actual results may vary depending on site-specific conditions. This study used conservative assumptions (e.g., worst-case meteorological conditions, receptor located directly downwind, etc.) and it is believed that most site-specific analyses would result in even lower concentrations. Therefore, the results from this assessment should be applicable to most training facilities, unless site-specific conditions vary significantly.

## 11. POINT OF CONTACT

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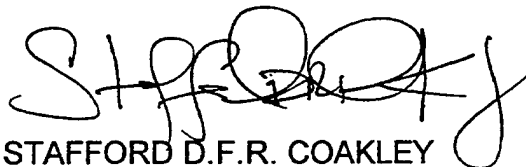
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APPENDIX A  
REFERENCES

1. U.S. Army (1994). *Technical Manual, Army Ammunition Data Sheets: Artillery Ammunition Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes. (Federal Supply Class 1310, 1315, 1320, 1390). TM-43-0001-28.*
2. U.S. Army (1988). *Field Manual, MK 19, 40-MM Grenade Machine Gun, Mod 3, FM 23-27.*
3. U.S. Army (1994). *Field Manual, 40-MM Grenade Launcher, M203, FM 23-31.*
4. U.S. Army (2000). *Draft Report No. 2 for the Firing Point Emission Study Phase II.* Prepared by Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, for U.S. Army Environmental Center, Aberdeen Proving Ground, MD.
5. USACHPPM (Aug 2000). *Ambient Air Quality Consultation NO. 43-EL-1485-00 Air Dispersion Modeling Evaluation For Military Munitions, Aberdeen Proving Ground, MD.*
6. Bowman Environmental, Inc. (1999). *INPUFF2, Multiple Source Integrated Puff Model, Version 4.1.*
7. Title 40, Code of Federal Regulations, Part 68 (40 CFR 68), Chemical Accident Prevention Provisions, 1 July 1998.
8. U.S. Army. Email communication between Ms. Tamera Clark-Rush, AEC, and Ms. Hsieng-Ye Chang, USACHPPM, 19 August 1999.
9. Army Training Evaluation Protocol (ARTEP) 7-20-MTP, *Mission Training Plan for the Infantry Battalion.*
10. EPA (April 2000). *Region 3 Risk Based Concentration (RBC) Tables.* Available online at [www.epa.gov/reghwmd/risk/riskmenu.htm](http://www.epa.gov/reghwmd/risk/riskmenu.htm)
11. EPA (Nov. 1999). *Region 9 Preliminary Remediation Goals (PRG).* Available online at [www.epa.gov/region09/waste/sfund/prg/index.html](http://www.epa.gov/region09/waste/sfund/prg/index.html)
12. EPA (1999). *Integrated Risk Information System.* Available online at <http://www.epa.gov/iris/>
13. EPA. *National Ambient Air Quality Standards.* Available online at <http://www.epa.gov/airprog/airs/criteria.html>

14. Total Petroleum Hydrocarbon Criteria Working Group (1997). *Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH)*, Volume 4. Amherst Scientific Publishers. Amherst, MA.
15. Manahan, Stanley (1994). *Environmental Chemistry*. Sixth edition. CRC Press, Inc. Boca Raton, FL.
16. U.S. Army (1996). *Final Screening Risk Assessment for the Anniston Chemical Agent Disposal Facility at the Anniston Army Depot, Alabama*. Revision No. 5. Prepared by the U.S. Army Center for Health Promotion and Preventive Medicine for the Program Manager for Chemical Demilitarization. Aberdeen Proving Ground, Maryland.
17. U.S. Army (1997). *Final Screening Risk Assessment for the Pine Bluff Chemical Agent Disposal Facility at the Pine Bluff Arsenal, Arkansas*. Revision No. 1. Prepared by the U.S. Army Center for Health Promotion and Preventive Medicine for the Program Manager for Chemical Demilitarization. Aberdeen Proving Ground, Maryland.
18. American Industrial Hygiene Association (AIHA) (1999). *Emergency Response Planning Guidelines*. AIHA Press, Fairfax, VA.
19. Department of Energy (1998). *Temporary Emergency Exposure Limits*, Revision 15. <http://www.scapa.bnl.gov>.

**APPENDIX B**

**AIR DISPERSION MODELING OUTPUT DATA**

Table B-1: Air Modeling Output Data for the Cartridge, 40-mm Target Practice, M918 (MK19 Mod3)

| Compound                   | Cartridge, 40-mm Target Practice, M918 (MK19 Mod3)     |                                                        |                                            |          | No. of rounds (I)                                  |                                                                         | 1 item                                                       |
|----------------------------|--------------------------------------------------------|--------------------------------------------------------|--------------------------------------------|----------|----------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|
|                            | DODIC: B584                                            |                                                        |                                            |          | release duration (I):                              |                                                                         | 2 seconds                                                    |
|                            | Number of items per test firing ==> 20                 |                                                        |                                            |          | Unit Concentration (UC):                           |                                                                         | 1.64E-04 g/m <sup>3</sup>                                    |
|                            |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| Compound                   | Average Adjusted Emission Factor (lb/item)             |                                                        |                                            |          | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m <sup>3</sup> ) CONC | Pollutant Emission Rate for One Item (g/sec) ER <sub>1</sub> |
|                            | Measured Background Concentration (mg/m <sup>3</sup> ) |                                                        | Average Adjusted Emission Factor (lb/item) |          |                                                    |                                                                         |                                                              |
|                            | Measured Actual Concentration (mg/m <sup>3</sup> )     | Measured Background Concentration (mg/m <sup>3</sup> ) | Average Adjusted Emission Factor (lb/item) |          |                                                    |                                                                         |                                                              |
|                            |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| <b>Permanent Gases</b>     |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| Ammonia (NH3)              | 5.25E+00                                               | NA                                                     | 8.52E-06                                   | 3.86E-03 | 3.16E-07                                           | 1.93E-03                                                                |                                                              |
| Carbon Dioxide (CO2)       | 1.63E+03                                               | NA                                                     | 2.64E-03                                   | 1.20E+00 | 9.82E-05                                           | 6.00E-01                                                                |                                                              |
| Carbon Monoxide (CO)       | 1.57E+03                                               | NA                                                     | 2.54E-03                                   | 1.15E+00 | 9.45E-05                                           | 5.77E-01                                                                |                                                              |
| Oxides of Nitrogen (as NO) | 3.86E+01                                               | NA                                                     | 6.26E-05                                   | 2.84E-02 | 2.32E-06                                           | 1.42E-02                                                                |                                                              |
| Sulfur Dioxide (SO2)       | 5.24E-01                                               | NA                                                     | ND                                         | ND       | ND                                                 | ND                                                                      |                                                              |
| <b>Acid Gases</b>          |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| Hydrogen Fluoride          | 1.30E-01                                               | 2.40E-01                                               | ND                                         | ND       | ND                                                 | ND                                                                      |                                                              |
| Hydrogen Chloride          | 3.55E-01                                               | 2.40E-01                                               | 6.49E-07                                   | 2.94E-04 | 2.41E-08                                           | 1.47E-04                                                                |                                                              |
| Hydrogen Bromide           | 2.10E-01                                               | 2.30E-01                                               | ND                                         | ND       | ND                                                 | ND                                                                      |                                                              |
| Nitric Acid                | 7.85E-01                                               | 2.30E-01                                               | 1.44E-06                                   | 6.51E-04 | 5.33E-08                                           | 3.25E-04                                                                |                                                              |
| Phosphoric Acid            | 2.15E-01                                               | 2.30E-01                                               | ND                                         | ND       | ND                                                 | ND                                                                      |                                                              |
| Sulfuric Acid              | 5.00E-02                                               | 2.40E-01                                               | ND                                         | ND       | ND                                                 | ND                                                                      |                                                              |
| <b>Cyanide</b>             |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| Particulate Cyanide        | 1.77E-01                                               | 1.21E-01                                               | 3.24E-07                                   | 1.47E-04 | 1.20E-08                                           | 7.35E-05                                                                |                                                              |
| Hydrogen Cyanide           | 7.24E-01                                               | 1.26E-01                                               | 1.32E-06                                   | 6.00E-04 | 4.91E-08                                           | 3.00E-04                                                                |                                                              |
| <b>Particulates</b>        |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| TSP                        | 7.69E+01                                               | NA                                                     | 1.41E-04                                   | 6.37E-02 | 5.22E-06                                           | 3.19E-02                                                                |                                                              |
| PM10                       | 7.58E+01                                               | 6.60E-02                                               | 1.39E-04                                   | 6.28E-02 | 5.14E-06                                           | 3.14E-02                                                                |                                                              |
| PM2.5                      | 6.28E+01                                               | 1.00E-02                                               | 1.15E-04                                   | 5.21E-02 | 4.26E-06                                           | 2.60E-02                                                                |                                                              |
| <b>Metals</b>              |                                                        |                                                        |                                            |          |                                                    |                                                                         |                                                              |
| Antimony                   | 6.84E-01                                               | 8.85E-04                                               | 1.25E-06                                   | 5.67E-04 | 4.64E-08                                           | 2.84E-04                                                                |                                                              |
| Arsenic                    | 1.51E-03                                               | 8.85E-04                                               | 2.76E-09                                   | 1.25E-06 | 1.02E-10                                           | 6.25E-07                                                                |                                                              |
| Barium                     | 8.60E+00                                               | 3.01E-03                                               | 1.57E-05                                   | 7.13E-03 | 5.83E-07                                           | 3.56E-03                                                                |                                                              |
| Beryllium                  | 3.33E-04                                               | 3.54E-04                                               | ND                                         | ND       | ND                                                 | ND                                                                      |                                                              |

Table B-2: Air Modeling Output Data for Volatile Organic Compounds - 100 meter location

| Compound                              | 155mm propelling charge M3 (zone 3), M199 cannon<br>DODIC: D540                                             |                                                                 |                                                        |                                                    | No. of rounds (I)<br>release duration (t):<br>Unit Concentration (UC): | Average Modeled<br>Concentration for<br>One Round<br>(grams/m <sup>3</sup> )<br><br>CONC | Substance<br>Emission Rate for<br>One Round<br>(g/sec)<br><br>ER <sub>1</sub> |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                                       | Net Explosive Weight (NEW) in lbs. => 3.28<br>Number of items = 1<br>SF6 Leak Rate Dilution Factor => 0.939 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
|                                       | Air Emissions Test Results                                                                                  |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
|                                       | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> )                                                    | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item)<br>EF | Average Adjusted<br>Emission Factor<br>(lb/lb NEW) |                                                                        |                                                                                          |                                                                               |
| VOCs                                  |                                                                                                             |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| Dichlorodifluoromethane               | 3.762E-03                                                                                                   | 3.762E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Methyl Chloride                       | 1.594E-03                                                                                                   | 1.594E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Dichlorotetrafluoroethane             | 4.683E-03                                                                                                   | 4.683E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Vinyl Chloride                        | 5.069E-03                                                                                                   | 5.069E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,3-Butadiene                         | 1.790E-03                                                                                                   | 1.790E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Methyl Bromide                        | 3.073E-03                                                                                                   | 3.073E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Ethyl Chloride                        | 2.112E-03                                                                                                   | 2.112E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Trichlorofluoromethane                | 3.934E-03                                                                                                   | 3.934E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,1-Dichloroethene                    | 9.028E-03                                                                                                   | 6.696E-03                                                       | 2.867E-05                                              | 8.739E-06                                          | 1.300E-02                                                              | 1.045E-06                                                                                | 6.501E-03                                                                     |
| Dichloromethane                       | 1.607E-01                                                                                                   | 5.722E-03                                                       | 1.904E-03                                              | 5.806E-04                                          | 8.638E-01                                                              | 6.945E-05                                                                                | 4.319E-01                                                                     |
| 3-Chloropropene                       | 2.754E-03                                                                                                   | 2.754E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 4.965E-03                                                                                                   | 5.750E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,1-Dichloroethane                    | 3.159E-03                                                                                                   | 3.159E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| cis-1,2-Dichloroethene                | 3.295E-03                                                                                                   | 3.295E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Trichloromethane                      | 4.099E-03                                                                                                   | 4.099E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,2-Dichloroethane                    | 3.443E-03                                                                                                   | 3.443E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,1,1-Trichloroethane                 | 2.007E-02                                                                                                   | 1.095E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Benzene                               | 5.931E-02                                                                                                   | 2.329E-03                                                       | 7.290E-04                                              | 2.223E-04                                          | 3.307E-01                                                              | 2.659E-05                                                                                | 1.653E-01                                                                     |
| Carbon Tetrachloride                  | 4.529E-03                                                                                                   | 4.529E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,2-Dichloropropane                   | 3.419E-03                                                                                                   | 3.419E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Trichloroethene                       | 3.866E-03                                                                                                   | 3.866E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| cis-1,3-Dichloropropene               | 3.360E-03                                                                                                   | 3.360E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| trans-1,3-Dichloropropene             | 2.860E-03                                                                                                   | 2.860E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,1,2-Trichloroethane                 | 3.877E-03                                                                                                   | 3.877E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Toluene                               | 5.333E-03                                                                                                   | 3.610E-03                                                       | 2.118E-05                                              | 6.456E-06                                          | 9.606E-03                                                              | 7.723E-07                                                                                | 4.803E-03                                                                     |
| 1,2-Dibromoethane                     | 5.844E-03                                                                                                   | 5.844E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Tetrachloroethene                     | 4.475E-03                                                                                                   | 4.475E-03                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |

| Cartridge, 40-mm Target Practice, M918 (MK19 Mod3) |                                                    | No. of rounds (I)                                      |                                                    | 1 item                                                                  |                                                              |
|----------------------------------------------------|----------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|
| DODIC: B584                                        |                                                    | release duration (t):                                  |                                                    | 2 seconds                                                               |                                                              |
| Number of items per test firing => 20              |                                                    | Unit Concentration (UC):                               |                                                    | 1.64E-04 g/m <sup>3</sup>                                               |                                                              |
| Compound                                           | Average Adjusted Emission Factor (lb/item)         |                                                        | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m <sup>3</sup> ) CONC | Pollutant Emission Rate for One Item (g/sec) ER <sub>1</sub> |
|                                                    | Measured Actual Concentration (mg/m <sup>3</sup> ) | Measured Background Concentration (mg/m <sup>3</sup> ) |                                                    |                                                                         |                                                              |
| Chlorodifluoromethane                              | 3.54E-03                                           | 1.06E-02                                               | 2.93E-06                                           | 2.40E-10                                                                | 1.47E-06                                                     |
| Freon 114                                          | 6.99E-03                                           | 2.10E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Chloromethane                                      | 1.45E-03                                           | 6.20E-03                                               | 1.20E-06                                           | 9.81E-11                                                                | 5.99E-07                                                     |
| Vinyl Chloride                                     | 1.28E-03                                           | 7.67E-03                                               | 1.59E-06                                           | 1.30E-10                                                                | 7.95E-07                                                     |
| 1,3-Butadiene                                      | 4.42E-03                                           | 6.64E-03                                               | 2.75E-06                                           | 2.25E-10                                                                | 1.38E-06                                                     |
| Bromomethane                                       | 3.88E-03                                           | 1.16E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Chloroethane                                       | 2.64E-03                                           | 7.92E-03                                               | ND                                                 | ND                                                                      | ND                                                           |
| Dichlorofluoromethane                              | 4.21E-03                                           | 1.26E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Trichlorofluoromethane                             | 1.69E-03                                           | 1.69E-02                                               | 1.40E-06                                           | 1.14E-10                                                                | 6.99E-07                                                     |
| Acrolein                                           | 2.33E-01                                           | 6.88E-03                                               | 1.93E-04                                           | 1.58E-08                                                                | 9.65E-05                                                     |
| 1,1-Dichloroethene                                 | 4.05E-03                                           | 1.21E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Freon 113                                          | 7.68E-03                                           | 2.30E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Methyl Iodide                                      | 5.81E-03                                           | 1.74E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Carbon Disulfide                                   | 2.18E-03                                           | 9.34E-03                                               | 1.81E-06                                           | 1.48E-10                                                                | 9.04E-07                                                     |
| Acetonitrile                                       | 8.56E-02                                           | 3.36E-03                                               | 6.85E-05                                           | 5.61E-09                                                                | 3.43E-05                                                     |
| 3-Chloropropene                                    | 3.13E-03                                           | 9.39E-03                                               | ND                                                 | ND                                                                      | ND                                                           |
| Methylene Chloride                                 | 1.56E-01                                           | 7.99E-02                                               | 7.07E-05                                           | 5.79E-09                                                                | 3.54E-05                                                     |
| tert-Butyl Alcohol                                 | 7.58E-02                                           | 9.09E-03                                               | 3.26E-05                                           | 2.67E-09                                                                | 1.63E-05                                                     |
| Acrylonitrile                                      | 1.02E-01                                           | 6.51E-03                                               | 8.46E-05                                           | 6.92E-09                                                                | 4.23E-05                                                     |
| trans-1,2-Dichloroethene                           | 3.96E-03                                           | 1.19E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Methyl t-Butyl Ether                               | 3.61E-03                                           | 1.08E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Hexane                                             | 1.08E+00                                           | 3.88E+00                                               | ND                                                 | ND                                                                      | ND                                                           |
| 1,1-Dichloroethane                                 | 3.97E-03                                           | 1.19E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| Vinyl Acetate                                      | 3.52E-03                                           | 1.06E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| cis-1,2-Dichloroethene                             | 3.96E-03                                           | 1.19E-02                                               | ND                                                 | ND                                                                      | ND                                                           |
| 2-Butanone                                         | 4.42E-03                                           | 8.85E-03                                               | 3.67E-06                                           | 3.00E-10                                                                | 1.83E-06                                                     |
| Ethyl Acetate                                      | 3.60E-03                                           | 1.08E-02                                               | ND                                                 | ND                                                                      | ND                                                           |

Table B-3: Air Modeling Output Data for Semi-Volatile Organic Compounds - 100 meter location

| Compound                    | 155mm propelling charge M3 (zone 3), M199 cannon<br>DODIC: D540   |                                                                 |                                                        |                                                    | No. of rounds (l)<br>release duration (t):<br>Unit Concentration (UC): | Average Modeled<br>Concentration for<br>One Round<br>(grams/m <sup>3</sup> )<br><br>CONC | Substance<br>Emission Rate for<br>One Round<br>(g/sec)<br><br>ER <sub>1</sub> |
|-----------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                             | Net Explosive Weight (NEW) in lbs. => 3.28<br>Number of items = 1 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
|                             | SF6 Leak Rate Dilution Factor => 0.939                            |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| Compound                    | Air Modeling Test Results                                         |                                                                 |                                                        |                                                    | Total Mass of Substance<br>Emitted<br>(grams/item)<br><br>M            |                                                                                          |                                                                               |
|                             | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> )          | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item)<br>EF | Average Adjusted<br>Emission Factor<br>(lb/lb NEW) |                                                                        |                                                                                          |                                                                               |
| SVOCs                       |                                                                   |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| n-nitrosodimethylamine      | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| bis(2-chloroethyl)ether     | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| phenol                      | 7.294E-03                                                         | 7.120E-03                                                       | 2.148E-06                                              | 6.548E-07                                          | 9.742E-04                                                              | 7.833E-08                                                                                | 4.871E-04                                                                     |
| 2-chlorophenol              | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,3-dichlorobenzene         | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,4-dichlorobenzene         | 2.355E-03                                                         | 5.684E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,2-dichlorobenzene         | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| benzyl alcohol              | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| bis(2-chloroisopropyl)ether | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2-methylphenol              | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| hexachloroethane            | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| n-nitroso-di-n-propylamine  | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 4-methylphenol              | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| nitrobenzene                | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| isophorone                  | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2-nitrophenol               | 2.355E-03                                                         | 3.660E-04                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2,4-dimethylphenol          | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| bis(2-chloroethoxy)methane  | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2,4-dichlorophenol          | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,2,4-trichlorobenzene      | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| naphthalene                 | 3.597E-03                                                         | 1.366E-04                                                       | 4.253E-05                                              | 1.297E-05                                          | 1.929E-02                                                              | 1.551E-06                                                                                | 9.647E-03                                                                     |
| 4-chloroaniline             | 2.355E-02                                                         | 5.605E-04                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| hexachlorobutadiene         | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 4-chloro-3-methylphenol     | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2-methylnaphthalene         | 2.355E-03                                                         | 1.694E-04                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| hexachlorocyclopentadiene   | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2,4,6-trichlorophenol       | 2.355E-03                                                         | 5.605E-05                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |

| Cartridge, 40-mm Target Practice, M918 (MK19 Mod3) |                                             | DODIC: B584                                        |                                                  | No. of rounds (I)                                           |                                                                        | 1 item                                                    |  |
|----------------------------------------------------|---------------------------------------------|----------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------|--|
|                                                    |                                             |                                                    |                                                  | release duration (t):                                       |                                                                        | 2 seconds                                                 |  |
| Number of items per test firing => 20              |                                             |                                                    |                                                  | Unit Concentration (UC):                                    |                                                                        | 1.64E-04 g/m³                                             |  |
| Compound                                           | ATC Firing Test Results                     |                                                    |                                                  | Total Mass of Pollutant<br>Emitted Per Item<br>(grams)<br>M | Average Modeled<br>Concentration for<br>One Item<br>(grams/m³)<br>CONC | Pollutant Emission<br>Rate for One Item<br>(g/sec)<br>ER₁ |  |
|                                                    | Measured Actual<br>Concentration<br>(mg/m³) | Measured<br>Background<br>Concentration<br>(mg/m³) | Average Adjusted<br>Emission Factor<br>(lb/item) |                                                             |                                                                        |                                                           |  |
| Ethylbenzene                                       | 1.52E-02                                    | 4.34E-03                                           | 2.07E-08                                         | 9.40E-06                                                    | 7.70E-10                                                               | 4.70E-06                                                  |  |
| m/p-Xylene                                         | 3.91E-02                                    | 2.17E-02                                           | 3.62E-08                                         | 1.64E-05                                                    | 1.34E-09                                                               | 8.21E-06                                                  |  |
| o-Xylene                                           | 2.61E-02                                    | 1.74E-02                                           | 1.94E-08                                         | 8.82E-06                                                    | 7.22E-10                                                               | 4.41E-06                                                  |  |
| Styrene                                            | 1.28E-02                                    | 1.28E-02                                           | 2.34E-08                                         | 1.06E-05                                                    | 8.68E-10                                                               | 5.30E-06                                                  |  |
| Bromoform                                          | 1.03E-02                                    | 3.10E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| Cumene                                             | 9.83E-04                                    | 1.47E-02                                           | 5.40E-09                                         | 2.45E-06                                                    | 2.00E-10                                                               | 1.22E-06                                                  |  |
| 1,1,2,2-Tetrachlorethane                           | 6.87E-03                                    | 2.06E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| 1,2,3-Trichloropropane                             | 6.03E-03                                    | 1.81E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| Bromobenzene                                       | 6.42E-03                                    | 1.93E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| 4-Ethyltoluene                                     | 2.95E-03                                    | 1.47E-02                                           | 5.39E-09                                         | 2.45E-06                                                    | 2.00E-10                                                               | 1.22E-06                                                  |  |
| 1,3,5-Trimethylbenzene                             | 2.21E-03                                    | 1.47E-02                                           | 4.04E-09                                         | 1.83E-06                                                    | 1.50E-10                                                               | 9.17E-07                                                  |  |
| Alpha Methyl Styrene                               | 4.83E-03                                    | 1.45E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| 1,2,4-Trimethylbenzene                             | 4.92E-03                                    | 1.47E-02                                           | 8.99E-09                                         | 4.08E-06                                                    | 3.34E-10                                                               | 2.04E-06                                                  |  |
| 1,3-Dichlorobenzene                                | 6.01E-03                                    | 1.80E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| 1,4-Dichlorobenzene                                | 6.01E-03                                    | 1.80E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| Benzyl Chloride                                    | 5.18E-03                                    | 1.55E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| 1,2-Dichlorobenzene                                | 6.01E-03                                    | 1.80E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| Hexachlorethane                                    | 9.68E-03                                    | 2.90E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| 1,2,4-Trichlorobenzene                             | 7.42E-03                                    | 2.23E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| Hexachlorobutadiene                                | 1.07E-02                                    | 3.20E-02                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                        |  |
| VOC Tentatively Identified Compounds (TICs)        |                                             |                                                    |                                                  |                                                             |                                                                        |                                                           |  |
| Propyne (confirmation)                             | 3.77E-02                                    | ND                                                 | 6.89E-08                                         | 3.13E-05                                                    | 2.56E-09                                                               | 1.56E-05                                                  |  |
| 1-Chloro-1,1-difluoroethane                        | 3.08E-02                                    | ND                                                 | 5.64E-08                                         | 2.56E-05                                                    | 2.09E-09                                                               | 1.28E-05                                                  |  |
| Isobutene (confirmation)                           | 2.43E-01                                    | ND                                                 | 4.44E-07                                         | 2.01E-04                                                    | 1.65E-08                                                               | 1.01E-04                                                  |  |
| Acetaldehyde (confirmation)                        | 3.78E-02                                    | ND                                                 | 6.92E-08                                         | 3.14E-05                                                    | 2.57E-09                                                               | 1.57E-05                                                  |  |
| 1-Buten-3-yne                                      | 1.17E-02                                    | ND                                                 | 2.14E-08                                         | 9.71E-06                                                    | 7.95E-10                                                               | 4.86E-06                                                  |  |
| Ethylcyclopropane                                  | 2.15E-02                                    | ND                                                 | 3.93E-08                                         | 1.78E-05                                                    | 1.46E-09                                                               | 8.92E-06                                                  |  |

Table B-4: Air Modeling Output Data for Polynuclear Aromatic Hydrocarbons, Dioxins/Furans, Aldehydes, and Acid Gases

100 meter location

| Compound               | 155mm propelling charge M3 (zone 3), M199 cannon<br>DODIC: D540                                             |                                                                 |                                                        |                                                    | No. of rounds (l)<br>release duration (t):<br>Unit Concentration (UC): | Average Modeled<br>Concentration for<br>One Round<br>(grams/m <sup>3</sup> )<br>CONC | Substance<br>Emission Rate for<br>One Round<br>(g/sec)<br>ER <sub>1</sub> |
|------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|                        | Net Explosive Weight (NEW) in lbs. => 3.28<br>Number of items = 1<br>SF6 Leak Rate Dilution Factor => 0.939 |                                                                 |                                                        |                                                    |                                                                        |                                                                                      |                                                                           |
|                        | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> )                                                    | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item)<br>EF | Average Adjusted<br>Emission Factor<br>(lb/lb NEW) |                                                                        |                                                                                      |                                                                           |
| ATC Hazardous Results  |                                                                                                             |                                                                 |                                                        |                                                    |                                                                        |                                                                                      |                                                                           |
| PAHs (TO-13 Method)    |                                                                                                             |                                                                 |                                                        |                                                    |                                                                        |                                                                                      |                                                                           |
| acenaphthylene         | 4.939E-04                                                                                                   | 1.328E-06                                                       | 6.054E-06                                              | 1.846E-06                                          | 2.746E-03                                                              | 2.208E-07                                                                            | 1.373E-03                                                                 |
| acenaphthene           | 1.464E-04                                                                                                   | 9.544E-05                                                       | 6.269E-07                                              | 1.911E-07                                          | 2.843E-04                                                              | 2.286E-08                                                                            | 1.422E-04                                                                 |
| fluorene               | 2.220E-04                                                                                                   | 6.502E-05                                                       | 1.930E-06                                              | 5.884E-07                                          | 8.754E-04                                                              | 7.038E-08                                                                            | 4.377E-04                                                                 |
| phenanthrene           | 5.217E-04                                                                                                   | 6.428E-05                                                       | 5.622E-06                                              | 1.714E-06                                          | 2.550E-03                                                              | 2.050E-07                                                                            | 1.275E-03                                                                 |
| anthracene             | 5.075E-05                                                                                                   | 4.197E-06                                                       | 5.721E-07                                              | 1.744E-07                                          | 2.595E-04                                                              | 2.087E-08                                                                            | 1.298E-04                                                                 |
| fluoranthene           | 3.162E-04                                                                                                   | 7.852E-06                                                       | 3.790E-06                                              | 1.155E-06                                          | 1.719E-03                                                              | 1.382E-07                                                                            | 8.594E-04                                                                 |
| pyrene                 | 8.843E-04                                                                                                   | 6.908E-06                                                       | 1.078E-05                                              | 3.288E-06                                          | 4.892E-03                                                              | 3.933E-07                                                                            | 2.446E-03                                                                 |
| benzo(a)anthracene     | 4.504E-05                                                                                                   | 1.390E-07                                                       | 5.518E-07                                              | 1.682E-07                                          | 2.503E-04                                                              | 2.012E-08                                                                            | 1.252E-04                                                                 |
| chrysene               | 4.510E-05                                                                                                   | 3.878E-07                                                       | 5.496E-07                                              | 1.676E-07                                          | 2.493E-04                                                              | 2.004E-08                                                                            | 1.246E-04                                                                 |
| benzo(b)fluoranthene   | 6.923E-05                                                                                                   | 2.220E-07                                                       | 8.482E-07                                              | 2.586E-07                                          | 3.847E-04                                                              | 3.093E-08                                                                            | 1.924E-04                                                                 |
| benzo(k)fluoranthene   | 9.756E-05                                                                                                   | 9.826E-08                                                       | 1.198E-06                                              | 3.652E-07                                          | 5.434E-04                                                              | 4.369E-08                                                                            | 2.717E-04                                                                 |
| benzo(a)pyrene         | 1.560E-04                                                                                                   | 8.980E-08                                                       | 1.917E-06                                              | 5.843E-07                                          | 8.693E-04                                                              | 6.989E-08                                                                            | 4.347E-04                                                                 |
| indeno(1,2,3-cd)pyrene | 2.926E-04                                                                                                   | 1.659E-07                                                       | 3.595E-06                                              | 1.096E-06                                          | 1.630E-03                                                              | 1.311E-07                                                                            | 8.152E-04                                                                 |
| dibenz(a,h)anthracene  | 1.008E-05                                                                                                   | 5.605E-08                                                       | 1.238E-07                                              | 3.776E-08                                          | 5.618E-05                                                              | 4.517E-09                                                                            | 2.809E-05                                                                 |
| benzo(g,h,i)perylene   | 6.659E-04                                                                                                   | 2.408E-07                                                       | 8.181E-06                                              | 2.494E-06                                          | 3.711E-03                                                              | 2.984E-07                                                                            | 1.856E-03                                                                 |
| Dioxin/Furan Data      |                                                                                                             |                                                                 |                                                        |                                                    |                                                                        |                                                                                      |                                                                           |
| 2378-TCDD              | 4.360E-10                                                                                                   | 8.000E-12                                                       | 5.359E-12                                              | 1.634E-12                                          | 2.431E-09                                                              | 1.954E-13                                                                            | 1.215E-09                                                                 |
| 12378-PECDD            | 1.341E-09                                                                                                   | 9.000E-12                                                       | 1.637E-11                                              | 4.991E-12                                          | 7.426E-09                                                              | 5.970E-13                                                                            | 3.713E-09                                                                 |
| 123478-HXCDD           | 1.989E-09                                                                                                   | 1.050E-11                                                       | 2.445E-11                                              | 7.453E-12                                          | 1.109E-08                                                              | 8.915E-13                                                                            | 5.544E-09                                                                 |
| 123678-HXCDD           | 5.812E-09                                                                                                   | 1.700E-11                                                       | 7.122E-11                                              | 2.171E-11                                          | 3.230E-08                                                              | 2.597E-12                                                                            | 1.615E-08                                                                 |
| 123789-HXCDD           | 5.536E-09                                                                                                   | 1.550E-11                                                       | 6.785E-11                                              | 2.068E-11                                          | 3.077E-08                                                              | 2.474E-12                                                                            | 1.539E-08                                                                 |
| 1234678-HPCDD          | 1.137E-07                                                                                                   | 2.495E-10                                                       | 1.395E-09                                              | 4.252E-10                                          | 6.327E-07                                                              | 5.087E-11                                                                            | 3.163E-07                                                                 |
| OCDD                   | 6.470E-07                                                                                                   | 1.587E-09                                                       | 7.932E-09                                              | 2.418E-09                                          | 3.598E-06                                                              | 2.893E-10                                                                            | 1.799E-06                                                                 |
| 2378-TCDF              | 1.560E-10                                                                                                   | 1.100E-11                                                       | 1.782E-12                                              | 5.433E-13                                          | 8.084E-10                                                              | 6.499E-14                                                                            | 4.042E-10                                                                 |
| 12378-PECDF            | 2.870E-10                                                                                                   | 1.050E-11                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                   | ND                                                                        |
| 23478-PECDF            | 1.870E-10                                                                                                   | 1.550E-11                                                       | 2.108E-12                                              | 6.427E-13                                          | 9.561E-10                                                              | 7.687E-14                                                                            | 4.781E-10                                                                 |
| 123478-HXCDF           | 3.965E-10                                                                                                   | 2.800E-11                                                       | 4.529E-12                                              | 1.381E-12                                          | 2.054E-09                                                              | 1.652E-13                                                                            | 1.027E-09                                                                 |
| 123678-HXCDF           | 2.380E-10                                                                                                   | 1.450E-11                                                       | 2.747E-12                                              | 8.375E-13                                          | 1.246E-09                                                              | 1.002E-13                                                                            | 6.230E-10                                                                 |
| 123789-HXCDF           | 3.015E-10                                                                                                   | 6.000E-12                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                   | ND                                                                        |

| Cartridge, 40-mm Target Practice, M918 (MK19 Mod3) |                                                          |                                                                 |                                                  | No. of rounds (I)                                           |                                                                                     | 1 item                                                                |    |
|----------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----|
| DODIC: B584                                        |                                                          |                                                                 |                                                  | release duration (t):                                       |                                                                                     | 2 seconds                                                             |    |
| Number of items per test firing => 20              |                                                          |                                                                 |                                                  | Unit Concentration (UC):                                    |                                                                                     | 1.64E-04 g/m <sup>3</sup>                                             |    |
| Compound                                           | ATCIRING Test Results                                    |                                                                 |                                                  | Total Mass of Pollutant<br>Emitted Per Item<br>(grams)<br>M | Average Modeled<br>Concentration for<br>One Item<br>(grams/m <sup>3</sup> )<br>CONC | Pollutant Emission<br>Rate for One Item<br>(g/sec)<br>ER <sub>1</sub> |    |
|                                                    | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> ) | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item) |                                                             |                                                                                     |                                                                       |    |
| phenol                                             | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2-chlorophenol                                     | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 1,3-dichlorobenzene                                | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 1,4-dichlorobenzene                                | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 1,2-dichlorobenzene                                | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| benzyl alcohol                                     | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| bis(2-chloroisopropyl)ether                        | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2-methylphenol                                     | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| hexachloroethane                                   | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| n-nitroso-di-n-propylamine                         | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 4-methylphenol                                     | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| nitrobenzene                                       | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| isophorone                                         | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2-nitrophenol                                      | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2,4-dimethylphenol                                 | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| bis(2-chloroethoxy)methane                         | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2,4-dichlorophenol                                 | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | 3.33E-05                                                    | 2.73E-09                                                                            | 1.67E-05                                                              | ND |
| Benzoic Acid                                       | 7.38E-02                                                 | 3.79E-02                                                        | 7.34E-08                                         | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 1,2,4-trichlorobenzene                             | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 4-chloroaniline                                    | 3.42E-02                                                 | 3.61E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| hexachlorobutadiene                                | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 4-chloro-3-methylphenol                            | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2-methylnaphthalene                                | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| hexachlorocyclopentadiene                          | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2,4,6-trichlorophenol                              | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2,4,5-trichlorophenol                              | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |
| 2-chloronaphthalene                                | 1.71E-02                                                 | 1.81E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    | ND |

Table B-5: Air Modeling Output Data for Cyanide and Energetics - 100 meter location

| Compound                                                                                                        | 155mm propelling charge M3 (zone 3), M199 cannon<br>DODIC: D540 |                                                                 |                                                        |                                                    | No. of rounds (l)<br>release duration (t):<br>Unit Concentration (UC): | Average Modeled<br>Concentration for<br>One Round<br>(grams/m <sup>3</sup> )<br><br>CONC | Substance<br>Emission Rate for<br>One Round<br>(g/sec)<br><br>ER <sub>1</sub> |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                                                                                                                 | Net Explosive Weight (NEW) in lbs. => 3.28                      |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
|                                                                                                                 | SF6 Leak Rate Dilution Factor => 0.939                          |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
|                                                                                                                 | ATC Firing Test Results                                         |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
|                                                                                                                 | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> )        | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item)<br>EF | Average Adjusted<br>Emission Factor<br>(lb/lb NEW) | Total Mass of Substance<br>Emitted<br>(grams/item)<br><br>M            |                                                                                          |                                                                               |
| Particulate Cyanide and HCN                                                                                     |                                                                 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| Particulate Cyanide                                                                                             | 8.000E-02                                                       | 8.000E-02                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Hydrogen Cyanide                                                                                                | 9.500E-01                                                       | 8.500E-02                                                       | 1.168E-02                                              | 3.560E-03                                          | 5.296E+00                                                              | 4.258E-04                                                                                | 2.648E+00                                                                     |
| Energetics Data                                                                                                 |                                                                 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| Nitrobenzene                                                                                                    | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2-Nitrotoluene                                                                                                  | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 3-Nitrotoluene                                                                                                  | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 4-Nitrotoluene                                                                                                  | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Nitroglycerine                                                                                                  | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,3-Dinitrobenzene                                                                                              | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2,6-Dinitrotoluene                                                                                              | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2,4-Dinitrotoluene                                                                                              | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 1,3,5-Trinitrobenzene                                                                                           | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2,4,6-Trinitrotoluene                                                                                           | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| RDX                                                                                                             | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 4-Amino-2,6-Dinitrotoluene                                                                                      | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| 2-Amino-4,6-Dinitrotoluene                                                                                      | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Tetryl                                                                                                          | 5.021E-01                                                       | 2.031E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| HMX                                                                                                             | 1.004E+00                                                       | 4.062E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Pentaerythritoltetranitrate                                                                                     | 1.004E+00                                                       | 4.062E-01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Dibutyl phthalate                                                                                               | 2.510E+01                                                       | 1.016E+01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Diethyl phthalate                                                                                               | 2.510E+01                                                       | 1.016E+01                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Diphenylamine                                                                                                   | 1.255E+01                                                       | 5.078E+00                                                       | ND                                                     | ND                                                 | ND                                                                     | ND                                                                                       | ND                                                                            |
| Footnotes:                                                                                                      |                                                                 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| ¹ATC = Aberdeen Test Center (for additional information on the data, refer to the Firing Point Emissions Study) |                                                                 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |
| ND = Not Detected                                                                                               |                                                                 |                                                                 |                                                        |                                                    |                                                                        |                                                                                          |                                                                               |

Footnotes:

1ATC = Aberdeen Test Center (for additional information on the data, refer to the Firing Point Emissions Study)

ND = Not Detected

| Cartridge, 40-mm Target Practice, M918 (MK19 Mod3) |                                                        |          |                                            | No. of rounds (I)                                  |                                                                         | 1 item                                                       |          |
|----------------------------------------------------|--------------------------------------------------------|----------|--------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|----------|
| DODIC: B584                                        |                                                        |          |                                            | release duration (t):                              |                                                                         | 2 seconds                                                    |          |
| Number of items per test firing => 20              |                                                        |          |                                            | Unit Concentration (UC):                           |                                                                         | 1.64E-04 g/m <sup>3</sup>                                    |          |
| Compound                                           | Measured Actual Concentration (mg/m <sup>3</sup> )     |          | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m <sup>3</sup> ) CONC | Pollutant Emission Rate for One Item (g/sec) ER <sub>1</sub> |          |
|                                                    | Measured Background Concentration (mg/m <sup>3</sup> ) |          |                                            |                                                    |                                                                         |                                                              |          |
| Hexyl-cyclohexane                                  | ND                                                     | ND       | ND                                         | ND                                                 | ND                                                                      | ND                                                           | ND       |
| Dodecamethylcyclohexasiloxane                      | 1.50E-02                                               | ND       | 4.52E-08                                   | 2.05E-05                                           | 1.68E-09                                                                | 1.03E-05                                                     | 1.03E-05 |
| Dodecanoic Acid                                    | ND                                                     | ND       | ND                                         | ND                                                 | ND                                                                      | ND                                                           | ND       |
| Hexadecanoic Acid                                  | 2.05E-02                                               | 8.20E-03 | 5.09E-08                                   | 2.31E-05                                           | 1.89E-09                                                                | 1.16E-05                                                     | 1.16E-05 |
| Octadecanoic Acid                                  | 1.65E-02                                               | ND       | 5.13E-08                                   | 2.33E-05                                           | 1.91E-09                                                                | 1.16E-05                                                     | 1.16E-05 |
| bis(2-ethylhexyl)Decanedioic Acid                  | 4.70E-01                                               | ND       | 1.46E-06                                   | 6.64E-04                                           | 5.44E-08                                                                | 3.32E-04                                                     | 3.32E-04 |
| TO-13 (PAHs)                                       |                                                        |          |                                            |                                                    |                                                                         |                                                              |          |
| naphthalene                                        | 1.24E-02                                               | 2.35E-04 | 2.22E-08                                   | 1.01E-05                                           | 8.26E-10                                                                | 5.04E-06                                                     | 5.04E-06 |
| acenaphthylene                                     | 1.79E-03                                               | 1.81E-05 | 3.28E-09                                   | 1.49E-06                                           | 1.22E-10                                                                | 7.43E-07                                                     | 7.43E-07 |
| acenaphthene                                       | 1.78E-04                                               | 4.69E-05 | 2.50E-10                                   | 1.13E-07                                           | 9.28E-12                                                                | 5.67E-08                                                     | 5.67E-08 |
| fluorene                                           | 3.83E-04                                               | 4.51E-05 | 6.27E-10                                   | 2.85E-07                                           | 2.33E-11                                                                | 1.42E-07                                                     | 1.42E-07 |
| phenanthrene                                       | 5.27E-04                                               | 1.12E-04 | 7.81E-10                                   | 3.54E-07                                           | 2.90E-11                                                                | 1.77E-07                                                     | 1.77E-07 |
| anthracene                                         | 9.70E-05                                               | 2.53E-05 | 1.36E-10                                   | 6.18E-08                                           | 5.06E-12                                                                | 3.09E-08                                                     | 3.09E-08 |
| fluoranthene                                       | 3.50E-04                                               | 6.32E-05 | 5.37E-10                                   | 2.43E-07                                           | 1.99E-11                                                                | 1.22E-07                                                     | 1.22E-07 |
| pyrene                                             | 6.65E-04                                               | 5.60E-05 | 1.13E-09                                   | 5.10E-07                                           | 4.18E-11                                                                | 2.55E-07                                                     | 2.55E-07 |
| benzo(a)anthracene                                 | 1.79E-04                                               | 5.05E-05 | 2.46E-10                                   | 1.11E-07                                           | 9.12E-12                                                                | 5.57E-08                                                     | 5.57E-08 |
| chrysene                                           | 1.09E-04                                               | 4.87E-05 | 1.20E-10                                   | 5.43E-08                                           | 4.44E-12                                                                | 2.71E-08                                                     | 2.71E-08 |
| benzo(b)fluoranthene                               | 1.24E-04                                               | 5.42E-05 | 1.38E-10                                   | 6.27E-08                                           | 5.13E-12                                                                | 3.13E-08                                                     | 3.13E-08 |
| benzo(k)fluoranthene                               | 2.05E-04                                               | 4.87E-05 | 2.95E-10                                   | 1.34E-07                                           | 1.10E-11                                                                | 6.69E-08                                                     | 6.69E-08 |
| benzo(a)pyrene                                     | 2.06E-04                                               | 3.61E-05 | 3.18E-10                                   | 1.44E-07                                           | 1.18E-11                                                                | 7.20E-08                                                     | 7.20E-08 |
| indeno(1,2,3-cd)pyrene                             | 1.73E-04                                               | 3.97E-05 | 2.52E-10                                   | 1.14E-07                                           | 9.36E-12                                                                | 5.71E-08                                                     | 5.71E-08 |
| dibenz(a,h)anthracene                              | 5.44E-05                                               | 4.15E-05 | 3.21E-11                                   | 1.46E-08                                           | 1.19E-12                                                                | 7.29E-09                                                     | 7.29E-09 |
| benzo(g,h,i)perylene                               | 4.86E-04                                               | 4.15E-05 | 8.21E-10                                   | 3.72E-07                                           | 3.05E-11                                                                | 1.86E-07                                                     | 1.86E-07 |
| Dioxins/Furans                                     |                                                        |          |                                            |                                                    |                                                                         |                                                              |          |
| 2378-TCDD                                          | 2.30E-09                                               | 5.01E-09 | ND                                         | ND                                                 | ND                                                                      | ND                                                           | ND       |
| 12378-PECDD                                        | 3.69E-09                                               | 3.58E-09 | ND                                         | ND                                                 | ND                                                                      | ND                                                           | ND       |
| 123478-HXCDD                                       | 1.56E-09                                               | 1.47E-09 | ND                                         | ND                                                 | ND                                                                      | ND                                                           | ND       |

| Cartridge, 40-mm Target Practice, M918 (MK19 Mod3)                                                                   |                                                          |                                                                 |                                                  | No. of rounds (I)                                           |                                                                                     | 1 item                                                                |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| DODIC: B584                                                                                                          |                                                          |                                                                 |                                                  | release duration (I):                                       |                                                                                     | 2 seconds                                                             |
| Number of items per test firing => 20                                                                                |                                                          |                                                                 |                                                  | Unit Concentration (UC):                                    |                                                                                     | 1.64E-04 g/m <sup>3</sup>                                             |
| Compound                                                                                                             | ATC Firing Test Results                                  |                                                                 |                                                  | Total Mass of Pollutant<br>Emitted Per Item<br>(grams)<br>M | Average Modeled<br>Concentration for<br>One Item<br>(grams/m <sup>3</sup> )<br>CONC | Pollutant Emission<br>Rate for One Item<br>(g/sec)<br>ER <sub>1</sub> |
|                                                                                                                      | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> ) | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item) |                                                             |                                                                                     |                                                                       |
| HMX                                                                                                                  | 6.68E-03                                                 | 7.12E-03                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    |
| Pentaerythritol tetranitrate                                                                                         | 6.68E-03                                                 | 7.12E-03                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    |
| Diphenylamine                                                                                                        | 8.35E-02                                                 | 8.90E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    |
| Footnotes:                                                                                                           |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |
| ATC = Aberdeen Test Center (for additional information on the data, refer to the Firing Point Emission Study Report) |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |
| NA = Not Applicable                                                                                                  |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |
| ND = Not Detected                                                                                                    |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |

TABLE B-2

M781 (M203)

Table B-2: Air Modeling Output Data for the Cartridge, 40-mm Target Practice, M781 (M203)

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |          |                                           |                                            | No. of rounds (l)                                  |                                                            | 1 item                                           |          |
|-----------------------------------------------|---------------------------------------|----------|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|----------|
| DODIC: B519                                   |                                       |          |                                           |                                            | release duration (t):                              |                                                            | 2 seconds                                        |          |
| Number of items per test firing => 14         |                                       |          |                                           |                                            | Unit Concentration (UC):                           |                                                            | 2.03E-04 g/m³                                    |          |
| Compound                                      | Measured Actual Concentration (mg/m³) |          | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |          |
|                                               |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |          |
| Permanent Gases                               |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |          |
| Ammonia (NH3)                                 | 2.10E+00                              | NA       | NA                                        | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Carbon Dioxide (CO2)                          | 2.36E+02                              | NA       | NA                                        | 2.52E-04                                   | 1.14E-01                                           | 1.16E-05                                                   | 5.72E-02                                         | 5.72E-02 |
| Carbon Monoxide (CO)                          | 3.25E+02                              | NA       | NA                                        | 3.48E-04                                   | 1.58E-01                                           | 1.60E-05                                                   | 7.88E-02                                         | 7.88E-02 |
| Oxides of Nitrogen (as NO)                    | 2.18E+01                              | NA       | NA                                        | 2.33E-05                                   | 1.06E-02                                           | 1.07E-06                                                   | 5.28E-03                                         | 5.28E-03 |
| Sulfur Dioxide (SO2)                          | 5.24E-01                              | NA       | NA                                        | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Acid Gases                                    |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |          |
| Hydrogen Fluoride                             | 2.20E-01                              | 2.10E-01 | 2.10E-01                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Hydrogen Chloride                             | 3.25E-01                              | 2.00E-01 | 2.00E-01                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Hydrogen Bromide                              | 2.10E-01                              | 2.00E-01 | 2.00E-01                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Nitric Acid                                   | 3.25E-01                              | 2.00E-01 | 2.00E-01                                  | 2.74E-07                                   | 1.24E-04                                           | 1.26E-08                                                   | 6.21E-05                                         | 6.21E-05 |
| Phosphoric Acid                               | 2.10E-01                              | 2.00E-01 | 2.00E-01                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Sulfuric Acid                                 | 1.15E-01                              | 2.00E-01 | 2.00E-01                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Cyanide                                       |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |          |
| Particulate Cyanide                           | 1.00E-01                              | 1.00E-01 | 1.00E-01                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Hydrogen Cyanide                              | 4.95E-01                              | 1.00E-01 | 1.00E-01                                  | 5.96E-07                                   | 2.70E-04                                           | 2.74E-08                                                   | 1.35E-04                                         | 1.35E-04 |
| Particulates                                  |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |          |
| TSP                                           | 1.87E+01                              | NA       | NA                                        | 3.40E-05                                   | 1.54E-02                                           | 1.57E-06                                                   | 7.71E-03                                         | 7.71E-03 |
| PM10                                          | 2.14E+01                              | 8.50E-02 | 8.50E-02                                  | 3.84E-05                                   | 1.74E-02                                           | 1.77E-06                                                   | 8.71E-03                                         | 8.71E-03 |
| PM2.5                                         | 1.89E+01                              | 6.10E-02 | 6.10E-02                                  | 3.41E-05                                   | 1.55E-02                                           | 1.57E-06                                                   | 7.73E-03                                         | 7.73E-03 |
| Metals                                        |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |          |
| Antimony                                      | 1.00E+00                              | 1.14E-03 | 1.14E-03                                  | 1.20E-06                                   | 5.46E-04                                           | 5.54E-08                                                   | 2.73E-04                                         | 2.73E-04 |
| Arsenic                                       | 1.12E-03                              | 1.14E-03 | 1.14E-03                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |
| Barium                                        | 5.40E-01                              | 2.27E-03 | 2.27E-03                                  | 6.47E-07                                   | 2.93E-04                                           | 2.98E-08                                                   | 1.47E-04                                         | 1.47E-04 |
| Beryllium                                     | 4.50E-04                              | 4.55E-04 | 4.55E-04                                  | ND                                         | ND                                                 | ND                                                         | ND                                               | ND       |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |          |                                           |                                            | No. of rounds (l)                                  |                                                            | 1 item                                           |  |  |
|-----------------------------------------------|---------------------------------------|----------|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|--|--|
| DODIC: B519                                   |                                       |          |                                           |                                            | release duration (l):                              |                                                            | 2 seconds                                        |  |  |
| Number of items per test firing => 14         |                                       |          |                                           |                                            | Unit Concentration (UC):                           |                                                            | 2.03E-04 g/m³                                    |  |  |
| Compound                                      | Measured Actual Concentration (mg/m³) |          | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |  |  |
|                                               | Cadmium                               | 1.12E-03 | 1.14E-03                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |  |
|                                               | Chromium                              | 1.19E-02 | 1.14E-03                                  | 1.43E-08                                   | 6.50E-06                                           | 6.60E-10                                                   | 3.25E-06                                         |  |  |
|                                               | Cobalt                                | 4.50E-04 | 4.55E-04                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |  |
|                                               | Copper                                | 6.52E-02 | 7.50E-03                                  | 7.04E-08                                   | 3.19E-05                                           | 3.24E-09                                                   | 1.60E-05                                         |  |  |
|                                               | Lead                                  | 5.40E+00 | 4.55E-03                                  | 6.49E-06                                   | 2.95E-03                                           | 2.99E-07                                                   | 1.47E-03                                         |  |  |
|                                               | Manganese                             | 9.22E-04 | 4.55E-04                                  | 1.11E-09                                   | 5.03E-07                                           | 5.11E-11                                                   | 2.52E-07                                         |  |  |
|                                               | Nickel                                | 1.12E-03 | 1.14E-03                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |  |
|                                               | Selenium                              | 2.25E-03 | 2.27E-03                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |  |
|                                               | Silver                                | 4.50E-04 | 4.55E-04                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |  |
|                                               | Thallium                              | 1.12E-03 | 1.14E-03                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |  |
|                                               | Zinc                                  | 3.37E+00 | 2.27E-02                                  | 4.06E-06                                   | 1.84E-03                                           | 1.87E-07                                                   | 9.20E-04                                         |  |  |
|                                               | TO-11 Carbonyls                       |          |                                           |                                            |                                                    |                                                            |                                                  |  |  |
|                                               | Formaldehyde                          | 7.37E-02 | 1.23E-02                                  | 8.86E-08                                   | 4.02E-05                                           | 4.08E-09                                                   | 2.01E-05                                         |  |  |
|                                               | Acetaldehyde                          | 5.40E-02 | 1.80E-02                                  | 6.50E-08                                   | 2.95E-05                                           | 2.99E-09                                                   | 1.47E-05                                         |  |  |
| Acetone                                       | 5.94E-02                              | 4.75E-02 | 2.06E-08                                  | 9.36E-06                                   | 9.50E-10                                           | 4.68E-06                                                   |                                                  |  |  |
| Propionaldehyde                               | 2.37E-02                              | 2.37E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| Crotonaldehyde                                | 2.87E-02                              | 2.87E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| Butyraldehyde                                 | 2.95E-02                              | 2.95E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| Benzaldehyde                                  | 4.34E-02                              | 4.34E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| Isovaleraldehyde                              | 3.52E-02                              | 3.52E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| Valeraldehyde                                 | 3.52E-02                              | 3.52E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| o,m,p-Tolualdehyde                            | 9.83E-02                              | 9.83E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| Hexaldehyde                                   | 4.10E-02                              | 4.10E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| 2,5-Dimethylbenzaldehyde                      | 4.10E-02                              | 4.10E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |
| VOCs                                          |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |  |  |
| Propene                                       | 7.31E-02                              | 8.61E-04 | 8.70E-08                                  | 3.95E-05                                   | 4.01E-09                                           | 1.97E-05                                                   |                                                  |  |  |
| Dichlorodifluoromethane                       | 1.98E-03                              | 2.47E-03 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |  |  |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                                          |                                                                 |                                                  | No. of rounds (l)<br>release duration (t):                  |  | 1 item<br>2 seconds                                                                 |  |
|-----------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------|--|-------------------------------------------------------------------------------------|--|
| DODIC: B519                                   |                                                          |                                                                 |                                                  | Unit Concentration (UC):                                    |  | 2.03E-04 g/m <sup>3</sup>                                                           |  |
| Number of items per test firing => 14         |                                                          |                                                                 |                                                  | Total Mass of Pollutant<br>Emitted Per Item<br>(grams)<br>M |  | Average Modeled<br>Concentration for<br>One Item<br>(grams/m <sup>3</sup> )<br>CONC |  |
| Compound                                      | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> ) | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item) |                                                             |  | Pollutant Emission<br>Rate for One Item<br>(g/sec)<br>ER <sub>1</sub>               |  |
| Chlorodifluoromethane                         | 3.54E-03                                                 | 3.54E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Freon 114                                     | 6.99E-03                                                 | 6.99E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Chloromethane                                 | 1.45E-03                                                 | 1.45E-03                                                        | 5.64E-10                                         | 2.56E-07                                                    |  | 2.59E-11                                                                            |  |
| Vinyl Chloride                                | 2.56E-03                                                 | 2.56E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| 1,3-Butadiene                                 | 8.85E-03                                                 | 2.21E-03                                                        | 1.06E-08                                         | 4.83E-06                                                    |  | 2.41E-06                                                                            |  |
| Bromomethane                                  | 3.88E-03                                                 | 3.88E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Chloroethane                                  | 2.64E-03                                                 | 2.64E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Dichlorofluoromethane                         | 4.21E-03                                                 | 4.21E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Trichlorofluoromethane                        | 1.69E-03                                                 | 1.69E-03                                                        | 2.24E-10                                         | 1.02E-07                                                    |  | 1.03E-11                                                                            |  |
| Acrolein                                      | 1.35E-01                                                 | 2.29E-03                                                        | 1.63E-07                                         | 7.38E-05                                                    |  | 7.49E-09                                                                            |  |
| 1,1-Dichloroethene                            | 4.05E-03                                                 | 4.05E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Freon 113                                     | 7.68E-03                                                 | 7.68E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Methyl Iodide                                 | 5.81E-03                                                 | 5.81E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Carbon Disulfide                              | 1.11E-01                                                 | 3.11E-03                                                        | 1.33E-07                                         | 6.03E-05                                                    |  | 6.12E-09                                                                            |  |
| Acetonitrile                                  | 5.29E-02                                                 | 3.38E-03                                                        | 6.00E-08                                         | 2.72E-05                                                    |  | 2.76E-09                                                                            |  |
| 3-Chloropropene                               | 3.13E-03                                                 | 3.13E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Methylene Chloride                            | 3.20E-01                                                 | 5.56E-02                                                        | 3.24E-07                                         | 1.47E-04                                                    |  | 1.49E-08                                                                            |  |
| tert-Butyl Alcohol                            | 1.52E-03                                                 | 2.43E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Acrylonitrile                                 | 7.81E-02                                                 | 2.17E-03                                                        | 9.39E-08                                         | 4.26E-05                                                    |  | 4.32E-09                                                                            |  |
| trans-1,2-Dichloroethene                      | 3.96E-03                                                 | 3.96E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Methyl t-Butyl Ether                          | 3.61E-03                                                 | 3.61E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Hexane                                        | 1.45E-01                                                 | 2.11E-02                                                        | 1.51E-07                                         | 6.85E-05                                                    |  | 6.95E-09                                                                            |  |
| 1,1-Dichloroethane                            | 3.97E-03                                                 | 3.97E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| Vinyl Acetate                                 | 3.52E-03                                                 | 3.52E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| cis-1,2-Dichloroethene                        | 3.96E-03                                                 | 3.96E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
| 2-Butanone                                    | 4.42E-03                                                 | 2.95E-03                                                        | 5.33E-09                                         | 2.42E-06                                                    |  | 2.45E-10                                                                            |  |
| Ethyl Acetate                                 | 3.60E-03                                                 | 3.60E-03                                                        | ND                                               | ND                                                          |  | ND                                                                                  |  |
|                                               |                                                          |                                                                 |                                                  |                                                             |  | 1.21E-06                                                                            |  |
|                                               |                                                          |                                                                 |                                                  |                                                             |  | ND                                                                                  |  |

| Compound                  | Cartridge, 40-mm Target Practice, M781 (M203) |                                                    |                                                  |                                                             | No. of rounds (l)<br>release duration (t):                             |                                                                       | 1 item<br>2 seconds |  |
|---------------------------|-----------------------------------------------|----------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------|--|
|                           | DODIC: B519                                   |                                                    |                                                  |                                                             |                                                                        |                                                                       |                     |  |
|                           | Number of items per test firing => 14         |                                                    |                                                  |                                                             |                                                                        |                                                                       |                     |  |
|                           |                                               |                                                    |                                                  |                                                             |                                                                        |                                                                       |                     |  |
|                           | Measured Actual<br>Concentration<br>(mg/m³)   | Measured<br>Background<br>Concentration<br>(mg/m³) | Average Adjusted<br>Emission Factor<br>(lb/item) | Total Mass of Pollutant<br>Emitted Per Item<br>(grams)<br>M | Average Modeled<br>Concentration for<br>One Item<br>(grams/m³)<br>CONC | Pollutant Emission<br>Rate for One Item<br>(g/sec)<br>ER <sub>1</sub> |                     |  |
| Methyl Acrylate           | 3.52E-03                                      | 3.52E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Chloroform                | 4.88E-03                                      | 4.88E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 1,1,1-Trichloroethane     | 1.34E-01                                      | 3.82E-02                                           | 1.20E-07                                         | 5.45E-05                                                    | 5.53E-09                                                               | 2.73E-05                                                              |                     |  |
| Carbon Tetrachloride      | 1.26E-03                                      | 6.29E-03                                           | 4.53E-09                                         | 2.06E-06                                                    | 2.09E-10                                                               | 1.03E-06                                                              |                     |  |
| 1,2-Dichlorethane         | 8.09E-03                                      | 4.05E-03                                           | 9.74E-09                                         | 4.42E-06                                                    | 4.48E-10                                                               | 2.21E-06                                                              |                     |  |
| Benzene                   | 5.59E-01                                      | 6.39E-04                                           | 6.72E-07                                         | 3.05E-04                                                    | 3.09E-08                                                               | 1.52E-04                                                              |                     |  |
| Isooctane                 | 4.67E-03                                      | 4.67E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Heptane                   | 4.10E-03                                      | 4.10E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Trichloroethane           | 4.88E-03                                      | 4.88E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Ethyl Acrylate            | 4.09E-03                                      | 4.09E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 1,2-Dichloropropane       | 4.62E-03                                      | 4.62E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Methyl Methacrylate       | 4.09E-03                                      | 4.09E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Dibromomethane            | 7.11E-03                                      | 7.11E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 1,4-Dioxane               | 3.60E-03                                      | 3.60E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Bromodichloromethane      | 6.70E-03                                      | 6.70E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 4-Methyl-2-Pentanone      | 4.10E-03                                      | 4.10E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Toluene                   | 7.16E-02                                      | 7.54E-04                                           | 8.54E-08                                         | 3.87E-05                                                    | 3.93E-09                                                               | 1.94E-05                                                              |                     |  |
| Octane                    | 1.17E-03                                      | 4.67E-03                                           | 1.41E-09                                         | 6.38E-07                                                    | 6.47E-11                                                               | 3.19E-07                                                              |                     |  |
| trans-1,3-Dichloropropene | 4.54E-03                                      | 4.54E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Ethyl Methacrylate        | 4.67E-03                                      | 4.67E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 1,1,2-Trichloroethane     | 5.46E-03                                      | 5.46E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Tetrachloroethene         | 6.78E-03                                      | 6.78E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 2-Hexanone                | 4.10E-03                                      | 4.10E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Dibromochloromethane      | 8.52E-03                                      | 8.52E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 1,2-Dibromoethane         | 7.68E-03                                      | 7.68E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| Chlorobenzene             | 4.60E-03                                      | 4.60E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |
| 1,1,1,2-Tetrachloroethane | 6.87E-03                                      | 6.87E-03                                           | ND                                               | ND                                                          | ND                                                                     | ND                                                                    |                     |  |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                                    |                                                        |          |  | No. of rounds (l)                                  |                                                                         | 1 item                                                       |  |
|-----------------------------------------------|----------------------------------------------------|--------------------------------------------------------|----------|--|----------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|--|
| DODIC: B519                                   |                                                    |                                                        |          |  | release duration (t):                              |                                                                         | 2 seconds                                                    |  |
| Number of items per test firing => 14         |                                                    |                                                        |          |  | Unit Concentration (UC):                           |                                                                         | 2.03E-04 g/m <sup>3</sup>                                    |  |
| Compound                                      | Average Adjusted Emission Factor (lb/item)         |                                                        |          |  | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m <sup>3</sup> ) CONC | Pollutant Emission Rate for One Item (g/sec) ER <sub>1</sub> |  |
|                                               | Measured Actual Concentration (mg/m <sup>3</sup> ) | Measured Background Concentration (mg/m <sup>3</sup> ) |          |  |                                                    |                                                                         |                                                              |  |
| Ethylbenzene                                  | 2.61E-02                                           | 8.68E-03                                               | 2.20E-08 |  | 9.99E-06                                           | 1.01E-09                                                                | 5.00E-06                                                     |  |
| m/p-Xylene                                    | 8.68E-02                                           | 2.61E-02                                               | 7.65E-08 |  | 3.47E-05                                           | 3.52E-09                                                                | 1.74E-05                                                     |  |
| o-Xylene                                      | 6.95E-02                                           | 2.61E-02                                               | 5.56E-08 |  | 2.52E-05                                           | 2.56E-09                                                                | 1.26E-05                                                     |  |
| Styrene                                       | 1.98E-01                                           | 4.26E-03                                               | 2.38E-07 |  | 1.08E-04                                           | 1.10E-08                                                                | 5.41E-05                                                     |  |
| Bromoform                                     | 1.03E-02                                           | 1.03E-02                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| Cumene                                        | 4.42E-03                                           | 1.47E-03                                               | 3.74E-09 |  | 1.70E-06                                           | 1.72E-10                                                                | 8.49E-07                                                     |  |
| 1,1,2,2-Tetrachlorethane                      | 6.87E-03                                           | 6.87E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| 1,2,3-Trichloropropane                        | 6.03E-03                                           | 6.03E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| Bromobenzene                                  | 6.42E-03                                           | 6.42E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| 4-Ethyltoluene                                | 3.69E-02                                           | 1.47E-02                                               | 2.85E-08 |  | 1.29E-05                                           | 1.31E-09                                                                | 6.47E-06                                                     |  |
| 1,3,5-Trimethylbenzene                        | 2.21E-02                                           | 9.83E-03                                               | 1.61E-08 |  | 7.29E-06                                           | 7.40E-10                                                                | 3.65E-06                                                     |  |
| Alpha Methyl Styrene                          | 4.83E-03                                           | 4.83E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| 1,2,4-Trimethylbenzene                        | 6.64E-02                                           | 2.46E-02                                               | 5.35E-08 |  | 2.43E-05                                           | 2.46E-09                                                                | 1.21E-05                                                     |  |
| 1,3-Dichlorobenzene                           | 6.01E-03                                           | 6.01E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| 1,4-Dichlorobenzene                           | 6.01E-03                                           | 6.01E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| Benzyl Chloride                               | 5.18E-03                                           | 5.18E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| 1,2-Dichlorobenzene                           | 6.01E-03                                           | 6.01E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| Hexachlorethane                               | 9.68E-03                                           | 9.68E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| 1,2,4-Trichlorobenzene                        | 7.42E-03                                           | 7.42E-03                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| Hexachlorobutadiene                           | 1.07E-02                                           | 1.07E-02                                               | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| VOC Tentatively Identified Compounds (TICs)   |                                                    |                                                        |          |  |                                                    |                                                                         |                                                              |  |
| Propyne (confirmation)                        | 3.52E-02                                           | ND                                                     | 4.24E-08 |  | 1.92E-05                                           | 1.95E-09                                                                | 9.61E-06                                                     |  |
| 1-Chloro-1,1-difluoroethane                   | ND                                                 | ND                                                     | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |
| Isobutene (confirmation)                      | 2.64E-02                                           | ND                                                     | 3.17E-08 |  | 1.44E-05                                           | 1.46E-09                                                                | 7.20E-06                                                     |  |
| Acetaldehyde (confirmation)                   | 2.88E-02                                           | 1.08E-02                                               | 2.31E-08 |  | 1.05E-05                                           | 1.06E-09                                                                | 5.24E-06                                                     |  |
| 1-Buten-3-yne                                 | 1.07E-02                                           | ND                                                     | 6.39E-09 |  | 2.90E-06                                           | 2.94E-10                                                                | 1.45E-06                                                     |  |
| Ethylcyclopropane                             | ND                                                 | ND                                                     | ND       |  | ND                                                 | ND                                                                      | ND                                                           |  |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |          |                                           |                                            |                                                    | No. of rounds (l)                                          |                                                  | 1 item        |  |
|-----------------------------------------------|---------------------------------------|----------|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|---------------|--|
| DODIC: B519                                   |                                       |          |                                           |                                            |                                                    | release duration (t):                                      |                                                  | 2 seconds     |  |
| Number of items per test firing => 14         |                                       |          |                                           |                                            |                                                    | Unit Concentration (UC):                                   |                                                  | 2.03E-04 g/m³ |  |
| Compound                                      | Measured Actual Concentration (mg/m³) |          | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |               |  |
|                                               |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |               |  |
| Ethanol                                       | 1.13E-02                              | 5.28E-02 | ND                                        | 1.67E-08                                   | 7.57E-06                                           | 7.69E-10                                                   | 3.79E-06                                         |               |  |
| Furan                                         | 1.39E-02                              | ND       | ND                                        | ND                                         | ND                                                 | ND                                                         | ND                                               |               |  |
| 1-Hexene                                      | ND                                    | ND       | ND                                        | 3.55E-08                                   | 1.61E-05                                           | 1.63E-09                                                   | 8.05E-06                                         |               |  |
| Thiirane                                      | 2.95E-02                              | ND       | ND                                        | 1.65E-08                                   | 7.49E-06                                           | 7.60E-10                                                   | 3.74E-06                                         |               |  |
| Thiophene                                     | 1.38E-02                              | ND       | ND                                        | ND                                         | ND                                                 | ND                                                         | ND                                               |               |  |
| 2,2,4-Trimethyl-1-pentene                     | ND                                    | 6.39E-03 | 1.55E-07                                  | 5.04E-08                                   | 7.03E-05                                           | 7.14E-09                                                   | 3.52E-05                                         |               |  |
| Undecane                                      | 1.34E-01                              | ND       | 5.04E-08                                  | 1.68E-07                                   | 7.62E-05                                           | 2.32E-09                                                   | 1.14E-05                                         |               |  |
| 3-Methyl-undecane                             | 4.18E-02                              | ND       | 6.37E-08                                  | 2.89E-05                                   | 2.93E-09                                           | 7.74E-09                                                   | 3.81E-05                                         |               |  |
| Dodecane                                      | 1.39E-01                              | ND       |                                           |                                            |                                                    |                                                            |                                                  |               |  |
| 2,6-Dimethyl-undecane                         | 5.28E-02                              | ND       |                                           |                                            |                                                    |                                                            |                                                  |               |  |
| Hydrocarbons                                  |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |               |  |
| Methane                                       | 4.69E+00                              | 1.64E+00 | 3.89E-06                                  | 1.76E-03                                   | 1.79E-07                                           | 8.81E-04                                                   |                                                  |               |  |
| Ethylene                                      | 1.43E+00                              | 2.29E-02 | 1.72E-06                                  | 7.82E-04                                   | 7.94E-08                                           | 3.91E-04                                                   |                                                  |               |  |
| Acetylene                                     | 1.17E+00                              | 2.13E-02 | 1.41E-06                                  | 6.39E-04                                   | 6.48E-08                                           | 3.19E-04                                                   |                                                  |               |  |
| Ethane                                        | 6.40E-02                              | 2.46E-02 | 7.69E-08                                  | 3.49E-05                                   | 3.54E-09                                           | 1.74E-05                                                   |                                                  |               |  |
| Propane                                       | 3.61E-02                              | 3.61E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| Propyne                                       | 5.68E-02                              | 3.20E-02 | 6.83E-08                                  | 3.10E-05                                   | 3.14E-09                                           | 1.55E-05                                                   |                                                  |               |  |
| Isobutane                                     | 4.75E-02                              | 4.75E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| 1-Butene/Isobutylene                          | 6.54E-02                              | 4.59E-02 | 7.87E-08                                  | 3.57E-05                                   | 3.62E-09                                           | 1.78E-05                                                   |                                                  |               |  |
| Butane                                        | 4.75E-02                              | 4.75E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| 1-Butyne/cis-Butene                           | 4.59E-02                              | 4.59E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| trans-Butene                                  | 4.59E-02                              | 4.59E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| 2-Butyne                                      | 4.42E-02                              | 4.42E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| n-Pentane                                     | 5.90E-02                              | 5.90E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| SVOCs                                         |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |               |  |
| n-nitrosodimethylamine                        | 1.77E-02                              | 1.78E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |
| bis(2-chloroethyl)ether                       | 1.77E-02                              | 1.78E-02 | ND                                        | ND                                         | ND                                                 | ND                                                         |                                                  |               |  |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |  |                                           |                                            | No. of rounds (I)                                  |                                                            | 1 item                                           |  |
|-----------------------------------------------|---------------------------------------|--|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|--|
| DODIC: B519                                   |                                       |  |                                           |                                            | release duration (t):                              |                                                            | 2 seconds                                        |  |
| Number of items per test firing => 14         |                                       |  |                                           |                                            | Unit Concentration (UC):                           |                                                            | 2.03E-04 g/m³                                    |  |
| Compound                                      | Measured Actual Concentration (mg/m³) |  | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |  |
|                                               |                                       |  |                                           |                                            |                                                    |                                                            |                                                  |  |
| phenol                                        | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2-chlorophenol                                | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 1,3-dichlorobenzene                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 1,4-dichlorobenzene                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 1,2-dichlorobenzene                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| benzyl alcohol                                | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| bis(2-chloroisopropyl)ether                   | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2-methylphenol                                | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| hexachloroethane                              | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| n-nitroso-di-n-propylamine                    | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 4-methylphenol                                | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| nitrobenzene                                  | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| isophorone                                    | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2-nitrophenol                                 | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2,4-dimethylphenol                            | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| bis(2-chloroethoxy)methane                    | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2,4-dichlorophenol                            | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| Benzole Acid                                  | 9.15E-02                              |  | 3.92E-02                                  | 6.72E-08                                   | 3.05E-05                                           | 3.10E-09                                                   | ND                                               |  |
| 1,2,4-trichlorobenzene                        | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | 3.05E-05                                           | 3.10E-09                                                   | 1.53E-05                                         |  |
| 4-chloroaniline                               | 3.55E-02                              |  | 3.57E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| hexachlorobutadiene                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 4-chloro-3-methylphenol                       | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2-methylnaphthalene                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| hexachlorocyclopentadiene                     | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2,4,6-trichlorophenol                         | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2,4,5-trichlorophenol                         | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |
| 2-chloronaphthalene                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |  |                                           |                                            |                                                    |                                                            | No. of rounds (l)                                |  | 1 item        |
|-----------------------------------------------|---------------------------------------|--|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|--|---------------|
| DODIC: B519                                   |                                       |  |                                           |                                            |                                                    |                                                            | release duration (t):                            |  | 2 seconds     |
| Number of items per test firing => 14         |                                       |  |                                           |                                            |                                                    |                                                            | Unit Concentration (UC):                         |  | 2.03E-04 g/m³ |
| Compound                                      | Measured Actual Concentration (mg/m³) |  | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |  |               |
|                                               |                                       |  |                                           |                                            |                                                    |                                                            |                                                  |  |               |
| 2-nitroaniline                                | 1.77E-02                              |  | 3.57E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| dimethylphthalate                             | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 2,6-dinitrotoluene                            | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 3-nitroaniline                                | 3.55E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 2,4-dinitrophenol                             | 3.55E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| dibenzofuran                                  | 1.77E-02                              |  | 1.34E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 2,4-dinitrotoluene                            | 1.77E-02                              |  | 3.57E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 4-nitrophenol                                 | 3.55E-02                              |  | 3.57E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 4-chlorophenyl-phenylether                    | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| diethylphthalate                              | 3.19E-02                              |  | 1.78E-02                                  | 3.82E-08                                   | 1.73E-05                                           | 1.76E-09                                                   | 8.66E-06                                         |  |               |
| 4-nitroaniline                                | 3.55E-02                              |  | 3.57E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 4,6-dinitro-2-methylphenol                    | 3.55E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| n-nitrosodiphenylamine(1)                     | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 4-bromophenyl-phenylether                     | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| hexachlorobenzene                             | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| pentachlorophenol                             | 3.55E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| di-n-butylphthalate                           | 2.57E-02                              |  | 1.78E-02                                  | 3.07E-08                                   | 1.39E-05                                           | 1.41E-09                                                   | 6.97E-06                                         |  |               |
| butylbenzylphthalate                          | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| 3,3-dichlorobenzidine                         | 3.55E-02                              |  | 3.57E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| bis(2-ethylhexyl)phthalate                    | 3.01E-01                              |  | 9.63E-02                                  | 2.56E-07                                   | 1.16E-04                                           | 1.18E-08                                                   | 5.80E-05                                         |  |               |
| di-n-octylphthalate                           | 1.77E-02                              |  | 1.78E-02                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |
| SVOC Tentatively Identified Compounds (TICs)  |                                       |  |                                           |                                            |                                                    |                                                            |                                                  |  |               |
| Acetophenone                                  | 2.00E-02                              |  | ND                                        | 4.24E-08                                   | 1.92E-05                                           | 1.95E-09                                                   | 9.61E-06                                         |  |               |
| Phenol (to be added to Form I)                | 5.80E-03                              |  | ND                                        | 1.22E-08                                   | 5.55E-06                                           | 5.63E-10                                                   | 2.78E-06                                         |  |               |
| Benzonitrile                                  | 8.90E-03                              |  | ND                                        | 1.88E-08                                   | 8.52E-06                                           | 8.65E-10                                                   | 4.26E-06                                         |  |               |
| Undecane                                      | 2.40E-02                              |  | ND                                        | 5.09E-08                                   | 2.31E-05                                           | 2.34E-09                                                   | 1.15E-05                                         |  |               |
| Dodecane                                      | 3.14E-02                              |  | ND                                        | 6.66E-08                                   | 3.02E-05                                           | 3.07E-09                                                   | 1.51E-05                                         |  |               |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |  |                                           |                                            | No. of rounds (l)                                  |                                                            | 1 item                                           |
|-----------------------------------------------|---------------------------------------|--|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|
| DODIC: B519                                   |                                       |  |                                           |                                            | release duration (l):                              |                                                            | 2 seconds                                        |
| Number of items per test firing => 14         |                                       |  |                                           |                                            | Unit Concentration (UC):                           |                                                            | 2.03E-04 g/m³                                    |
| Compound                                      | Measured Actual Concentration (mg/m³) |  | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |
|                                               |                                       |  |                                           |                                            |                                                    |                                                            |                                                  |
| Hexyl-cyclohexane                             | 1.60E-02                              |  | ND                                        | 3.40E-08                                   | 1.54E-05                                           | 1.57E-09                                                   | 7.72E-06                                         |
| Dodecamethylcyclotrihexasiloxane              | 1.18E-02                              |  | ND                                        | 2.49E-08                                   | 1.13E-05                                           | 1.15E-09                                                   | 5.66E-06                                         |
| Dodecanoic Acid                               | 9.30E-03                              |  | ND                                        | 1.96E-08                                   | 8.90E-06                                           | 9.03E-10                                                   | 4.45E-06                                         |
| Hexadecanoic Acid                             | 1.10E-02                              |  | ND                                        | 2.32E-08                                   | 1.05E-05                                           | 1.07E-09                                                   | 5.26E-06                                         |
| Octadecanoic Acid                             | ND                                    |  | ND                                        | ND                                         | ND                                                 | ND                                                         | ND                                               |
| bis(2-ethylhexyl)Decanedioic Acid             | ND                                    |  | ND                                        | ND                                         | ND                                                 | ND                                                         | ND                                               |
| TO-13 (PAHs)                                  |                                       |  |                                           |                                            |                                                    |                                                            |                                                  |
| naphthalene                                   | 1.02E-02                              |  | 2.67E-04                                  | 1.19E-08                                   | 5.40E-06                                           | 5.48E-10                                                   | 2.70E-06                                         |
| acenaphthylene                                | 1.73E-03                              |  | 1.78E-05                                  | 2.07E-09                                   | 9.38E-07                                           | 9.52E-11                                                   | 4.69E-07                                         |
| acenaphthene                                  | 1.68E-04                              |  | 8.02E-05                                  | 1.15E-10                                   | 5.23E-08                                           | 5.31E-12                                                   | 2.62E-08                                         |
| fluorene                                      | 2.93E-04                              |  | 7.66E-05                                  | 2.68E-10                                   | 1.21E-07                                           | 1.23E-11                                                   | 6.07E-08                                         |
| phenanthrene                                  | 3.90E-04                              |  | 1.32E-04                                  | 3.25E-10                                   | 1.47E-07                                           | 1.50E-11                                                   | 7.37E-08                                         |
| anthracene                                    | 4.88E-05                              |  | 1.78E-05                                  | 5.83E-11                                   | 2.64E-08                                           | 2.68E-12                                                   | 1.32E-08                                         |
| fluoranthene                                  | 1.17E-04                              |  | 3.39E-05                                  | 1.04E-10                                   | 4.71E-08                                           | 4.78E-12                                                   | 2.35E-08                                         |
| pyrene                                        | 1.19E-04                              |  | 3.21E-05                                  | 1.08E-10                                   | 4.89E-08                                           | 4.96E-12                                                   | 2.44E-08                                         |
| benzo(a)anthracene                            | 4.61E-05                              |  | 3.21E-05                                  | 2.08E-11                                   | 9.42E-09                                           | 9.56E-13                                                   | 4.71E-09                                         |
| chrysene                                      | 5.33E-05                              |  | 2.14E-05                                  | 4.07E-11                                   | 1.85E-08                                           | 1.87E-12                                                   | 9.23E-09                                         |
| benzo(b)fluoranthene                          | 1.28E-04                              |  | 3.92E-05                                  | 1.11E-10                                   | 5.02E-08                                           | 5.09E-12                                                   | 2.51E-08                                         |
| benzo(k)fluoranthene                          | 7.92E-05                              |  | 1.96E-05                                  | 7.35E-11                                   | 3.33E-08                                           | 3.38E-12                                                   | 1.67E-08                                         |
| benzo(a)pyrene                                | 8.80E-05                              |  | 2.32E-05                                  | 8.02E-11                                   | 3.64E-08                                           | 3.69E-12                                                   | 1.82E-08                                         |
| indeno(1,2,3-cd)pyrene                        | 1.15E-04                              |  | 2.14E-05                                  | 1.15E-10                                   | 5.21E-08                                           | 5.29E-12                                                   | 2.61E-08                                         |
| dibenz(a,h)anthracene                         | 3.00E-05                              |  | 2.14E-05                                  | 5.69E-12                                   | 2.58E-09                                           | 2.62E-13                                                   | 1.29E-09                                         |
| benzo(g,h,i)perylene                          | 2.00E-04                              |  | 2.14E-05                                  | 2.16E-10                                   | 9.78E-08                                           | 9.93E-12                                                   | 4.89E-08                                         |
| Dioxins/Furans                                |                                       |  |                                           |                                            |                                                    |                                                            |                                                  |
| 2378-TCDD                                     | 3.26E-09                              |  | 2.82E-09                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |
| 12378-PECDD                                   | 4.74E-09                              |  | 4.32E-09                                  | ND                                         | ND                                                 | ND                                                         | ND                                               |
| 123478-HXCDD                                  | 2.08E-09                              |  | 1.74E-09                                  | 2.49E-15                                   | 1.13E-12                                           | 1.15E-16                                                   | 5.65E-13                                         |

| Cartridge, 40-mm Target Practice, M781 (M203) |                                       |          |                                           |                                            |                                                    |                                                            | No. of rounds (I)                                |  | 1 item        |  |
|-----------------------------------------------|---------------------------------------|----------|-------------------------------------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|--|---------------|--|
| DODIC: B519                                   |                                       |          |                                           |                                            |                                                    |                                                            | release duration (t):                            |  | 2 seconds     |  |
| Number of items per test firing => 14         |                                       |          |                                           |                                            |                                                    |                                                            | Unit Concentration (UC):                         |  | 2.03E-04 g/m³ |  |
| Compound                                      | Measured Actual Concentration (mg/m³) |          | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Total Mass of Pollutant Emitted Per Item (grams) M | Average Modeled Concentration for One Item (grams/m³) CONC | Pollutant Emission Rate for One Item (g/sec) ER₁ |  |               |  |
|                                               |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |  |               |  |
| 123678-HXCDD                                  | 2.04E-09                              | 1.90E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 123789-HXCDD                                  | 5.36E-09                              | 4.91E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 1234678-HPCDD                                 | 2.25E-08                              | 3.38E-09 |                                           | 2.34E-14                                   | 1.06E-11                                           | 1.08E-15                                                   | 5.31E-12                                         |  |               |  |
| OCDD                                          | 1.59E-07                              | 1.95E-08 |                                           | 1.69E-13                                   | 7.69E-11                                           | 7.80E-15                                                   | 3.84E-11                                         |  |               |  |
| 2378-TCDF                                     | 2.71E-09                              | 2.28E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 12378-PECDF                                   | 2.15E-09                              | 1.99E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 23478-PECDF                                   | 9.48E-10                              | 8.49E-10 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 123478-HXCDF                                  | 2.65E-09                              | 2.45E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 123678-HXCDF                                  | 1.45E-09                              | 1.34E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 123789-HXCDF                                  | 4.76E-09                              | 4.52E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 234678-HXCDF                                  | 2.66E-09                              | 2.41E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 1234678-HPCDF                                 | 2.62E-09                              | 2.38E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 1234789-HPCDF                                 | 3.69E-09                              | 3.80E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| OCDF                                          | 5.71E-09                              | 5.23E-09 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| Energetics                                    |                                       |          |                                           |                                            |                                                    |                                                            |                                                  |  |               |  |
| Nitrobenzene                                  | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 2-Nitrotoluene                                | 2.59E-01                              | 3.45E-01 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 3-Nitrotoluene                                | 2.59E-01                              | 3.45E-01 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 4-Nitrotoluene                                | 2.59E-01                              | 3.45E-01 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| Nitroglycerine                                | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 1,3-Dinitrobenzene                            | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 1,3,5-Trinitrobenzene                         | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 2,4,6-Trinitrotoluene                         | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| RDX                                           | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 4-Amino-2,6-Dinitrotoluene                    | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| 2-Amino-4,6-Dinitrotoluene                    | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |
| Tetryl                                        | 3.46E-03                              | 3.45E-03 |                                           | ND                                         | ND                                                 | ND                                                         | ND                                               |  |               |  |

| Cartridge, 40-mm Target Practice, M781 (M203)                                                                           |                                                          |                                                                 |                                                  | No. of rounds (l)<br>release duration (t):                  |                                                                                     | 1 item                                                                |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| DODIC: B519                                                                                                             |                                                          |                                                                 |                                                  | Unit Concentration (UC):                                    |                                                                                     | 2 seconds                                                             |
| Number of items per test firing => 14                                                                                   |                                                          |                                                                 |                                                  | 2.03E-04                                                    |                                                                                     | g/m <sup>3</sup>                                                      |
| Compound                                                                                                                | Measured Actual<br>Concentration<br>(mg/m <sup>3</sup> ) | Measured<br>Background<br>Concentration<br>(mg/m <sup>3</sup> ) | Average Adjusted<br>Emission Factor<br>(lb/item) | Total Mass of Pollutant<br>Emitted Per Item<br>(grams)<br>M | Average Modeled<br>Concentration for<br>One Item<br>(grams/m <sup>3</sup> )<br>CONC | Pollutant Emission<br>Rate for One Item<br>(g/sec)<br>ER <sub>1</sub> |
| HMX                                                                                                                     | 6.92E-03                                                 | 6.90E-03                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    |
| Pentaerythritol tetranitrate                                                                                            | 6.92E-03                                                 | 6.90E-03                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    |
| Diphenylamine                                                                                                           | 8.65E-02                                                 | 8.62E-02                                                        | ND                                               | ND                                                          | ND                                                                                  | ND                                                                    |
| Footnotes:                                                                                                              |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |
| 1. ATC = Aberdeen Test Center (for additional information on the data, refer to the Firing Point Emission Study Report) |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |
| NA = Not Applicable                                                                                                     |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |
| ND = Not Detected                                                                                                       |                                                          |                                                                 |                                                  |                                                             |                                                                                     |                                                                       |

## APPENDIX C

### HEALTH-BASED SCREENING LEVELS AND ACUTE TOXICITY VALUES

| Compound                          |            | CAS # | For the Chronic Evaluation (HBSL) |                             |                      |                             |              | For the Acute Evaluation (ATV) |              |              |                 |             |          |
|-----------------------------------|------------|-------|-----------------------------------|-----------------------------|----------------------|-----------------------------|--------------|--------------------------------|--------------|--------------|-----------------|-------------|----------|
|                                   |            |       | Region 9 PRG (µg/m³)              | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m³) | Toxicity Endpoint (c or nc) | HBSL (µg/m³) | ERPG (µg/m³)                   | TEEL (µg/m³) | AEGL (µg/m³) | Source (T or E) | ATV (µg/m³) |          |
| Permanent Gases                   |            |       |                                   |                             |                      |                             |              |                                |              |              |                 |             |          |
| Ammonia (NH <sub>3</sub> )        | 7664-41-7  |       | 1.04E+02                          | nc                          | 104.39               | nc                          |              |                                | 1.04E+02     | 17500        | 1.75E+04        | E           | 1.75E+04 |
| Carbon Dioxide (CO <sub>2</sub> ) | 124-38-9   |       | NA                                |                             | NA                   |                             |              | NA                             | NA           | NA           | 5.40E+07        | T           | 5.40E+07 |
| Carbon Monoxide (CO)              | 630-08-0   |       | 1.00E+04                          | nc                          | NA                   | nc                          |              | 1.00E+04                       | 2.30E+05     | 2.30E+05     | 2.28E+05        | E           | 2.30E+05 |
| Oxides of Nitrogen (as NO)        | 10102-43-9 |       | 1.00E+02                          | nc                          | NA                   | nc                          |              | 1.00E+02                       |              |              | 3.08E+04        | T           | 3.08E+04 |
| Methane (CH <sub>4</sub> )        | 74-82-8    |       | NA                                |                             | NA                   |                             |              | NA                             | NA           | NA           | 9.90E+06        | T           | 9.90E+06 |
| Sulfur Dioxide (SO <sub>2</sub> ) | 7446-09-5  |       | 8.00E+01                          | nc                          | NA                   | nc                          |              | 8.00E+01                       | 7.89E+02     | 7.89E+02     | 7.86E+02        | E           | 7.89E+02 |
| Acid Gases                        |            |       |                                   |                             |                      |                             |              |                                |              |              |                 |             |          |
| Hydrogen fluoride                 | 7664-39-3  |       | NA                                |                             | NA                   |                             |              | NA                             | 1.60E+03     | 1.60E+03     | 1.64E+03        | E           | 1.60E+03 |
| Hydrogen chloride                 | 7647-01-0  |       | 2.08E+01                          | nc                          | 2.08E+01             | nc                          |              | 2.08E+01                       | 4.50E+03     | 4.50E+03     | 4.47E+03        | E           | 4.50E+03 |
| Hydrogen bromide                  | 10035-10-6 |       | NA                                |                             | NA                   |                             |              | NA                             | NA           | NA           | 9.93E+03        | T           | 9.93E+03 |
| Nitric Acid                       | 7697-37-2  |       | NA                                |                             | NA                   |                             |              | NA                             | NA           | NA           | 2.58E+03        | A           | 1.30E+03 |
| Phosphoric acid                   | 7664-38-2  |       | 1.04E+01                          | nc                          | 1.06E+01             | nc                          |              | 1.04E+01                       | NA           | NA           | 3.00E+03        | T           | 3.00E+03 |
| Sulfuric Acid                     | 7664-93-9  |       | NA                                |                             | NA                   |                             |              | NA                             | 2.00E+03     | 2.00E+03     | 2.00E+03        | E           | 2.00E+03 |
| Cyanide                           |            |       |                                   |                             |                      |                             |              |                                |              |              |                 |             |          |
| Particulate Cyanide               | 57-12-5    |       | NA                                |                             | 7.30E+01             | nc                          |              | 7.30E+01                       | NA           | NA           | 5.00E+03        | T           | 5.00E+03 |
| Hydrogen Cyanide                  | 74-90-8    |       | 3.13E+00                          | nc                          | 3.14E+00             | nc                          |              | 3.13E+00                       | NA           | NA           | 5.17E+03        | T           | 5.17E+03 |
| Particulates                      |            |       |                                   |                             |                      |                             |              |                                |              |              |                 |             |          |
| TSP                               | 12789-66-1 |       | 5.00E+01                          | nc                          | NA                   |                             |              | 5.00E+01                       | NA           | NA           | NA              |             | NA       |
| PM <sub>10</sub>                  |            |       | 5.00E+01                          | nc                          | NA                   |                             |              | 5.00E+01                       | NA           | NA           | NA              |             | NA       |
| PM <sub>2.5</sub>                 |            |       | 1.50E+01                          | nc                          | NA                   |                             |              | 1.50E+01                       | NA           | NA           | NA              |             | NA       |
| Metals                            |            |       |                                   |                             |                      |                             |              |                                |              |              |                 |             |          |
| Antimony                          | 7440-36-0  |       | NA                                |                             | 1.46E+00             | nc                          |              | 1.46E+00                       | NA           | NA           | 1.50E+03        | T           | 1.50E+03 |
| Arsenic                           | 7440-38-2  |       | 4.47E-04                          | c                           | 4.15E-04             | c                           |              | 4.47E-04                       | NA           | NA           | 3.00E+01        | T           | 3.00E+01 |
| Barium                            | 7440-39-3  |       | 5.21E-01                          | nc                          | 5.11E-01             | nc                          |              | 5.21E-01                       | NA           | NA           | 1.50E+03        | T           | 1.50E+03 |
| Beryllium                         | 7440-41-7  |       | 8.00E-04                          | c                           | 7.45E-04             | c                           |              | 8.00E-04                       | NA           | NA           | 5.00E+00        | T           | 5.00E+00 |
| Cadmium                           | 7440-43-9  |       | 1.07E-03                          | c                           | 9.94E-04             | c                           |              | 1.07E-03                       | NA           | NA           | 3.00E+01        | T           | 3.00E+01 |
| Chromium                          | 7440-47-3  |       |                                   | c                           | 1.53E-04             | c                           |              | 1.53E-04                       | NA           | NA           | 1.50E+03        | T           | 1.50E+03 |
| Cobalt                            | 7440-48-4  |       | NA                                |                             | 2.20E+02             | nc                          |              | 2.20E+02                       | NA           | NA           | 6.00E+01        | T           | 6.00E+01 |
| Copper                            | 7440-50-8  |       | NA                                |                             | 1.46E+02             | nc                          |              | 1.46E+02                       | NA           | NA           | 3.00E+03        | T           | 3.00E+03 |
| Lead                              | 7439-92-1  |       | 1.50E+00                          | nc                          | NA                   | nc                          |              | 1.50E+00                       | NA           | NA           | 1.50E+02        | T           | 1.50E+02 |
| Manganese                         | 7439-96-5  |       | 5.11E-02                          | nc                          | 5.22E-02             | nc                          |              | 5.11E-02                       | NA           | NA           | 3.00E+03        | T           | 3.00E+03 |
| Nickel                            | 7440-02-0  |       | NA                                |                             | 7.30E+01             | nc                          |              | 7.30E+01                       | NA           | NA           | 3.00E+03        | T           | 3.00E+03 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound                 | CAS #     | For the Chronic Evaluation (HBSL)               |                                   |                                                 |                                   |                                      | For the Acute Evaluation (ATV)       |                                      |                                      |                    |                                     |
|--------------------------|-----------|-------------------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------|-------------------------------------|
|                          |           | Region 9<br>PRG<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>RBC<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>( $\mu\text{g}/\text{m}^3$ ) | ERPG<br>( $\mu\text{g}/\text{m}^3$ ) | TEEL<br>( $\mu\text{g}/\text{m}^3$ ) | AEGL<br>( $\mu\text{g}/\text{m}^3$ ) | Source<br>(T or E) | ATV<br>( $\mu\text{g}/\text{m}^3$ ) |
| Selenium                 | 7782-49-2 | NA                                              |                                   | 1.83E+01                                        | nc                                | 1.83E+01                             | NA                                   | 6.00E+02                             | NA                                   | T                  | 6.00E+02                            |
| Silver                   | 7740-22-4 | NA                                              |                                   | 1.83E+01                                        | nc                                | 1.83E+01                             | NA                                   | 3.00E+02                             | NA                                   | T                  | 3.00E+02                            |
| Thallium                 | 7440-28-0 | NA                                              |                                   | 2.56E-01                                        | nc                                | 2.56E-01                             | NA                                   | 3.00E+02                             | NA                                   | T                  | 3.00E+02                            |
| Zinc                     | 7440-66-6 | NA                                              |                                   | 1.10E+03                                        | nc                                | 1.10E+03                             | NA                                   | 3.00E+04                             | NA                                   | T                  | 3.00E+04                            |
| <b>TO-11 Carbonyls</b>   |           |                                                 |                                   |                                                 |                                   |                                      |                                      |                                      |                                      |                    |                                     |
| Formaldehyde             | 50-00-0   | 1.48E-01                                        | c                                 | 1.39E-01                                        | c                                 | 1.48E-01                             | 1.23E+03                             | 1.23E+03                             | NA                                   | E                  | 1.23E+03                            |
| Acetaldehyde             | 75-07-0   | 8.73E-01                                        | c                                 | 8.13E-01                                        | c                                 | 8.73E-01                             | 1.80E+04                             | 1.80E+04                             | NA                                   | E                  | 1.80E+04                            |
| Acetone                  | 67-64-1   | 3.65E+02                                        | nc                                | 3.65E+02                                        | nc                                | 3.65E+02                             | NA                                   | 2.37E+06                             | NA                                   | T                  | 2.37E+06                            |
| Acrolein                 | 107-02-8  | 2.09E-02                                        | nc                                | 2.08E-02                                        | nc                                | 2.09E-02                             | 2.30E+02                             | 2.29E+02                             | NA                                   | E                  | 2.30E+02                            |
| Propionaldehyde          | 123-38-6  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 7.50E+04                             | NA                                   | T                  | 7.50E+04                            |
| Crotonaldehyde           | 4170-30-3 | 3.54E-03                                        | c                                 | 3.30E-03                                        | c                                 | 3.54E-03                             | 5.72E+03                             | 5.72E+03                             | NA                                   | E                  | 5.72E+03                            |
| Butyraldehyde            | 123-72-8  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 7.38E+04                             | NA                                   | T                  | 7.38E+04                            |
| Benzaldehyde             | 100-52-7  | 3.65E+02                                        | nc                                | 3.65E+02                                        | nc                                | 3.65E+02                             | NA                                   | 1.50E+04                             | NA                                   | T                  | 1.50E+04                            |
| Isovaleraldehyde         | 590-86-3  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   | NA                                   |                    | NA                                  |
| Valeraldehyde            | 110-62-3  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   | NA                                   |                    | NA                                  |
| o,m,p-Tolualdehyde       | 1334-78-7 | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   | NA                                   |                    | NA                                  |
| Hexaldehyde              | 66-25-1   | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   | NA                                   |                    | NA                                  |
| 2,5-Dimethylbenzaldehyde | 5779-94-2 | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   | NA                                   |                    | NA                                  |
| <b>VOCs</b>              |           |                                                 |                                   |                                                 |                                   |                                      |                                      |                                      |                                      |                    |                                     |
| Propene                  | 115-07-1  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   | NA                                   |                    | NA                                  |
| Dichlorodifluoromethane  | 75-71-8   | 2.09E+02                                        | nc                                | 1.83E+02                                        | nc                                | 2.09E+02                             | NA                                   | 1.48E+07                             | NA                                   | T                  | 1.48E+07                            |
| Chlorodifluoromethane    | 75-45-6   | 5.11E+04                                        | nc                                | 5.11E+04                                        | nc                                | 5.11E+04                             | NA                                   | 4.41E+06                             | NA                                   | T                  | 4.41E+06                            |
| Freon 114                | 76-14-2   | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 2.10E+07                             | NA                                   | T                  | 2.10E+07                            |
| Chloromethane            | 74-87-3   | 1.07E+00                                        | c                                 | 1.79E+00                                        | c                                 | 1.07E+00                             | NA                                   | 2.06E+05                             | NA                                   | T                  | 2.06E+05                            |
| Vinyl Chloride           | 75-01-4   | 2.20E-02                                        | c                                 | 2.10E-02                                        | c                                 | 2.20E-02                             | NA                                   | 1.28E+04                             | NA                                   | T                  | 1.28E+04                            |
| 1,3-Butadiene            | 106-99-0  | 3.74E-03                                        | c                                 | 3.48E-03                                        | c                                 | 3.74E-03                             | 2.20E+04                             | 2.21E+04                             | NA                                   | E                  | 2.20E+04                            |
| Bromomethane             | 74-83-9   | 5.21E+00                                        | nc                                | 5.11E+00                                        | nc                                | 5.21E+00                             | NA                                   | 5.82E+04                             | NA                                   | T                  | 5.82E+04                            |
| Chloroethane             | 75-00-3   | 2.32E+00                                        | nc                                | NA                                              | nc                                | 2.32E+00                             | NA                                   | 2.64E+06                             | NA                                   | T                  | 2.64E+06                            |
| Dichlorodifluoromethane  | 75-71-8   | 2.09E+02                                        | nc                                | 1.83E+02                                        | nc                                | 2.09E+02                             | NA                                   | 1.48E+07                             | NA                                   | T                  | 1.48E+07                            |
| Trichlorofluoromethane   | 75-69-4   | 7.30E+02                                        | nc                                | 7.30E+02                                        | nc                                | 7.30E+02                             | NA                                   | 2.81E+06                             | NA                                   | T                  | 2.81E+06                            |
| Pentane                  | 109-66-0  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 1.80E+06                             | NA                                   | T                  | 1.80E+06                            |
| Acrolein                 | 107-02-8  | 2.09E-02                                        | nc                                | 2.08E-02                                        | nc                                | 2.09E-02                             | 2.30E+02                             | 2.29E+02                             | NA                                   | E                  | 2.30E+02                            |
| 1,1-Dichloroethene       | 75-35-4   | 5.21E+02                                        | nc                                | 5.11E+02                                        | nc                                | 5.21E+02                             | NA                                   | 7.92E+04                             | NA                                   | T                  | 7.92E+04                            |
| Freon 113                | 76-13-1   | 3.13E+04                                        | nc                                | 3.14E+04                                        | nc                                | 3.13E+04                             | NA                                   | 9.58E+06                             | NA                                   | T                  | 9.58E+06                            |
| Acetone                  | 67-84-1   | 3.65E+02                                        | nc                                | 3.65E+02                                        | nc                                | 3.65E+02                             | NA                                   | 2.37E+06                             | NA                                   | T                  | 2.37E+06                            |

Appendix C: Hazardous Screening Levels and Acute Toxicity Values

| Compound                           | CAS #      | For the Chronic Evaluation (HBSL)               |                                   |                                                 |                                   |                                      | For the Acute Evaluation (ATV)       |                                      |                                      |                    |                                     |
|------------------------------------|------------|-------------------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------|-------------------------------------|
|                                    |            | Region 9<br>PRG<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>RBC<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>( $\mu\text{g}/\text{m}^3$ ) | ERPG<br>( $\mu\text{g}/\text{m}^3$ ) | ATEL<br>( $\mu\text{g}/\text{m}^3$ ) | AEGL<br>( $\mu\text{g}/\text{m}^3$ ) | Source<br>(T or E) | ATV<br>( $\mu\text{g}/\text{m}^3$ ) |
| Methyl Iodide                      | 74-88-4    | NA                                              |                                   | NA                                              |                                   | NA                                   | 145000                               | 1.45E+05                             |                                      | E                  | 1.45E+05                            |
| Carbon Disulfide                   | 75-15-0    | 7.30E+02                                        | nc                                | 7.30E+02                                        | nc                                | 7.30E+02                             | NA                                   | 3.11E+04                             |                                      | T                  | 3.11E+04                            |
| Acetonitrile                       | 75-05-8    | 6.20E+01                                        | nc                                | 6.21E+01                                        | nc                                | 6.20E+01                             | NA                                   | 1.01E+05                             |                                      | T                  | 1.01E+05                            |
| 3-Chloropropene                    | 107-05-1   | 1.04E+00                                        | nc                                | NA                                              |                                   | 1.04E+00                             | 9.39E+03                             | 9.39E+03                             |                                      | E                  | 9.39E+03                            |
| Methylene Chloride                 | 75-09-2    | 4.09E+00                                        | c                                 | 3.79E+00                                        | c                                 | 4.09E+00                             | 696000                               | 6.94E+05                             |                                      | E                  | 6.96E+05                            |
| tert-Butyl Alcohol                 | 75-65-0    | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 4.55E+05                             |                                      | T                  | 4.55E+05                            |
| Acrylonitrile                      | 107-13-1   | 2.83E-02                                        | c                                 | 2.61E-02                                        | c                                 | 2.83E-02                             | 21700                                | 2.17E+04                             |                                      | E                  | 2.17E+04                            |
| trans-1,2-Dichloroethene           | 156-60-5   | 7.30E+01                                        | nc                                | 7.30E+01                                        | nc                                | 7.30E+01                             | NA                                   | 4.95E+04                             |                                      | T                  | 4.95E+04                            |
| Methyl t-Butyl Ether               | 1634-04-4  | 3.13E+03                                        | nc                                | 3.13E+03                                        | nc                                | 3.13E+03                             | NA                                   | 4.32E+05                             |                                      | T                  | 4.32E+05                            |
| Hexane                             | 110-54-3   | 2.09E+02                                        | nc                                | 2.08E+02                                        | nc                                | 2.09E+02                             | NA                                   | 5.28E+05                             |                                      | T                  | 5.28E+05                            |
| 1,1-Dichloroethane                 | 75-34-3    | 5.21E+02                                        | nc                                | 5.11E+02                                        | nc                                | 5.21E+02                             | NA                                   | 1.21E+06                             |                                      | T                  | 1.21E+06                            |
| Vinyl Acetate                      | 108-05-4   | 2.09E+02                                        | nc                                | 2.08E+02                                        | nc                                | 2.09E+02                             | 19150                                | 1.76E+04                             |                                      | E                  | 1.92E+04                            |
| cis-1,2-Dichloroethene             | 156-59-2   | 3.65E+01                                        | nc                                | 3.65E+01                                        | nc                                | 3.65E+01                             | NA                                   | 7.92E+05                             |                                      | T                  | 7.92E+05                            |
| 2-Butanone                         | 78-93-3    | 1.04E+03                                        | nc                                | 1.04E+03                                        | nc                                | 1.04E+03                             | NA                                   | 8.85E+05                             |                                      | T                  | 8.85E+05                            |
| Ethyl Acetate                      | 141-78-6   | 3.29E+03                                        | nc                                | 3.29E+03                                        | nc                                | 3.29E+03                             | NA                                   | 1.44E+06                             |                                      | T                  | 1.44E+06                            |
| Methyl Acrylate                    | 96-33-3    | 1.10E+02                                        | nc                                | 1.10E+02                                        | nc                                | 1.10E+02                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| Chloroform                         | 67-66-3    | 8.35E-02                                        | c                                 | 7.73E-02                                        | c                                 | 8.35E-02                             | NA                                   | 9.76E+03                             |                                      | T                  | 9.76E+03                            |
| 1,1,1-Trichloroethane              | 71-55-6    | 1.04E+03                                        | nc                                | 2.30E+03                                        | nc                                | 1.04E+03                             | 1.94E+06                             | 1.91E+06                             |                                      | E                  | 1.94E+06                            |
| Carbon Tetrachloride               | 56-23-5    | 1.28E-01                                        | c                                 | 1.18E-01                                        | c                                 | 1.28E-01                             | 1.28E+05                             | 1.26E+05                             |                                      | E                  | 1.28E+05                            |
| 1,2-Dichloroethane                 | 107-06-2   | 7.39E-02                                        | c                                 | 6.88E-02                                        | c                                 | 7.39E-02                             | NA                                   | 8.08E+03                             |                                      | T                  | 8.08E+03                            |
| Benzene                            | 71-43-2    | 2.49E-01                                        | c                                 | 2.16E-01                                        | c                                 | 2.49E-01                             | 1.56E+05                             | 1.60E+05                             |                                      | E                  | 1.56E+05                            |
| Isooctane (2,2,4-trimethylpentane) | 540-84-1   | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 3.50E+05                             |                                      | T                  | 3.50E+05                            |
| Heptane                            | 142-82-5   | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 1.80E+06                             |                                      | T                  | 1.80E+06                            |
| Trichloroethane                    | 71-55-6    | 1.04E+03                                        | nc                                | 2.30E+03                                        | nc                                | 1.04E+03                             | 1.94E+06                             | 1.91E+06                             |                                      | E                  | 1.94E+06                            |
| Ethyl Acrylate                     | 140-88-5   | 1.40E-01                                        | c                                 | NA                                              |                                   | 1.40E-01                             | NA                                   | 6.14E+04                             |                                      | T                  | 6.14E+04                            |
| 1,2-Dichloropropane                | 78-87-5    | 9.89E-02                                        | c                                 | 9.21E-02                                        | c                                 | 9.89E-02                             | NA                                   | 5.08E+05                             |                                      | T                  | 5.08E+05                            |
| Methyl Methacrylate                | 80-62-6    | 7.30E+02                                        | nc                                | 7.30E+02                                        | nc                                | 7.30E+02                             | NA                                   | 4.09E+05                             |                                      | T                  | 4.09E+05                            |
| Dibromomethane                     | 74-95-3    | 3.65E+01                                        | nc                                | 3.65E+01                                        | nc                                | 3.65E+01                             | NA                                   | 2.50E+05                             |                                      | T                  | 2.50E+05                            |
| 1,4-Dioxane                        | 123-91-1   | 6.11E-01                                        | c                                 | 5.69E-01                                        | c                                 | 6.11E-01                             | NA                                   | 9.00E+04                             |                                      | T                  | 9.00E+04                            |
| Bromodichloromethane               | 75-27-4    | 1.08E-01                                        | c                                 | 1.01E-01                                        | c                                 | 1.08E-01                             | NA                                   | 4.00E+03                             |                                      | T                  | 4.00E+03                            |
| 4-Methyl-2-Pentanone               | 108-10-1   | 8.34E+01                                        | nc                                | 7.30E+01                                        | nc                                | 8.34E+01                             | NA                                   | 3.07E+05                             |                                      | T                  | 3.07E+05                            |
| Toluene                            | 108-88-3   | 4.02E+02                                        | nc                                | 4.16E+02                                        | nc                                | 4.02E+02                             | 1.88E+05                             | 1.89E+05                             |                                      | E                  | 1.88E+05                            |
| Octane                             | 111-65-9   | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   |                                      |                    | NA                                  |
| trans-1,3-Dichloropropene          | 10061-02-6 | 5.17E-02                                        | c                                 | 4.82E-02                                        | c                                 | 5.17E-02                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| Ethyl Methacrylate                 | 97-63-2    | 3.29E+02                                        | nc                                | 3.29E+02                                        | nc                                | 3.29E+02                             | NA                                   | NA                                   |                                      |                    | NA                                  |

| Compound                   | CAS #    | For the Chronic Evaluation (HBSL)               |                                   |                                                 |                                   | For the Acute Evaluation (ATV)       |                                      |                                      |                                      |                    |                                     |
|----------------------------|----------|-------------------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------|-------------------------------------|
|                            |          | Region 9<br>PRG<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>RBC<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>( $\mu\text{g}/\text{m}^3$ ) | ERPG<br>( $\mu\text{g}/\text{m}^3$ ) | TEEL<br>( $\mu\text{g}/\text{m}^3$ ) | AEBL<br>( $\mu\text{g}/\text{m}^3$ ) | Source<br>(T or E) | ATV<br>( $\mu\text{g}/\text{m}^3$ ) |
| 1,1,2-Trichloroethane      | 79-00-5  | 1.20E-01                                        | c                                 | 1.12E-01                                        | c                                 | 1.20E-01                             | NA                                   | 1.64E+05                             |                                      | T                  | 1.64E+05                            |
| Tetrachloroethane          | 127-18-4 | 3.31E+00                                        | c                                 | 3.13E+00                                        | c                                 | 3.31E+00                             | NA                                   | 6.78E+05                             |                                      | T                  | 6.78E+05                            |
| 2-Hexanone                 | 591-78-6 | NA                                              |                                   | 5.11E+00                                        | nc                                | 5.11E+00                             | NA                                   | 4.09E+04                             |                                      | T                  | 4.09E+04                            |
| Dibromochloromethane       | 124-48-1 | 8.00E-02                                        | c                                 | 7.45E-02                                        | c                                 | 8.00E-02                             | NA                                   | 6.00E+03                             |                                      | T                  | 6.00E+03                            |
| 1,2-Dibromoethane          | 106-93-4 | 8.73E-03                                        | c                                 | 8.24E-03                                        | c                                 | 8.73E-03                             | NA                                   | 1.54E+05                             |                                      | T                  | 1.54E+05                            |
| Chlorobenzene              | 108-90-7 | 6.21E+01                                        | nc                                | 6.21E+01                                        | nc                                | 6.21E+01                             | NA                                   | 1.38E+05                             |                                      | T                  | 1.38E+05                            |
| 1,1,1,2-Tetrachloroethane  | 630-20-6 | 2.60E-01                                        | c                                 | 2.41E-01                                        | c                                 | 2.60E-01                             | NA                                   | 5.15E+04                             |                                      | T                  | 5.15E+04                            |
| Ethylbenzene               | 100-41-4 | 1.06E+03                                        | nc                                | 1.06E+03                                        | nc                                | 1.06E+03                             | NA                                   | 5.43E+05                             |                                      | T                  | 5.43E+05                            |
| m&p-Xylene                 | 106-38-3 | 7.30E+02                                        | nc                                | 7.30E+03                                        | nc                                | 7.30E+02                             | NA                                   | 6.51E+05                             |                                      | T                  | 6.51E+05                            |
| o-Xylene                   | 95-47-6  | 7.30E+02                                        | nc                                | 7.30E+03                                        | nc                                | 7.30E+02                             | NA                                   | 6.51E+05                             |                                      | T                  | 6.51E+05                            |
| Styrene                    | 100-42-5 | 1.06E+03                                        | nc                                | 1.04E+03                                        | nc                                | 1.06E+03                             | 2.13E+05                             | 2.13E+05                             |                                      | E                  | 2.13E+05                            |
| Bromoform                  | 75-25-2  | 1.75E+00                                        | c                                 | 1.61E+00                                        | c                                 | 1.75E+00                             | NA                                   | 6.20E+03                             |                                      | T                  | 6.20E+03                            |
| Cumene                     | 98-82-8  | 4.02E+02                                        | nc                                | 4.02E+02                                        | nc                                | 4.02E+02                             | NA                                   | 2.46E+05                             |                                      | T                  | 2.46E+05                            |
| 1,1,2,2-Tetrachloroethane  | 79-34-5  | 3.31E-02                                        | c                                 | 3.13E-02                                        | c                                 | 3.31E-02                             | NA                                   | 2.06E+04                             |                                      | T                  | 2.06E+04                            |
| 1,2,3-Trichloropropane     | 96-18-4  | 9.61E-04                                        | c                                 | 3.13E-03                                        | c                                 | 9.61E-04                             | NA                                   | 6.03E+04                             |                                      | T                  | 6.03E+04                            |
| Bromobenzene               | 108-86-1 | 1.04E+01                                        | nc                                | NA                                              | nc                                | 1.04E+01                             | NA                                   | 4.82E+04                             |                                      | T                  | 4.82E+04                            |
| 4-Ethyltoluene             | 622-96-8 | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 1.25E+05                             |                                      | T                  | 1.25E+05                            |
| 1,3,5-Trimethylbenzene     | 108-67-8 | 6.21E+00                                        | nc                                | 6.21E+00                                        | nc                                | 6.21E+00                             | NA                                   | 3.68E+05                             |                                      | T                  | 3.68E+05                            |
| Alpha Methyl Styrene       | 98-83-9  | 2.56E+02                                        | nc                                | 2.56E+02                                        | nc                                | 2.56E+02                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| 1,2,4-Trimethylbenzene     | 95-63-6  | 6.21E+00                                        | nc                                | 6.21E+00                                        | nc                                | 6.21E+00                             | NA                                   | 1.80E+05                             |                                      | T                  | 1.80E+05                            |
| 1,3-Dichlorobenzene        | 541-73-1 | 3.29E+00                                        | nc                                | 3.29E+00                                        | nc                                | 3.29E+00                             | NA                                   | 3.61E+04                             |                                      | T                  | 3.61E+04                            |
| 1,4-Dichlorobenzene        | 106-46-7 | 3.06E-01                                        | c                                 | 2.85E-01                                        | c                                 | 3.06E-01                             |                                      | 6.61E+05                             |                                      | T                  | 6.61E+05                            |
| Benzyl Chloride            | 100-44-7 | 3.96E-02                                        | c                                 | 3.68E-02                                        | c                                 | 3.96E-02                             | 5.20E+03                             | 5.17E+03                             |                                      | E                  | 5.20E+03                            |
| 1,2-Dichlorobenzene        | 95-50-1  | 2.09E+02                                        | nc                                | 3.29E+01                                        | nc                                | 2.09E+02                             | NA                                   | 3.01E+05                             |                                      | T                  | 3.01E+05                            |
| Hexachlorethane            | 67-72-1  | 4.80E-01                                        | c                                 | 4.47E-01                                        | c                                 | 4.80E-01                             | NA                                   | 2.90E+04                             |                                      | T                  | 2.90E+04                            |
| 1,2,4-Trichlorobenzene     | 120-82-1 | 2.08E+02                                        | nc                                | 2.08E+02                                        | nc                                | 2.08E+02                             | NA                                   | 3.71E+04                             |                                      | T                  | 3.71E+04                            |
| Hexachlorobutadiene        | 87-68-3  | 8.73E-02                                        | c                                 | 8.03E-02                                        | c                                 | 8.73E-02                             | 3.21E+04                             | 3.20E+04                             |                                      | E                  | 3.21E+04                            |
| Hydrocarbons               |          |                                                 |                                   |                                                 |                                   |                                      |                                      |                                      |                                      |                    |                                     |
| Methane                    | 74-82-8  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 3.30E+06                             |                                      | T                  | 3.30E+06                            |
| Ethylene                   | 74-85-1  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 4.60E+05                             |                                      | T                  | 4.60E+05                            |
| Acetylene                  | 74-86-2  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   |                                      |                    | NA                                  |
| Ethane                     | 74-84-0  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   |                                      |                    | NA                                  |
| Propylene                  | 115-07-1 | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   |                                      |                    | NA                                  |
| Propane                    | 74-98-6  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 3.78E+06                             |                                      | T                  | 3.78E+06                            |
| Propyne (methyl acetylene) | 74-99-7  | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 2.79E+06                             |                                      | T                  | 2.79E+06                            |

Table 1. Summary of Chronic and Acute Toxicity Values

| Compound                                    | CAS#       | For the Chronic Evaluation (HBSL) |                                   |                            |                                   |                 | For the Acute Evaluation (ATV) |                 |                 |                    |                |
|---------------------------------------------|------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------------------|-----------------|--------------------------------|-----------------|-----------------|--------------------|----------------|
|                                             |            | Region 9<br>PRG<br>(µg/m³)        | Toxicity<br>Endpoint<br>(g or nc) | Region 3<br>RBC<br>(µg/m³) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>(µg/m³) | ERPG<br>(µg/m³)                | TEEL<br>(µg/m³) | AEGL<br>(µg/m³) | Source<br>(T or E) | ATV<br>(µg/m³) |
| Isobutane                                   | 75-28-5    | NA                                |                                   | NA                         |                                   | NA              | NA                             | 9.52E+05        |                 | T                  | 9.52E+05       |
| 1-Butene/Isobutylene (115-11-7)             | 106-98-9   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 6.87E+06        |                 | T                  | 6.87E+06       |
| 1,3-Butadiene                               | 106-99-0   | 3.74E-03                          | c                                 | 3.48E-03                   | c                                 | 3.74E-03        | 2.20E+04                       | 2.21E+04        |                 | E                  | 2.20E+04       |
| Butane                                      | 106-97-8   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 5.71E+06        |                 | T                  | 5.71E+06       |
| 1-Butyne/cis-Butene                         | 107-00-6   | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| trans-Butene                                | 25167-67-3 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| 2-Butyne (crotonylene)                      | 503-17-3   | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| n-Pentane                                   | 109-66-0   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 1.80E+06        |                 | T                  | 1.80E+06       |
| n-Hexane                                    | 110-54-3   | 2.10E+02                          | nc                                | 2.08E+02                   | nc                                | 2.10E+02        | NA                             | 5.28E+05        |                 | T                  | 5.28E+05       |
| VOC Tentatively Identified Compounds (TICs) |            |                                   |                                   |                            |                                   |                 |                                |                 |                 |                    |                |
| Propyne /1-Propyne                          | 74-99-7    | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.79E+06        |                 | T                  | 2.79E+06       |
| 1-Chloro-1,1-difluoroethane                 | 75-68-3    | 5.22E+04                          | nc                                | 5.11E+04                   | nc                                | 5.22E+04        | NA                             | 4.11E+07        |                 | T                  | 4.11E+07       |
| 2-Methyl-1-propene (Isobutene)              | 115-11-7   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 6.87E+06        |                 | T                  | 6.87E+06       |
| Acetaldehyde                                | 75-07-0    | 8.73E-01                          | c                                 | 8.13E-01                   | c                                 | 8.73E-01        | 1.80E+04                       | 1.80E+04        |                 | E                  | 1.80E+04       |
| 1-Buten-3-yne (Vinyl acetylene)             | 689-97-4   | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Ethylcyclopropane                           | 1191-96-4  | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Ethanol                                     | 64-17-5    | NA                                |                                   | NA                         |                                   | NA              | NA                             | 5.64E+06        |                 | T                  | 5.64E+06       |
| Furan                                       | 110-00-9   | 3.65E+00                          | nc                                | NA                         |                                   | 3.65E+00        | NA                             | 1.67E+02        |                 | T                  | 1.67E+02       |
| 1-Hexene                                    | 592-41-6   | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Thiirane (ethylene sulfide)                 | 420-12-2   | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Thiophene                                   | 110-02-1   | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| 2,2,4-Trimethyl-1-pentene                   | 61665-19-8 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Undecane                                    | 1120-21-4  | NA                                |                                   | NA                         |                                   | NA              | NA                             | 6.39E+03        |                 | T                  | 6.39E+03       |
| 3-Methyl-undecane (dodecane)                | 112-40-3   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 3.48E+03        |                 | T                  | 3.48E+03       |
| Dodecane                                    | 112-40-3   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 3.48E+03        |                 | T                  | 3.48E+03       |
| 2,6-Dimethyl-undecane                       | 17301-23-4 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| SVOCs                                       |            |                                   |                                   |                            |                                   |                 |                                |                 |                 |                    |                |
| n-nitrosodimethylamine                      | 62-75-9    | 1.37E-04                          | c                                 | 1.23E-04                   | c                                 | 1.37E-04        | NA                             | 2.50E+03        |                 |                    |                |
| bis(2-chloroethyl)ether                     | 111-44-4   | 5.82E-03                          | c                                 | 5.69E-03                   | c                                 | 5.82E-03        | NA                             | 5.85E+04        |                 | T                  | 2.50E+03       |
| phenol                                      | 108-95-2   | 2.19E+03                          | nc                                | 2.19E+03                   | nc                                | 2.19E+03        | NA                             | 3.85E+04        |                 | T                  | 5.85E+04       |
| 2-chlorophenol                              | 95-57-8    | 1.83E+01                          | nc                                | 1.83E+01                   | nc                                | 1.83E+01        | NA                             | 5.25E+03        |                 | T                  | 3.85E+04       |
| 1,3-Dichlorobenzene                         | 541-73-1   | 3.29E+00                          | nc                                | 3.29E+00                   | nc                                | 3.29E+00        | NA                             | 3.61E+04        |                 | T                  | 5.25E+03       |
| 1,4-dichlorobenzene                         | 106-46-7   | 3.06E-01                          | c                                 | 2.85E-01                   | c                                 | 3.06E-01        | NA                             | 6.61E+05        |                 | T                  | 3.61E+04       |
| 1,2-dichlorobenzene                         | 95-50-1    | 2.09E+02                          | nc                                | 3.29E+01                   | nc                                | 2.09E+02        | NA                             | 3.01E+05        |                 | T                  | 6.61E+05       |
| benzyl alcohol                              | 100-51-6   | 1.10E+03                          | nc                                | 1.10E+03                   | nc                                | 1.10E+03        | NA                             | 5.53E+04        |                 | T                  | 3.01E+05       |
|                                             |            |                                   |                                   |                            |                                   |                 |                                |                 |                 |                    | 5.53E+04       |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound                    | CAS #     | For the Chronic Evaluation (HBSL)       |                                   |                                         |                                   |                              | For the Acute Evaluation (ATV) |                              |                              |                    |                             |
|-----------------------------|-----------|-----------------------------------------|-----------------------------------|-----------------------------------------|-----------------------------------|------------------------------|--------------------------------|------------------------------|------------------------------|--------------------|-----------------------------|
|                             |           | Region 9<br>PRG<br>(µg/m <sup>3</sup> ) | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>PRG<br>(µg/m <sup>3</sup> ) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>(µg/m <sup>3</sup> ) | ERPG<br>(µg/m <sup>3</sup> )   | TEEL<br>(µg/m <sup>3</sup> ) | AEGL<br>(µg/m <sup>3</sup> ) | Source<br>(T or E) | ATV<br>(µg/m <sup>3</sup> ) |
| bis(2-chloroisopropyl)ether | 108-60-1  | 1.92E-01                                | c                                 | 1.79E-01                                | c                                 | 1.92E-01                     | NA                             | 6.99E+04                     |                              | T                  | 6.99E+04                    |
| 2-methylphenol              | 95-48-7   | 1.83E+02                                | nc                                | 1.83E+02                                | nc                                | 1.83E+02                     | NA                             | NA                           |                              |                    | NA                          |
| hexachloroethane            | 67-72-1   | 4.80E-01                                | c                                 | 4.47E-01                                | c                                 | 4.80E-01                     | NA                             | 2.90E+04                     |                              | T                  | 2.90E+04                    |
| n-nitroso-di-n-propylamine  | 621-64-7  | 9.61E-04                                | c                                 | 8.94E-04                                | c                                 | 9.61E-04                     | NA                             | 2.00E+02                     |                              | T                  | 2.00E+02                    |
| 4-methylphenol              | 106-44-5  | 1.83E+02                                | nc                                | 1.83E+02                                | nc                                | 1.83E+02                     | NA                             | NA                           |                              |                    | NA                          |
| nitrobenzene                | 98-95-3   | 2.09E+00                                | nc                                | 2.19E+00                                | nc                                | 2.09E+00                     | NA                             | 1.51E+04                     |                              | T                  | 1.51E+04                    |
| isophorone                  | 78-59-1   | 7.08E+00                                | c                                 | 6.59E+00                                | c                                 | 7.08E+00                     | NA                             | 2.83E+04                     |                              | T                  | 2.83E+04                    |
| 2-nitrophenol               | 88-75-5   | NA                                      |                                   | NA                                      |                                   | NA                           | NA                             | NA                           |                              |                    | NA                          |
| 2,4-dimethylphenol          | 105-67-9  | 7.30E+01                                | nc                                | 7.30E+01                                | nc                                | 7.30E+01                     | NA                             | NA                           |                              |                    | NA                          |
| bis(2-chloroethoxy)methane  | 111-91-1  | NA                                      |                                   | NA                                      |                                   | NA                           | NA                             | NA                           |                              |                    | NA                          |
| 2,4-dichlorophenol          | 120-83-2  | 1.10E+01                                | nc                                | 1.10E+01                                | nc                                | 1.10E+01                     | NA                             | 3.00E+04                     |                              | T                  | 3.00E+04                    |
| Benzoic Acid                | 65-85-0   | 1.46E+04                                | nc                                | 14600                                   | nc                                | 1.46E+04                     | NA                             | 12500                        |                              | T                  | 1.25E+04                    |
| 1,2,4-trichlorobenzene      | 120-82-1  | 2.08E+02                                | nc                                | 2.08E+02                                | nc                                | 2.08E+02                     | NA                             | 3.71E+04                     |                              | T                  | 3.71E+04                    |
| naphthalene                 | 91-20-3   | 3.13E+00                                | nc                                | 3.29E+00                                | nc                                | 3.13E+00                     | NA                             | 7.86E+04                     |                              | T                  | 7.86E+04                    |
| 4-chloroaniline             | 106-47-8  | 1.46E+01                                | nc                                | 1.46E+01                                | nc                                | 1.46E+01                     | NA                             | 3.00E+04                     |                              | T                  | 3.00E+04                    |
| hexachlorobutadiene         | 87-68-3   | 8.62E-02                                | c                                 | 8.03E-02                                | c                                 | 8.62E-02                     | 3.21E+04                       | 3.20E+04                     |                              | E                  | 3.21E+04                    |
| 4-chloro-3-methylphenol     | 59-50-7   | NA                                      |                                   | NA                                      |                                   | NA                           | NA                             | 2.00E+04                     |                              | T                  | 2.00E+04                    |
| 2-methylnaphthalene         | 91-57-6   | NA                                      |                                   | 7.30E+01                                | nc                                | 7.30E+01                     | NA                             | 2.00E+04                     |                              | T                  | 2.00E+04                    |
| hexachlorocyclopentadiene   | 77-47-4   | 7.30E-02                                | nc                                | 7.30E-02                                | nc                                | 7.30E-02                     | NA                             | 2.23E+02                     |                              | T                  | 2.23E+02                    |
| 2,4,6-trichlorophenol       | 88-06-2   | 1.10E+02                                | nc                                | 1.10E+02                                | nc                                | 1.10E+02                     | NA                             | 3.00E+04                     |                              | T                  | 3.00E+04                    |
| 2,4,5-trichlorophenol       | 95-95-4   | 3.65E+02                                | nc                                | 3.65E+02                                | nc                                | 3.65E+02                     | NA                             | 3.00E+04                     |                              | T                  | 3.00E+04                    |
| 2-chloronaphthalene         | 91-58-7   | 2.92E+02                                | nc                                | 2.92E+02                                | nc                                | 2.92E+02                     | NA                             | 6.00E+02                     |                              | T                  | 6.00E+02                    |
| 2-nitroaniline              | 88-74-4   | 2.09E-01                                | nc                                | 2.08E-01                                | nc                                | 2.09E-01                     | NA                             | NA                           |                              |                    | NA                          |
| Acenaphthylene              | 208-96-8  | NA                                      |                                   | NA                                      |                                   | NA                           | NA                             | 2.00E+02                     |                              | T                  | 2.00E+02                    |
| dimethylphthalate           | 131-11-3  | 3.65E+04                                | nc                                | 3.65E+04                                | nc                                | 3.65E+04                     | NA                             | 1.50E+04                     |                              | T                  | 1.50E+04                    |
| 2,6-dinitrotoluene          | 606-20-2  | 3.65E+00                                | nc                                | 3.65E+00                                | nc                                | 3.65E+00                     | NA                             | 6.00E+02                     |                              | T                  | 6.00E+02                    |
| Acenaphthene                | 83-32-9   | 2.19E+02                                | nc                                | 2.19E+02                                | nc                                | 2.19E+02                     | NA                             | 1.25E+03                     |                              | T                  | 1.25E+03                    |
| 3-nitroaniline              | 99-09-2   | NA                                      |                                   | NA                                      |                                   | NA                           | NA                             | NA                           |                              |                    | NA                          |
| 2,4-dinitrophenol           | 51-28-5   | 7.30E+00                                | nc                                | 7.30E+00                                | nc                                | 7.30E+00                     | NA                             | 7.50E+03                     |                              | T                  | 7.50E+03                    |
| dibenzofuran                | 132-64-9  | 1.46E+01                                | nc                                | 1.46E+01                                | nc                                | 1.46E+01                     | NA                             | NA                           |                              |                    | NA                          |
| 2,4-dinitrotoluene          | 121-14-2  | 7.30E+00                                | nc                                | 7.30E+00                                | nc                                | 7.30E+00                     | NA                             | 6.00E+02                     |                              | T                  | 6.00E+02                    |
| 4-nitrophenol               | 100-02-7  | 2.92E+01                                | nc                                | 2.92E+01                                | nc                                | 2.92E+01                     | NA                             | 3.00E+04                     |                              | T                  | 3.00E+04                    |
| Fluorene                    | 86-73-7   | 1.46E+02                                | nc                                | 1.46E+02                                | nc                                | 1.46E+02                     | NA                             | 7.50E+04                     |                              | T                  | 7.50E+04                    |
| 4-chlorophenyl-phenylether  | 7005-72-3 | NA                                      |                                   | NA                                      |                                   | NA                           | NA                             | NA                           |                              |                    | NA                          |
| diethylphthalate            | 84-66-2   | 2.92E+03                                | nc                                | 2.92E+03                                | nc                                | 2.92E+03                     | NA                             | 1.50E+04                     |                              | T                  | 1.50E+04                    |

| Compound                                            | CAS #     | For the Chronic Evaluation (HBSL) |                                   |                            |                                   |                 | For the Acute Evaluation (ATV) |                 |                 |                    |                |
|-----------------------------------------------------|-----------|-----------------------------------|-----------------------------------|----------------------------|-----------------------------------|-----------------|--------------------------------|-----------------|-----------------|--------------------|----------------|
|                                                     |           | Region 9<br>PRG<br>(µg/m³)        | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>RBC<br>(µg/m³) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>(µg/m³) | ERPG<br>(µg/m³)                | TEEL<br>(µg/m³) | AEGL<br>(µg/m³) | Source<br>(T or E) | ATV<br>(µg/m³) |
| 4-nitroaniline                                      | 100-01-6  | NA                                |                                   | NA                         |                                   | NA              | NA                             | 9.00E+03        |                 | T                  | 9.00E+03       |
| 4,6-dinitro-2-methylphenol                          | 534-52-1  | NA                                |                                   | 3.65E-01                   | nc                                | 3.65E-01        | NA                             | 5.00E+02        |                 | T                  | 5.00E+02       |
| n-nitrosodiphenylamine(1)                           | 86-30-6   | 1.37E+00                          | c                                 | 1.28E+00                   | c                                 | 1.37E+00        | NA                             | NA              |                 |                    | NA             |
| 4-bromophenyl-phenylether                           | 101-55-3  | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| hexachlorobenzene                                   | 118-74-1  | 4.18E-03                          | c                                 | 3.91E-03                   | c                                 | 4.18E-03        | NA                             | 7.50E+01        |                 | T                  | 7.50E+01       |
| pentachlorophenol                                   | 87-86-5   | 5.60E-02                          | c                                 | 5.22E-02                   | c                                 | 5.60E-02        | NA                             | 1.50E+03        |                 | T                  | 1.50E+03       |
| phenanthrene                                        | 85-01-8   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.00E+03        |                 | T                  | 2.00E+03       |
| anthracene                                          | 120-12-7  | 1.10E+03                          | nc                                | 1.10E+03                   | nc                                | 1.10E+03        | NA                             | 6.00E+03        |                 | T                  | 6.00E+03       |
| di-n-butylphthalate                                 | 84-74-2   | 3.65E+02                          | nc                                | 3.65E+02                   | nc                                | 3.65E+02        | NA                             | 1.50E+04        |                 | T                  | 1.50E+04       |
| fluoranthene                                        | 206-44-0  | 1.46E+02                          | nc                                | 1.46E+02                   | nc                                | 1.46E+02        | NA                             | 3.00E+01        |                 | T                  | 3.00E+01       |
| pyrene                                              | 129-00-0  | 1.10E+02                          | nc                                | 1.10E+02                   | nc                                | 1.10E+02        | NA                             | 1.50E+04        |                 | T                  | 1.50E+04       |
| butylbenzylphthalate                                | 85-68-7   | 7.30E+02                          | nc                                | 7.30E+02                   | nc                                | 7.30E+02        | NA                             | 5.00E+05        |                 | T                  | 5.00E+05       |
| benzo(a)anthracene                                  | 56-56-3   | 2.17E-02                          | c                                 | 8.58E-03                   | c                                 | 2.17E-02        | NA                             | 6.00E+02        |                 | T                  | 6.00E+02       |
| chrysene                                            | 218-01-9  | 2.17E+00                          | c                                 | 8.58E-01                   | c                                 | 2.17E+00        | NA                             | 2.00E+02        |                 | T                  | 2.00E+02       |
| 3,3-dichlorobenzidine                               | 91-94-1   | 1.50E-02                          | c                                 | 1.39E-02                   | c                                 | 1.50E-02        | NA                             | 6.21E+03        |                 | T                  | 6.21E+03       |
| bis(2-ethylhexyl)phthalate                          | 117-81-7  | 4.80E-01                          | c                                 | 4.47E-01                   | c                                 | 4.80E-01        | NA                             | 1.00E+04        |                 | T                  | 1.00E+04       |
| di-n-octylphthalate                                 | 117-84-0  | 7.30E+01                          | nc                                | 7.30E+01                   | nc                                | 7.30E+01        | NA                             | 1.50E+05        |                 | T                  | 1.50E+05       |
| benzo(b)fluoranthene                                | 205-99-2  | 2.17E-02                          | c                                 | 8.58E-03                   | c                                 | 2.17E-02        | NA                             | NA              |                 |                    | NA             |
| benzo(k)fluoranthene                                | 207-08-9  | 2.17E-01                          | c                                 | 8.58E-02                   | c                                 | 2.17E-01        | NA                             | NA              |                 |                    | NA             |
| benzo(a)pyrene                                      | 50-32-8   | 2.17E-03                          | c                                 | 2.02E-03                   | c                                 | 2.17E-03        | NA                             | 7.50E+03        |                 | T                  | 7.50E+03       |
| indeno(1,2,3-cd)pyrene                              | 193-39-5  | 2.17E-02                          | c                                 | 8.58E-03                   | c                                 | 2.17E-02        | NA                             | NA              |                 |                    | NA             |
| dibenz(a,h)anthracene                               | 53-70-3   | 2.17E-03                          | c                                 | 8.58E-04                   | c                                 | 2.17E-03        | NA                             | 3.00E+04        |                 | T                  | 3.00E+04       |
| benzo(g,h,i)perylene                                | 191-24-2  | NA                                |                                   | NA                         |                                   | NA              | NA                             | 3.00E+04        |                 | T                  | 3.00E+04       |
| <b>SVOC Tentatively Identified Compounds (TICs)</b> |           |                                   |                                   |                            |                                   |                 |                                |                 |                 |                    |                |
| Acetophenone                                        | 98-86-2   | 2.10E-02                          | nc                                | 2.08E-02                   | nc                                | 2.10E-02        | NA                             | 3.00E+04        |                 | T                  | 3.00E+04       |
| Phenol (to be added to Form I)                      | 108-95-2  | 2.19E+03                          | nc                                | 2.19E+03                   | nc                                | 2.19E+03        | NA                             | 3.85E+04        |                 | T                  | 3.85E+04       |
| Benzonitrile                                        | 100-47-0  | NA                                |                                   | NA                         |                                   | NA              | NA                             | 1.50E+04        |                 | T                  | 1.50E+04       |
| Undecane                                            | 1120-21-4 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 6.39E+03        |                 | T                  | 6.39E+03       |
| Dodecane                                            | 112-40-3  | NA                                |                                   | NA                         |                                   | NA              | NA                             | 3.48E+03        |                 | T                  | 3.48E+03       |
| Hexyl-cyclohexane                                   | 4292-75-5 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Dodecamethylcyclotrihexasiloxane                    | 540-97-6  | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Dodecanoic Acid (Lauric Acid)                       | 143-07-7  | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| Hexadecanoic Acid (Palmitic Acid)                   | 57-10-3   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 7.50E+02        |                 | T                  | 7.50E+02       |
| Octadecanoic Acid (Stearic Acid)                    | 57-11-4   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 3.50E+04        |                 | T                  | 3.50E+04       |
| bis(2-ethylhexyl) Decanedioic Acid                  | 122-62-3  | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |

| Compound                            | CAS #      | For the Chronic Evaluation (HBSL) |                                   |                            |                                   |                 | For the Acute Evaluation (ATV) |                 |                 |                    |                |
|-------------------------------------|------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------------------|-----------------|--------------------------------|-----------------|-----------------|--------------------|----------------|
|                                     |            | Region 9<br>PRG<br>(µg/m³)        | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>RBC<br>(µg/m³) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>(µg/m³) | ERPG<br>(µg/m³)                | TEEL<br>(µg/m³) | AEGL<br>(µg/m³) | Source<br>(T or E) | ATV<br>(µg/m³) |
| TO-13 (PAHs)                        |            |                                   |                                   |                            |                                   |                 |                                |                 |                 |                    |                |
| naphthalene                         | 91-20-3    | 3.13E+00                          | nc                                | 3.29E+00                   | nc                                | 3.13E+00        | NA                             | 7.86E+04        |                 | T                  | 7.86E+04       |
| acenaphthylene                      | 208-96-8   | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.00E+02        |                 | T                  | 2.00E+02       |
| acenaphthene                        | 83-32-9    | 2.19E+02                          | nc                                | 2.19E+02                   | nc                                | 2.19E+02        | NA                             | 1.25E+03        |                 | T                  | 1.25E+03       |
| fluorene                            | 86-73-7    | 1.46E+02                          | nc                                | 1.46E+02                   | nc                                | 1.46E+02        | NA                             | 7.50E+04        |                 | T                  | 7.50E+04       |
| phenanthrene                        | 85-01-8    | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.00E+03        |                 | T                  | 2.00E+03       |
| anthracene                          | 120-12-7   | 1.10E+03                          | nc                                | 1.10E+03                   | nc                                | 1.10E+03        | NA                             | 6.00E+03        |                 | T                  | 6.00E+03       |
| fluoranthene                        | 206-44-0   | 1.46E+02                          | nc                                | 1.46E+02                   | nc                                | 1.46E+02        | NA                             | 3.00E+01        |                 | T                  | 3.00E+01       |
| pyrene                              | 129-00-0   | 1.10E+02                          | nc                                | 1.10E+02                   | nc                                | 1.10E+02        | NA                             | 1.50E+04        |                 | T                  | 1.50E+04       |
| benzo(a)anthracene                  | 56-55-3    | 2.17E-02                          | c                                 | 8.58E-03                   | c                                 | 2.17E-02        | NA                             | 6.00E+02        |                 | T                  | 6.00E+02       |
| chrysene                            | 218-01-9   | 2.17E+00                          | c                                 | 8.58E-01                   | c                                 | 2.17E-02        | NA                             | 2.00E+02        |                 | T                  | 2.00E+02       |
| benzo(b)fluoranthene                | 205-99-2   | 2.17E-02                          | c                                 | 8.58E-03                   | c                                 | 2.17E-01        | NA                             | NA              |                 |                    | NA             |
| benzo(k)fluoranthene                | 207-08-9   | 2.17E-01                          | c                                 | 8.58E-02                   | c                                 | 2.17E-03        | NA                             | 7.50E+03        |                 | T                  | 7.50E+03       |
| benzo(a)pyrene                      | 50-32-8    | 2.17E-03                          | c                                 | 2.02E-03                   | c                                 | 2.17E-02        | NA                             | NA              |                 |                    | NA             |
| indeno(1,2,3-cd)pyrene              | 193-39-5   | 2.17E-02                          | c                                 | 8.58E-03                   | c                                 | 2.17E-02        | NA                             | 3.00E+04        |                 | T                  | 3.00E+04       |
| dibenz(a,h)anthracene               | 53-70-3    | 2.17E-03                          | c                                 | 8.58E-04                   | c                                 | 2.17E-03        | NA                             | 3.00E+04        |                 | T                  | 3.00E+04       |
| benzo(g,h,i)perylene                | 191-24-2   | NA                                |                                   | NA                         |                                   | NA              | NA                             |                 |                 |                    |                |
| Dioxins/Furans                      |            |                                   |                                   |                            |                                   |                 |                                |                 |                 |                    |                |
| 2378-Tetrachlorodibenzo-p-dioxin    | 1746-01-6  | 4.48E-08                          | c                                 | 4.17E-08                   | c                                 | 4.48E-08        | NA                             | 3.50E+00        |                 | T                  | 3.50E+00       |
| 12378-Pentachlorodibenzo-p-dioxin   | 40321-76-4 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.50E+00        |                 | T                  | 2.50E+00       |
| 123478-Hexachlorodibenzo-p-dioxin   | 39227-28-6 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| 123678-Hexachlorodibenzo-p-dioxin   | 57653-85-7 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 1.50E+01        |                 | T                  | 1.50E+01       |
| 123789-Hexachlorodibenzo-p-dioxin   | 19408-74-3 | 1.48E-06                          | c                                 | 1.38E-06                   | c                                 | 1.48E-06        | NA                             | NA              |                 |                    | NA             |
| 1234678-Heptachlorodibenzo-p-dioxin | 35822-46-9 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| OCDD                                | 3268-87-9  | NA                                |                                   | NA                         |                                   | NA              | NA                             | 1.50E+02        |                 | T                  | 1.50E+02       |
| 2378-Tetrachlorodibenzo-p-furan     | 51207-31-9 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.00E+00        |                 | T                  | 2.00E+00       |
| 12378-Pentachlorodibenzo-p-furan    | 57117-41-6 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| 23478-Pentachlorodibenzo-o-furan    | 57117-31-4 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 7.50E-02        |                 | T                  | 7.50E-02       |
| 123478-Hexachlorodibenzo-p-furan    | 70648-26-9 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 7.50E+00        |                 | T                  | 7.50E+00       |
| 123678-Hexachlorodibenzo-p-furan    | 57117-44-9 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 2.50E+00        |                 | T                  | 2.50E+00       |
| 123789-Hexachlorodibenzo-p-furan    | 72918-21-9 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| 234678-Hexachlorodibenzo-p-furan    | 60851-34-5 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 1.50E+00        |                 | T                  | 1.50E+00       |
| 1234678-Heptachlorodibenzo-p-furan  | 67562-39-4 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| 1234789-Heptachlorodibenzo-p-furan  | 55673-89-7 | NA                                |                                   | NA                         |                                   | NA              | NA                             | NA              |                 |                    | NA             |
| OCDF                                | 39001-02-0 | NA                                |                                   | NA                         |                                   | NA              | NA                             | 3.00E+02        |                 | T                  | 3.00E+02       |

| Compound                     | CAS #      | For the Chronic Evaluation (HBSL)               |                                   |                                                 |                                   |                                      | For the Acute Evaluation (ATV)       |                                      |                                      |                    |                                     |
|------------------------------|------------|-------------------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------|-------------------------------------|
|                              |            | Region 9<br>PRG<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | Region 3<br>RBC<br>( $\mu\text{g}/\text{m}^3$ ) | Toxicity<br>Endpoint<br>(c or nc) | HBSL<br>( $\mu\text{g}/\text{m}^3$ ) | ERPG<br>( $\mu\text{g}/\text{m}^3$ ) | TEEL<br>( $\mu\text{g}/\text{m}^3$ ) | AEGL<br>( $\mu\text{g}/\text{m}^3$ ) | Source<br>(T or E) | ATV<br>( $\mu\text{g}/\text{m}^3$ ) |
| <b>Energetics</b>            |            |                                                 |                                   |                                                 |                                   |                                      |                                      |                                      |                                      |                    |                                     |
| Nitrobenzene                 | 98-95-3    | 2.09E+00                                        | nc                                | 2.19E+00                                        | nc                                | 2.09E+00                             | NA                                   | 1.51E+04                             |                                      | T                  | 1.51E+04                            |
| 2-Nitrotoluene               | 88-72-2    | 3.65E+01                                        | nc                                | 3.65E+01                                        | nc                                | 3.65E+01                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| 3-Nitrotoluene               | 99-08-1    | 3.65E+01                                        | nc                                | 7.30E+01                                        | nc                                | 3.65E+01                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| 4-Nitrotoluene               | 99-99-0    | 3.65E+01                                        | nc                                | 3.65E+01                                        | nc                                | 3.65E+01                             | NA                                   | 3.37E+04                             |                                      | T                  | 3.37E+04                            |
| Nitroglycerine               | 55-63-0    | 4.80E-01                                        | c                                 | 4.47E-01                                        | c                                 | 4.80E-01                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| 1,3-Dinitrobenzene           | 99-65-0    | 3.65E-01                                        | nc                                | 3.65E-01                                        | nc                                | 3.65E-01                             | NA                                   | 3.00E+03                             |                                      | T                  | 3.00E+03                            |
| 2,6-Dinitrotoluene           | 606-20-2   | 3.65E+00                                        | nc                                | 3.65E+00                                        | nc                                | 3.65E+00                             | NA                                   | 6.00E+02                             |                                      | T                  | 6.00E+02                            |
| 2,5-Dinitrotoluene           | 619-15-8   | 3.65E+00                                        | nc                                | 3.65E+00                                        | nc                                | 3.65E+00                             | NA                                   | 6.00E+02                             |                                      | T                  | 6.00E+02                            |
| 1,3,5-Trinitrobenzene        | 99-35-4    | 1.10E+02                                        | nc                                | 1.10E+02                                        | nc                                | 1.10E+02                             | NA                                   | 3.00E+04                             |                                      | T                  | 3.00E+04                            |
| 2,4,6-Trinitrotoluene        | 118-96-7   | 2.24E-01                                        | c                                 | 2.09E-01                                        | c                                 | 2.24E-01                             | NA                                   | 2.50E+04                             |                                      | T                  | 2.50E+04                            |
| RDX                          | 121-82-4   | 6.11E-02                                        | c                                 | 5.69E-02                                        | c                                 | 6.11E-02                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| 4-Amino-2,6-Dinitrotoluene   | 19406-51-0 | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | NA                                   |                                      |                    | NA                                  |
| 2-Amino-2,6-Dinitrotoluene   | 35572-78-2 | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 1.50E+04                             |                                      | T                  | 1.50E+04                            |
| Tetryl                       | 479-45-8   | 3.65E+01                                        | nc                                | 3.65E+01                                        | nc                                | 3.65E+01                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| HMX                          | 2691-41-0  | 1.83E+02                                        | nc                                | 1.83E+02                                        | nc                                | 1.83E+02                             | NA                                   | NA                                   |                                      |                    | NA                                  |
| Pentaerythritol tetranitrate | 78-11-5    | NA                                              |                                   | NA                                              |                                   | NA                                   | NA                                   | 5.00E+01                             |                                      | T                  | 5.00E+01                            |
| Dibutyl Phthalate            | 84-74-2    | 3.65E+02                                        | nc                                | 3.65E+02                                        | nc                                | 3.65E+02                             | NA                                   | 1.50E+04                             |                                      | T                  | 1.50E+04                            |
| Diocetyl Phthalate           | 117-81-7   | 4.80E-01                                        | c                                 | 4.47E-01                                        | c                                 | 4.80E-01                             | NA                                   | 1.00E+04                             |                                      | T                  | 1.00E+04                            |
| Diphenylamine                | 122-39-4   | 9.13E+01                                        | nc                                | 9.13E+01                                        | nc                                | 9.13E+01                             | NA                                   | 3.00E+04                             |                                      | T                  | 3.00E+04                            |

Footnotes:

PRG: Preliminary Remediation Goals

c: Cancer

nc: non-cancer

RBC: Risk-Based Concentration

HBSL: Health-based Screening Level

(E) ERPG: Emergency Response Planning Guidelines

(T) TEEL: Temporary Emergency Exposure Limits

(A) AEGL: Acute Exposure Guideline Level

ATV: Acute Toxicity Value

NA: Not available

APPENDIX D  
RISK ASSESSMENT DATA

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| <b>Permanent Gases</b>                         |                                              |                                                         |                                |      |                                            |                                              |                              |
| Ammonia (NH <sub>3</sub> )                     | 3.10E-02                                     | 1.04E+02                                                | 2.97E-04                       | no   | 2.81E+00                                   | 1.75E+04                                     | 1.61E-04                     |
| Carbon Dioxide (CO <sub>2</sub> )              | 9.61E+00                                     | NV                                                      |                                | na   | 3.49E+03                                   | 5.40E+07                                     | 6.47E-05                     |
| Carbon Monoxide (CO)                           | 9.25E+00                                     | 1.00E+04                                                | 9.25E-04                       | no   | 8.40E+02                                   | 2.30E+05                                     | 3.65E-03                     |
| Oxides of Nitrogen (as NO)                     | 2.27E-01                                     | 1.00E+02                                                | 2.27E-03                       | no   | 8.26E+01                                   | 3.08E+04                                     | 2.69E-03                     |
| Sulfur Dioxide (SO <sub>2</sub> )              | NA                                           | 8.00E+01                                                |                                | na   | NA                                         | 7.89E+02                                     | na                           |
| <b>Acid Gases</b>                              |                                              |                                                         |                                |      |                                            |                                              |                              |
| Hydrogen fluoride                              | NA                                           | NV                                                      |                                | na   | NA                                         | 1.60E+03                                     | na                           |
| Hydrogen chloride                              | 2.36E-03                                     | 2.08E+01                                                | 1.13E-04                       | no   | 2.14E-01                                   | 4.50E+03                                     | 4.76E-05                     |
| Hydrogen bromide                               | NA                                           | NV                                                      |                                | na   | NA                                         | 9.93E+03                                     | na                           |
| Nitric Acid                                    | 5.22E-03                                     | NV                                                      |                                | na   | 4.74E-01                                   | 1.30E+03                                     | 3.64E-04                     |
| Phosphoric acid                                | NA                                           | 1.04E+01                                                |                                | na   | NA                                         | 3.00E+03                                     | na                           |
| Sulfuric Acid                                  | NA                                           | NV                                                      |                                | na   | NA                                         | 2.00E+03                                     | na                           |
| <b>Cyanide</b>                                 |                                              |                                                         |                                |      |                                            |                                              |                              |
| Particulate Cyanide                            | 1.18E-03                                     | 7.30E+01                                                | 1.61E-05                       | no   | 4.28E-01                                   | 5.00E+03                                     | 8.56E-05                     |
| Hydrogen Cyanide                               | 4.80E-03                                     | 3.13E+00                                                | 1.54E-03                       | no   | 1.75E+00                                   | 5.17E+03                                     | 3.38E-04                     |
| <b>Particulates</b>                            |                                              |                                                         |                                |      |                                            |                                              |                              |
| TSP                                            | 5.11E-01                                     | 5.00E+01                                                | 1.02E-02                       | no   | 4.64E+01                                   | NA                                           | na                           |
| PM10                                           | 5.03E-01                                     | 5.00E+01                                                | 1.01E-02                       | no   | 4.57E+01                                   | NA                                           | na                           |
| PM2.5                                          | 4.17E-01                                     | 1.50E+01                                                | 2.78E-02                       | no   | 3.79E+01                                   | NA                                           | na                           |
| <b>Metals</b>                                  |                                              |                                                         |                                |      |                                            |                                              |                              |
| Antimony                                       | 4.54E-09                                     | 1.46E+00                                                | 3.11E-09                       | no   | 1.65E+00                                   | 1.50E+03                                     | 1.10E-03                     |
| Arsenic                                        | 4.30E-12                                     | 4.47E-04                                                | 9.61E-09                       | no   | 3.64E-03                                   | 3.00E+01                                     | 1.21E-04                     |
| Barium                                         | 5.71E-08                                     | 5.21E-01                                                | 1.10E-07                       | no   | 2.07E+01                                   | 1.50E+03                                     | 1.38E-02                     |
| Beryllium                                      | NA                                           | 8.00E-04                                                |                                | na   | NA                                         | 5.00E+00                                     | na                           |
| Cadmium                                        | NA                                           | 1.07E-03                                                |                                | na   | NA                                         | 3.00E+01                                     | na                           |
| Chromium                                       | 3.94E-11                                     | 1.53E-04                                                | 2.58E-07                       | no   | 1.43E-02                                   | 1.50E+03                                     | 9.53E-06                     |
| Cobalt                                         | 1.13E-11                                     | 2.20E+02                                                | 5.15E-14                       | no   | 4.12E-03                                   | 6.00E+01                                     | 6.86E-05                     |
| Copper                                         | 9.09E-08                                     | 1.46E+02                                                | 6.23E-10                       | no   | 3.30E+01                                   | 3.00E+03                                     | 1.10E-02                     |
| Lead                                           | 4.10E-08                                     | 1.50E+00                                                | 2.74E-08                       | no   | 1.49E+01                                   | 1.50E+02                                     | 9.94E-02                     |

Table D-1: Comparison of Air Concentrations With Health-Based Values for the M918

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                          |      |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|--------------------------|------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> / ATV | > 1? |
| Manganese                                      | 7.38E-11                                     | 5.11E-02                                                | 1.44E-09                       | no   | 2.68E-02                                   | 3.00E+03                                     | 8.93E-06                 | no   |
| Nickel                                         | 2.10E-10                                     | 7.30E+01                                                | 2.88E-12                       | no   | 7.64E-02                                   | 3.00E+03                                     | 2.55E-05                 | no   |
| Selenium                                       | NA                                           | 1.83E+01                                                |                                | na   | NA                                         | 6.00E+02                                     |                          | na   |
| Silver                                         | 2.66E-12                                     | 1.83E+01                                                | 1.46E-13                       | no   | 9.67E-04                                   | 3.00E+02                                     | 3.22E-06                 | no   |
| Thallium                                       | NA                                           | 2.56E-01                                                |                                | na   | NA                                         | 3.00E+02                                     |                          | na   |
| Zinc                                           | 6.89E-09                                     | 1.10E+03                                                | 6.29E-12                       | no   | 2.50E+00                                   | 3.00E+04                                     | 8.34E-05                 | no   |
| TO-11 Carbonyls                                |                                              |                                                         |                                |      |                                            |                                              |                          |      |
| Formaldehyde                                   | 4.20E-10                                     | 1.48E-01                                                | 6.64E-09                       | no   | 8.91E-02                                   | 1.23E+03                                     | 7.24E-05                 | no   |
| Acetaldehyde                                   | 1.54E-10                                     | 8.73E-01                                                | 4.12E-10                       | no   | 3.27E-02                                   | 1.80E+04                                     | 1.82E-06                 | no   |
| Acetone                                        | NA                                           | 3.65E+02                                                |                                | na   | NA                                         | 2.37E+06                                     |                          | na   |
| Propionaldehyde                                | NA                                           | NV                                                      |                                | na   | NA                                         | 7.50E+04                                     |                          | na   |
| Crotonaldehyde                                 | NA                                           | 3.54E-03                                                |                                | na   | NA                                         | 5.72E+03                                     |                          | na   |
| Butyraldehyde                                  | NA                                           | NV                                                      |                                | na   | NA                                         | 7.38E+04                                     |                          | na   |
| Benzaldehyde                                   | NA                                           | 3.65E+02                                                |                                | na   | NA                                         | 1.50E+04                                     |                          | na   |
| Isovaleraldehyde                               | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                          | na   |
| Valeraldehyde                                  | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                          | na   |
| o,m,p-Tolualdehyde                             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                          | na   |
| Hexaldehyde                                    | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                          | na   |
| 2,5-Dimethylbenzaldehyde                       | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                          | na   |
| VOCs                                           |                                              |                                                         |                                |      |                                            |                                              |                          |      |
| Propene                                        | 1.37E-09                                     | NV                                                      |                                | na   | 1.25E-01                                   | NA                                           |                          | na   |
| Dichlorodifluoromethane                        | 1.48E-11                                     | 2.09E+02                                                | 7.09E-14                       | no   | 5.37E-03                                   | 1.48E+07                                     | 3.62E-10                 | no   |
| Chlorodifluoromethane                          | 2.35E-11                                     | 5.11E+04                                                | 4.60E-16                       | no   | 8.54E-03                                   | 4.41E+06                                     | 1.93E-09                 | no   |
| Freon 114                                      | NA                                           | NV                                                      |                                | na   | NA                                         | 2.10E+07                                     |                          | na   |
| Chloromethane                                  | 4.12E-12                                     | 1.07E+00                                                | 9.00E-12                       | no   | 3.49E-03                                   | 2.06E+05                                     | 1.69E-08                 | no   |
| Vinyl Chloride                                 | 5.46E-12                                     | 2.20E-02                                                | 5.79E-10                       | no   | 4.63E-03                                   | 1.28E+04                                     | 3.63E-07                 | no   |
| 1,3-Butadiene                                  | 9.46E-12                                     | 3.74E-03                                                | 5.91E-09                       | no   | 2.00E-03                                   | 2.20E+04                                     | 9.11E-08                 | no   |
| Bromomethane                                   | NA                                           | 5.21E+00                                                |                                | na   | NA                                         | 5.82E+04                                     |                          | na   |
| Chloroethane                                   | NA                                           | 2.32E+00                                                |                                | na   | NA                                         | 2.64E+06                                     |                          | na   |
| Dichlorofluoromethane                          | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 1.48E+07                                     |                          | na   |

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Trichlorofluoromethane                         | 1.12E-11                                     | 7.30E+02                                                | 1.53E-14                       | no   | 4.07E-03                                   | 2.81E+06                                     | 1.45E-09                     |
| Acrolein                                       | 1.55E-09                                     | 2.09E-02                                                | 7.41E-08                       | no   | 1.40E-01                                   | 2.30E+02                                     | 6.11E-04                     |
| 1,1-Dichloroethene                             | NA                                           | 5.21E+02                                                |                                | na   | NA                                         | 7.92E+04                                     | na                           |
| Freon 113                                      | NA                                           | 3.13E+04                                                |                                | na   | NA                                         | 9.58E+06                                     | na                           |
| Methyl Iodide                                  | NA                                           | NV                                                      |                                | na   | NA                                         | 1.45E+05                                     | na                           |
| Carbon Disulfide                               | 1.45E-11                                     | 7.30E+02                                                | 1.98E-14                       | no   | 5.26E-03                                   | 3.11E+04                                     | 1.69E-07                     |
| Acetonitrile                                   | 5.49E-10                                     | 6.20E+01                                                | 8.86E-12                       | no   | 1.99E-01                                   | 1.01E+05                                     | 1.98E-06                     |
| 3-Chloropropene                                | NA                                           | 1.04E+00                                                |                                | na   | NA                                         | 9.39E+03                                     | na                           |
| Methylene Chloride                             | 2.43E-10                                     | 4.09E+00                                                | 1.39E-10                       | no   | 5.15E-02                                   | 6.96E+05                                     | 7.40E-08                     |
| tert-Butyl Alcohol                             | 2.61E-10                                     | NV                                                      |                                | na   | 9.50E-02                                   | 4.55E+05                                     | 2.09E-07                     |
| Acrylonitrile                                  | 2.90E-10                                     | 2.83E-02                                                | 2.40E-08                       | no   | 6.16E-02                                   | 2.17E+04                                     | 2.84E-06                     |
| trans-1,2-Dichloroethene                       | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 4.95E+04                                     | na                           |
| Methyl t-Butyl Ether                           | NA                                           | 3.13E+03                                                |                                | na   | NA                                         | 4.32E+05                                     | na                           |
| Hexane                                         | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 5.28E+05                                     | na                           |
| 1,1-Dichloroethane                             | NA                                           | 5.21E+02                                                |                                | na   | NA                                         | 1.21E+06                                     | na                           |
| Vinyl Acetate                                  | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 1.92E+04                                     | na                           |
| cis-1,2-Dichloroethene                         | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | 7.92E+05                                     | na                           |
| 2-Butanone                                     | 2.94E-11                                     | 1.04E+03                                                | 2.82E-14                       | no   | 1.07E-02                                   | 8.85E+05                                     | 1.21E-08                     |
| Ethyl Acetate                                  | NA                                           | 3.29E+03                                                |                                | na   | NA                                         | 1.44E+06                                     | na                           |
| Methyl Acrylate                                | NA                                           | 1.10E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| Chloroform                                     | NA                                           | 8.35E-02                                                |                                | na   | NA                                         | 9.76E+03                                     | na                           |
| 1,1,1-Trichloroethane                          | NA                                           | 1.04E+03                                                |                                | na   | NA                                         | 1.94E+06                                     | na                           |
| Carbon Tetrachloride                           | NA                                           | 1.28E-01                                                |                                | na   | NA                                         | 1.28E+05                                     | na                           |
| 1,2-Dichloroethane                             | 2.88E-11                                     | 7.39E-02                                                | 9.10E-10                       | no   | 2.44E-02                                   | 8.08E+03                                     | 3.02E-06                     |
| Benzene                                        | 1.36E-09                                     | 2.49E-01                                                | 1.28E-08                       | no   | 2.89E-01                                   | 1.56E+05                                     | 1.85E-06                     |
| Isooctane (2,2,4-trimethylpentane)             | NA                                           | NV                                                      |                                | na   | NA                                         | 3.50E+05                                     | na                           |
| Heptane                                        | 4.08E-11                                     | NV                                                      |                                | na   | 1.48E-02                                   | 1.80E+06                                     | 8.22E-09                     |
| Trichloroethane                                | NA                                           | 1.04E+03                                                |                                | na   | NA                                         | 1.94E+06                                     | na                           |
| Ethyl Acrylate                                 | NA                                           | 1.40E-01                                                |                                | na   | NA                                         | 6.14E+04                                     | na                           |
| 1,2-Dichloropropane                            | NA                                           | 9.89E-02                                                |                                | na   | NA                                         | 5.08E+05                                     | na                           |

Table D-1: Comparison of Air Concentrations With Health-Based Values for the M918

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Methyl Methacrylate                            | NA                                           | 7.30E+02                                                |                                | na   | NA                                         | 4.09E+05                                     | na                           |
| Dibromomethane                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | 2.50E+05                                     | na                           |
| 1,4-Dioxane                                    | NA                                           | 6.11E-01                                                |                                | na   | NA                                         | 9.00E+04                                     | na                           |
| Bromodichloromethane                           | NA                                           | 1.08E-01                                                |                                | na   | NA                                         | 4.00E+03                                     | na                           |
| 4-Methyl-2-Pentanone                           | NA                                           | 8.34E+01                                                |                                | na   | NA                                         | 3.07E+05                                     | na                           |
| Toluene                                        | 5.01E-10                                     | 4.02E+02                                                | 1.25E-12                       | no   | 4.55E-02                                   | 1.88E+05                                     | 2.43E-07                     |
| Octane                                         | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| trans-1,3-Dichloropropene                      | NA                                           | 5.17E-02                                                |                                | na   | NA                                         | NA                                           | na                           |
| Ethyl Methacrylate                             | NA                                           | 3.29E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| 1,1,2-Trichloroethane                          | NA                                           | 1.20E-01                                                |                                | na   | NA                                         | 1.64E+05                                     | na                           |
| Tetrachloroethene                              | 1.16E-11                                     | 3.31E+00                                                | 8.17E-12                       | no   | 9.83E-03                                   | 6.78E+05                                     | 1.45E-08                     |
| 2-Hexanone                                     | 2.72E-11                                     | 5.11E+00                                                | 5.33E-12                       | no   | 9.89E-03                                   | 4.09E+04                                     | 2.42E-07                     |
| Dibromochloromethane                           | NA                                           | 8.00E-02                                                |                                | na   | NA                                         | 6.00E+03                                     | na                           |
| 1,2-Dibromoethane                              | NA                                           | 8.73E-03                                                |                                | na   | NA                                         | 1.54E+05                                     | na                           |
| Chlorobenzene                                  | NA                                           | 6.21E+01                                                |                                | na   | NA                                         | 1.38E+05                                     | na                           |
| 1,1,1,2-Tetrachloroethane                      | NA                                           | 2.60E-01                                                |                                | na   | NA                                         | 5.15E+04                                     | na                           |
| Ethylbenzene                                   | 7.54E-11                                     | 1.06E+03                                                | 7.12E-14                       | no   | 2.74E-02                                   | 5.43E+05                                     | 5.05E-08                     |
| m&p-Xylene                                     | 1.32E-10                                     | 7.30E+02                                                | 1.80E-13                       | no   | 4.78E-02                                   | 6.51E+05                                     | 7.34E-08                     |
| o-Xylene                                       | 7.06E-11                                     | 7.30E+02                                                | 9.68E-14                       | no   | 2.57E-02                                   | 6.51E+05                                     | 3.94E-08                     |
| Styrene                                        | 8.50E-11                                     | 1.06E+03                                                | 8.03E-14                       | no   | 7.72E-03                                   | 2.13E+05                                     | 3.62E-08                     |
| Bromoform                                      | NA                                           | 1.75E+00                                                |                                | na   | NA                                         | 6.20E+03                                     | na                           |
| Cumene                                         | 1.96E-11                                     | 4.02E+02                                                | 4.89E-14                       | no   | 7.13E-03                                   | 2.46E+05                                     | 2.90E-08                     |
| 1,1,2,2-Tetrachloroethane                      | NA                                           | 3.31E-02                                                |                                | na   | NA                                         | 2.06E+04                                     | na                           |
| 1,2,3-Trichloropropane                         | NA                                           | 9.61E-04                                                |                                | na   | NA                                         | 6.03E+04                                     | na                           |
| Bromobenzene                                   | NA                                           | 1.04E+01                                                |                                | na   | NA                                         | 4.82E+04                                     | na                           |
| 4-Ethyltoluene                                 | 1.96E-11                                     | NV                                                      |                                | na   | 7.12E-03                                   | 1.25E+05                                     | 5.69E-08                     |
| 1,3,5-Trimethylbenzene                         | 1.47E-11                                     | 6.21E+00                                                | 2.37E-12                       | no   | 5.34E-03                                   | 3.68E+05                                     | 1.45E-08                     |
| Alpha Methyl Styrene                           | NA                                           | 2.56E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| 1,2,4-Trimethylbenzene                         | 3.27E-11                                     | 6.21E+00                                                | 5.26E-12                       | no   | 1.19E-02                                   | 1.80E+05                                     | 6.59E-08                     |
| 1,3-Dichlorobenzene                            | NA                                           | 3.29E+00                                                |                                | na   | NA                                         | 3.61E+04                                     | na                           |

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| 1,4-Dichlorobenzene                            | NA                                           | 3.06E-01                                                |                                | na   | NA                                         | 6.61E+05                                     | na                           |
| Benzyl Chloride                                | NA                                           | 3.96E-02                                                |                                | na   | NA                                         | 5.20E+03                                     | na                           |
| 1,2-Dichlorobenzene                            | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 3.01E+05                                     | na                           |
| Hexachlorethane                                | NA                                           | 4.80E-01                                                |                                | na   | NA                                         | 2.90E+04                                     | na                           |
| 1,2,4-Trichlorobenzene                         | NA                                           | 2.08E+02                                                |                                | na   | NA                                         | 3.71E+04                                     | na                           |
| Hexachlorobutadiene                            | NA                                           | 8.73E-02                                                |                                | na   | NA                                         | 3.21E+04                                     | na                           |
| Hydrocarbons                                   |                                              |                                                         |                                |      |                                            |                                              |                              |
| Methane                                        | 3.13E-08                                     | NV                                                      |                                | na   | 1.14E+01                                   | 3.30E+06                                     | 3.44E-06                     |
| Ethylene                                       | 1.26E-08                                     | NV                                                      |                                | na   | 4.56E+00                                   | 4.60E+05                                     | 9.92E-06                     |
| Acetylene                                      | 6.22E-09                                     | NV                                                      |                                | na   | 5.65E-01                                   | NA                                           | na                           |
| Ethane                                         | 1.59E-09                                     | NV                                                      |                                | na   | 1.44E-01                                   | NA                                           | na                           |
| Propane                                        | 5.11E-10                                     | NV                                                      |                                | na   | 1.86E-01                                   | 3.78E+06                                     | 4.91E-08                     |
| Propyne (methyl acetylene)                     | NA                                           | NV                                                      |                                | na   | NA                                         | 2.79E+06                                     | na                           |
| Isobutane                                      | NA                                           | NV                                                      |                                | na   | NA                                         | 9.52E+05                                     | na                           |
| 1-Butene/isobutylene (115-11-7)                | 3.96E-09                                     | NV                                                      |                                | na   | 1.44E+00                                   | 6.87E+06                                     | 2.09E-07                     |
| Butane                                         | NA                                           | NV                                                      |                                | na   | NA                                         | 5.71E+06                                     | na                           |
| 1-Butyne/cis-Butene                            | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| trans-Butene                                   | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2-Butyne (crotonylene)                         | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| n-Pentane                                      | 3.91E-10                                     | NV                                                      |                                | na   | 1.42E-01                                   | 1.80E+06                                     | 7.90E-08                     |
| C Tentatively Identified Compounds (TICs)      |                                              |                                                         |                                |      |                                            |                                              |                              |
| Propyne /1-Propyne                             | 2.50E-10                                     | NV                                                      |                                | na   | 9.10E-02                                   | 2.79E+06                                     | 3.26E-08                     |
| 1-Chloro-1,1-difluoroethane                    | 2.05E-10                                     | 5.22E+04                                                | 3.93E-15                       | no   | 7.44E-02                                   | 4.11E+07                                     | 1.81E-09                     |
| 2-Methyl-1-propene (Isobutene)                 | 1.61E-09                                     | NV                                                      |                                | na   | 5.87E-01                                   | 6.87E+06                                     | 8.54E-08                     |
| Acetaldehyde                                   | 1.08E-10                                     | 8.73E-01                                                | 2.88E-10                       | no   | 2.28E-02                                   | 1.80E+04                                     | 1.27E-06                     |
| 1-Buten-3-yne (vinyl acetylene)                | 7.78E-11                                     | NV                                                      |                                | na   | 7.07E-03                                   | NA                                           | na                           |
| Ethylcyclopropane                              | 1.43E-10                                     | NV                                                      |                                | na   | 1.30E-02                                   | NA                                           | na                           |
| Ethanol                                        | NA                                           | NV                                                      |                                | na   | NA                                         | 5.64E+06                                     | na                           |
| Furan                                          | 1.39E-10                                     | 3.65E+00                                                | 3.80E-11                       | no   | 5.04E-02                                   | 1.67E+02                                     | 3.02E-04                     |
| 1-Hexene                                       | 2.06E-10                                     | NV                                                      |                                | na   | 1.87E-02                                   | NA                                           | na                           |

Table D-1: Comparison of Air Concentrations With Health-Based Values for the M918

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Thiirane (ethylene sulfide)                    | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Thiophene                                      | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2,2,4-Trimethyl-1-pentene                      | 5.03E-10                                     | NV                                                      |                                | na   | 4.57E-02                                   | NA                                           | na                           |
| Undecane                                       | NA                                           | NV                                                      |                                | na   | NA                                         | 6.39E+03                                     | na                           |
| 3-Methyl-undecane (dodecane)                   | NA                                           | NV                                                      |                                | na   | NA                                         | 3.48E+03                                     | na                           |
| Dodecane                                       | NA                                           | NV                                                      |                                | na   | NA                                         | 3.48E+03                                     | na                           |
| 2,6-Dimethyl-undecane                          | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| <b>SVOCs</b>                                   |                                              |                                                         |                                |      |                                            |                                              |                              |
| n-nitrosodimethylamine                         | NA                                           | 1.37E-04                                                |                                | na   | NA                                         | 2.50E+03                                     | na                           |
| bis(2-chloroethyl)ether<br>phenol              | NA                                           | 5.82E-03                                                |                                | na   | NA                                         | 5.85E+04                                     | na                           |
| 2-chlorophenol                                 | NA                                           | 2.19E+03                                                |                                | na   | NA                                         | 3.85E+04                                     | na                           |
| 1,3-Dichlorobenzene                            | NA                                           | 1.83E+01                                                |                                | na   | NA                                         | 5.25E+03                                     | na                           |
| 1,4-dichlorobenzene                            | NA                                           | 3.29E+00                                                |                                | na   | NA                                         | 3.61E+04                                     | na                           |
| 1,2-dichlorobenzene                            | NA                                           | 3.06E-01                                                |                                | na   | NA                                         | 6.61E+05                                     | na                           |
| benzyl alcohol                                 | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 3.01E+05                                     | na                           |
| bis(2-chloroisopropyl)ether                    | NA                                           | 1.10E+03                                                |                                | na   | NA                                         | 5.53E+04                                     | na                           |
| 2-methylphenol                                 | NA                                           | 1.92E-01                                                |                                | na   | NA                                         | 6.99E+04                                     | na                           |
| hexachloroethane                               | NA                                           | 1.83E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| n-nitroso-di-n-propylamine                     | NA                                           | 4.80E-01                                                |                                | na   | NA                                         | 2.90E+04                                     | na                           |
| 4-methylphenol                                 | NA                                           | 9.61E-04                                                |                                | na   | NA                                         | 2.00E+02                                     | na                           |
| nitrobenzene                                   | NA                                           | 1.83E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| isophorone                                     | NA                                           | 2.09E+00                                                |                                | na   | NA                                         | 1.51E+04                                     | na                           |
| 2-nitrophenol                                  | NA                                           | 7.08E+00                                                |                                | na   | NA                                         | 2.83E+04                                     | na                           |
| 2,4-dimethylphenol                             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| bis(2-chloroethoxy)methane                     | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 2,4-dichlorophenol                             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Benzoic Acid                                   | 2.67E-10                                     | 1.10E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| 1,2,4-trichlorobenzene                         | NA                                           | 1.46E+04                                                | 1.83E-14                       | no   | 9.70E-02                                   | 1.25E+04                                     | no                           |
| 4-chloroaniline                                | NA                                           | 2.08E+02                                                |                                | na   | NA                                         | 3.71E+04                                     | na                           |
|                                                | NA                                           | 1.46E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                         |      |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|-------------------------|------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV | > 1? |
| hexachlorobutadiene                            | NA                                           | 8.62E-02                                                |                                | na   | NA                                         | 3.21E+04                                     |                         | na   |
| 4-chloro-3-methylphenol                        | NA                                           | NV                                                      |                                | na   | NA                                         | 2.00E+04                                     |                         | na   |
| 2-methylnaphthalene                            | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 2.00E+04                                     |                         | na   |
| hexachlorocyclopentadiene                      | NA                                           | 7.30E-02                                                |                                | na   | NA                                         | 2.23E+02                                     |                         | na   |
| 2,4,6-trichlorophenol                          | NA                                           | 1.10E+02                                                |                                | na   | NA                                         | 3.00E+04                                     |                         | na   |
| 2,4,5-trichlorophenol                          | NA                                           | 3.65E+02                                                |                                | na   | NA                                         | 3.00E+04                                     |                         | na   |
| 2-chloronaphthalene                            | NA                                           | 2.92E+02                                                |                                | na   | NA                                         | 6.00E+02                                     |                         | na   |
| 2-nitroaniline                                 | NA                                           | 2.09E-01                                                |                                | na   | NA                                         | NA                                           |                         | na   |
| dimethylphthalate                              | NA                                           | 3.65E+04                                                |                                | na   | NA                                         | 1.50E+04                                     |                         | na   |
| 2,6-dinitrotoluene                             | NA                                           | 3.65E+00                                                |                                | na   | NA                                         | 6.00E+02                                     |                         | na   |
| 3-nitroaniline                                 | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                         | na   |
| 2,4-dinitrophenol                              | NA                                           | 7.30E+00                                                |                                | na   | NA                                         | 7.50E+03                                     |                         | na   |
| dibenzofuran                                   | NA                                           | 1.46E+01                                                |                                | na   | NA                                         | NA                                           |                         | na   |
| 2,4-dinitrotoluene                             | NA                                           | 7.30E+00                                                |                                | na   | NA                                         | 6.00E+02                                     |                         | na   |
| 4-nitrophenol                                  | NA                                           | 2.92E+01                                                |                                | na   | NA                                         | 3.00E+04                                     |                         | na   |
| 4-chlorophenyl-phenylether                     | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                         | na   |
| diethylphthalate                               | NA                                           | 2.92E+03                                                |                                | na   | NA                                         | 1.50E+04                                     |                         | na   |
| 4-nitroaniline                                 | NA                                           | NV                                                      |                                | na   | NA                                         | 9.00E+03                                     |                         | na   |
| 4,6-dinitro-2-methylphenol                     | NA                                           | 3.65E-01                                                |                                | na   | NA                                         | 5.00E+02                                     |                         | na   |
| n-nitrosodiphenylamine(1)                      | NA                                           | 1.37E+00                                                |                                | na   | NA                                         | NA                                           |                         | na   |
| 4-bromophenyl-phenylether                      | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           |                         | na   |
| hexachlorobenzene                              | NA                                           | 4.18E-03                                                |                                | na   | NA                                         | NA                                           |                         | na   |
| pentachlorophenol                              | NA                                           | 5.60E-02                                                |                                | na   | NA                                         | 7.50E+01                                     |                         | na   |
| di-n-butylphthalate                            | NA                                           | 3.65E+02                                                |                                | na   | NA                                         | 1.50E+03                                     |                         | na   |
| butylbenzylphthalate                           | NA                                           | 7.30E+02                                                |                                | na   | NA                                         | 1.50E+04                                     |                         | na   |
| 3,3-dichlorobenzidine                          | NA                                           | 1.50E-02                                                |                                | na   | NA                                         | 5.00E+05                                     |                         | na   |
| bis(2-ethylhexyl)phthalate                     | 5.53E-11                                     | 4.80E-01                                                | 2.69E-10                       | na   | NA                                         | 6.21E+03                                     |                         | na   |
| di-n-octylphthalate                            | NA                                           | 7.30E+01                                                |                                | no   | 4.69E-02                                   | 1.00E+04                                     | 4.69E-06                | no   |
| SVOC Tentatively Identified Compounds (TICs)   |                                              |                                                         |                                |      |                                            |                                              |                         |      |
| Acetophenone                                   | NA                                           | 2.10E-02                                                |                                | na   | NA                                         | 1.50E+05                                     |                         | na   |
|                                                |                                              |                                                         |                                |      |                                            | 3.00E+04                                     |                         | na   |

Table D-1: Comparison of Air Concentrations With Health-Based Values for the M918

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Phenol (to be added to Form I)                 | NA                                           | 2.19E+03                                                |                                | na   | NA                                         | 3.85E+04                                     | na                           |
| Benzonitrile                                   | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+04                                     | na                           |
| Undecane                                       | NA                                           | NV                                                      |                                | na   | NA                                         | 6.39E+03                                     | na                           |
| Dodecane                                       | NA                                           | NV                                                      |                                | na   | NA                                         | 3.48E+03                                     | na                           |
| Hexyl-cyclohexane                              | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Dodecamethylcyclohexasiloxane                  | 1.64E-10                                     | NV                                                      |                                | na   | 1.49E-02                                   | NA                                           | na                           |
| Dodecanoic Acid (Lauric Acid)                  | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Hexadecanoic Acid (Palmitic Acid)              | 1.85E-10                                     | NV                                                      |                                | na   | 6.73E-02                                   | 7.50E+02                                     | 8.97E-05                     |
| Octadecanoic Acid (Stearic Acid)               | 1.86E-10                                     | NV                                                      |                                | na   | 6.77E-02                                   | 3.50E+04                                     | 1.94E-06                     |
| bis(2-ethylhexyl) Decanedioic Acid             | 5.32E-09                                     | NV                                                      |                                | na   | 4.84E-01                                   | NA                                           | na                           |
| <b>TO-13 (PAHs)</b>                            |                                              |                                                         |                                |      |                                            |                                              |                              |
| naphthalene                                    | 8.08E-11                                     | 3.13E+00                                                | 2.58E-11                       | no   | 2.94E-02                                   | 7.86E+04                                     | 3.74E-07                     |
| acenaphthylene                                 | 1.19E-11                                     | NV                                                      |                                | na   | 4.33E-03                                   | 2.00E+02                                     | 2.16E-05                     |
| acenaphthene                                   | 9.08E-13                                     | 2.19E+02                                                | 4.15E-15                       | no   | 3.30E-04                                   | 1.25E+03                                     | 2.64E-07                     |
| fluorene                                       | 2.28E-12                                     | 1.46E+02                                                | 1.56E-14                       | no   | 8.28E-04                                   | 7.50E+04                                     | 1.10E-08                     |
| phenanthrene                                   | 2.84E-12                                     | NV                                                      |                                | na   | 1.03E-03                                   | 2.00E+03                                     | 5.16E-07                     |
| anthracene                                     | 4.95E-13                                     | 1.10E+03                                                | 4.52E-16                       | no   | 1.80E-04                                   | 6.00E+03                                     | 3.00E-08                     |
| fluoranthene                                   | 1.95E-12                                     | 1.46E+02                                                | 1.34E-14                       | no   | 7.09E-04                                   | 3.00E+01                                     | 2.36E-05                     |
| pyrene                                         | 4.09E-12                                     | 1.10E+02                                                | 3.73E-14                       | no   | 1.49E-03                                   | 1.50E+04                                     | 9.90E-08                     |
| benzo(a)anthracene                             | 3.83E-13                                     | 2.17E-02                                                | 4.12E-11                       | no   | 3.24E-04                                   | 6.00E+02                                     | 5.41E-07                     |
| chrysene                                       | 1.86E-13                                     | 2.17E+00                                                | 2.00E-13                       | no   | 1.58E-04                                   | 2.00E+02                                     | 7.90E-07                     |
| benzo(b)fluoranthene                           | 2.15E-13                                     | 2.17E-02                                                | 2.32E-11                       | no   | 4.56E-05                                   | NA                                           | na                           |
| benzo(k)fluoranthene                           | 4.59E-13                                     | 2.17E-01                                                | 4.94E-12                       | no   | 9.74E-05                                   | NA                                           | na                           |
| benzo(a)pyrene                                 | 4.95E-13                                     | 2.17E-03                                                | 5.32E-10                       | no   | 4.19E-04                                   | 7.50E+03                                     | 5.59E-08                     |
| indeno(1,2,3-cd)pyrene                         | 3.92E-13                                     | 2.17E-02                                                | 4.22E-11                       | no   | 8.32E-05                                   | NA                                           | na                           |
| dibenz(a,h)anthracene                          | 5.00E-14                                     | 2.17E-03                                                | 5.38E-11                       | no   | 4.24E-05                                   | 3.00E+04                                     | 1.41E-09                     |
| benzo(g,h,i)perylene                           | 2.98E-12                                     | NV                                                      |                                | na   | 1.08E-03                                   | 3.00E+04                                     | 3.61E-08                     |
| <b>Dioxins/Furans</b>                          |                                              |                                                         |                                |      |                                            |                                              |                              |
| 2378-Tetrachlorodibenzo-p-dioxin               | NA                                           | 4.48E-08                                                |                                | na   | NA                                         | 3.50E+00                                     | na                           |
| 12378-Pentachlorodibenzo-p-dioxin              | NA                                           | NV                                                      |                                | na   | NA                                         | 2.50E+00                                     | na                           |

| M918 40mm TPT fired from the MK19 (DODIC B584) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| 123478-Hexachlorodibenzo-p-dioxin              | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 123678-Hexachlorodibenzo-p-dioxin              | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+01                                     | na                           |
| 123789-Hexachlorodibenzo-p-dioxin              | NA                                           | 1.48E-06                                                |                                | na   | NA                                         | NA                                           | na                           |
| 1234678-Heptachlorodibenzo-p-dioxin            | 2.93E-17                                     | NV                                                      |                                | na   | 2.67E-09                                   | NA                                           | na                           |
| OCDD                                           | 2.61E-16                                     | NV                                                      |                                | na   | 9.50E-08                                   | 1.50E+02                                     | 6.33E-10                     |
| 2378-Tetrachlorodibenzo-p-furan                | NA                                           | NV                                                      |                                | na   | NA                                         | 2.00E+00                                     | na                           |
| 12378-Pentachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 23478-Pentachlorodibenzo-o-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 7.50E-02                                     | na                           |
| 123478-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 7.50E+00                                     | na                           |
| 123678-Hexachlorodibenzo-p-furan               | 4.92E-18                                     | NV                                                      |                                | na   | 1.79E-09                                   | 2.50E+00                                     | 7.15E-10                     |
| 123789-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 234678-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+00                                     | na                           |
| 1234678-Heptachlorodibenzo-p-furan             | 6.59E-18                                     | NV                                                      |                                | na   | 5.99E-10                                   | NA                                           | na                           |
| 1234789-Heptachlorodibenzo-p-furan             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| OCDF                                           | 8.96E-18                                     | NV                                                      |                                | na   | 3.26E-09                                   | 3.00E+02                                     | 1.09E-11                     |
| <b>Energetics</b>                              |                                              |                                                         |                                |      |                                            |                                              |                              |
| Nitrobenzene                                   | NA                                           | 2.09E+00                                                |                                | na   | NA                                         | 1.51E+04                                     | na                           |
| 2-Nitrotoluene                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 3-Nitrotoluene                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 4-Nitrotoluene                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | 3.37E+04                                     | na                           |
| Nitroglycerine                                 | NA                                           | 4.80E-01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 1,3-Dinitrobenzene                             | NA                                           | 3.65E-01                                                |                                | na   | NA                                         | 3.00E+03                                     | na                           |
| 1,3,5-Trinitrobenzene                          | NA                                           | 1.10E+02                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| 2,4,6-Trinitrotoluene                          | NA                                           | 2.24E-01                                                |                                | na   | NA                                         | 2.50E+04                                     | na                           |
| RDX                                            | NA                                           | 6.11E-02                                                |                                | na   | NA                                         | NA                                           | na                           |
| 4-Amino-2,6-Dinitrotoluene                     | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2-Amino-2,6-Dinitrotoluene                     | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+04                                     | na                           |
| Tetryl                                         | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| HMX                                            | NA                                           | 1.83E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| Pentaerythritoltetranitrate                    | NA                                           | NV                                                      |                                | na   | NA                                         | 5.00E+01                                     | na                           |

Table D-1: Comparison of Air Concentrations With Health-Based Values for the M918

| M918 40mm TPT fired from the MK19 (DODIC B584)                                                                                                                                                                                                                                                                                                                                                                 |                                              |                                                         |                                |      |                                            |                                              |                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                                                                                                                                                                                                                                                                                                                                                                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Diphenylamine                                                                                                                                                                                                                                                                                                                                                                                                  | NA                                           | 9.13E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| Footnotes:<br>NA: Not applicable because compound was not detected.<br>na: Not available because health-based screening value is not available or not applicable if compound was not detected.<br>NV: No value available.<br>C <sub>chronic</sub> : Chronic time-averaged concentration<br>HBSL: Chronic health-based screening level<br>C <sub>acute</sub> : acute concentration<br>ATV: Acute toxicity value |                                              |                                                         |                                |      |                                            |                                              |                              |

TABLE 3-4. Comparison of Air Concentrations With Health-Based Values for the M918: Total Petroleum Hydrocarbons

| Compound                             | M918 40mm TPT fired from the MK19 (DODIC B584) |                                           |                                           |                                           |
|--------------------------------------|------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
|                                      | C <sub>chronic</sub> (µg/m <sup>3</sup> )      | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) |
|                                      | Aliphatic: C≤8                                 | Aliphatic: C>8                            | Aromatic: C≤8                             | Aromatic: C>8                             |
| Benzene                              | NA                                             | NA                                        | 3.18E-09                                  | NA                                        |
| Heptane                              | 4.08E-11                                       | NA                                        | NA                                        | NA                                        |
| Toluene                              | NA                                             | NA                                        | 5.01E-10                                  | NA                                        |
| Ethylbenzene                         | NA                                             | NA                                        | 7.54E-11                                  | NA                                        |
| m&p-Xylene                           | NA                                             | NA                                        | 1.32E-10                                  | NA                                        |
| o-Xylene                             | NA                                             | NA                                        | 7.06E-11                                  | NA                                        |
| Styrene                              | NA                                             | NA                                        | NA                                        | 8.50E-11                                  |
| Cumene                               | NA                                             | NA                                        | NA                                        | 1.96E-11                                  |
| 4-Ethyltoluene                       | NA                                             | NA                                        | NA                                        | 1.96E-11                                  |
| 1,3,5-Trimethylbenzene               | NA                                             | NA                                        | NA                                        | 1.47E-11                                  |
| 1,2,4-Trimethylbenzene               | NA                                             | NA                                        | NA                                        | 3.27E-11                                  |
| Propane                              | 5.11E-10                                       | NA                                        | NA                                        | NA                                        |
| 1-Butene/isobutylene (115-11-7)      | 3.96E-09                                       | NA                                        | NA                                        | NA                                        |
| n-Pentane                            | 3.91E-10                                       | NA                                        | NA                                        | NA                                        |
| Propyne /1-Propyne                   | 2.50E-10                                       | NA                                        | NA                                        | NA                                        |
| Ethylcyclopropane                    | 1.43E-10                                       | NA                                        | NA                                        | NA                                        |
| 1-Hexene                             | 2.06E-10                                       | NA                                        | NA                                        | NA                                        |
| 2,2,4-Trimethyl-1-pentene            | 5.03E-10                                       | NA                                        | NA                                        | NA                                        |
| naphthalene                          | NA                                             | NA                                        | NA                                        | NA                                        |
| acenaphthylene                       | NA                                             | NA                                        | NA                                        | 8.08E-11                                  |
| acenaphthene                         | NA                                             | NA                                        | NA                                        | 1.19E-11                                  |
| fluorene                             | NA                                             | NA                                        | NA                                        | 9.08E-13                                  |
| phenanthrene                         | NA                                             | NA                                        | NA                                        | 2.28E-12                                  |
| anthracene                           | NA                                             | NA                                        | NA                                        | 2.84E-12                                  |
| fluoranthene                         | NA                                             | NA                                        | NA                                        | 4.95E-13                                  |
| Total (µg/m <sup>3</sup> )           | 6.00E-09                                       | 0.00E+00                                  | 3.96E-09                                  | 2.73E-10                                  |
| Derived Health-Based Screening Level | 1.92E+04                                       | 1.04E+03                                  | 4.17E+02                                  | 2.09E+02                                  |
| C <sub>chronic</sub> /HBSL           | 3.13E-13                                       | 0.00E+00                                  | 9.50E-12                                  | 1.31E-12                                  |

Table D-2: Comparison of Air Concentrations With Health-Based Values for the M918: Total Petroleum Hydrocarbons

| M918 40mm TPT fired from the MK19 (DODIC B584)                                                                                                                                                                  |                                           |                                           |                                           |                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| Compound                                                                                                                                                                                                        | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) |
|                                                                                                                                                                                                                 | Aliphatic: C≤8                            | Aliphatic: C>8                            | Aromatic: C≤8                             | Aromatic: C>8                             |
| >1?                                                                                                                                                                                                             | no                                        | no                                        | no                                        | no                                        |
| Footnotes:<br>>1? = Is the ratio greater than one?<br>NA = Not Applicable because compound was not detected<br>C <sub>chronic</sub> = chronic averaged air Concentration<br>HBSL = Health-Based Screening Level |                                           |                                           |                                           |                                           |

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| <b>Permanent Gases</b>                         |                                              |                                                         |                                |      |                                            |                                              |                              |
| Ammonia (NH3)                                  | NA                                           | 1.04E+02                                                |                                | na   | NA                                         | 1.75E+04                                     | na                           |
| Carbon Dioxide (CO2)                           | 1.14E+00                                     | NV                                                      |                                | na   | 3.72E+02                                   | 5.40E+07                                     | 6.88E-06                     |
| Carbon Monoxide (CO)                           | 1.57E+00                                     | 1.00E+04                                                | 1.57E-04                       | no   | 1.28E+02                                   | 2.30E+05                                     | 5.56E-04                     |
| Oxides of Nitrogen (as NO)                     | 1.05E-01                                     | 1.00E+02                                                | 1.05E-03                       | no   | 3.43E+01                                   | 3.08E+04                                     | 1.12E-03                     |
| Sulfur Dioxide (SO2)                           | NA                                           | 8.00E+01                                                |                                | na   | NA                                         | 7.89E+02                                     | na                           |
| <b>Acid Gases</b>                              |                                              |                                                         |                                |      |                                            |                                              |                              |
| Hydrogen fluoride                              | NA                                           | NV                                                      |                                | na   | NA                                         | 1.60E+03                                     | na                           |
| Hydrogen chloride                              | NA                                           | 2.08E+01                                                |                                | na   | NA                                         | 4.50E+03                                     | na                           |
| Hydrogen bromide                               | NA                                           | NV                                                      |                                | na   | NA                                         | 9.93E+03                                     | na                           |
| Nitric Acid                                    | 1.24E-03                                     | NV                                                      |                                | na   | 1.01E-01                                   | 1.30E+03                                     | 7.76E-05                     |
| Phosphoric acid                                | NA                                           | 1.04E+01                                                |                                | na   | NA                                         | 3.00E+03                                     | na                           |
| Sulfuric Acid                                  | NA                                           | NV                                                      |                                | na   | NA                                         | 2.00E+03                                     | na                           |
| <b>Cyanide</b>                                 |                                              |                                                         |                                |      |                                            |                                              |                              |
| Particulate Cyanide                            | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 5.00E+03                                     | na                           |
| Hydrogen Cyanide                               | 2.69E-03                                     | 3.13E+00                                                | 8.61E-04                       | no   | 8.78E-01                                   | 5.17E+03                                     | 1.70E-04                     |
| <b>Particulates</b>                            |                                              |                                                         |                                |      |                                            |                                              |                              |
| TSP                                            | 1.54E-01                                     | 5.00E+01                                                | 3.08E-03                       | no   | 1.25E+01                                   | NA                                           | na                           |
| PM10                                           | 1.74E-01                                     | 5.00E+01                                                | 3.47E-03                       | no   | 1.41E+01                                   | NA                                           | na                           |
| PM2.5                                          | 1.54E-01                                     | 1.50E+01                                                | 1.03E-02                       | no   | 1.26E+01                                   | NA                                           | na                           |
| <b>Metals</b>                                  |                                              |                                                         |                                |      |                                            |                                              |                              |
| Antimony                                       | 5.44E-09                                     | 1.46E+00                                                | 3.73E-09                       | no   | 1.77E+00                                   | 1.50E+03                                     | 1.18E-03                     |
| Arsenic                                        | NA                                           | 4.47E-04                                                |                                | na   | NA                                         | 3.00E+01                                     | na                           |
| Barium                                         | 2.92E-09                                     | 5.21E-01                                                | 5.61E-09                       | no   | 9.53E-01                                   | 1.50E+03                                     | 6.35E-04                     |
| Beryllium                                      | NA                                           | 8.00E-04                                                |                                | na   | NA                                         | 5.00E+00                                     | na                           |
| Cadmium                                        | NA                                           | 1.07E-03                                                |                                | na   | NA                                         | 3.00E+01                                     | na                           |
| Chromium                                       | 6.48E-11                                     | 1.53E-04                                                | 4.25E-07                       | no   | 2.11E-02                                   | 1.50E+03                                     | 1.41E-05                     |
| Cobalt                                         | NA                                           | 2.20E+02                                                |                                | na   | NA                                         | 6.00E+01                                     | na                           |
| Copper                                         | 3.18E-10                                     | 1.46E+02                                                | 2.18E-12                       | no   | 1.04E-01                                   | 3.00E+03                                     | 3.46E-05                     |
| Lead                                           | 2.94E-08                                     | 1.50E+00                                                | 1.96E-08                       | no   | 9.56E+00                                   | 1.50E+02                                     | 6.38E-02                     |

Table D-3: Comparison of Air Concentrations With Health-Based Values for the M781

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Manganese                                      | 5.02E-12                                     | 5.11E-02                                                | 9.82E-11                       | no   | 1.63E-03                                   | 3.00E+03                                     | 5.45E-07                     |
| Nickel                                         | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 3.00E+03                                     | na                           |
| Selenium                                       | NA                                           | 1.83E+01                                                |                                | na   | NA                                         | 6.00E+02                                     | na                           |
| Silver                                         | NA                                           | 1.83E+01                                                |                                | na   | NA                                         | 3.00E+02                                     | na                           |
| Thallium                                       | NA                                           | 2.56E-01                                                |                                | na   | NA                                         | 3.00E+02                                     | na                           |
| Zinc                                           | 1.83E-08                                     | 1.10E+03                                                | 1.68E-11                       | no   | 5.98E+00                                   | 3.00E+04                                     | 1.99E-04                     |
| TO-11 Carbonyls                                |                                              |                                                         |                                |      |                                            |                                              |                              |
| Formaldehyde                                   | 1.72E-10                                     | 1.48E-01                                                | 2.71E-09                       | no   | 3.26E-02                                   | 1.23E+03                                     | 2.65E-05                     |
| Acetaldehyde                                   | 1.26E-10                                     | 8.73E-01                                                | 3.37E-10                       | no   | 2.39E-02                                   | 1.80E+04                                     | 1.33E-06                     |
| Acetone                                        | 9.33E-11                                     | 3.65E+02                                                | 2.56E-13                       | no   | 3.04E-02                                   | 2.37E+06                                     | 1.28E-08                     |
| Propionaldehyde                                | NA                                           | NV                                                      |                                | na   | NA                                         | 7.50E+04                                     | na                           |
| Crotonaldehyde                                 | NA                                           | 3.54E-03                                                |                                | na   | NA                                         | 5.72E+03                                     | na                           |
| Butyraldehyde                                  | NA                                           | NV                                                      |                                | na   | NA                                         | 7.38E+04                                     | na                           |
| Benzaldehyde                                   | NA                                           | 3.65E+02                                                |                                | na   | NA                                         | 1.50E+04                                     | na                           |
| Isovaleraldehyde                               | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Valeraldehyde                                  | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| o,m,p-Tolualdehyde                             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Hexaldehyde                                    | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2,5-Dimethylbenzaldehyde                       | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| VOCs                                           |                                              |                                                         |                                |      |                                            |                                              |                              |
| Propene                                        | 3.94E-10                                     | NV                                                      |                                | na   | 3.21E-02                                   | NA                                           | na                           |
| Dichlorodifluoromethane                        | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 1.48E+07                                     | na                           |
| Chlorodifluoromethane                          | NA                                           | 5.11E+04                                                |                                | na   | NA                                         | 4.41E+06                                     | na                           |
| Freon 114                                      | NA                                           | NV                                                      |                                | na   | NA                                         | 2.10E+07                                     | na                           |
| Chloromethane                                  | 1.09E-12                                     | 1.07E+00                                                | 2.39E-12                       | no   | 8.30E-04                                   | 2.06E+05                                     | 4.03E-09                     |
| Vinyl Chloride                                 | NA                                           | 2.20E-02                                                |                                | na   | NA                                         | 1.28E+04                                     | na                           |
| 1,3-Butadiene                                  | 2.06E-11                                     | 3.74E-03                                                | 1.29E-08                       | no   | 3.92E-03                                   | 2.20E+04                                     | 1.78E-07                     |
| Bromomethane                                   | NA                                           | 5.21E+00                                                |                                | na   | NA                                         | 5.82E+04                                     | na                           |
| Chloroethane                                   | NA                                           | 2.32E+00                                                |                                | na   | NA                                         | 2.64E+06                                     | na                           |
| Dichlorodifluoromethane                        | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 1.48E+07                                     | na                           |

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Trichlorofluoromethane                         | 1.01E-12                                     | 7.30E+02                                                | 1.39E-15                       | no   | 3.30E-04                                   | 2.81E+06                                     | 1.18E-10                     |
| Acrolein                                       | 7.35E-10                                     | 2.09E-02                                                | 3.53E-08                       | no   | 5.99E-02                                   | 2.30E+02                                     | 2.60E-04                     |
| 1,1-Dichloroethene                             | NA                                           | 5.21E+02                                                |                                | na   | NA                                         | 7.92E+04                                     | na                           |
| Freon 113                                      | NA                                           | 3.13E+04                                                |                                | na   | NA                                         | 9.58E+06                                     | na                           |
| Methyl Iodide                                  | NA                                           | NV                                                      |                                | na   | NA                                         | 1.45E+05                                     | na                           |
| Carbon Disulfide                               | 6.01E-10                                     | 7.30E+02                                                | 8.23E-13                       | no   | 1.96E-01                                   | 3.11E+04                                     | 6.29E-06                     |
| Acetonitrile                                   | 2.71E-10                                     | 6.20E+01                                                | 4.37E-12                       | no   | 8.84E-02                                   | 1.01E+05                                     | 8.77E-07                     |
| 3-Chloropropene                                | NA                                           | 1.04E+00                                                |                                | na   | NA                                         | 9.39E+03                                     | na                           |
| Methylene Chloride                             | 6.29E-10                                     | 4.09E+00                                                | 3.59E-10                       | no   | 1.19E-01                                   | 6.96E+05                                     | 1.72E-07                     |
| tert-Butyl Alcohol                             | NA                                           | NV                                                      |                                | na   | NA                                         | 4.55E+05                                     | na                           |
| Acrylonitrile                                  | 1.82E-10                                     | 2.83E-02                                                | 1.50E-08                       | no   | 3.46E-02                                   | 2.17E+04                                     | 1.59E-06                     |
| trans-1,2-Dichloroethene                       | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 4.95E+04                                     | na                           |
| Methyl t-Butyl Ether                           | NA                                           | 3.13E+03                                                |                                | na   | NA                                         | 4.32E+05                                     | na                           |
| Hexane                                         | 6.83E-10                                     | 2.09E+02                                                | 3.27E-12                       | no   | 2.22E-01                                   | 5.28E+05                                     | 4.21E-07                     |
| 1,1-Dichloroethane                             | NA                                           | 5.21E+02                                                |                                | na   | NA                                         | 1.21E+06                                     | na                           |
| Vinyl Acetate                                  | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 1.92E+04                                     | na                           |
| cis-1,2-Dichloroethene                         | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | 7.92E+05                                     | na                           |
| 2-Butanone                                     | 2.41E-11                                     | 1.04E+03                                                | 2.31E-14                       | no   | 7.84E-03                                   | 8.85E+05                                     | 8.86E-09                     |
| Ethyl Acetate                                  | NA                                           | 3.29E+03                                                |                                | na   | NA                                         | 1.44E+06                                     | na                           |
| Methyl Acrylate                                | NA                                           | 1.10E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| Chloroform                                     | NA                                           | 8.35E-02                                                |                                | na   | NA                                         | 9.76E+03                                     | na                           |
| 1,1,1-Trichloroethane                          | 5.44E-10                                     | 1.04E+03                                                | 5.21E-13                       | no   | 4.43E-02                                   | 1.94E+06                                     | 2.28E-08                     |
| Carbon Tetrachloride                           | 8.78E-12                                     | 1.28E-01                                                | 1.60E-10                       | no   | 1.67E-03                                   | 1.28E+05                                     | 1.30E-08                     |
| 1,2-Dichloroethane                             | 1.89E-11                                     | 7.39E-02                                                | 5.96E-10                       | no   | 1.43E-02                                   | 8.08E+03                                     | 1.77E-06                     |
| Benzene                                        | 1.30E-09                                     | 2.49E-01                                                | 1.22E-08                       | no   | 2.47E-01                                   | 1.56E+05                                     | 1.59E-06                     |
| Isocotane (2,2,4-trimethylpentane)             | NA                                           | NV                                                      |                                | na   | NA                                         | 3.50E+05                                     | na                           |
| Heptane                                        | NA                                           | NV                                                      |                                | na   | NA                                         | 1.80E+06                                     | na                           |
| Trichloroethane                                | NA                                           | 1.04E+03                                                |                                | na   | NA                                         | 1.94E+06                                     | na                           |
| Ethyl Acrylate                                 | NA                                           | 1.40E-01                                                |                                | na   | NA                                         | 6.14E+04                                     | na                           |
| 1,2-Dichloropropane                            | NA                                           | 9.89E-02                                                |                                | na   | NA                                         | 5.08E+05                                     | na                           |

Table D-3: Comparison of Air Concentrations With Health-Based Values for the M781

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                                 |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|---------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV<br>> 1? |
| Methyl Methacrylate                            | NA                                           | 7.30E+02                                                |                                | na   | NA                                         | 4.09E+05                                     | na                              |
| Dibromomethane                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | 2.50E+05                                     | na                              |
| 1,4-Dioxane                                    | NA                                           | 6.11E-01                                                |                                | na   | NA                                         | 9.00E+04                                     | na                              |
| Bromodichloromethane                           | NA                                           | 1.08E-01                                                |                                | na   | NA                                         | 4.00E+03                                     | na                              |
| 4-Methyl-2-Pentanone                           | NA                                           | 8.34E+01                                                |                                | na   | NA                                         | 3.07E+05                                     | na                              |
| Toluene                                        | 3.86E-10                                     | 4.02E+02                                                | 9.62E-13                       | no   | 3.14E-02                                   | 1.88E+05                                     | 1.68E-07                        |
| Octane                                         | 6.36E-12                                     | NV                                                      |                                | na   | 5.18E-04                                   | NA                                           | na                              |
| trans-1,3-Dichloropropene                      | NA                                           | 5.17E-02                                                |                                | na   | NA                                         | NA                                           | na                              |
| Ethyl Methacrylate                             | NA                                           | 3.29E+02                                                |                                | na   | NA                                         | NA                                           | na                              |
| 1,1,2-Trichloroethane                          | NA                                           | 1.20E-01                                                |                                | na   | NA                                         | 1.64E+05                                     | na                              |
| Tetrachloroethene                              | NA                                           | 3.31E+00                                                |                                | na   | NA                                         | 6.78E+05                                     | na                              |
| 2-Hexanone                                     | NA                                           | 5.11E+00                                                |                                | na   | NA                                         | 4.09E+04                                     | na                              |
| Dibromochloromethane                           | NA                                           | 8.00E-02                                                |                                | na   | NA                                         | 6.00E+03                                     | na                              |
| 1,2-Dibromoethane                              | NA                                           | 8.73E-03                                                |                                | na   | NA                                         | 1.54E+05                                     | na                              |
| Chlorobenzene                                  | NA                                           | 6.21E+01                                                |                                | na   | NA                                         | 1.38E+05                                     | na                              |
| 1,1,1,2-Tetrachloroethane                      | NA                                           | 2.60E-01                                                |                                | na   | NA                                         | 5.15E+04                                     | na                              |
| Ethylbenzene                                   | 9.96E-11                                     | 1.06E+03                                                | 9.41E-14                       | no   | 3.24E-02                                   | 5.43E+05                                     | 5.98E-08                        |
| m&p-Xylene                                     | 3.46E-10                                     | 7.30E+02                                                | 4.74E-13                       | no   | 1.13E-01                                   | 6.51E+05                                     | 1.73E-07                        |
| o-Xylene                                       | 2.52E-10                                     | 7.30E+02                                                | 3.45E-13                       | no   | 8.20E-02                                   | 6.51E+05                                     | 1.26E-07                        |
| Styrene                                        | 1.08E-09                                     | 1.06E+03                                                | 1.02E-12                       | no   | 8.78E-02                                   | 2.13E+05                                     | 4.12E-07                        |
| Bromoform                                      | NA                                           | 1.75E+00                                                |                                | na   | NA                                         | 6.20E+03                                     | na                              |
| Cumene                                         | 1.69E-11                                     | 4.02E+02                                                | 4.21E-14                       | no   | 5.51E-03                                   | 2.46E+05                                     | 2.25E-08                        |
| 1,1,2,2-Tetrachloroethane                      | NA                                           | 3.31E-02                                                |                                | na   | NA                                         | 2.06E+04                                     | na                              |
| 1,2,3-Trichloropropane                         | NA                                           | 9.61E-04                                                |                                | na   | NA                                         | 6.03E+04                                     | na                              |
| Bromobenzene                                   | NA                                           | 1.04E+01                                                |                                | na   | NA                                         | 4.82E+04                                     | na                              |
| 4-Ethyltoluene                                 | 1.29E-10                                     | NV                                                      |                                | na   | 4.20E-02                                   | 1.25E+05                                     | 3.36E-07                        |
| 1,3,5-Trimethylbenzene                         | 7.27E-11                                     | 6.21E+00                                                | 1.17E-11                       | no   | 2.37E-02                                   | 3.68E+05                                     | 6.43E-08                        |
| Alpha Methyl Styrene                           | NA                                           | 2.56E+02                                                |                                | na   | NA                                         | NA                                           | na                              |
| 1,2,4-Trimethylbenzene                         | 2.42E-10                                     | 6.21E+00                                                | 3.90E-11                       | no   | 7.88E-02                                   | 1.80E+05                                     | 4.38E-07                        |
| 1,3-Dichlorobenzene                            | NA                                           | 3.29E+00                                                |                                | na   | NA                                         | 3.61E+04                                     | na                              |

| M781 40mm TPT fired from the M203 (DODIC B519)   |                                              |                                                         |                                |      |                                            |                                              |                              |
|--------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                         | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| 1,4-Dichlorobenzene                              | NA                                           | 3.06E-01                                                |                                | na   | NA                                         | 6.61E+05                                     | na                           |
| Benzyl Chloride                                  | NA                                           | 3.96E-02                                                |                                | na   | NA                                         | 5.20E+03                                     | na                           |
| 1,2-Dichlorobenzene                              | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 3.01E+05                                     | na                           |
| Hexachlorethane                                  | NA                                           | 4.80E-01                                                |                                | na   | NA                                         | 2.90E+04                                     | na                           |
| 1,2,4-Trichlorobenzene                           | NA                                           | 2.08E+02                                                |                                | na   | NA                                         | 3.71E+04                                     | na                           |
| Hexachlorobutadiene                              | NA                                           | 8.73E-02                                                |                                | na   | NA                                         | 3.21E+04                                     | na                           |
| <b>Hydrocarbons</b>                              |                                              |                                                         |                                |      |                                            |                                              |                              |
| Methane                                          | 1.76E-08                                     | NV                                                      |                                | na   | 5.72E+00                                   | 3.30E+06                                     | 1.73E-06                     |
| Ethylene                                         | 7.80E-09                                     | NV                                                      |                                | na   | 2.54E+00                                   | 4.60E+05                                     | 5.52E-06                     |
| Acetylene                                        | 6.37E-09                                     | NV                                                      |                                | na   | 5.19E-01                                   | NA                                           | na                           |
| Ethane                                           | 3.48E-10                                     | NV                                                      |                                | na   | 2.83E-02                                   | NA                                           | na                           |
| Propane                                          | NA                                           | NV                                                      |                                | na   | NA                                         | 3.78E+06                                     | na                           |
| Propyne (methyl acetylene)                       | 3.09E-10                                     | NV                                                      |                                | na   | 1.01E-01                                   | 2.79E+06                                     | 3.61E-08                     |
| Isobutane                                        | NA                                           | NV                                                      |                                | na   | NA                                         | 9.52E+05                                     | na                           |
| 1-Butene/Isobutylene (115-11-7)                  | 3.56E-10                                     | NV                                                      |                                | na   | 1.16E-01                                   | 6.87E+06                                     | 1.69E-08                     |
| Butane                                           | NA                                           | NV                                                      |                                | na   | NA                                         | 5.71E+06                                     | na                           |
| 1-Butyne/cis-Butene                              | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| trans-Butene                                     | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2-Butyne (crotonylene)                           | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| n-Pentane                                        | NA                                           | NV                                                      |                                | na   | NA                                         | 1.80E+06                                     | na                           |
| <b>C Tentatively Identified Compounds (TICs)</b> |                                              |                                                         |                                |      |                                            |                                              |                              |
| Propyne /1-Propyne                               | 1.92E-10                                     | NV                                                      |                                | na   | 6.24E-02                                   | 2.79E+06                                     | 2.24E-08                     |
| 1-Chloro-1,1-difluoroethane                      | NA                                           | 5.22E+04                                                |                                | na   | NA                                         | 4.11E+07                                     | na                           |
| 2-Methyl-1-propene (Isobutene)                   | 1.43E-10                                     | NV                                                      |                                | na   | 4.67E-02                                   | 6.87E+06                                     | 6.80E-09                     |
| Acetaldehyde                                     | 4.47E-11                                     | 8.73E-01                                                | 1.20E-10                       | no   | 8.50E-03                                   | 1.80E+04                                     | 4.72E-07                     |
| 1-Buten-3-yne (vinyl acetylene)                  | 2.89E-11                                     | NV                                                      |                                | na   | 2.35E-03                                   | NA                                           | na                           |
| Ethylcyclopropane                                | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| Ethanol                                          | NA                                           | NV                                                      |                                | na   | NA                                         | 5.64E+06                                     | na                           |
| Furan                                            | 7.55E-11                                     | 3.65E+00                                                | 2.07E-11                       | no   | 2.46E-02                                   | 1.67E+02                                     | 1.47E-04                     |
| 1-Hexene                                         | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |

Table D-3: Comparison of Air Concentrations With Health-Based Values for the M781

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                                 |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|---------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV<br>> 1? |
| Thiirane (ethylene sulfide)                    | 1.60E-10                                     | NV                                                      |                                | na   | 1.31E-02                                   | NA                                           | na                              |
| Thiophene                                      | 7.46E-11                                     | NV                                                      |                                | na   | 6.08E-03                                   | NA                                           | na                              |
| 2,2,4-Trimethyl-1-pentene                      | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                              |
| Undecane                                       | 7.01E-10                                     | NV                                                      |                                | na   | 2.28E-01                                   | 6.39E+03                                     | 3.57E-05                        |
| 3-Methyl-undecane (dodecane)                   | 2.28E-10                                     | NV                                                      |                                | na   | 7.43E-02                                   | 3.48E+03                                     | 2.13E-05                        |
| Dodecane                                       | 7.60E-10                                     | NV                                                      |                                | na   | 2.48E-01                                   | 3.48E+03                                     | 7.11E-05                        |
| 2,6-Dimethyl-undecane                          | 2.88E-10                                     | NV                                                      |                                | na   | 2.34E-02                                   | NA                                           | na                              |
| <b>SVOCs</b>                                   |                                              |                                                         |                                |      |                                            |                                              |                                 |
| n-nitrosodimethylamine                         | NA                                           | 1.37E-04                                                |                                | na   | NA                                         | 2.50E+03                                     | na                              |
| bis(2-chloroethyl)ether                        | NA                                           | 5.82E-03                                                |                                | na   | NA                                         | 5.85E+04                                     | na                              |
| phenol                                         | NA                                           | 2.19E+03                                                |                                | na   | NA                                         | 3.85E+04                                     | na                              |
| 2-chlorophenol                                 | NA                                           | 1.83E+01                                                |                                | na   | NA                                         | 5.25E+03                                     | na                              |
| 1,3-Dichlorobenzene                            | NA                                           | 3.29E+00                                                |                                | na   | NA                                         | 3.61E+04                                     | na                              |
| 1,4-dichlorobenzene                            | NA                                           | 3.06E-01                                                |                                | na   | NA                                         | 6.61E+05                                     | na                              |
| 1,2-dichlorobenzene                            | NA                                           | 2.09E+02                                                |                                | na   | NA                                         | 3.01E+05                                     | na                              |
| benzyl alcohol                                 | NA                                           | 1.10E+03                                                |                                | na   | NA                                         | 5.53E+04                                     | na                              |
| bis(2-chloroisopropyl)ether                    | NA                                           | 1.92E-01                                                |                                | na   | NA                                         | 6.99E+04                                     | na                              |
| 2-methylphenol                                 | NA                                           | 1.83E+02                                                |                                | na   | NA                                         | NA                                           | na                              |
| hexachloroethane                               | NA                                           | 4.80E-01                                                |                                | na   | NA                                         | 2.90E+04                                     | na                              |
| n-nitroso-di-n-propylamine                     | NA                                           | 9.61E-04                                                |                                | na   | NA                                         | 2.00E+02                                     | na                              |
| 4-methylphenol                                 | NA                                           | 1.83E+02                                                |                                | na   | NA                                         | NA                                           | na                              |
| nitrobenzene                                   | NA                                           | 2.09E+00                                                |                                | na   | NA                                         | 1.51E+04                                     | na                              |
| isophorone                                     | NA                                           | 7.08E+00                                                |                                | na   | NA                                         | 2.83E+04                                     | na                              |
| 2-nitrophenol                                  | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                              |
| 2,4-dimethylphenol                             | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | NA                                           | na                              |
| bis(2-chloroethoxy)methane                     | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                              |
| 2,4-dichlorophenol                             | NA                                           | 1.10E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                              |
| Benzoic Acid                                   | 3.04E-10                                     | 1.46E+04                                                | 2.08E-14                       | no   | 9.91E-02                                   | 1.25E+04                                     | 7.92E-06                        |
| 1,2,4-trichlorobenzene                         | NA                                           | 2.08E+02                                                |                                | na   | NA                                         | 3.71E+04                                     | na                              |
| 4-chloroaniline                                | NA                                           | 1.46E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                              |

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| hexachlorobutadiene                            | NA                                           | 8.62E-02                                                |                                | na   | NA                                         | 3.21E+04                                     | na                           |
| 4-chloro-3-methylphenol                        | NA                                           | NV                                                      |                                | na   | NA                                         | 2.00E+04                                     | na                           |
| 2-methylnaphthalene                            | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 2.00E+04                                     | na                           |
| hexachlorocyclopentadiene                      | NA                                           | 7.30E-02                                                |                                | na   | NA                                         | 2.23E+02                                     | na                           |
| 2,4,6-trichlorophenol                          | NA                                           | 1.10E+02                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| 2,4,5-trichlorophenol                          | NA                                           | 3.65E+02                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| 2-chloronaphthalene                            | NA                                           | 2.92E+02                                                |                                | na   | NA                                         | 6.00E+02                                     | na                           |
| 2-nitroaniline                                 | NA                                           | 2.09E-01                                                |                                | na   | NA                                         | NA                                           | na                           |
| dimethylphthalate                              | NA                                           | 3.65E+04                                                |                                | na   | NA                                         | 1.50E+04                                     | na                           |
| 2,6-dinitrotoluene                             | NA                                           | 3.65E+00                                                |                                | na   | NA                                         | 6.00E+02                                     | na                           |
| 3-nitroaniline                                 | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2,4-dinitrophenol                              | NA                                           | 7.30E+00                                                |                                | na   | NA                                         | 7.50E+03                                     | na                           |
| dibenzofuran                                   | NA                                           | 1.46E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 2,4-dinitrotoluene                             | NA                                           | 7.30E+00                                                |                                | na   | NA                                         | 6.00E+02                                     | na                           |
| 4-nitrophenol                                  | NA                                           | 2.92E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| 4-chlorophenyl-phenylether                     | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| diethylphthalate                               | 1.73E-10                                     | 2.92E+03                                                | 5.91E-14                       | no   | 5.62E-02                                   | 1.50E+04                                     | 3.75E-06                     |
| 4-nitroaniline                                 | NA                                           | NV                                                      |                                | na   | NA                                         | 9.00E+03                                     | na                           |
| 4,6-dinitro-2-methylphenol                     | NA                                           | 3.65E-01                                                |                                | na   | NA                                         | 5.00E+02                                     | na                           |
| n-nitrosodiphenylamine(1)                      | NA                                           | 1.37E+00                                                |                                | na   | NA                                         | NA                                           | na                           |
| 4-bromophenyl-phenylether                      | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| hexachlorobenzene                              | NA                                           | 4.18E-03                                                |                                | na   | NA                                         | NA                                           | na                           |
| pentachlorophenol                              | NA                                           | 5.60E-02                                                |                                | na   | NA                                         | 7.50E+01                                     | na                           |
| di-n-butylphthalate                            | 1.39E-10                                     | 3.65E+02                                                | 3.81E-13                       | no   | 4.53E-02                                   | 1.50E+03                                     | na                           |
| butylbenzylphthalate                           | NA                                           | 7.30E+02                                                |                                | na   | NA                                         | 1.50E+04                                     | 3.02E-06                     |
| 3,3-dichlorobenzidine                          | NA                                           | 1.50E-02                                                |                                | na   | NA                                         | 5.00E+05                                     | na                           |
| bis(2-ethylhexyl)phthalate                     | 4.96E-10                                     | 4.80E-01                                                | 2.41E-09                       | no   | 3.77E-01                                   | 6.21E+03                                     | na                           |
| di-n-octylphthalate                            | NA                                           | 7.30E+01                                                |                                | na   | NA                                         | 1.00E+04                                     | 3.77E-05                     |
| SVOC Tentatively Identified Compounds (TICs)   |                                              |                                                         |                                |      |                                            |                                              |                              |
| Acetophenone                                   | 1.92E-10                                     | 2.10E-02                                                | 9.12E-09                       | no   | 6.24E-02                                   | 3.00E+04                                     | 2.08E-06                     |
|                                                |                                              |                                                         |                                |      |                                            |                                              | no                           |

Table D-3: Comparison of Air Concentrations With Health-Based Values for the M781

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                                 |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|---------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV<br>> 1? |
| Phenol (to be added to Form I)                 | 5.53E-11                                     | 2.19E+03                                                | 2.53E-14                       | no   | 1.80E-02                                   | 3.85E+04                                     | 4.68E-07                        |
| Benzonitrile                                   | 8.49E-11                                     | NV                                                      |                                | na   | 2.77E-02                                   | 1.50E+04                                     | 1.84E-06                        |
| Undecane                                       | 2.30E-10                                     | NV                                                      |                                | na   | 7.50E-02                                   | 6.39E+03                                     | 1.17E-05                        |
| Dodecane                                       | 3.01E-10                                     | NV                                                      |                                | na   | 9.82E-02                                   | 3.48E+03                                     | 2.82E-05                        |
| Hexyl-cyclohexane                              | 1.54E-10                                     | NV                                                      |                                | na   | 1.25E-02                                   | NA                                           | na                              |
| Dodecamethylcyclohexasiloxane                  | 1.13E-10                                     | NV                                                      |                                | na   | 9.19E-03                                   | NA                                           | na                              |
| Dodecanoic Acid (Lauric Acid)                  | 8.87E-11                                     | NV                                                      |                                | na   | 7.23E-03                                   | NA                                           | na                              |
| Hexadecanoic Acid (Palmitic Acid)              | 1.05E-10                                     | NV                                                      |                                | na   | 3.42E-02                                   | 7.50E+02                                     | 4.56E-05                        |
| Octadecanoic Acid (Stearic Acid)               | NA                                           | NV                                                      |                                | na   | NA                                         | 3.50E+04                                     | na                              |
| bis(2-ethylhexyl) Decanedioic Acid             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                              |
| <b>TO-13 (PAHs)</b>                            |                                              |                                                         |                                |      |                                            |                                              |                                 |
| naphthalene                                    | 5.38E-11                                     | 3.13E+00                                                | 1.72E-11                       | no   | 1.75E-02                                   | 7.86E+04                                     | 2.23E-07                        |
| acenaphthylene                                 | 9.35E-12                                     | NV                                                      |                                | na   | 3.05E-03                                   | 2.00E+02                                     | 1.52E-05                        |
| acenaphthene                                   | 5.22E-13                                     | 2.19E+02                                                | 2.38E-15                       | no   | 1.70E-04                                   | 1.25E+03                                     | 1.36E-07                        |
| fluorene                                       | 1.21E-12                                     | 1.46E+02                                                | 8.29E-15                       | no   | 3.94E-04                                   | 7.50E+04                                     | 5.26E-09                        |
| phenanthrene                                   | 1.47E-12                                     | NV                                                      |                                | na   | 4.79E-04                                   | 2.00E+03                                     | 2.39E-07                        |
| anthracene                                     | 2.63E-13                                     | 1.10E+03                                                | 2.41E-16                       | no   | 8.58E-05                                   | 6.00E+03                                     | 1.43E-08                        |
| fluoranthene                                   | 4.69E-13                                     | 1.46E+02                                                | 3.21E-15                       | no   | 1.53E-04                                   | 3.00E+01                                     | 5.09E-06                        |
| pyrene                                         | 4.87E-13                                     | 1.10E+02                                                | 4.45E-15                       | no   | 1.59E-04                                   | 1.50E+04                                     | 1.06E-08                        |
| benzo(a)anthracene                             | 4.02E-14                                     | 2.17E-02                                                | 4.33E-12                       | no   | 3.06E-05                                   | 6.00E+02                                     | 5.10E-08                        |
| chrysene                                       | 7.89E-14                                     | 2.17E+00                                                | 8.49E-14                       | no   | 6.00E-05                                   | 2.00E+02                                     | 3.00E-07                        |
| benzo(b)fluoranthene                           | 2.14E-13                                     | 2.17E-02                                                | 2.31E-11                       | no   | 4.07E-05                                   | NA                                           | na                              |
| benzo(k)fluoranthene                           | 1.42E-13                                     | 2.17E-01                                                | 1.53E-12                       | no   | 2.71E-05                                   | NA                                           | na                              |
| benzo(a)pyrene                                 | 1.55E-13                                     | 2.17E-03                                                | 1.67E-10                       | no   | 1.18E-04                                   | 7.50E+03                                     | 1.57E-08                        |
| indeno(1,2,3-cd)pyrene                         | 2.23E-13                                     | 2.17E-02                                                | 2.40E-11                       | no   | 4.23E-05                                   | NA                                           | na                              |
| dibenzo(a,h)anthracene                         | 1.10E-14                                     | 2.17E-03                                                | 1.19E-11                       | no   | 8.38E-06                                   | 3.00E+04                                     | 2.79E-10                        |
| benzo(g,h,i)perylene                           | 9.75E-13                                     | NV                                                      |                                | na   | 3.18E-04                                   | 3.00E+04                                     | 1.06E-08                        |
| <b>Dioxins/Furans</b>                          |                                              |                                                         |                                |      |                                            |                                              |                                 |
| 2378-Tetrachlorodibenzo-p-dioxin               | NA                                           | 4.48E-08                                                |                                | na   | NA                                         | 3.50E+00                                     | na                              |
| 12378-Pentachlorodibenzo-p-dioxin              | NA                                           | NV                                                      |                                | na   | NA                                         | 2.50E+00                                     | na                              |

| M781 40mm TPT fired from the M203 (DODIC B519) |                                              |                                                         |                                |      |                                            |                                              |                              |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                       | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| 123478-Hexachlorodibenzo-p-dioxin              | 1.13E-17                                     | NV                                                      |                                | na   | 9.17E-10                                   | NA                                           | na                           |
| 123678-Hexachlorodibenzo-p-dioxin              | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+01                                     | na                           |
| 123789-Hexachlorodibenzo-p-dioxin              | NA                                           | 1.48E-06                                                |                                | na   | NA                                         | NA                                           | na                           |
| 1234678-Heptachlorodibenzo-p-dioxin            | 1.06E-16                                     | NV                                                      |                                | na   | 8.62E-09                                   | NA                                           | na                           |
| OCDD                                           | 7.66E-16                                     | NV                                                      |                                | na   | 2.50E-07                                   | 1.50E+02                                     | 1.66E-09                     |
| 2378-Tetrachlorodibenzo-p-furan                | NA                                           | NV                                                      |                                | na   | NA                                         | 2.00E+00                                     | na                           |
| 12378-Pentachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 23478-Pentachlorodibenzo-o-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 7.50E-02                                     | na                           |
| 123478-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 7.50E+00                                     | na                           |
| 123678-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 2.50E+00                                     | na                           |
| 123789-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 234678-Hexachlorodibenzo-p-furan               | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+00                                     | na                           |
| 1234678-Heptachlorodibenzo-p-furan             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 1234789-Heptachlorodibenzo-p-furan             | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| OCDF                                           | NA                                           | NV                                                      |                                | na   | NA                                         | 3.00E+02                                     | na                           |
| <b>Energetics</b>                              |                                              |                                                         |                                |      |                                            |                                              |                              |
| Nitrobenzene                                   | NA                                           | 2.09E+00                                                |                                | na   | NA                                         | 1.51E+04                                     | na                           |
| 2-Nitrotoluene                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 3-Nitrotoluene                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 4-Nitrotoluene                                 | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | 3.37E+04                                     | na                           |
| Nitroglycerine                                 | NA                                           | 4.80E-01                                                |                                | na   | NA                                         | NA                                           | na                           |
| 1,3-Dinitrobenzene                             | NA                                           | 3.65E-01                                                |                                | na   | NA                                         | 3.00E+03                                     | na                           |
| 1,3,5-Trinitrobenzene                          | NA                                           | 1.10E+02                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| 2,4,6-Trinitrotoluene                          | NA                                           | 2.24E-01                                                |                                | na   | NA                                         | 2.50E+04                                     | na                           |
| RDX                                            | NA                                           | 6.11E-02                                                |                                | na   | NA                                         | NA                                           | na                           |
| 4-Amino-2,6-Dinitrotoluene                     | NA                                           | NV                                                      |                                | na   | NA                                         | NA                                           | na                           |
| 2-Amino-2,6-Dinitrotoluene                     | NA                                           | NV                                                      |                                | na   | NA                                         | 1.50E+04                                     | na                           |
| Tetryl                                         | NA                                           | 3.65E+01                                                |                                | na   | NA                                         | NA                                           | na                           |
| HMX                                            | NA                                           | 1.83E+02                                                |                                | na   | NA                                         | NA                                           | na                           |
| Pentaerythritoltetranitrate                    | NA                                           | NV                                                      |                                | na   | NA                                         | 5.00E+01                                     | na                           |

Table D-3: Comparison of Air Concentrations With Health-Based Values for the M781

| M781 40mm TPT fired from the M203 (DODIC B519)                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                                                         |                                |      |                                            |                                              |                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------------------|------|--------------------------------------------|----------------------------------------------|------------------------------|
| Compound                                                                                                                                                                                                                                                                                                                                                                                                                                      | C <sub>chronic</sub><br>(µg/m <sup>3</sup> ) | Health-Based<br>Screening Level<br>(µg/m <sup>3</sup> ) | C <sub>chronic</sub> /<br>HBSL | > 1? | C <sub>acute</sub><br>(µg/m <sup>3</sup> ) | Acute Toxicity<br>Value (µg/m <sup>3</sup> ) | C <sub>acute</sub> /ATV > 1? |
| Diphenylamine                                                                                                                                                                                                                                                                                                                                                                                                                                 | NA                                           | 9.13E+01                                                |                                | na   | NA                                         | 3.00E+04                                     | na                           |
| <p>Footnotes:</p> <p>NA: Not applicable because compound was not detected.</p> <p>na: Not available because health-based screening value is not available or not applicable if compound was not detected.</p> <p>NV: No value available.</p> <p>C<sub>chronic</sub>: Chronic time-averaged concentration</p> <p>HBSL: Chronic health-based screening level</p> <p>C<sub>acute</sub>: acute concentration</p> <p>ATV: Acute toxicity value</p> |                                              |                                                         |                                |      |                                            |                                              |                              |

TABLE 2. Comparison of Air Concentrations With Health-Based Values for the M781: Total Petroleum Hydrocarbons

| Compound (a)                    | M781 40mm TPT fired from the M203 (DODIC B519) |                                           |                                           |                                           |
|---------------------------------|------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
|                                 | C <sub>chronic</sub> (µg/m <sup>3</sup> )      | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) |
|                                 | Aliphatic:C<=8                                 | Aliphatic:C>8                             | Aromatic:C<=8                             | Aromatic:C>8                              |
| Hexane                          | 6.83E-10                                       | NA                                        | NA                                        | NA                                        |
| Benzene                         | NA                                             | NA                                        | 3.04E-09                                  | NA                                        |
| Toluene                         | NA                                             | NA                                        | 3.86E-10                                  | NA                                        |
| Octane                          | 6.36E-12                                       | NA                                        | NA                                        | NA                                        |
| Ethylbenzene                    | NA                                             | NA                                        | 9.96E-11                                  | NA                                        |
| m&p-Xylene                      | NA                                             | NA                                        | 3.46E-10                                  | NA                                        |
| o-Xylene                        | NA                                             | NA                                        | 2.52E-10                                  | NA                                        |
| Styrene                         | NA                                             | NA                                        | NA                                        | 1.08E-09                                  |
| Cumene                          | NA                                             | NA                                        | NA                                        | 1.69E-11                                  |
| 4-Ethyltoluene                  | NA                                             | NA                                        | NA                                        | 1.29E-10                                  |
| 1,3,5-Trimethylbenzene          | NA                                             | NA                                        | NA                                        | 7.27E-11                                  |
| 1,2,4-Trimethylbenzene          | NA                                             | NA                                        | NA                                        | 2.42E-10                                  |
| Propyne (methyl acetylene)      | 3.09E-10                                       | NA                                        | NA                                        | NA                                        |
| 1-Butene/Isobutylene (115-11-7) | 3.56E-10                                       | NA                                        | NA                                        | NA                                        |
| Propyne /1-Propyne              | 1.92E-10                                       | NA                                        | NA                                        | NA                                        |
| Undecane                        | NA                                             | 7.01E-10                                  | NA                                        | NA                                        |
| 3-Methyl-undecane (dodecane)    | NA                                             | 2.28E-10                                  | NA                                        | NA                                        |
| Dodecane                        | NA                                             | 7.60E-10                                  | NA                                        | NA                                        |
| 2,6-Dimethyl-undecane           | NA                                             | 2.88E-10                                  | NA                                        | NA                                        |
| Undecane                        | NA                                             | 2.30E-10                                  | NA                                        | NA                                        |
| Dodecane                        | NA                                             | 3.01E-10                                  | NA                                        | NA                                        |
| Hexyl-cyclohexane               | NA                                             | 1.54E-10                                  | NA                                        | NA                                        |
| naphthalene                     | NA                                             | NA                                        | NA                                        | NA                                        |
| acenaphthylene                  | NA                                             | NA                                        | NA                                        | 5.38E-11                                  |
| acenaphthene                    | NA                                             | NA                                        | NA                                        | 9.35E-12                                  |
| fluorene                        | NA                                             | NA                                        | NA                                        | 5.22E-13                                  |
| phenanthrene                    | NA                                             | NA                                        | NA                                        | 1.21E-12                                  |
| anthracene                      | NA                                             | NA                                        | NA                                        | 1.47E-12                                  |
|                                 |                                                |                                           | NA                                        | 2.63E-13                                  |

Table D-4: Comparison of Air Concentrations With Health-Based Values for the M781: Total Petroleum Hydrocarbons

| M781 40mm TPT fired from the M203 (DODIC B519)                                                                                                                                                                  |                                           |                                           |                                           |                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| Compound (a)                                                                                                                                                                                                    | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) | C <sub>chronic</sub> (µg/m <sup>3</sup> ) |
|                                                                                                                                                                                                                 | <i>Aliphatic:C&lt;=8</i>                  | <i>Aliphatic:C&gt;8</i>                   | <i>Aromatic:C&lt;=8</i>                   | <i>Aromatic:C&gt;8</i>                    |
| fluoranthene                                                                                                                                                                                                    | NA                                        | NA                                        | NA                                        | 4.69E-13                                  |
| Total (µg/m <sup>3</sup> )                                                                                                                                                                                      | 1.55E-09                                  | 2.66E-09                                  | 4.12E-09                                  | 1.61E-09                                  |
| Derived Health-Based Screening Level                                                                                                                                                                            | 1.92E+04                                  | 1.04E+03                                  | 4.17E+02                                  | 2.09E+02                                  |
| C <sub>chronic</sub> /HBSL                                                                                                                                                                                      | 8.05E-14                                  | 2.55E-12                                  | 9.88E-12                                  | 7.70E-12                                  |
| >1?                                                                                                                                                                                                             | no                                        | no                                        | no                                        | no                                        |
| Footnotes:<br>>1? = Is the ratio greater than one?<br>NA = Not Applicable because compound was not detected<br>C <sub>chronic</sub> = chronic averaged air Concentration<br>HBSL = Health-Based Screening Level |                                           |                                           |                                           |                                           |

## **APPENDIX E**

### **FACT SHEETS SUBMITTED TO THE U.S. ARMY ENVIRONMENTAL CENTER**

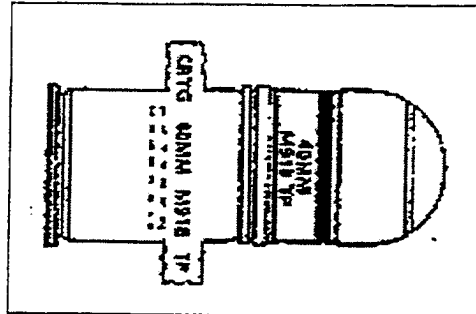
# U.S. Army Environmental Center

## Training Munitions Fact Sheet

### ***M918 40-mm Practice Cartridge***

*Department of Defense Identification Code: B584*

***Breathing air emissions from the M918 40-mm practice cartridge will not impact the health of residents who live near Army training facilities.***



To be fully prepared to protect our country, U.S. soldiers must train with many different weapons and munitions, including the M918 40-mm practice cartridge. This training is important because it helps prepare our soldiers for a variety of combat situations. While the Army recognizes the value of such comprehensive training on our installations, we also work hard to ensure the safety and health of surrounding communities.

### **WILL BREATHING AIR EMISSIONS FROM THE M918 40-MM PRACTICE CARTRIDGE AFFECT MY HEALTH?**

To answer this question, the U.S. Army tested the air emissions that are released when the M918 is fired. The information gathered during these tests was then analyzed to determine if there would be a potential for health effects from inhalation to residents who live near training areas. Study results, generated using conservative methods, showed that offsite residents breathing air as close as 100 meters (328 feet or about the length of a football field) from the firing location are safe from these emissions. At most locations, training areas are at least 1,000 meters (over half a mile) away from populated areas and the distance to firing locations may be even farther.

### **HOW WAS THE STUDY CONDUCTED?**

To gather data for this study, the M918 was fired from the Mark 19 machine gun in a test chamber. The air in the chamber was then tested to identify the types and amounts of substances released. About 300 different substances were looked for during this part of the study.

This information was then used in an U.S. Environmental Protection Agency (USEPA) approved air model (a computer program that allows estimation of air concentrations) to determine the amount of each substance to which someone living near a training site might be exposed. Downwind concentrations were

estimated based on a typical use scenario for the M918 during training exercises. Since this study did not look at any one specific training area, the assumptions used in the model would, in most cases, predict higher downwind air concentrations than those expected at an actual training site.

These estimated air concentrations were then compared to screening levels established by the USEPA and other federal agencies. If the air concentrations are less than these screening levels, they are considered safe for the general population, including sensitive people such as the sick, elderly, and children.

### **WHAT ARE THE STUDY LIMITATIONS?**

Many steps were taken to ensure that the results of this study are protective of residents who live near training facilities. However, as with any study, this study has limitations. For example, the study does not consider exposure to other types of munitions that could also be used during the same training event. Due to these limitations, conservative model conditions were used to ensure the protection of public health from breathing M918 air emissions.

### **WHAT EXACTLY IS THE M918 40-MM PRACTICE CARTRIDGE?**

The M918 is a practice round used only in training. Multiple cartridges are linked together and fired at targets of varying distance. The M918 mimics the appearance and behavior of the M430 cartridge used in combat. Each M918 cartridge consists of a steel body enclosed in an aluminum case. The propelling charge is made primarily of nitrocellulose and nitroglycerine. Nitrocellulose is the primary ingredient in smokeless propellant (for both military and commercial use) and is also used in the production of lacquers and artificial leathers.

Nitroglycerine is a component in dynamite and is used for military and industrial purposes such as mining and demolition. Each M918 cartridge is about the length of a soda can and can be identified by its blue and brown color with black markings.

### **WHERE CAN I GET MORE INFORMATION?**

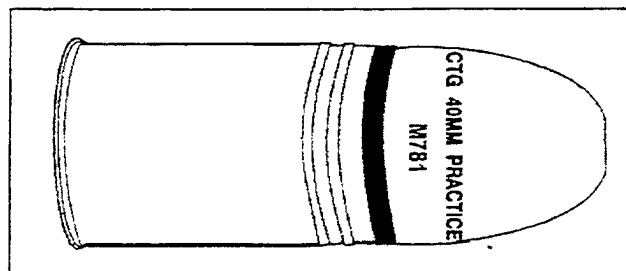
For more information on the M918 or other military munitions, please call the Army Environmental Hotline at 1-800-USA-3845, visit our Web site at [www.aec.army.mil](http://www.aec.army.mil), or e-mail [t2hotline@aec.apgea.army.mil](mailto:t2hotline@aec.apgea.army.mil).

# U.S. Army Environmental Center Training Munitions Fact Sheet

## ***M781 40-mm Practice Cartridge***

*Department of Defense Identification Code: B519*

***Breathing air emissions from the M781 40-mm practice cartridge will not impact the health of residents who live near Army training facilities.***



To be fully prepared to protect our country, U.S. soldiers must train with many different weapons and munitions, including the M781 40-mm practice cartridge. This training is important because it helps prepare our soldiers for a variety of combat situations. While the Army recognizes the value of such comprehensive training on our installations, we also work hard to ensure the safety and health of surrounding communities.

### **WILL BREATHING AIR EMISSIONS FROM THE M781 40-MM PRACTICE CARTRIDGE AFFECT MY HEALTH?**

To answer this question, the U.S. Army tested the air emissions that are released when the M781 is fired. The information gathered during these tests was then analyzed to determine if there would be a potential for health effects from inhalation to residents who live near training areas. Study results, generated using conservative methods, showed that offsite residents breathing air as close as 100 meters (328 feet or about the length of a football field) from the firing location are safe from these emissions. At most locations, training areas are at least 1,000 meters (over half a mile) away from populated areas and the distance to firing locations may be even farther.

### **HOW WAS THE STUDY CONDUCTED?**

To gather data for this study, the M781 was fired from the M203 40-mm Grenade Launcher in a test chamber. The air in the chamber was then tested to identify the types and amounts of substances released. About 300 different substances were looked for during this part of the study.

This information was then used in an U.S. Environmental Protection Agency (USEPA) approved air model (a computer program that allows estimation of air concentrations) to determine the amount of each substance to which someone living near a training site might be exposed. Downwind concentrations were estimated based on a typical use scenario for the M781 during training exercises.

Since this study did not look at any one specific training area, the assumptions used in the model would, in most cases, predict higher downwind air concentrations than those expected at an actual training site.

These estimated air concentrations were then compared to screening levels established by the USEPA and other federal agencies. If the air concentrations are less than these screening levels, they are considered safe for the general population, including sensitive people such as the sick, elderly, and children.

### **WHAT ARE THE STUDY LIMITATIONS?**

Many steps were taken to ensure that the results of this study are protective of residents who live near training facilities. However, as with any study, this study has limitations. For example, the study does not consider exposure to other types of munitions that could also be used during the same training event.. Due to these limitations, conservative model conditions were used to ensure the protection of public health from breathing M781 air emissions.

### **WHAT EXACTLY IS THE M781 40-MM PRACTICE CARTRIDGE?**

The M781 is a practice round used to train soldiers operation of the M203. When launched, the M781 can reach a maximum distance of up to 400 meters (0.25 miles). Upon impact, the M781 releases a bright yellow-orange smoke that can be used to determine the distance from the target. The M781 consists of a metal projectile that is attached to a plastic cartridge case. The cartridge is filled with a yellow-orange dye that produces smoke when the M781 hits a target. Each M781 cartridge is about the length of a soda can and can be identified by its blue casing with white markings.

### **WHERE CAN I GET MORE INFORMATION?**

For more information on the M781 or other military munitions, please call the Army Environmental Hotline at 1-800-USA-3845, visit our Web site at [www.aec.army.mil](http://www.aec.army.mil), or e-mail [t2hotline@aec.apgea.army.mil](mailto:t2hotline@aec.apgea.army.mil).