BACKGROUND DOCUMENT

REPORT ON CREATION OF 5TH EDITION AP-42 CHAPTER 15 - ORDNANCE DETONATION

EMISSION FACTORS DEVELOPED BASED ON PHASE I TESTING CONDUCTED AT DUGWAY PROVING GROUND, UTAH

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Due to the lack of credible data concerning emissions from training ordnance when used in their tactical configurations, the U.S. Army Environmental Center (USAEC) established a program to quantify emissions from the detonation of ordnance. This document presents background information concerning the development of air emission factors for eight ordnance types used during training exercises at U.S. Army installations. The air emission factors were developed from test data collected by USAEC. Ordnance for which emission factors have been developed and their corresponding AP-42 sections are identified in Table 1. To help readers easily find those emission factors of interest, the ordnance are organized according to their Department of Defense Identification Code (DODIC).

TABLE 1 ORDNANCE FOR WHICH EMISSION FACTORS WERE DEVELOPED

DODIC	Ordnance Description	AP-42 Section
D505	M485A2 155 mm Illumination Round	15.4.1
L305	M195 Green Star Parachute Signal Flare	15.8.1
L312	M127A1 White Star Parachute Signal Flare	15.8.5
L314	M125A1 Green Star Cluster Signal Flare	15.8.6
L594	M115A2 Ground Burst Simulator	15.8.10
L596	M110 Flash Artillery Simulator	15.8.11
L598	M117 Flash Booby Trap Simulator	15.8.12
L601	M116A1 Hand Grenade Simulator	15.8.15

These eight ordnance are the first of a series of ordnance being tested by USAEC. They include projectiles, canisters, and charges (DODICs beginning with the letter D) as well as signals and simulators (DODICs beginning with the letter L). The U.S. Army eventually hopes to prepare emission factors for hundreds of ordnance types that will be presented in 11 new AP-42 sections as identified in Table 2.

The emission factors described in this document are based on data obtained during testing conducted at Dugway Proving Ground, Utah, as presented in the final test report titled *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*[1] and supplemented by additional information from the testing contractor.[2] For each ordnance, one or two test runs were conducted. The number of individual ordnance detonated per run varied with the ordnance. Generally, the number of individual ordnance detonated was greater for smaller ordnance in order to generate measurable quantities of emissions. Source test protocols were developed by USAEC before any testing was conducted and were reviewed by the U.S. Environmental Protection Agency's (EPA's) Emission Measurement Center. The tests were conducted between March 28 and April 1, 1998.

The compounds that were measured included carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), total suspended particulate (TSP), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM-10), metals, hydrogen chloride and chlorine (HCl/Cl_2), volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and dioxins/furans (PCDD/PCDF). Appendix A identifies, by ordnance type, all of the compounds for which analyses were performed and the emission factors that were developed. Within each of the AP-42 sections, only emission factors for criteria pollutants, carbon dioxide, hazardous air pollutants (as defined by §112(b)(1) of the *Clean Air Act*), and toxic chemicals (as defined by §313 of the *Emergency Planning and Community Right-to-Know Act*) are presented.

TABLE 2 ORGANIZATION OF AP-42 CHAPTER 15

First Letter of DODIC	Ordnance Description	AP-42 Section Number
A	Cartridges < 30 mm	15.1
B	Cartridges 30-75 mm	15.2
C	Cartridges > 75 mm	15.3
D	Projectiles, Canisters, and Charges	15.4
G	Grenades	15.5
H	Rockets, Rocket Motors, and Igniters	15.6
K	Mines and Smoke Pots	15.7
L	Signals and Simulators	15.8
M	Blasting Caps, Demolition Charges, and Detonators	15.9
N	Fuses and Primers	15.10
P	Guided Missiles	15.11

The emission factors were developed on a "per item" basis and on a "per net explosive weight (NEW)" basis. Users should choose the appropriate emission factor to estimate emissions based upon the data available; either factor is equally valid. The NEW of each ordnance tested is provided in the corresponding AP-42 section and in Table 3.

TABLE 3 ORDNANCE NET EXPLOSIVE WEIGHT

DODIC	Ordnance Description	NEW (lb/item)[a]
D505	M485A2 155 mm Illumination Round	6.123
L305	M195 Green Star Parachute Signal Flare	0.316
L312	M127A1 White Star Parachute Signal Flare	0.2827
L314	M125A1 Green Star Cluster Signal Flare	1.669
L594	M115A2 Ground Burst Simulator	0.141
L596	M110 Flash Artillery Simulator	0.1875
L598	M117 Flash Booby Trap Simulator	0.0077
L601	M116A1 Hand Grenade Simulator	0.0813

[a] NEW values were obtained from Reference 3.

This document includes five sections in addition to this Introduction. Section 2 of this document identifies the compounds measured during the test program and describes the emission measurement methods used. Section 3 includes a discussion of the emission factor final test report and ratings for the test data contained therein. Section 4 describes the calculations and methodologies used to develop emission factors for each type of compound measured. Section 5 describes the methodology used to rate the emission factors and provides emission factor ratings for each type of compound measured. Section 6 includes a complete list of the references cited in this document.

There are two appendices included with this document. Appendix A identifies, by ordnance type, all of the compounds for which analyses were performed and the emission factors that were developed. Appendix A also identifies the minimum detection levels associated with all compounds that were not detected. Appendix B includes the new AP-42 sections for the eight ordnance that were tested. In addition to this document, there are electronic databases available on the web (www.epa.gopv/ttn/chief) that contain the data used in the development of the emission factors. The procedures that were followed to develop these emission factors can be found at the same web address under the title *Procedures for Preparing Emission Factor Documents*.[4]

2.0 COMPOUNDS MEASURED AND EMISSION MEASUREMENT METHODS

During the USAEC Phase I Training Ordnance Emission Characterization tests, ordnance were detonated in a thermal treatment characterization facility known as a BangBox™. The BangBox used during the test was a 50-foot diameter hemisphere made from plasticized fabric, which was kept rigid by a constant injection of fresh air and a semirigid airlock. Within the test chamber were samplers, a steel-lined detonation pit, an automatically-regulated inflation blower, environmental control equipment, and a sampling tube. Real-time analyzers were connected to a data recorder.

A number of different test methods were employed to collect and analyze the emission data that were used to develop emission factors for detonation of ordnance. Table 4 identifies each emission test method used. The emissions data were collected using EPA test methods published in Title 40 of the Code of Federal Regulations, Part 50 (40 CFR 50) and 40 CFR 60, and in *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*.[5] Some of the sample analytical procedures used were from EPA Office of Solid Waste (OSW) publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*.[6] Where necessary, the test methods were adapted to reflect application to the unique testing of ordnance detonation in the BangBox.

The following sections identify and briefly describe the sampling and analytical methods used to measure each compound or group of compounds. Additional information regarding the operation of the BangBox and the sampling methods used is presented in Appendix II-K of Reference 1. EPA-approved methods were used by the laboratories that provided sampling and analysis data.

2.1 Carbon Monoxide, Carbon Dioxide, Oxides of Nitrogen, and Sulfur Dioxide

Real-time concentrations of CO, CO_2, NO_x, and SO_2 that resulted from the detonation of ordnance in the BangBox were measured using a continuous emissions measurement system (CEMS). CO sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 10, with an API 300 nondispersive infrared analyzer. CO_2 sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 3A, with a TECO Model 41C infrared analyzer. NO_x sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 7E, with an API 200A chemiluminescent NO-NO_2 gas analyzer. SO_2 sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 6C, with an API 100A fluorescent analyzer.

TABLE 4 EMISSION TEST METHODS USED

Compound	Test Method
CO	40 CFR 60, Appendix A, EPA Method 10 [sampling and analysis]
CO_2	40 CFR 60, Appendix A, EPA Method 3A [sampling and analysis]
NO_x	40 CFR 60, Appendix A, EPA Method 7E [sampling and analysis]
SO_2	40 CFR 60, Appendix A, EPA Method 6C [sampling and analysis]
TSP	40 CFR 50, Appendix B [sampling and analysis]
PM-10	40 CFR 50, Appendix J [sampling and analysis]
Metals	40 CFR 50, Appendix B [sampling] 40 CFR 60, Appendix A, EPA Method 29 (analysis of TSP) [analysis]
HCl/Cl_2	40 CFR 60, Appendix A, EPA Method 26 [sampling] EPA Method 9057 [analysis]
VOC	TO-12 - *Method for the Determination of Non-Methane Organic Compounds (NMOC) in Ambient Air Using Cryogenic Preconcentration and Direct Flame Ionization Detection (FID)* [sampling and analysis]
Speciated VOC	TO-14 - *Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography* [sampling and analysis]
SVOC	TO-13 - *Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)* [sampling] SW-846 Method 8270 [analysis]
PCDD/PCDF	TO-9 - *Determination of Polychlorinated, Polybrominated, and Brominated/ Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in Ambient Air* [sampling] SW-846 Method 8290 [analysis]

[a] All TO methods are from *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*.[5]

2.2 Total Suspended Particulate

The TSP concentration that resulted from the detonation of ordnance in the BangBox was determined using a high-volume sampling and analysis procedure based on 40 CFR 50, Appendix B – *Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method)*. During each run, duplicate samples were obtained using two high-volume samplers operating simultaneously. For each run, the target minimum sampling time was 20 minutes. The sampling rate was recorded continuously using a data acquisition system (DAS). The TSP concentration was computed by dividing the mass of TSP collected by the volume of air sampled, corrected to standard conditions.

2.3 Particulate Matter with an Aerodynamic Diameter Less than or Equal to 10 Microns

The PM-10 concentration that resulted from the detonation of ordnance in the BangBox was determined using a high-volume sampling and analysis procedure based on 40 CFR 50, Appendix J – *Reference Method for the Determination of Particulate Matter as PM-10 in the Atmosphere*. A high-

volume PM-10 sampler with a size-selective inlet was used to collect the PM-10. During each run, duplicate samples were obtained using two samplers operating simultaneously. Due to high PM-10 concentrations, the filters would become loaded with PM-10 and the samplers could not maintain the desired flow throughout a run. To maintain the sampling cut point near PM-10, each sampler was to be stopped when the sampling flow rate dropped to 80 percent of the initial sampling rate (i.e., a 20 percent drop in the sampling rate). The PM-10 concentration was computed by dividing the mass of PM-10 collected by the volume of air sampled, corrected to standard conditions.

2.4 Metals

Metal concentrations that resulted from the detonation of ordnance in the BangBox were determined using particulate matter from the TSP Hi-Vol samples. As described above, TSP was collected using a high-volume sampling and analysis procedure based on 40 CFR 50, Appendix B. After the TSP total weight gain was determined in the laboratory, a portion of the TSP filter was digested with concentrated hydrogen fluoride and nitric acid per 40 CFR 60, Appendix A, Method 29. Alternatively, if insufficient TSP material was present, the entire filter was digested. The digestate was then analyzed for metals (except mercury) using inductively coupled argon plasma (ICAP) emission spectroscopy in accordance with SW-846 Method 6010A. Mercury was determined by cold vapor atomic absorption spectroscopy (CVAAS) in accordance with SW-846 Method 7470. The concentration of each target metal was computed by dividing the mass of metal collected by the volume of air sampled, corrected to standard conditions.

2.5 Hydrogen Chloride and Chlorine

Hydrogen chloride and chlorine that resulted from the detonation of ordnance in the BangBox were measured in accordance with 40 CFR Part 60, Appendix A, Method 26 - *Determination of Hydrogen Chloride Emissions from Stationary Sources*. During each run, duplicate samples were obtained using two samplers operating simultaneously. The target sampling duration was 30 minutes. Collected samples were analyzed using SW-846 Method 9057 - *Determination of Chloride from HCl/Cl_2 Emission Sampling Train (Methods 0050 and 0051) by Anion Chromatography*. The concentrations of HCl and Cl_2 were computed by dividing the mass collected by the volume of air sampled, corrected to standard conditions. HCl was also measured by a continuous analyzer, but these results were not used for development of emission factors.

2.6 Volatile Organic Compounds

VOC concentrations that resulted from the detonation of ordnance in the BangBox were determined using two methods from the *Second Supplement to Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*: (1) Method TO-12 - *Method for the Determination of Non-methane Organic Compounds in Ambient Air using Cryogenic Preconcentration and Direct Flame Ionization Detection* and (2) Method TO-14 - *Determination of Volatile Organic Compounds in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analysis*. For both procedures, air samples were collected in stainless steel SUMMA® canisters. Two or three identical canisters were used for each test run. The minimum sampling time for each VOC canister was 10 minutes.

2.7 Semivolatile Organic Compounds

SVOC concentrations that resulted from the detonation of ordnance in the BangBox were determined based on procedures found in Method TO-13 - *Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)*. During

each run, duplicate samples were collected using two PS-1 samplers that contained special sampling inlets (i.e., aluminum sampling modules) designed to hold 100-mm diameter quartz fiber filters to collect particulate matter, followed by XAD-2 adsorbent resin cartridges for collection of vapor phase SVOCs. A 20-minute sampling time was targeted. Following sampling, the filters and resin cartridges underwent solvent extraction and the mass of SVOC collected was quantitatively determined by GC/MS analysis following procedures in SW-846 Method 8270 - *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)*.

2.8 Dioxin/Furan Compounds

Dioxin/furan compound concentrations that resulted from the detonation of ordnance in the BangBox were determined based on procedures found in Method TO-9 - *Determination of Polychlorinated, Polybrominated, and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in Ambient Air*. During each run, duplicate samples were obtained using two modified PS-1 samplers. The modified samplers used standard quartz filters, but the adsorbent cartridges contained XAD-2 resin sandwiched between polyurethane foam (PUF) plugs. A minimum sampling time of 20 minutes was targeted. After sampling, the filters and adsorbent cartridges underwent extraction with the appropriate solvent(s). The mass of PCDD/PCDF collected was quantitatively determined following SW-846 Method 8290 - *Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS)*.

3.0 TEST DATA ANALYSIS AND RATING

3.1 EPA Guidance Regarding Test Data Quality Ratings

Prior to inclusion of emission factors in AP-42, the reliability of the underlying emission test data must be appraised in accordance with the rating system specified in *Procedures for Preparing Emission Factor Documents*.[4] Under this rating system, test data are assigned a rating from A to D, where an "A" rating is assigned to the highest quality data. The criteria used to assign a specific data quality rating are summarized below.

- **A** Tests are performed by using an EPA reference test method, or when not applicable, a sound methodology. Tests are reported in enough detail for adequate validation and raw data are provided that can be used to duplicate the emission results presented in the report.
- **B** Tests are performed by a generally sound methodology, but lacking enough detail for adequate validation. Data are insufficient to completely duplicate the emission result presented in the report.
- **C** Tests are based on an unproven or new methodology, or are lacking a significant amount of background information.
- **D** Tests are based on a generally unacceptable method, but the method may provide an order-of-magnitude value for the source.

Four specific criteria are identified in *Procedures for Preparing Emission Factor Documents* for consideration to assist in the assignment of a test data quality rating. These four criteria are:

1. Source operation. If the manner in which the source was operated is well documented in the report and the source was operating within typical parameters during the test, an A rating should be assigned. If the report stated parameters that were typical, but lacked detailed information, a B

rating should be assigned. If there is reason to believe the operation was not typical, a C or D rating should be assigned.

2. Test methods and sampling procedures. In developing the ratings, the estimated accuracy and precision of the test method as well as the adequacy of the documentation should be considered. In general, if a current EPA reference test method, appropriate for the source, was followed, the rating should be higher (A or B). If other methods were used, an assessment should be made of their validity. If it is judged that the method was likely to be inaccurate or biased, a lower rating (C or D) should be given. A complete report should indicate whether any procedures deviated from standard methods and explain any deviations. If deviations were reported, an evaluation should be made of whether these were likely to influence the test results.

3. Process information. During testing, many variations in the process can occur without warning and sometimes without being noticed. Such variations can induce wide deviations in sampling results. If a large variation between test run results cannot be explained by information contained in the site final test report or from final test reports of other sources, the data are suspect and should be given a lower rating or excluded. However, it should be recognized that a process may have highly variable emissions and a lower rating may not be appropriate solely on the basis of wide deviations in sampling results.

4. Analysis and calculations. Ideally, final test reports should contain original raw data sheets and other documentation such as gas parameters (dry cubic feet per minute, oxygen percentage), calculation sheets, or example calculations describing how the calculated emission results were obtained. If there are data sheets, the nomenclature and equations used should be compared to those specified by EPA to establish equivalency. The depth of review of the calculations should be dictated by the reviewers' confidence in the ability and conscientiousness of the tester, based on such factors as consistency of results and completeness of other areas of the final test report. Reports may indicate that raw data sheets were available, but were not included. If the final test report is of high quality based on the other criteria, the quality rating should not be lowered due to a lack of data sheets.

An overall test data quality rating should be assigned based upon the ratings assigned for each of the four criteria.

3.2 Analysis of Test Data

Data included in the final test report titled *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*[1] were rated in accordance with the rating system described above. Results for each of the four criteria described above are presented in the following sections.

3.2.1 Source Operations

The manner by which the ordnance were deployed (i.e., used) is documented in the final test report. Each of the ordnance that was tested was deployed in a manner similar to that which would occur in the field. Handheld and mounted ordnance were installed in a frame and deployed remotely using either electronic or mechanical actuators, while flares were deployed by launching into a sand-filled pit. Although the flares were launched into a sand-filled pit rather than into the air, they (and all other ordnance) were fully deployed during their respective test runs. Consequently, the tests appear to have replicated typical ordnance operating parameters and the test data should be assigned an "A" rating based on this criterion.

3.2.2 Test Methods and Sampling Procedures

The test methods and sampling procedures were evaluated as being appropriate and consistent with EPA test methods or sound methodology. Only one problem of any significance was identified. This problem affected the collection of data for PM-10. The test procedure for PM-10 sampling required that sampling stop once the flow rate dropped to more than 20 percent of the set point. Based on the raw data provided, sampling continued well past the 20 percent stop point for three of the ordnance and to some extent for the other five (see Table 5). The reduced flow condition allowed particles greater than 10 microns in diameter to be collected and measured as part of the PM-10 fraction. Although the test data indicate that the vast majority of the TSP fell within the PM-10 fraction, the discrepancy between the sampling procedure used and the procedure called for in the protocol should lead to a downgrading of the PM-10 test data to a "B" rating for the three ordnance with the largest discrepancies. The remaining test data should be assigned an "A" rating based on this criterion.

TABLE 5 PERCENT REDUCTION IN SAMPLING VOLUME FLOW RATE FOR PM-10 TESTING

Ordnance (DODIC #)	Test Run 1		Test Run 2	
	Sample A	Sample B	Sample A	Sample B
D505[a]	-50%	-43%	--	--
L305[a]	-62%	-41%	--	--
L312	-24%	-14%	--	--
L314	-13%	-21%	--	--
L594	-25%	-29%	-23%	-23%
L596	-16%	-10%	-18%	-15%
L598	-23%	-15%	--	--
L601[a]	-60%	-56%	-44%	-36%

[a] Data quality ratings were downgraded for these ordnance.

3.2.3 Process Information

Large discrepancies (i.e., order of magnitude) were not observed between test runs for any of the ordnance tested. Furthermore, ordnance are manufactured to tight tolerances and are expected to deploy (i.e., the process) in a very repeatable fashion. Consequently, the test data should be assigned an "A" rating based on this criterion.

3.2.4 Analysis and Calculations

The final test report was reviewed to determine whether it contained all of the original raw data, other documentation, and example calculations. Although the final test report contained almost all of the raw data, it did not contain data associated with the calculation of the BangBox volume. The lack of this information was judged insufficient to result in a downgrade of the test data quality rating. The final test report also lacked certain calibration data. Again, the missing information was judged insufficient to result in a downgrade of the test data quality rating.

The raw data and sample calculations presented in the final test report were reviewed to determine if the emission factors presented in the report could be duplicated. Excel spreadsheets were developed to assist in this effort. The sample calculations and raw data were presented in the final test report in sufficient detail to allow the emission factors to be calculated. Where differences were found between the emission factors calculated using the Excel spreadsheets and those presented in the final test report, an examination was made to determine the reason for the differences. Several minor errors were noted in the calculation of the emission factors within the final test report, particularly with respect to the incorporation of analytical detection limits into the emission factors (see Section 4.4 for a discussion of the methodology). However, the emission factors presented in AP-42 are based upon the corrected spreadsheets. Based upon the raw data, other documentation, and the Excel spreadsheet calculations, the test data should be assigned an "A" rating.

3.3 Test Data Quality Ratings

Upon completing the analysis described in the preceding section of this document, the test data quality ratings assigned as a result of the four criteria were reviewed. This review led to a "B" rating for the PM-10 test data associated with the three ordnance for which the sampling volume flow rate dropped below expected parameters. The remaining test data were assigned an "A" rating. Table 6 summarizes the test data ratings for each compound and set of compounds.

TABLE 6 TEST DATA QUALITY RATINGS

Compound(s)	Data Quality Rating
CO	A
CO_2	A
NO_x	A
SO_2	A
TSP	A
PM-10 (D505, L305, L601)	B
PM-10 (all others)	A
Metals	A
HCl/Cl_2	A
VOC	A
SVOC	A
PCDD/PCDF	A

4.0 EMISSION FACTOR CALCULATIONS

The methodologies and procedures that were used to develop emission factors from the test data are described in this section. A similar approach was used to calculate emission factors for TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds. The calculation steps that were performed for each sampling train and each run are summarized below.

1. The sample duration was calculated for the background and test runs.

2. Volumetric flow meter biases were calculated for the background and test runs.
3. The sample volumes associated with the background and test runs were calculated.
4. For compounds for which more than one test sample was obtained, analytical detection limits were incorporated into the test data.
5. The background compound concentration was calculated by dividing the mass of compound detected during the background run by the background run sample volume.
6. The test compound concentration was calculated by dividing the mass of compound detected during the test run by the test run sample volume.
7. A background-corrected concentration was calculated by subtracting the background concentration from the test concentration.
8. A dilution correction factor was calculated for the test run.
9. A dilution-corrected concentration was calculated by dividing the background-corrected concentration by the dilution correction factor.
10. The mass of compound released during the test run was calculated by multiplying the dilution-corrected concentration by the volume of the BangBox.
11. Emission factors for each sample or sampling train and test run were calculated by dividing the mass of compound released by the number of ordnance detonated during the test run or by the NEW detonated during the test run, as appropriate.
12. Average emission factors were calculated for each compound.

For CEMS-measured compounds (i.e., CO, CO_2, NO_x, and SO_2), the sample times were calculated in accordance with step 1 above. Because concentration data (i.e., mg/m^3, ppmv, or ppbv) were recorded during the background and test runs for VOC and CEMS-measured compounds, it was not necessary to calculate either a volumetric flow meter bias or a sample volume as described in steps 2 and 3, respectively. Where present, ppmv and ppbv values were converted to mg/m^3. Emission factors for VOC and CEMS-measured compounds were then estimated in accordance with the remaining steps described above.

The following sections describe the emission factor calculation steps in more detail. Sections 4.1 through 4.12 discuss the calculations involved with the completion of the 12 basis steps listed above. Section 4.13 discusses how data from combined sampling runs were handled. Section 4.14 discusses how specific compounds that were measured using more than one test method or that were analyzed using more than one analytical method were addressed. Finally, Section 4.15 discusses the calculation of a toxicity equivalency factor for dioxin/furan compounds.

4.1 Determination of Sample Duration

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the background run sample duration was calculated as the difference between the time the sampler was turned on and the time the sampler was turned off. The time the sampler was turned on was identified as the first apparent deviation (an increase) from the volumetric flow meter bias point (see Section 4.2), while the time the sampler was turned off was identified as the time that the volumetric sampling rate data appeared to reach a steady state value following a substantial decrease (i.e., returned to the volumetric flow meter bias point) or the end of the test data, whichever came first. The exact times to select were somewhat subjective, but the final results were not affected in any substantial way. For Phase I testing at Dugway Proving Ground, the typical background sampling time was 30 minutes.

For test runs during which the sampler was turned on prior to detonation, the sample duration was calculated as the difference between the time of detonation and the time the sampler was turned off. For test runs during which the sampler was turned on after detonation, the sample duration was calculated as the difference between the time the sampler was turned on and the time the sample was turned off. The time the sampler was turned on and turned off was determined in the same manner as discussed above for the background runs. The detonation time was identified by the first nonzero value in the "Fire" data field.

For the CEMS-measured compounds, the sample duration was calculated as the difference between the time the compounds emitted from the detonation appeared to be fully mixed with the air within the BangBox and the time the sampler was turned off. The time the compounds were fully mixed within the BangBox was identified as the time at which the peak concentration data were recorded on the CEMS. This peak value typically occurred between 3 and 5 minutes after detonation. The exact time to select was somewhat subjective, but the final results were not affected in any substantial way. The time the sampler was turned off was identified as the time that the CEMS sampling data appeared to reach a steady state value following a substantial decrease or the end of the test data, whichever came first.

4.2 Determination of Volumetric Flow Meter Bias

The volumetric flow meters used during the collection of the TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds typically recorded a nonzero value while the associated pumps were turned off. This bias was quantified as the arithmetic mean of all volumetric flow rate measurements recorded while the pumps were off.

4.3 Determination of Sample Volume

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the sample volume was calculated by multiplying the average volumetric sampling rate by the sample duration. The average volumetric sampling rate was calculated by subtracting the volumetric flow meter bias from the arithmetic mean of all volumetric flow rate measurements recorded during the sample duration. This calculation is illustrated by the following equation:

$$\textit{sample volume} = (\textit{average volumetric flow rate}) - (\textit{volumetric flow meter bias})\,(\textit{sample duration})$$

Sample volumes were not calculated for VOC and CEMS-measured compounds because the test data for these compounds were recorded in terms of concentrations rather than in terms of mass.

4.4 Incorporation of Analytical Detection-Limits to the Test Data

In many cases, more than one test sample was obtained for a specific compound (i.e., more than one sample was obtained for a given test run or more than one test run was conducted). When multiple samples were obtained for the same compound, a comparison was made of all the sample data collected. Based upon the results of the comparison, the following adjustments were made to the test data:

1. If all of the samples indicated that a compound was "not detected," the sample data were not adjusted.
2. If all of the samples indicated that a compound was detected, the sample data were not adjusted.
3. If one or more of the samples indicated that a compound was detected and one or more of the samples indicated that a compound was not detected, the "not detected" values were replaced

with a value equal to one half of the compound's analytical detection limit. The assumption inherent to this adjustment was that the measured presence of a compound in one or more samples was indicative of the compound's presence in all samples. The analytical detection limits for each sample were obtained from the test data report.

4.5 Determination of Background Concentration

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the background compound concentration was calculated by dividing the mass of compound detected during the background run by the background run sample volume. This calculation is illustrated by the following equation:

$$background\ compound\ concentration = \frac{(mass\ of\ compound\ measured\ during\ background\ run)}{(background\ run\ sample\ volume)}$$

For VOC compounds, the background run data were used directly. For CEMS-measured compounds, the background compound concentration was calculated as the arithmetic mean of all CEMS measurements recorded during the test run prior to detonation. This methodology was used to provide a reading of the background compound concentrations within the BangBox that was as accurate as possible for the given test run.

4.6 Determination of Test Compound Concentration

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the test compound concentration was calculated by dividing the mass of compound measured during the test run by the test run sample volume. This calculation is illustrated by the following equation:

$$test\ compound\ concentration = \frac{(mass\ of\ compound\ measured\ during\ test\ run)}{(test\ run\ sample\ volume)}$$

For VOC compounds, the test run data were used directly. For CEMS-measured compounds, the test compound concentration was calculated as the arithmetic mean of all CEMS measurements recorded during the sample duration.

4.7 Determination of Background-Corrected Concentration

For all compounds, the calculation of the background-corrected concentration was dependent on whether the background and test concentrations were detected and whether they were less than, equal to, or greater than one another. The procedures used to calculate the background-corrected concentration for an individual sampling train are described below and are displayed graphically in Figure 1.

1. If the test concentration was not detected (ND), the background-corrected concentration equaled ND.
2. If the test concentration was detected and the background concentration was not detected, the background-corrected concentration equaled the test concentration.
3. If the test and background concentrations were detected and the test concentration was less than or equal to the background concentration, the background-corrected concentration equaled 0.

4. If the test and background concentrations were detected and the background concentration was less than the test concentration, the background concentration was subtracted from the test concentration. This calculation is illustrated by the following equation:

background corrected concentration = (*test concentration*) – (*background concentration*)

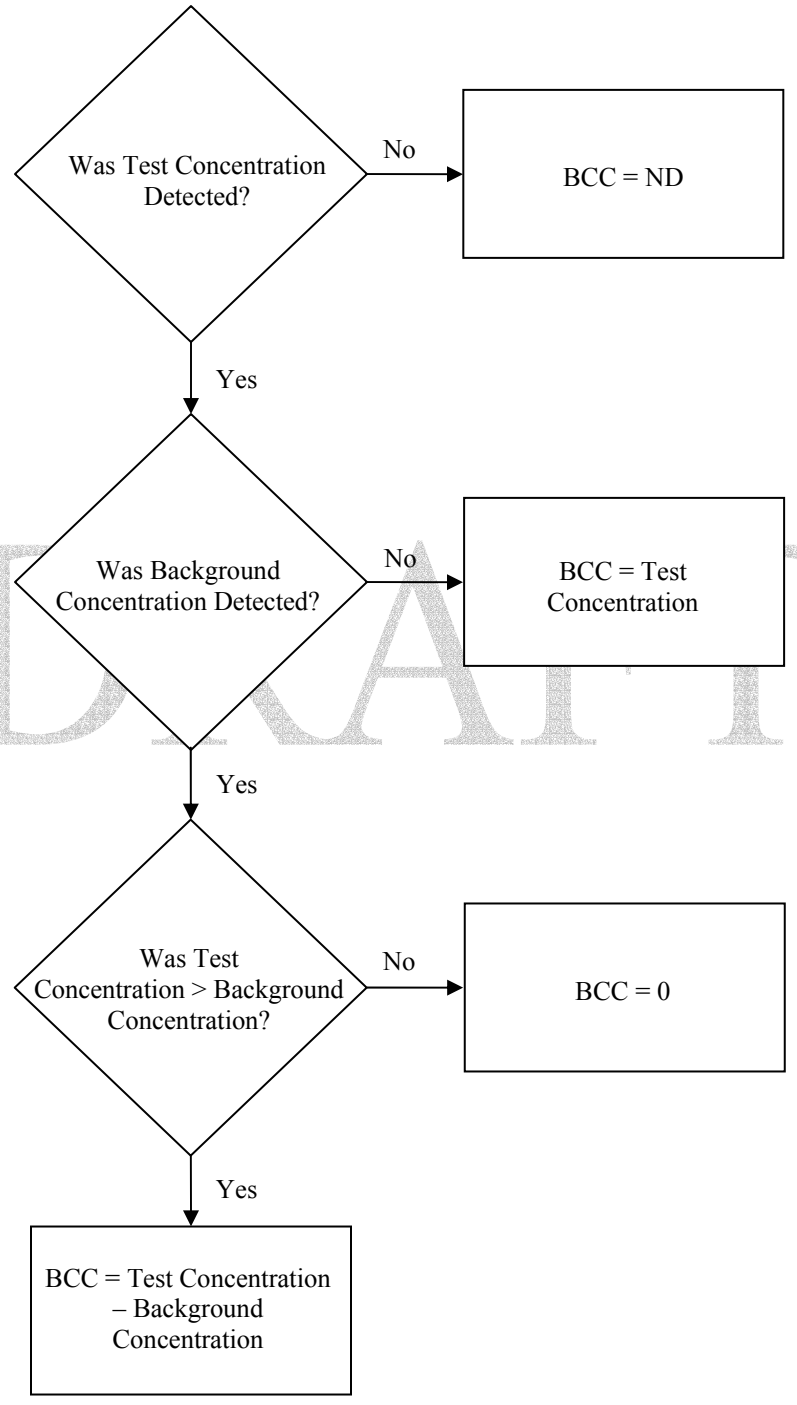

Figure 1 Calculation of background-corrected concentration (BCC).

4.8 Determination of Dilution Correction Factor

Because the BangBox is not a rigid structure, the box was continually pressurized to maintain its shape and volume using a supply of fresh air. A tracer gas, sulfur hexafluoride (SF_6), was released into the BangBox at the same time as detonation to allow the dilution of the sample volume to be quantified. Using measurements of the tracer gas concentration, a dilution correction factor was calculated using the following equation:

$$dilution\ correction\ \ factor = \frac{1}{(100)\ (aD)}\ (e^{Aa} - e^{Ba})$$

where:

a = slope of the regression line fitted to the tracer gas concentration vs. time data
A = sample start time, as measured from the detonation time (min)
B = sample stop time, as measured from the detonation time (min)
D = sample duration (min)

4.9 Determination of Dilution-Corrected Concentration

The dilution-corrected concentration was calculated by dividing the background-corrected concentration by the applicable dilution correction factor. This calculation is illustrated by the following equation:

$$dilution\ corrected\ concentration = \frac{(background\ corrected\ concentration)}{(dilution\ correction\ \ factor)}$$

4.10 Determination of Mass of Compound Released

The mass of compound released was calculated by multiplying the dilution-corrected concentration by the volume of the BangBox. This calculation is illustrated by the following equation:

$$mass\ compound\ released = (dilution\ corrected\ concentration)\ (BangBox\ volume)$$

4.11 Determination of Emission Factors

Once the mass of compound released was calculated, two emission factors were developed for each sample or sampling train and for each test run: the mass of compound released per item (i.e., per single ordnance) and the mass of compound released per pound NEW. The NEW for all ordnance were determined from Reference 3.

4.12 Determination of Average Emission Factors

Steps 1 through 11, as described in Sections 4.1 through 4.11, are applicable to individual samples or sampling trains within individual test runs. The final step in the emission factor calculation process was to calculate average emission factors for each compound in terms of mass released per item and mass released per pound NEW. The average emission factors for each compound were calculated as the arithmetic mean of the individual samples or sampling trains associated with the compound. Not detected (ND) values were ignored in the calculation process unless all samples or sampling trains

indicated the compound was not detected. In this instance, the average emission factor was assigned a value of ND. [Note: The minimum detection levels associated with the compounds that were not detected are presented in Appendix A.]

4.13 Handling Composite Test Data Collected Over Multiple Test Runs

Two test runs were conducted for three of the ordnance tested (DODICs L594, L596, and L601). Typically, separate samples were obtained for each test run for each compound measured. However, composite samples were obtained across both test runs for two compounds: SVOC and dioxin/furan. In each of these instances, one sample train obtained separate samples for each test run while the second sample train obtained a single composite sample across both test runs.

For each of the composite samples, the following adjustments were made to the emission factor calculation procedures previously described. First, the total mass of compound collected during the composite run was assigned to each test run (i.e., the mass collected was essentially doubled). Second, the test compound concentration was calculated for each test run by dividing the total mass of compound collected by the combined sample volumes collected during test runs 1 and 2. This approach yielded a test compound concentration that was the same for both test runs 1 and 2. Third, the background-corrected concentration for each test run was calculated as described in Section 4.7. Fourth, the dilution-corrected concentration was calculated by dividing the background-corrected concentrations by the average of the dilution correction factors calculated for each test run. The remaining emission factor calculations were performed in accordance with the procedures described in Sections 4.10 through 4.12.

4.14 Handling Compounds Sampled or Analyzed Using More than One Test or Analytical Method

Twenty one compounds were either sampled or analyzed using two methods; these compounds are identified in Table 7. For each of these compounds, emission factors were calculated based upon the data measured using the more appropriate test or analytical method; data measured using the less appropriate method were ignored. The more appropriate method was identified by reviewing the methods and the target compound lists associated with each method. If a specific compound appeared on the target compound list for one method but not the other, the method targeting the compound was selected. If a specific compound appeared on the target compound lists for both methods, the method judged to provide the most accurate data was selected. For all volatile organic compounds measured using both the TO-12 and TO-14 methods and for which the compounds appeared on both target compound lists, the TO-14 method was judged to be more accurate and was therefore selected. For compounds measured using both the TO-13 and TO-14 methods and for which the compounds appeared on both target compound lists, the TO-14 method was judged to be more accurate and was therefore selected. For HCl, which was measured using 40 CFR 60 Method 26 and by CEMS, Method 26 was judged to be more accurate and was therefore selected.

4.15 Dioxin and Furan Emission Factor Calculations

The laboratory responsible for analyzing the dioxin and furan test data analyzed each sample for the presence of 17 individual dioxin and furan compounds. However, the masses of individual compounds detected were annotated within the final test report as being below the analytical detection limits. Consequently, the individual compounds were not reported in the AP-42 sections. Instead, all of the dioxin and furan compounds detected were converted to equivalent masses of 2,3,7,8-TCDD. This conversion was accomplished by multiplying the emission factors calculated (in accordance with steps 1 through 12 described above) for each individual compound by the compound's toxicity equivalency factor, a ratio of the toxicity of the compound as compared to the toxicity of 2,3,7,8-TCDD. The

individual emission factors calculated in this method were summed to produce 2,3,7,8-TCDD toxic equivalent (TEQ) emission factors. These factors were presented in the AP-42 sections.

TABLE 7 COMPOUNDS MEASURED USING MORE THAN ONE TEST OR ANALYTICAL METHOD

Compounds	Selected Method	Other Method Employed
Acetophenone	SVOC, TO-13	VOC, TO-14
Benzene	VOC, TO-14	VOC, TO-12
1,3-Butadiene	VOC, TO-14	VOC, TO-12
1,2-Dichlorobenzene	VOC, TO-14	SVOC, TO-13
1,3-Dichlorobenzene	VOC, TO-14	SVOC, TO-13
1,4-Dichlorobenzene	VOC, TO-14	SVOC, TO-13
Ethyl benzene	VOC, TO-14	VOC, TO-12
p-Ethyltoluene	VOC, TO-14	VOC, TO-12
Hexachlorobutadiene	VOC, TO-14	SVOC, TO-13
Hydrochloric acid	40 CFR 60 Method 26	CEMS
2-Methylnaphthalene	SVOC, TO-13	VOC, TO-14
Methyl tert-butyl ether	VOC, TO-14	VOC, TO-12
Naphthalene	SVOC, TO-13	VOC, TO-14
2-Nitrophenol	SVOC, TO-13	VOC, TO-14
Styrene	VOC, TO-14	VOC, TO-12
Toluene	VOC, TO-14	VOC, TO-12
1,2,4-Trichlorobenzene	VOC, TO-14	SVOC, TO-13
1,2,4-Trimethylbenzene	VOC, TO-14	VOC, TO-12
1,3,5-Trimethylbenzene	VOC, TO-14	VOC, TO-12
m-Xylene/p-Xylene	VOC, TO-14	VOC, TO-12
o-Xylene	VOC, TO-14	VOC, TO-12

4.16 Handling Tentatively Identified Compounds

No tentatively identified compounds (TICs) were qualified during the Phase I testing conducted at Dugway Proving Ground.

5.0 EMISSION FACTOR RATINGS

The emission factors were appraised in accordance with the rating system specified in *Procedures for Preparing Emission Factor Documents*.[4] Under this rating system, emission factors are assigned a rating from A to E, where an "A" rating is assigned to the highest quality factors. The criteria used to assign a specific emission factor rating are summarized below.

A Excellent. The emission factor was developed primarily from A- and B-rated source test data taken from many randomly chosen facilities in the industry population. The source category population was sufficiently specific to minimize variability.

B Above average. The emission factor was developed primarily from A- or B-rated test data from a moderate number of facilities. Although no specific bias was evident, it was not clear if the facilities tested represented a random sample of the industry. As with the A rating, the source category population was sufficiently specific to minimize variability.

C Average. The emission factor was developed primarily from A-, B- and/or C-rated test data from a reasonable number of facilities. Although no specific bias was evident, it was not clear if the facilities tested represented a random sample of the industry. As with the A rating, the source category population was sufficiently specific to minimize variability.

D Below average. The emission factor was developed primarily from A-, B-, and C-rated test data from a small number of facilities, and there may have been reason to suspect that these facilities did not represent a random sample of the industry. There also may have been evidence of variability within the source category population.

E Poor. The emission factor was developed from C- and D-rated test data from a very limited number of facilities, and there may have been reason to suspect that the facilities tested did not represent a random sample of the industry. There also may have been evidence of variability within the source category population.

Although the emission factors for the eight ordnance described in this report were developed using A- and B-rated test data, only one or two tests were conducted and only a few ordnance were included in each test. Consequently, emission factor ratings of A and B were considered inappropriate. Conversely, ordnance are manufactured to very tight tolerance levels so there is little variability among items, and there was no evidence that suggested the tested items within each type of ordnance were not randomly selected from available stocks. These considerations ruled out assigning the emission factors an E rating. Although the number of items tested within each ordnance was very limited, the other considerations (randomness and potential variability) lead to the judgment that a C rating was a better fit than a D rating. Therefore, each emission factor was assigned a C rating.

6.0 REFERENCES

1. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.

2. John R. Carson, *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.

3. *Hazard Classification of United States Military Explosives and Munitions*, Revision 11, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, February 2001.

4. *Procedures for Preparing Emission Factor Documents*, EPA-454/R-95-015, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1997.

5. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Supplement, EPA/600/4-89/017, U.S. Environmental Protection Agency, Research Triangle Park, NC, June 1988.

6. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), U.S. Environmental Protection Agency, http://www.epa.gov/epaoswer/hazwaste/test/main.htm.

APPENDIX A

COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR ORDNANCE INCLUDED IN PHASE I TESTING AT DUGWAY PROVING GROUND, UTAH

TABLE A1 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC D505, M485A2 155 MM ILLUMINATION ROUND

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	1.8	3.0 E-01	--
630-08-0	Carbon monoxide	2.6 E-02	4.3 E-03	--
10102-43-9	Nitrogen oxide	5.9 E-02	9.6 E-03	--
10102-44-0	Nitrogen dioxide	3.9 E-03	6.4 E-04	--
--	Oxides of nitrogen	9.4 E-02	1.5 E-02	--
--	PM-10	3.0	4.9 E-01	--
7446-09-5	Sulfur dioxide	2.7 E-03	4.5 E-04	--
--	Total nonmethane hydrocarbons	1.5 E-03	2.5 E-04	--
12789-66-1	Total suspended particulate	2.1	3.5 E-01	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.4 E-03
208-96-8	Acenaphthylene	ND	ND	1.2 E-03
75-05-8	Acetonitrile	2.6 E-05	4.2 E-06	--
98-86-2	Acetophenone	7.7 E-06	1.3 E-06	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.2 E-03
107-02-8	Acrolein	2.9 E-05	4.7 E-06	--
107-13-1	Acrylonitrile	2.1 E-05	3.4 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	3.6 E-04	5.8 E-05	--
92-67-1	4-Aminobiphenyl	ND	ND	7.8 E-03
62-53-3	Aniline	ND	ND	1.5 E-03
120-12-7	Anthracene	ND	ND	1.4 E-03
7440-36-0	Antimony	2.1 E-05	3.5 E-06	--
7440-38-2	Arsenic	ND	ND	1.4 E-03
7440-39-3	Barium	3.9 E-04	6.4 E-05	--
56-55-3	Benzo[a]anthracene	ND	ND	1.7 E-03
71-43-2	Benzene	1.1 E-04	1.8 E-05	--
92-87-5	Benzidine	ND	ND	5.1 E-02
191-24-2	Benzo[g,h,i]perylene	ND	ND	8.9 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.1 E-03
207-08-9	Benzo[k]fluoranthene	ND	ND	2.2 E-03
50-32-8	Benzo[a]pyrene	ND	ND	1.2 E-03

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	2.1 E-07	3.4 E-08	--
101-55-3	4-Bromophenylphenylether	ND	ND	2.6 E-03
106-99-0	1,3-Butadiene	ND	ND	2.2 E-04
123-72-8	Butanal	3.5 E-06	5.7 E-07	--
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	5.1 E-06	8.4 E-07	--
84-74-2	Dibutylphthalate	9.5 E-06	1.6 E-06	--
7440-43-9	Cadmium	7.4 E-05	1.2 E-05	--
86-74-8	Carbazole	ND	ND	9.3 E-04
75-15-0	Carbon disulfide	6.4 E-05	1.0 E-05	--
56-23-5	Carbon tetrachloride	1.7 E-07	2.7 E-08	--
463-58-1	Carbonyl sulfide	3.8 E-06	6.3 E-07	--
7782-50-5	Chlorine	2.0 E-06	3.3 E-07	--
106-47-8	p-Chloroaniline	ND	ND	1.2 E-03
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	1.9 E-03
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	1.5 E-03
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.2 E-03
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	1.4 E-03
91-58-7	2-Chloronaphthalene	ND	ND	2.1 E-03
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	1.1 E-03
7440-47-3	Chromium	7.0 E-06	1.1 E-06	--
218-01-9	Chrysene	ND	ND	1.8 E-03
7440-48-4	Cobalt	1.8 E-06	3.0 E-07	--
7440-50-8	Copper	7.6 E-05	1.2 E-05	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	1.8 E-03
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	5.7 E-07	9.2 E-08	--
2303-16-4	Diallate	ND	ND	1.8 E-03
53-70-3	Dibenz[a,h]anthracene	ND	ND	9.3 E-04
132-64-9	Dibenzofuran	ND	ND	9.2 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.3 E-03
75-71-8	Dichlorodifluoromethane	1.0 E-06	1.6 E-07	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	1.9 E-03
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.4 E-03
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	1.7 E-03
119-93-7	3,3'-Dimethylbenzidine	ND	ND	7.5 E-03
131-11-3	Dimethyl phthalate	ND	ND	1.1 E-03
105-67-9	2,4-Dimethylphenol	ND	ND	1.3 E-03
99-65-0	1,3-Dinitrobenzene	ND	ND	3.2 E-03
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.0 E-01
51-28-5	2,4-Dinitrophenol	ND	ND	1.2 E-01
121-14-2	2,4-Dinitrotoluene	ND	ND	1.7 E-03
606-20-2	2,6-Dinitrotoluene	ND	ND	2.7 E-03
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	7.3 E-06	1.2 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	2.8 E-04	4.6 E-05	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	ND	ND	4.6 E-03
206-44-0	Fluoranthene	ND	ND	1.4 E-03
118-74-1	Hexachlorobenzene	ND	ND	1.4 E-03
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	4.2 E-02
67-72-1	Hexachloroethane	ND	ND	1.9 E-03
110-54-3	n-Hexane	2.6 E-06	4.3 E-07	--
7647-01-0	Hydrochloric acid	ND	ND	5.8 E-02

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	8.3 E-04
78-59-1	Isophorone	ND	ND	8.1 E-04
120-58-1	Isosafrole	ND	ND	4.1 E-03
7439-92-1	Lead	5.8 E-05	9.5 E-06	--
7439-96-5	Manganese	5.4 E-05	8.9 E-06	--
7439-97-6	Mercury	1.2 E-08	2.0 E-09	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	2.1 E-07	3.4 E-08	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	4.4 E-03
75-09-2	Methylene chloride	1.6 E-03	2.6 E-04	--
78-93-3	Methyl ethyl ketone	1.6 E-05	2.6 E-06	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	ND	ND	1.4 E-03
95-48-7	2-Methylphenol	ND	ND	2.1 E-03
91-20-3	Naphthalene	1.6 E-05	2.6 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	3.8 E-03
134-32-7	1-Naphthylamine	ND	ND	6.7 E-03
91-59-8	2-Naphthylamine	ND	ND	5.9 E-03
7440-02-0	Nickel	9.2 E-06	1.5 E-06	--
100-01-6	4-Nitroaniline	ND	ND	2.9 E-03
98-95-3	Nitrobenzene	ND	ND	3.4 E-03
88-75-5	2-Nitrophenol	ND	ND	2.0 E-03
100-02-7	4-Nitrophenol	ND	ND	1.2 E-01
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	8.5 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	1.4 E-03
55-18-5	N-Nitrosodiethylamine	ND	ND	3.2 E-03
62-75-9	N-Nitrosodimethylamine	ND	ND	1.3 E-03
621-64-7	N-Nitrosodipropylamine	ND	ND	1.1 E-03
59-89-2	N-Nitrosomorpholine	ND	ND	3.4 E-03
100-75-4	N-Nitrosopiperidine	ND	ND	2.8 E-03
99-55-8	5-Nitro-o-toluidine	ND	ND	1.4 E-03

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
608-93-5	Pentachlorobenzene	ND	ND	2.5 E-03
76-01-7	Pentachloroethane	ND	ND	2.7 E-03
82-68-8	Pentachloronitrobenzene	ND	ND	5.1 E-03
87-86-5	Pentachlorophenol	ND	ND	1.1 E-01
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	3.5 E-06	5.7 E-07	--
108-95-2	Phenol	ND	ND	9.5 E-04
7723-14-0	Phosphorus	6.0 E-05	9.7 E-06	--
109-06-8	2-Picoline	ND	ND	4.0 E-03
23950-58-5	Pronamide	ND	ND	9.7 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	4.3 E-05	7.0 E-06	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	1.9 E-03
110-86-1	Pyridine	ND	ND	3.9 E-03
94-59-7	Safrole	ND	ND	2.7 E-03
7782-49-2	Selenium	ND	ND	1.1 E-03
7440-22-4	Silver	ND	ND	2.0 E-04
100-42-5	Styrene	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin TEQ	2.1 E-11	3.5 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	2.5 E-03
108-88-3	Toluene	2.4 E-05	4.0 E-06	--
95-53-4	o-Toluidine	ND	ND	1.5 E-03
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	1.3 E-07	2.1 E-08	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	2.0 E-03
88-06-2	2,4,6-Trichlorophenol	ND	ND	2.4 E-03
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	4.7 E-08	7.6 E-09	--
95-63-6	1,2,4-Trimethylbenzene	2.1 E-06	3.4 E-07	--
540-84-1	2,2,4-Trimethylpentane	4.1 E-06	6.7 E-07	--

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	4.2 E-06	6.9 E-07	--
95-47-6	o-Xylene	4.5 E-06	7.3 E-07	--
7440-66-6	Zinc	1.2 E-03	1.9 E-04	--
Other Pollutants				
64-19-7	Acetic Acid	9.4 E-06	1.5 E-06	--
67-64-1	Acetone	1.3 E-04	2.1 E-05	--
74-86-2	Acetylene	2.6 E-04	4.2 E-05	--
100-52-7	Benzaldehyde	1.8 E-05	3.0 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	1.4 E-01
100-47-0	Benzonitrile	1.5 E-05	2.5 E-06	--
100-51-6	Benzyl alcohol	ND	ND	2.6 E-03
123-73-9	trans-2-Butenal	3.3 E-06	5.5 E-07	--
75-28-5	i-Butane	1.5 E-06	2.4 E-07	--
106-97-8	n-Butane	7.2 E-06	1.2 E-06	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	2.0 E-05	3.2 E-06	--
115-11-7	i-Butene	2.4 E-05	4.0 E-06	--
590-18-1	cis-2-Butene	3.5 E-06	5.7 E-07	--
624-64-6	trans-2-Butene	8.4 E-06	1.4 E-06	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	2.1 E-03
95-57-8	2-Chlorophenol	ND	ND	6.0 E-04
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	4.5 E-07	7.4 E-08	--
120-92-3	Cyclopentanone	1.7 E-04	2.8 E-05	--
142-29-0	Cyclopentene	2.1 E-06	3.4 E-07	--
112-31-2	Decanal	2.3 E-06	3.7 E-07	--
124-18-5	n-Decane	9.1 E-07	1.5 E-07	--
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.3 E-03
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
84-66-2	Diethylphthalate	4.5 E-06	7.4 E-07	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	ND	ND	1.0 E-04
79-29-8	2,3-Dimethylbutane	1.1 E-07	1.8 E-08	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	0	0	--
589-43-5	2,4-Dimethylhexane	7.9 E-07	1.3 E-07	--
592-13-2	2,5-Dimethylhexane	3.4 E-07	5.5 E-08	--
565-59-3	2,3-Dimethylpentane	4.5 E-07	7.4 E-08	--
108-08-7	2,4-Dimethylpentane	5.7 E-07	9.2 E-08	--
--	Dimethylphenethylamine	ND	ND	7.7 E-02
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	6.9 E-06	1.1 E-06	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	1.5 E-03
620-14-4	m-Ethyltoluene	1.4 E-06	2.2 E-07	--
611-14-3	o-Ethyltoluene	1.4 E-06	2.2 E-07	--
622-96-8	p-Ethyltoluene	8.5 E-07	1.4 E-07	--
86-73-7	Fluorene	ND	ND	1.3 E-03
98-01-1	2-Furaldehyde	3.1 E-05	5.0 E-06	--
110-00-9	Furan	4.7 E-06	7.7 E-07	--
111-71-7	Heptanal	6.7 E-07	1.1 E-07	--
142-82-5	n-Heptane	1.8 E-06	3.0 E-07	--
1888-71-7	Hexachloropropene	ND	ND	2.1 E-03
66-25-1	Hexanal	9.1 E-07	1.5 E-07	--
628-73-9	Hexanenitrile	6.3 E-06	1.0 E-06	--
592-41-6	1-Hexene	1.1 E-05	1.8 E-06	--
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	7.1 E-02
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	1.5 E-01	2.4 E-02	--
78-85-3	Methacrolein	5.1 E-06	8.3 E-07	--
91-80-5	Methapyrilene	ND	ND	7.8 E-02
563-45-1	3-Methyl-1-butene	5.1 E-07	8.3 E-08	--
563-46-2	2-Methyl-1-butene	3.2 E-06	5.2 E-07	--
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	1.0 E-06	1.7 E-07	--
96-37-7	Methylcyclopentane	6.8 E-07	1.1 E-07	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	4.5 E-07	7.4 E-08	--
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	4.5 E-07	7.4 E-08	--
589-34-4	3-Methylhexane	1.1 E-06	1.8 E-07	--
66-27-3	Methyl methanesulfonate	ND	ND	1.5 E-03
624-91-9	Methylnitrite	1.1 E-05	1.8 E-06	--
107-83-5	2-Methylpentane	1.1 E-06	1.8 E-07	--
96-14-0	3-Methylpentane	1.1 E-06	1.8 E-07	--
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	5.0 E-06	8.2 E-07	--
78-94-4	Methyl vinyl ketone	3.2 E-06	5.3 E-07	--
88-74-4	2-Nitroaniline	ND	ND	1.4 E-03
99-09-2	3-Nitroaniline	ND	ND	3.3 E-03
75-52-5	Nitromethane	1.2 E-05	1.9 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	3.0 E-03

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
930-55-2	N-Nitrosopyrrolidine	ND	ND	4.5 E-03
124-19-6	Nonanal	1.6 E-06	2.5 E-07	--
111-84-2	n-Nonane	1.4 E-06	2.2 E-07	--
124-13-0	Octanal	1.2 E-06	1.9 E-07	--
111-65-9	n-Octane	5.7 E-07	9.2 E-08	--
117-84-0	bis(n-octyl)phthalate	ND	ND	1.2 E-03
110-62-3	Pentanal	7.5 E-06	1.2 E-06	--
78-78-4	i-Pentane	1.1 E-06	1.8 E-07	--
109-66-0	n-Pentane	2.5 E-06	4.1 E-07	--
110-59-8	Pentanenitrile	5.4 E-06	8.8 E-07	--
107-87-9	2-Pentanone	3.6 E-06	5.8 E-07	--
109-67-1	1-Pentene	4.0 E-06	6.6 E-07	--
627-20-3	cis-2-Pentene	5.1 E-07	8.3 E-08	--
646-04-8	trans-2-Pentene	1.2 E-06	2.0 E-07	--
62-44-2	Phenacetin	ND	ND	8.5 E-04
536-74-3	Phenylacetylene	5.2 E-06	8.5 E-07	--
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	3.8 E-05	6.2 E-06	--
107-12-0	Propanenitrile	4.9 E-06	7.9 E-07	--
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	1.2 E-06	2.0 E-07	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	2.1 E-03
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	2.7 E-03
109-99-9	Tetrahydrofuran	5.3 E-07	8.6 E-08	--
110-02-1	Thiophene	3.0 E-06	4.9 E-07	--
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	1.8 E-06	3.0 E-07	--
565-75-3	2,3,4-Trimethylpentane	3.4 E-07	5.5 E-08	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	4.7 E-03

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 6.123 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A2 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L305, M195 GREEN STAR PARACHUTE SIGNAL FLARE

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	8.8 E-02	2.8 E-01	--
630-08-0	Carbon monoxide	9.4 E-03	3.0 E-02	--
10102-43-9	Nitrogen oxide	1.5 E-03	4.7 E-03	--
10102-44-0	Nitrogen dioxide	1.1 E-04	3.4 E-04	--
--	Oxides of nitrogen	2.4 E-03	7.6 E-03	--
--	PM-10	1.2 E-01	3.7 E-01	--
7446-09-5	Sulfur dioxide	7.8 E-05	2.5 E-04	--
--	Total nonmethane hydrocarbons	1.7 E-04	5.5 E-04	--
12789-66-1	Total suspended particulate	1.3 E-01	4.2 E-01	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.9 E-04
208-96-8	Acenaphthylene	ND	ND	1.7 E-04
75-05-8	Acetonitrile	1.3 E-06	4.1 E-06	--
98-86-2	Acetophenone	3.9 E-07	1.2 E-06	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.6 E-04
107-02-8	Acrolein	1.1 E-06	3.4 E-06	--
107-13-1	Acrylonitrile	1.3 E-06	4.0 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	9.3 E-05	3.0 E-04	--
92-67-1	4-Aminobiphenyl	ND	ND	1.1 E-03
62-53-3	Aniline	ND	ND	2.1 E-04
120-12-7	Anthracene	ND	ND	1.9 E-04
7440-36-0	Antimony	1.2 E-06	3.7 E-06	--
7440-38-2	Arsenic	ND	ND	9.8 E-05
7440-39-3	Barium	8.7 E-03	2.7 E-02	--
56-55-3	Benzo[a]anthracene	ND	ND	2.3 E-04
71-43-2	Benzene	1.3 E-05	4.2 E-05	--
92-87-5	Benzidine	ND	ND	7.0 E-03
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.2 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.4 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	3.0 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.7 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	1.6 E-08	5.2 E-08	--
101-55-3	4-Bromophenylphenylether	ND	ND	3.6 E-04
106-99-0	1,3-Butadiene	3.6 E-06	1.1 E-05	--
123-72-8	Butanal	1.5 E-07	4.7 E-07	--
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	ND	ND	1.1 E-04
7440-43-9	Cadmium	1.2 E-06	3.7 E-06	--
86-74-8	Carbazole	ND	ND	1.3 E-04
75-15-0	Carbon disulfide	1.0 E-05	3.3 E-05	--
56-23-5	Carbon tetrachloride	2.9 E-07	9.2 E-07	--
463-58-1	Carbonyl sulfide	2.6 E-07	8.1 E-07	--
7782-50-5	Chlorine	3.1 E-06	9.8 E-06	--
106-47-8	p-Chloroaniline	ND	ND	1.7 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	2.7 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	2.0 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.6 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	2.0 E-04
91-58-7	2-Chloronaphthalene	ND	ND	2.9 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	1.5 E-04
7440-47-3	Chromium	7.3 E-06	2.3 E-05	--
218-01-9	Chrysene	ND	ND	2.5 E-04
7440-48-4	Cobalt	3.7 E-06	1.2 E-05	--
7440-50-8	Copper	1.4 E-05	4.4 E-05	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	2.5 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	0	0	--
2303-16-4	Diallate	ND	ND	2.5 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	1.3 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	1.3 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	0	0	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.7 E-04
75-71-8	Dichlorodifluoromethane	8.0 E-07	2.5 E-06	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	2.5 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.9 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	2.4 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	1.0 E-03
131-11-3	Dimethyl phthalate	ND	ND	1.5 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	1.8 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	4.3 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.4 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	1.6 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	2.3 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	3.7 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	5.2 E-07	1.6 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	5.7 E-05	1.8 E-04	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	ND	ND	6.3 E-04
206-44-0	Fluoranthene	ND	ND	1.9 E-04
118-74-1	Hexachlorobenzene	ND	ND	1.9 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	5.8 E-03
67-72-1	Hexachloroethane	ND	ND	2.6 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	0	0	--
7647-01-0	Hydrochloric acid	ND	ND	5.8 E-02
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	1.1 E-04
78-59-1	Isophorone	ND	ND	1.1 E-04
120-58-1	Isosafrole	ND	ND	5.6 E-04
7439-92-1	Lead	4.7 E-07	1.5 E-06	--
7439-96-5	Manganese	1.1 E-05	3.6 E-05	--
7439-97-6	Mercury	1.3 E-08	4.3 E-08	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	2.1 E-07	6.6 E-07	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	6.1 E-04
75-09-2	Methylene chloride	1.2 E-04	3.9 E-04	--
78-93-3	Methyl ethyl ketone	2.1 E-06	6.7 E-06	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	6.8 E-07	2.1 E-06	--
95-48-7	2-Methylphenol	ND	ND	2.9 E-04
91-20-3	Naphthalene	8.0 E-07	2.5 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	5.2 E-04
134-32-7	1-Naphthylamine	ND	ND	9.1 E-04
91-59-8	2-Naphthylamine	ND	ND	8.1 E-04
7440-02-0	Nickel	5.2 E-07	1.6 E-06	--
100-01-6	4-Nitroaniline	ND	ND	4.0 E-04
98-95-3	Nitrobenzene	ND	ND	4.6 E-04
88-75-5	2-Nitrophenol	ND	ND	2.8 E-04
100-02-7	4-Nitrophenol	ND	ND	1.6 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	1.2 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	1.9 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	4.4 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	1.8 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	1.5 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	4.7 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	ND	ND	3.8 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	1.9 E-04
608-93-5	Pentachlorobenzene	ND	ND	3.5 E-04
76-01-7	Pentachloroethane	ND	ND	3.7 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	7.0 E-04
87-86-5	Pentachlorophenol	ND	ND	1.5 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	3.2 E-04
108-95-2	Phenol	ND	ND	1.3 E-04
7723-14-0	Phosphorus	1.2 E-05	3.7 E-05	--
109-06-8	2-Picoline	ND	ND	5.5 E-04
23950-58-5	Pronamide	ND	ND	1.3 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	1.6 E-05	5.0 E-05	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	2.6 E-04
110-86-1	Pyridine	ND	ND	5.3 E-04
94-59-7	Safrole	ND	ND	3.7 E-04
7782-49-2	Selenium	ND	ND	7.8 E-05
7440-22-4	Silver	ND	ND	1.5 E-05
100-42-5	Styrene	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin TEQ	2.0 E-12	6.2 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	1.8 E-04
108-88-3	Toluene	1.6 E-06	5.1 E-06	--
95-53-4	o-Toluidine	ND	ND	2.1 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	9.7 E-08	3.1 E-07	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	2.8 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	3.3 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1.3 E-07	4.2 E-07	--

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	5.5 E-07	1.7 E-06	--
540-84-1	2,2,4-Trimethylpentane	0	0	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	1.1 E-06	3.4 E-06	--
95-47-6	o-Xylene	3.5 E-07	1.1 E-06	--
7440-66-6	Zinc	3.7 E-06	1.2 E-05	--
Other Pollutants				
64-19-7	Acetic Acid	2.4 E-06	7.6 E-06	--
67-64-1	Acetone	7.1 E-06	2.2 E-05	--
74-86-2	Acetylene	2.5 E-05	8.0 E-05	--
100-52-7	Benzaldehyde	2.0 E-06	6.4 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	1.9 E-02
100-47-0	Benzonitrile	1.3 E-06	4.1 E-06	--
100-51-6	Benzyl alcohol	ND	ND	3.6 E-04
123-73-9	trans-2-Butenal	ND	ND	2.9 E-04
75-28-5	i-Butane	0	0	--
106-97-8	n-Butane	3.4 E-07	1.1 E-06	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	4.9 E-06	1.5 E-05	--
115-11-7	i-Butene	1.2 E-06	3.9 E-06	--
590-18-1	cis-2-Butene	4.5 E-07	1.4 E-06	--
624-64-6	trans-2-Butene	1.8 E-06	5.7 E-06	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	2.9 E-04
95-57-8	2-Chlorophenol	ND	ND	8.3 E-05
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	ND	ND	1.0 E-04
120-92-3	Cyclopentanone	8.8 E-07	2.8 E-06	--
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	3.7 E-06	1.2 E-05	--
124-18-5	n-Decane	2.3 E-07	7.2 E-07	--

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.8 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	4.3 E-06	1.4 E-05	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	0	0	--
79-29-8	2,3-Dimethylbutane	3.4 E-07	1.1 E-06	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	0	0	--
589-43-5	2,4-Dimethylhexane	0	0	--
592-13-2	2,5-Dimethylhexane	0	0	--
565-59-3	2,3-Dimethylpentane	1.1 E-07	3.6 E-07	--
108-08-7	2,4-Dimethylpentane	2.3 E-07	7.2 E-07	--
--	Dimethylphenethylamine	ND	ND	1.1 E-02
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	7.0 E-06	2.2 E-05	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	2.0 E-04
620-14-4	m-Ethyltoluene	3.4 E-07	1.1 E-06	--
611-14-3	o-Ethyltoluene	3.4 E-07	1.1 E-06	--
622-96-8	p-Ethyltoluene	2.2 E-07	7.0 E-07	--
86-73-7	Fluorene	ND	ND	1.8 E-04
98-01-1	2-Furaldehyde	7.6 E-07	2.4 E-06	--
110-00-9	Furan	7.3 E-07	2.3 E-06	--
111-71-7	Heptanal	1.8 E-07	5.8 E-07	--
142-82-5	n-Heptane	0	0	--
1888-71-7	Hexachloropropene	ND	ND	2.9 E-04
66-25-1	Hexanal	2.2 E-07	6.9 E-07	--
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	7.9 E-07	2.5 E-06	--
7688-21-3	cis-2-Hexene	1.7 E-07	5.4 E-07	--
4050-45-7	trans-2-Hexene	1.7 E-07	5.4 E-07	--
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	0	0	--
143-50-0	Kepone	ND	ND	9.8 E-03
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	2.7 E-02	8.6 E-02	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	1.1 E-02
563-45-1	3-Methyl-1-butene	2.3 E-07	7.2 E-07	--
563-46-2	2-Methyl-1-butene	3.4 E-07	1.1 E-06	--
513-35-9	2-Methyl-2-butene	1.7 E-07	5.4 E-07	--
108-87-2	Methylcyclohexane	0	0	--
96-37-7	Methylcyclopentane	0	0	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	5.7 E-07	1.8 E-06	--
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	1.1 E-07	3.6 E-07	--
589-34-4	3-Methylhexane	0	0	--
66-27-3	Methyl methanesulfonate	ND	ND	2.1 E-04
624-91-9	Methylnitrite	8.9 E-07	2.8 E-06	--
107-83-5	2-Methylpentane	0	0	--
96-14-0	3-Methylpentane	0	0	--
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	1.7 E-07	5.4 E-07	--
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl Ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.9 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	4.6 E-04
75-52-5	Nitromethane	3.0 E-06	9.5 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	4.1 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	6.2 E-04
124-19-6	Nonanal	2.5 E-06	7.8 E-06	--
111-84-2	n-Nonane	3.4 E-07	1.1 E-06	--
124-13-0	Octanal	1.4 E-06	4.4 E-06	--
111-65-9	n-Octane	2.3 E-07	7.2 E-07	--
117-84-0	bis(n-Octyl)phthalate	ND	ND	1.6 E-04
110-62-3	Pentanal	5.4 E-07	1.7 E-06	--
78-78-4	i-Pentane	0	0	--
109-66-0	n-Pentane	2.3 E-07	7.2 E-07	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	1.4 E-06	4.4 E-06	--
109-67-1	1-Pentene	5.1 E-07	1.6 E-06	--
627-20-3	cis-2-Pentene	2.8 E-07	9.0 E-07	--
646-04-8	trans-2-Pentene	4.5 E-07	1.4 E-06	--
62-44-2	Phenacetin	ND	ND	1.2 E-04
536-74-3	Phenylacetylene	ND	ND	4.2 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	1.1 E-06	3.6 E-06	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	1.1 E-07	3.6 E-07	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	2.8 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	3.7 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	6.0 E-07	1.9 E-06	--
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	0	0	--
565-75-3	2,3,4-Trimethylpentane	0	0	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	6.5 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.316 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A3 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L312, M127A1 WHITE STAR PARACHUTE SIGNAL FLARE

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	3.8 E-03	1.3 E-02	--
630-08-0	Carbon monoxide	4.4 E-03	1.6 E-02	--
10102-43-9	Nitrogen oxide	3.6 E-03	1.3 E-02	--
10102-44-0	Nitrogen dioxide	9.9 E-05	3.5 E-04	--
--	Oxides of nitrogen	5.7 E-03	2.0 E-02	--
--	PM-10	1.7 E-01	6.1 E-01	--
7446-09-5	Sulfur dioxide	1.3 E-04	4.7 E-04	--
--	Total nonmethane hydrocarbons	8.5 E-05	3.0 E-04	--
12789-66-1	Total suspended particulate	1.8 E-01	6.4 E-01	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.9 E-04
208-96-8	Acenaphthylene	ND	ND	1.8 E-04
75-05-8	Acetonitrile	1.7 E-06	6.1 E-06	--
98-86-2	Acetophenone	7.9 E-07	2.8 E-06	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.7 E-04
107-02-8	Acrolein	1.2 E-06	4.1 E-06	--
107-13-1	Acrylonitrile	2.0 E-06	7.0 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	2.2 E-05	7.9 E-05	--
92-67-1	4-Aminobiphenyl	ND	ND	1.1 E-03
62-53-3	Aniline	ND	ND	2.1 E-04
120-12-7	Anthracene	ND	ND	2.0 E-04
7440-36-0	Antimony	1.6 E-06	5.6 E-06	--
7440-38-2	Arsenic	ND	ND	1.7 E-04
7440-39-3	Barium	8.9 E-05	3.1 E-04	--
56-55-3	Benzo[a]anthracene	ND	ND	2.4 E-04
71-43-2	Benzene	9.6 E-06	3.4 E-05	--
92-87-5	Benzidine	ND	ND	7.2 E-03
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.3 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.5 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	3.1 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.8 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	2.5 E-08	9.0 E-08	--
101-55-3	4-Bromophenylphenylether	ND	ND	3.7 E-04
106-99-0	1,3-Butadiene	1.8 E-06	6.2 E-06	--
123-72-8	Butanal	ND	ND	3.0 E-04
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	ND	ND	1.1 E-04
7440-43-9	Cadmium	1.3 E-07	4.4 E-07	--
86-74-8	Carbazole	ND	ND	1.3 E-04
75-15-0	Carbon disulfide	2.0 E-05	7.1 E-05	--
56-23-5	Carbon tetrachloride	2.0 E-07	7.2 E-07	--
463-58-1	Carbonyl sulfide	6.9 E-07	2.4 E-06	--
7782-50-5	Chlorine	1.0 E-04	3.6 E-04	--
106-47-8	p-Chloroaniline	ND	ND	1.7 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	2.7 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	2.1 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.7 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	2.0 E-04
91-58-7	2-Chloronaphthalene	ND	ND	3.0 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	1.5 E-04
7440-47-3	Chromium	7.5 E-06	2.6 E-05	--
218-01-9	Chrysene	ND	ND	2.6 E-04
7440-48-4	Cobalt	2.6 E-07	9.1 E-07	--
7440-50-8	Copper	7.6 E-06	2.7 E-05	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	2.5 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	0	0	--
2303-16-4	Diallate	ND	ND	2.5 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	1.3 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	1.3 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	2.7 E-06	9.5 E-06	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.8 E-04
75-71-8	Dichlorodifluoromethane	8.8 E-07	3.1 E-06	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	2.6 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	2.0 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	2.5 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	1.1 E-03
131-11-3	Dimethyl phthalate	ND	ND	1.6 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	1.8 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	4.5 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.5 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	1.7 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	2.4 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	3.8 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	8.9 E-07	3.1 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	2.1 E-05	7.4 E-05	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	ND	ND	6.5 E-04
206-44-0	Fluoranthene	ND	ND	1.9 E-04
118-74-1	Hexachlorobenzene	ND	ND	2.0 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	5.9 E-03
67-72-1	Hexachloroethane	ND	ND	2.6 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	0	0	--
7647-01-0	Hydrochloric acid	ND	ND	6.7 E-02
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	1.2 E-04
78-59-1	Isophorone	ND	ND	1.1 E-04
120-58-1	Isosafrole	ND	ND	5.8 E-04
7439-92-1	Lead	5.5 E-06	1.9 E-05	--
7439-96-5	Manganese	3.1 E-05	1.1 E-04	--
7439-97-6	Mercury	4.1 E-08	1.5 E-07	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	1.3 E-07	4.6 E-07	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	6.3 E-04
75-09-2	Methylene chloride	4.7 E-06	1.7 E-05	--
78-93-3	Methyl ethyl ketone	1.9 E-06	6.7 E-06	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	ND	ND	1.9 E-04
95-48-7	2-Methylphenol	ND	ND	3.0 E-04
91-20-3	Naphthalene	4.6 E-07	1.6 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	5.4 E-04
134-32-7	1-Naphthylamine	ND	ND	9.4 E-04
91-59-8	2-Naphthylamine	ND	ND	8.4 E-04
7440-02-0	Nickel	9.2 E-07	3.3 E-06	--
100-01-6	4-Nitroaniline	ND	ND	4.2 E-04
98-95-3	Nitrobenzene	ND	ND	4.8 E-04
88-75-5	2-Nitrophenol	ND	ND	2.9 E-04
100-02-7	4-Nitrophenol	ND	ND	1.6 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	1.2 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	2.0 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	4.6 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	1.9 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	1.5 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	4.8 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	ND	ND	3.9 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	1.9 E-04
608-93-5	Pentachlorobenzene	ND	ND	3.6 E-04
76-01-7	Pentachloroethane	ND	ND	3.9 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	7.2 E-04
87-86-5	Pentachlorophenol	ND	ND	1.5 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	3.3 E-04
108-95-2	Phenol	ND	ND	1.3 E-04
7723-14-0	Phosphorus	1.1 E-05	3.8 E-05	--
109-06-8	2-Picoline	ND	ND	5.7 E-04
23950-58-5	Pronamide	ND	ND	1.4 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	7.4 E-06	2.6 E-05	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	2.7 E-04
110-86-1	Pyridine	ND	ND	5.5 E-04
94-59-7	Safrole	ND	ND	3.8 E-04
7782-49-2	Selenium	ND	ND	1.4 E-04
7440-22-4	Silver	ND	ND	2.6 E-05
100-42-5	Styrene	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	1.4 E-12	4.8 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	3.3 E-04
108-88-3	Toluene	1.8 E-06	6.2 E-06	--
95-53-4	o-Toluidine	ND	ND	2.1 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	0	0	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	2.9 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	3.4 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1.3 E-08	4.7 E-08	--

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	3.3 E-08	1.2 E-07	--
540-84-1	2,2,4-Trimethylpentane	0	0	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	2.5 E-07	9.0 E-07	--
95-47-6	o-Xylene	5.9 E-07	2.1 E-06	--
7440-66-6	Zinc	4.9 E-06	1.7 E-05	--
Other Pollutants				
64-19-7	Acetic Acid	5.6 E-07	2.0 E-06	--
67-64-1	Acetone	5.3 E-06	1.9 E-05	--
74-86-2	Acetylene	6.4 E-06	2.3 E-05	--
100-52-7	Benzaldehyde	2.3 E-06	8.1 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	2.0 E-02
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	ND	ND	3.7 E-04
123-73-9	trans-2-Butenal	ND	ND	2.9 E-04
75-28-5	i-Butane	9.2 E-07	3.3 E-06	--
106-97-8	n-Butane	0	0	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	1.3 E-06	4.5 E-06	--
115-11-7	i-Butene	8.0 E-07	2.8 E-06	--
590-18-1	cis-2-Butene	2.3 E-07	8.1 E-07	--
624-64-6	trans-2-Butene	2.2 E-06	7.7 E-06	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	3.0 E-04
95-57-8	2-Chlorophenol	ND	ND	8.5 E-05
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	0	0	--
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	7.2 E-07	2.5 E-06	--
124-18-5	n-Decane	3.4 E-07	1.2 E-06	--

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.8 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	4.1 E-07	1.4 E-06	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	0	0	--
79-29-8	2,3-Dimethylbutane	0	0	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	2.3 E-07	8.1 E-07	--
589-43-5	2,4-Dimethylhexane	0	0	--
592-13-2	2,5-Dimethylhexane	0	0	--
565-59-3	2,3-Dimethylpentane	0	0	--
108-08-7	2,4-Dimethylpentane	1.4 E-06	4.9 E-06	--
--	Dimethylphenethylamine	ND	ND	1.1 E-02
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	2.1 E-06	7.3 E-06	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	2.1 E-04
620-14-4	m-Ethyltoluene	3.4 E-07	1.2 E-06	--
611-14-3	o-Ethyltoluene	4.6 E-07	1.6 E-06	--
622-96-8	p-Ethyltoluene	4.2 E-09	1.5 E-08	--
86-73-7	Fluorene	ND	ND	1.8 E-04
98-01-1	2-Furaldehyde	ND	ND	4.0 E-04
110-00-9	Furan	ND	ND	2.8 E-04
111-71-7	Heptanal	1.2 E-07	4.1 E-07	--
142-82-5	n-Heptane	0	0	--
1888-71-7	Hexachloropropene	ND	ND	3.0 E-04
66-25-1	Hexanal	0	0	--
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	6.9 E-07	2.4 E-06	--
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	1.0 E-02
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	2.4 E-02	8.5 E-02	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	1.1 E-02
563-45-1	3-Methyl-1-butene	0	0	--
563-46-2	2-Methyl-1-butene	3.4 E-07	1.2 E-06	--
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	0	0	--
96-37-7	Methylcyclopentane	2.3 E-07	8.1 E-07	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	1.1 E-07	4.1 E-07	--
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	1.1 E-07	4.1 E-07	--
589-34-4	3-Methylhexane	0	0	--
66-27-3	Methyl methanesulfonate	ND	ND	2.1 E-04
624-91-9	Methylnitrite	9.9 E-07	3.5 E-06	--
107-83-5	2-Methylpentane	0	0	--
96-14-0	3-Methylpentane	0	0	--
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.9 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	4.7 E-04
75-52-5	Nitromethane	2.0 E-06	6.9 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	4.3 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	6.4 E-04
124-19-6	Nonanal	1.2 E-07	4.3 E-07	--
111-84-2	n-Nonane	4.6 E-07	1.6 E-06	--
124-13-0	Octanal	2.6 E-07	9.4 E-07	--
111-65-9	n-Octane	0	0	--
117-84-0	bis(n-Octyl)phthalate	ND	ND	1.7 E-04
110-62-3	Pentanal	0	0	--
78-78-4	i-Pentane	0	0	--
109-66-0	n-Pentane	0	0	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	1.3 E-06	4.6 E-06	--
109-67-1	1-Pentene	2.3 E-07	8.1 E-07	--
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	1.1 E-07	4.1 E-07	--
62-44-2	Phenacetin	ND	ND	1.2 E-04
536-74-3	Phenylacetylene	ND	ND	4.2 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	5.7 E-07	2.0 E-06	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	2.3 E-07	8.1 E-07	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	2.9 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	3.8 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	ND	ND	3.5 E-04
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	0	0	--
565-75-3	2,3,4-Trimethylpentane	0	0	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	6.7 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.2827 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A4 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L314, M125A1 GREEN STAR CLUSTER SIGNAL FLARE

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	1.4 E-01	8.5 E-02	--
630-08-0	Carbon monoxide	1.0 E-02	6.2 E-03	--
10102-43-9	Nitrogen oxide	1.1 E-03	6.4 E-04	--
10102-44-0	Nitrogen dioxide	1.6 E-05	9.4 E-06	--
--	Oxides of nitrogen	1.7 E-03	9.9 E-04	--
--	PM-10	6.6 E-02	3.9 E-02	--
7446-09-5	Sulfur dioxide	2.9 E-07	1.8 E-07	--
--	Total nonmethane hydrocarbons	2.5 E-04	1.5 E-04	--
12789-66-1	Total suspended particulate	7.6 E-02	4.5 E-02	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.5 E-04
208-96-8	Acenaphthylene	ND	ND	1.4 E-04
75-05-8	Acetonitrile	2.1 E-06	1.3 E-06	--
98-86-2	Acetophenone	8.0 E-07	4.8 E-07	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.3 E-04
107-02-8	Acrolein	1.3 E-06	7.9 E-07	--
107-13-1	Acrylonitrile	4.3 E-06	2.6 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	2.5 E-05	1.5 E-05	--
92-67-1	4-Aminobiphenyl	ND	ND	8.8 E-04
62-53-3	Aniline	ND	ND	1.7 E-04
120-12-7	Anthracene	ND	ND	1.6 E-04
7440-36-0	Antimony	1.3 E-06	7.8 E-07	--
7440-38-2	Arsenic	ND	ND	7.2 E-05
7440-39-3	Barium	1.3 E-03	7.6 E-04	--
56-55-3	Benzo[a]anthracene	ND	ND	1.9 E-04
71-43-2	Benzene	1.7 E-05	1.0 E-05	--
92-87-5	Benzidine	ND	ND	5.7 E-03
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.0 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.2 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	2.5 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.4 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	1.7 E-08	1.0 E-08	--
101-55-3	4-Bromophenylphenylether	ND	ND	2.9 E-04
106-99-0	1,3-Butadiene	3.7 E-06	2.2 E-06	--
123-72-8	Butanal	1.4 E-07	8.5 E-08	--
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	ND	ND	8.7 E-05
7440-43-9	Cadmium	8.4 E-08	5.1 E-08	--
86-74-8	Carbazole	ND	ND	1.0 E-04
75-15-0	Carbon disulfide	1.7 E-05	1.0 E-05	--
56-23-5	Carbon tetrachloride	2.5 E-07	1.5 E-07	--
463-58-1	Carbonyl sulfide	7.6 E-08	4.5 E-08	--
7782-50-5	Chlorine	1.2 E-05	7.2 E-06	--
106-47-8	p-Chloroaniline	ND	ND	1.4 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	2.2 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	1.7 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.3 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	1.6 E-04
91-58-7	2-Chloronaphthalene	ND	ND	2.4 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	1.2 E-04
7440-47-3	Chromium	6.5 E-06	3.9 E-06	--
218-01-9	Chrysene	ND	ND	2.1 E-04
7440-48-4	Cobalt	7.8 E-07	4.6 E-07	--
7440-50-8	Copper	9.7 E-06	5.8 E-06	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	2.0 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	0	0	--
2303-16-4	Diallate	ND	ND	2.0 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	1.0 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	1.0 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	9.9 E-07	6.0 E-07	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.4 E-04
75-71-8	Dichlorodifluoromethane	4.9 E-07	3.0 E-07	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	2.1 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.6 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	2.0 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	8.4 E-04
131-11-3	Dimethyl phthalate	ND	ND	1.2 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	1.4 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	3.6 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.2 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	1.3 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	1.9 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	3.0 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	1.7 E-06	1.0 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	5.3 E-05	3.2 E-05	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	1.8 E-05	1.1 E-05	--
206-44-0	Fluoranthene	ND	ND	1.5 E-04
118-74-1	Hexachlorobenzene	ND	ND	1.6 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	4.7 E-03
67-72-1	Hexachloroethane	ND	ND	2.1 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	0	0	--
7647-01-0	Hydrochloric acid	1.3 E-04	8.0 E-05	--
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	9.3 E-05
78-59-1	Isophorone	ND	ND	9.1 E-05
120-58-1	Isosafrole	ND	ND	4.6 E-04
7439-92-1	Lead	2.0 E-06	1.2 E-06	--
7439-96-5	Manganese	1.6 E-05	9.7 E-06	--
7439-97-6	Mercury	8.2 E-09	4.9 E-09	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	1.2 E-07	7.0 E-08	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	5.0 E-04
75-09-2	Methylene chloride	9.3 E-05	5.6 E-05	--
78-93-3	Methyl ethyl ketone	3.1 E-06	1.8 E-06	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	6.9 E-07	4.1 E-07	--
95-48-7	2-Methylphenol	ND	ND	2.4 E-04
91-20-3	Naphthalene	1.0 E-06	6.1 E-07	--
130-15-4	1,4-Naphthoquinone	ND	ND	4.2 E-04
134-32-7	1-Naphthylamine	ND	ND	7.5 E-04
91-59-8	2-Naphthylamine	ND	ND	6.6 E-04
7440-02-0	Nickel	4.9 E-07	2.9 E-07	--
100-01-6	4-Nitroaniline	ND	ND	3.3 E-04
98-95-3	Nitrobenzene	ND	ND	3.8 E-04
88-75-5	2-Nitrophenol	ND	ND	2.3 E-04
100-02-7	4-Nitrophenol	ND	ND	1.3 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	9.6 E-03
924-16-3	N-Nitrosodibutylamine	ND	ND	1.6 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	3.6 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	1.5 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	1.2 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	3.8 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	ND	ND	3.1 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	1.5 E-04
608-93-5	Pentachlorobenzene	ND	ND	2.9 E-04
76-01-7	Pentachloroethane	ND	ND	3.1 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	5.7 E-04
87-86-5	Pentachlorophenol	ND	ND	1.2 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	2.6 E-04
108-95-2	Phenol	ND	ND	1.1 E-04
7723-14-0	Phosphorus	6.3 E-06	3.8 E-06	--
109-06-8	2-Picoline	ND	ND	4.5 E-04
23950-58-5	Pronamide	ND	ND	1.1 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
115-07-1	Propene	1.9 E-05	1.1 E-05	--
129-00-0	Pyrene	ND	ND	2.1 E-04
110-86-1	Pyridine	ND	ND	4.3 E-04
94-59-7	Safrole	ND	ND	3.0 E-04
7782-49-2	Selenium	ND	ND	5.7 E-05
7440-22-4	Silver	ND	ND	1.1 E-05
100-42-5	Styrene	6.7 E-07	4.0 E-07	--
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	2.5 E-13	1.5 E-13	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	1.3 E-04
108-88-3	Toluene	4.8 E-06	2.9 E-06	--
95-53-4	o-Toluidine	ND	ND	1.7 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	1.4 E-07	8.4 E-08	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	2.3 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	2.7 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0	0	--

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	7.1 E-07	4.3 E-07	--
540-84-1	2,2,4-Trimethylpentane	0	0	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	1.5 E-06	9.1 E-07	--
95-47-6	o-Xylene	1.8 E-06	1.1 E-06	--
7440-66-6	Zinc	1.7 E-05	1.0 E-05	--
Other Pollutants				
64-19-7	Acetic Acid	4.3 E-06	2.6 E-06	--
67-64-1	Acetone	7.7 E-06	4.6 E-06	--
74-86-2	Acetylene	5.6 E-05	3.4 E-05	--
100-52-7	Benzaldehyde	2.0 E-06	1.2 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	1.6 E-02
100-47-0	Benzonitrile	1.2 E-06	6.9 E-07	--
100-51-6	Benzyl alcohol	ND	ND	3.0 E-04
123-73-9	trans-2-Butenal	ND	ND	2.9 E-04
75-28-5	i-Butane	0	0	--
106-97-8	n-Butane	4.5 E-07	2.7 E-07	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	2.9 E-06	1.8 E-06	--
115-11-7	i-Butene	1.6 E-06	9.4 E-07	--
590-18-1	cis-2-Butene	9.0 E-07	5.4 E-07	--
624-64-6	trans-2-Butene	3.2 E-06	1.9 E-06	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	2.4 E-04
95-57-8	2-Chlorophenol	ND	ND	6.8 E-05
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	ND	ND	1.0 E-04
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	0	0	--
124-18-5	n-Decane	0	0	--

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.5 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	1.4 E-06	8.4 E-07	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	0	0	--
79-29-8	2,3-Dimethylbutane	2.3 E-07	1.3 E-07	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	0	0	--
589-43-5	2,4-Dimethylhexane	0	0	--
592-13-2	2,5-Dimethylhexane	0	0	--
565-59-3	2,3-Dimethylpentane	ND	ND	1.0 E-04
108-08-7	2,4-Dimethylpentane	2.3 E-07	1.3 E-07	--
--	Dimethylphenethylamine	ND	ND	8.7 E-03
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	6.5 E-06	3.9 E-06	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	1.7 E-04
620-14-4	m-Ethyltoluene	9.0 E-07	5.4 E-07	--
611-14-3	o-Ethyltoluene	6.8 E-07	4.0 E-07	--
622-96-8	p-Ethyltoluene	8.8 E-07	5.3 E-07	--
86-73-7	Fluorene	ND	ND	1.4 E-04
98-01-1	2-Furaldehyde	1.6 E-06	9.6 E-07	--
110-00-9	Furan	1.3 E-06	7.9 E-07	--
111-71-7	Heptanal	0	0	--
142-82-5	n-Heptane	2.3 E-07	1.3 E-07	--
1888-71-7	Hexachloropropene	ND	ND	2.4 E-04
66-25-1	Hexanal	1.3 E-06	7.6 E-07	--
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	2.3 E-06	1.3 E-06	--
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	8.0 E-03
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	7.7 E-03	4.6 E-03	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	8.8 E-03
563-45-1	3-Methyl-1-butene	2.3 E-07	1.3 E-07	--
563-46-2	2-Methyl-1-butene	4.5 E-07	2.7 E-07	--
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	0	0	--
96-37-7	Methylcyclopentane	0	0	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	ND	ND	1.0 E-04
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	ND	ND	1.0 E-04
589-34-4	3-Methylhexane	ND	ND	1.0 E-04
66-27-3	Methyl methanesulfonate	ND	ND	1.7 E-04
624-91-9	Methylnitrite	9.1 E-07	5.4 E-07	--
107-83-5	2-Methylpentane	0	0	--
96-14-0	3-Methylpentane	6.8 E-07	4.0 E-07	--
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.5 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	3.7 E-04
75-52-5	Nitromethane	2.1 E-06	1.3 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	3.4 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	5.1 E-04
124-19-6	Nonanal	2.6 E-07	1.5 E-07	--
111-84-2	n-Nonane	9.0 E-07	5.4 E-07	--
124-13-0	Octanal	1.3 E-08	7.7 E-09	--
111-65-9	n-Octane	2.3 E-07	1.3 E-07	--
117-84-0	bis(n-Octyl)phthalate	ND	ND	1.3 E-04
110-62-3	Pentanal	0	0	--
78-78-4	i-Pentane	0	0	--
109-66-0	n-Pentane	0	0	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	1.0 E-06	6.0 E-07	--
109-67-1	1-Pentene	4.5 E-07	2.7 E-07	--
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	ND	ND	1.0 E-04
62-44-2	Phenacetin	ND	ND	9.5 E-05
536-74-3	Phenylacetylene	ND	ND	4.2 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	2.5 E-06	1.5 E-06	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	2.3 E-07	1.3 E-07	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	2.3 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	3.0 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	8.7 E-07	5.2 E-07	--
108-67-8	1,3,5-Trimethylbenzene	5.7 E-07	3.4 E-07	--
16747-26-5	2,2,4-Trimethylhexane	2.3 E-07	1.3 E-07	--
565-75-3	2,3,4-Trimethylpentane	0	0	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	5.3 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.669 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A5 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L594, M115A2 GROUND BURST SIMULATOR

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	3.4 E-03	2.4 E-02	--
630-08-0	Carbon monoxide	2.1 E-03	1.5 E-02	--
10102-43-9	Nitrogen oxide	3.5 E-03	2.5 E-02	--
10102-44-0	Nitrogen dioxide	1.5 E-04	1.1 E-03	--
--	Oxides of nitrogen	5.5 E-03	3.9 E-02	--
--	PM-10	1.9 E-01	1.4	--
7446-09-5	Sulfur dioxide	1.5 E-04	1.1 E-03	--
--	Total nonmethane hydrocarbons	1.3 E-04	9.1 E-04	--
12789-66-1	Total suspended particulate	1.6 E-01	1.1	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	3.5 E-04
208-96-8	Acenaphthylene	ND	ND	3.2 E-04
75-05-8	Acetonitrile	2.6 E-07	1.8 E-06	--
98-86-2	Acetophenone	6.1 E-07	4.3 E-06	--
53-96-3	2-Acetylaminofluorene	ND	ND	3.1 E-04
107-02-8	Acrolein	2.7 E-06	1.9 E-05	--
107-13-1	Acrylonitrile	ND	ND	2.2 E-04
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	1.9 E-02	1.3 E-01	--
92-67-1	4-Aminobiphenyl	ND	ND	2.0 E-03
62-53-3	Aniline	ND	ND	3.9 E-04
120-12-7	Anthracene	ND	ND	3.6 E-04
7440-36-0	Antimony	2.7 E-05	1.9 E-04	--
7440-38-2	Arsenic	2.6 E-07	1.9 E-06	--
7440-39-3	Barium	6.0 E-05	4.3 E-04	--
56-55-3	Benzo[a]anthracene	ND	ND	4.4 E-04
71-43-2	Benzene	8.8 E-06	6.3 E-05	--
92-87-5	Benzidine	ND	ND	1.3 E-02
191-24-2	Benzo[g,h,i]perylene	ND	ND	2.3 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	2.7 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	5.7 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	3.2 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	4.8 E-08	3.4 E-07	--
101-55-3	4-Bromophenylphenylether	ND	ND	6.8 E-04
106-99-0	1,3-Butadiene	9.7 E-07	7.0 E-06	--
123-72-8	Butanal	1.7 E-07	1.2 E-06	--
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	2.1 E-06	1.5 E-05	--
7440-43-9	Cadmium	3.8 E-07	2.7 E-06	--
86-74-8	Carbazole	ND	ND	2.4 E-04
75-15-0	Carbon disulfide	5.1 E-05	3.6 E-04	--
56-23-5	Carbon tetrachloride	9.7 E-08	6.9 E-07	--
463-58-1	Carbonyl sulfide	3.9 E-07	2.8 E-06	--
7782-50-5	Chlorine	5.5 E-05	4.0 E-04	--
106-47-8	p-Chloroaniline	ND	ND	3.2 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	5.0 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	3.8 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	3.1 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	3.7 E-04
91-58-7	2-Chloronaphthalene	ND	ND	5.5 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	2.8 E-04
7440-47-3	Chromium	1.2 E-06	8.3 E-06	--
218-01-9	Chrysene	ND	ND	4.8 E-04
7440-48-4	Cobalt	5.9 E-07	4.2 E-06	--
7440-50-8	Copper	3.9 E-05	2.8 E-04	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	4.7 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	ND	ND	1.0 E-04
2303-16-4	Diallate	ND	ND	4.7 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	2.4 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	2.4 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	2.2 E-06	1.6 E-05	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	3.3 E-04
75-71-8	Dichlorodifluoromethane	0	0	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	4.8 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	3.6 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	4.5 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	1.9 E-03
131-11-3	Dimethyl phthalate	ND	ND	2.9 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	3.3 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	8.2 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	2.7 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	3.1 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	4.4 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	6.9 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	7.5 E-07	5.4 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	3.2 E-05	2.3 E-04	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	0	0	--
206-44-0	Fluoranthene	ND	ND	3.5 E-04
118-74-1	Hexachlorobenzene	ND	ND	3.6 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	1.1 E-02
67-72-1	Hexachloroethane	ND	ND	4.8 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	0	0	--
7647-01-0	Hydrochloric acid	6.4 E-05	4.6 E-04	--
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	2.1 E-04
78-59-1	Isophorone	ND	ND	2.1 E-04
120-58-1	Isosafrole	ND	ND	1.1 E-03
7439-92-1	Lead	4.1 E-06	2.9 E-05	--
7439-96-5	Manganese	3.7 E-05	2.7 E-04	--
7439-97-6	Mercury	1.8 E-08	1.3 E-07	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	ND	ND	3.7 E-04
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	1.1 E-03
75-09-2	Methylene chloride	9.0 E-06	6.4 E-05	--
78-93-3	Methyl ethyl ketone	1.8 E-06	1.3 E-05	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	3.1 E-07	2.2 E-06	--
95-48-7	2-Methylphenol	ND	ND	5.5 E-04
91-20-3	Naphthalene	1.3 E-06	9.3 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	9.8 E-04
134-32-7	1-Naphthylamine	ND	ND	1.7 E-03
91-59-8	2-Naphthylamine	ND	ND	1.5 E-03
7440-02-0	Nickel	2.1 E-06	1.5 E-05	--
100-01-6	4-Nitroaniline	ND	ND	7.6 E-04
98-95-3	Nitrobenzene	ND	ND	8.7 E-04
88-75-5	2-Nitrophenol	ND	ND	5.3 E-04
100-02-7	4-Nitrophenol	ND	ND	3.0 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	2.2 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	3.7 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	8.3 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	3.4 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	2.8 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	8.8 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	ND	ND	7.2 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	3.6 E-04
608-93-5	Pentachlorobenzene	ND	ND	6.6 E-04
76-01-7	Pentachloroethane	ND	ND	7.1 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	1.3 E-03
87-86-5	Pentachlorophenol	ND	ND	2.8 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	6.0 E-04
108-95-2	Phenol	ND	ND	2.5 E-04
7723-14-0	Phosphorus	6.6 E-05	4.7 E-04	--
109-06-8	2-Picoline	ND	ND	1.0 E-03
23950-58-5	Pronamide	ND	ND	2.5 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	7.0 E-06	5.0 E-05	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	4.9 E-04
110-86-1	Pyridine	ND	ND	1.0 E-03
94-59-7	Safrole	ND	ND	7.0 E-04
7782-49-2	Selenium	ND	ND	2.1 E-04
7440-22-4	Silver	ND	ND	4.0 E-05
100-42-5	Styrene	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	1.7 E-12	1.2 E-11	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	5.0 E-04
108-88-3	Toluene	1.8 E-06	1.3 E-05	--
95-53-4	o-Toluidine	ND	ND	3.9 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	0	0	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	5.3 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	6.2 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1.9 E-08	1.3 E-07	--

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	6.7 E-07	4.8 E-06	--
540-84-1	2,2,4-Trimethylpentane	4.2 E-07	3.0 E-06	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	8.3 E-07	5.9 E-06	--
95-47-6	o-Xylene	6.4 E-07	4.6 E-06	--
7440-66-6	Zinc	3.0 E-05	2.1 E-04	--
Other Pollutants				
64-19-7	Acetic Acid	3.7 E-07	2.6 E-06	--
67-64-1	Acetone	6.4 E-06	4.6 E-05	--
74-86-2	Acetylene	4.0 E-05	2.9 E-04	--
100-52-7	Benzaldehyde	1.3 E-06	9.3 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	3.6 E-02
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	ND	ND	6.8 E-04
123-73-9	trans-2-Butenal	4.4 E-07	3.1 E-06	--
75-28-5	i-Butane	6.0 E-08	4.3 E-07	--
106-97-8	n-Butane	0	0	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	1.1 E-06	7.7 E-06	--
115-11-7	i-Butene	5.6 E-07	4.0 E-06	--
590-18-1	cis-2-Butene	1.8 E-07	1.3 E-06	--
624-64-6	trans-2-Butene	2.4 E-06	1.7 E-05	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	5.6 E-04
95-57-8	2-Chlorophenol	ND	ND	1.6 E-04
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	ND	ND	1.0 E-04
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	4.7 E-07	3.4 E-06	--
124-18-5	n-Decane	7.9 E-08	5.7 E-07	--

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	3.4 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	2.1 E-07	1.5 E-06	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	7.7 E-08	5.5 E-07	--
79-29-8	2,3-Dimethylbutane	ND	ND	1.0 E-04
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	ND	ND	1.0 E-04
589-43-5	2,4-Dimethylhexane	9.8 E-08	7.0 E-07	--
592-13-2	2,5-Dimethylhexane	6.0 E-08	4.3 E-07	--
565-59-3	2,3-Dimethylpentane	ND	ND	1.0 E-04
108-08-7	2,4-Dimethylpentane	1.4 E-07	9.8 E-07	--
--	Dimethylphenethylamine	ND	ND	2.0 E-02
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	4.7 E-07	3.4 E-06	--
637-92-3	Ethyl tert butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	3.8 E-04
620-14-4	m-Ethyltoluene	2.0 E-07	1.4 E-06	--
611-14-3	o-Ethyltoluene	2.0 E-07	1.4 E-06	--
622-96-8	p-Ethyltoluene	ND	ND	5.0 E-04
86-73-7	Fluorene	ND	ND	3.3 E-04
98-01-1	2-Furaldehyde	1.7 E-06	1.2 E-05	--
110-00-9	Furan	3.2 E-07	2.3 E-06	--
111-71-7	Heptanal	4.2 E-07	3.0 E-06	--
142-82-5	n-Heptane	7.9 E-08	5.7 E-07	--
1888-71-7	Hexachloropropene	ND	ND	5.5 E-04
66-25-1	Hexanal	3.2 E-07	2.3 E-06	--
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	9.8 E-08	7.0 E-07	--
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	1.8 E-02
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	2.2 E-02	1.6 E-01	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	2.0 E-02
563-45-1	3-Methyl-1-butene	1.1 E-07	7.6 E-07	--
563-46-2	2-Methyl-1-butene	ND	ND	1.0 E-04
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	ND	ND	1.0 E-04
96-37-7	Methylcyclopentane	0	0	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	ND	ND	1.0 E-04
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	ND	ND	1.0 E-04
589-34-4	3-Methylhexane	ND	ND	1.0 E-04
66-27-3	Methyl methanesulfonate	ND	ND	3.9 E-04
624-91-9	Methylnitrite	4.8 E-07	3.4 E-06	--
107-83-5	2-Methylpentane	9.8 E-08	7.0 E-07	--
96-14-0	3-Methylpentane	ND	ND	1.0 E-04
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl ketone	3.0 E-07	2.2 E-06	--
88-74-4	2-Nitroaniline	ND	ND	3.5 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	8.6 E-04
75-52-5	Nitromethane	1.3 E-06	9.5 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	7.8 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	1.2 E-03
124-19-6	Nonanal	1.7 E-08	1.2 E-07	--
111-84-2	n-Nonane	4.5 E-07	3.2 E-06	--
124-13-0	Octanal	2.4 E-07	1.7 E-06	--
111-65-9	n-Octane	6.8 E-08	4.9 E-07	--
117-84-0	bis(n-Octyl)phthalate	5.6 E-07	4.0 E-06	--
110-62-3	Pentanal	9.7 E-08	6.9 E-07	--
78-78-4	i-Pentane	9.8 E-08	7.0 E-07	--
109-66-0	n-Pentane	1.4 E-07	9.8 E-07	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	3.0 E-07	2.1 E-06	--
109-67-1	1-Pentene	ND	ND	1.0 E-04
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	ND	ND	1.0 E-04
62-44-2	Phenacetin	ND	ND	2.2 E-04
536-74-3	Phenylacetylene	6.5 E-07	4.6 E-06	--
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	6.1 E-07	4.3 E-06	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	1.2 E-07	8.6 E-07	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	5.4 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	7.0 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	2.9 E-07	2.1 E-06	--
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	1.1 E-07	7.6 E-07	--
565-75-3	2,3,4-Trimethylpentane	7.7 E-08	5.5 E-07	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	1.2 E-03

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.141 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A6 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L596, M110 FLASH ARTILLERY SIMULATOR

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	2.5 E-01	1.3	--
630-08-0	Carbon monoxide	6.8 E-03	3.6 E-02	--
10102-43-9	Nitrogen oxide	1.1 E-03	5.7 E-03	--
10102-44-0	Nitrogen dioxide	3.1 E-04	1.7 E-03	--
--	Oxides of nitrogen	2.0 E-03	1.0 E-02	--
--	PM-10	4.5 E-02	2.4 E-01	--
7446-09-5	Sulfur dioxide	1.8 E-04	9.4 E-04	--
--	Total nonmethane hydrocarbons	4.9 E-03	2.6 E-02	--
12789-66-1	Total suspended particulate	5.8 E-02	3.1 E-01	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.2 E-04
208-96-8	Acenaphthylene	1.0 E-06	5.6 E-06	--
75-05-8	Acetonitrile	ND	ND	1.7 E-04
98-86-2	Acetophenone	ND	ND	9.8 E-05
53-96-3	2-Acetylaminofluorene	ND	ND	1.0 E-04
107-02-8	Acrolein	1.8 E-05	9.4 E-05	--
107-13-1	Acrylonitrile	ND	ND	2.2 E-04
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	3.1 E-04	1.7 E-03	--
92-67-1	4-Aminobiphenyl	ND	ND	6.9 E-04
62-53-3	Aniline	ND	ND	1.3 E-04
120-12-7	Anthracene	ND	ND	1.2 E-04
7440-36-0	Antimony	4.5 E-05	2.4 E-04	--
7440-38-2	Arsenic	ND	ND	6.0 E-05
7440-39-3	Barium	3.4 E-03	1.8 E-02	--
56-55-3	Benzo[a]anthracene	ND	ND	1.5 E-04
71-43-2	Benzene	2.1 E-03	1.1 E-02	--
92-87-5	Benzidine	ND	ND	4.5 E-03
191-24-2	Benzo[g,h,i]perylene	ND	ND	7.9 E-05
205-99-2	Benzo[b]fluoranthene	ND	ND	9.3 E-05
207-08-9	Benzo[k]fluoranthene	ND	ND	1.9 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.1 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	ND	ND	2.8 E-05
101-55-3	4-Bromophenylphenylether	ND	ND	2.3 E-04
106-99-0	1,3-Butadiene	4.4 E-05	2.3 E-04	--
123-72-8	Butanal	ND	ND	3.0 E-04
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	ND	ND	6.8 E-05
7440-43-9	Cadmium	3.0 E-07	1.6 E-06	--
86-74-8	Carbazole	ND	ND	8.2 E-05
75-15-0	Carbon disulfide	1.8 E-05	9.8 E-05	--
56-23-5	Carbon tetrachloride	ND	ND	6.4 E-04
463-58-1	Carbonyl sulfide	5.1 E-06	2.7 E-05	--
7782-50-5	Chlorine	4.7 E-05	2.5 E-04	--
106-47-8	p-Chloroaniline	ND	ND	1.1 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	1.7 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	1.3 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.0 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	1.3 E-04
91-58-7	2-Chloronaphthalene	ND	ND	1.9 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	9.4 E-05
7440-47-3	Chromium	8.5 E-06	4.5 E-05	--
218-01-9	Chrysene	ND	ND	1.6 E-04
7440-48-4	Cobalt	9.6 E-07	5.1 E-06	--
7440-50-8	Copper	7.6 E-05	4.1 E-04	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	1.3 E-06	6.8 E-06	--
98-82-8	Cumene	4.7 E-06	2.5 E-05	--
110-82-7	Cyclohexane	9.9 E-05	5.3 E-04	--
2303-16-4	Diallate	ND	ND	1.6 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	8.2 E-05

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	8.1 E-05
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	0	0	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.1 E-04
75-71-8	Dichlorodifluoromethane	2.2 E-06	1.2 E-05	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	1.6 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.2 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	1.5 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	6.6 E-04
131-11-3	Dimethyl phthalate	ND	ND	9.7 E-05
105-67-9	2,4-Dimethylphenol	ND	ND	1.1 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	2.8 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	9.1 E-03
51-28-5	2,4-Dinitrophenol	ND	ND	1.1 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	1.5 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	2.3 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	2.0 E-03	1.1 E-02	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	4.7 E-05	2.5 E-04	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	ND	ND	4.1 E-04
206-44-0	Fluoranthene	ND	ND	1.2 E-04
118-74-1	Hexachlorobenzene	ND	ND	1.2 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	3.7 E-03
67-72-1	Hexachloroethane	ND	ND	1.6 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	2.3 E-04	1.2 E-03	--
7647-01-0	Hydrochloric acid	1.3 E-04	6.9 E-04	--
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	7.3 E-05
78-59-1	Isophorone	ND	ND	7.1 E-05
120-58-1	Isosafrole	ND	ND	3.6 E-04
7439-92-1	Lead	1.1 E-05	5.8 E-05	--
7439-96-5	Manganese	1.3 E-05	6.8 E-05	--
7439-97-6	Mercury	ND	ND	No Data
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	2.1 E-03	1.1 E-02	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	3.9 E-04
75-09-2	Methylene chloride	1.8 E-05	9.6 E-05	--
78-93-3	Methyl ethyl ketone	2.2 E-05	1.2 E-04	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	3.1 E-05	1.6 E-04	--
95-48-7	2-Methylphenol	ND	ND	1.9 E-04
91-20-3	Naphthalene	7.1 E-05	3.8 E-04	--
130-15-4	1,4-Naphthoquinone	ND	ND	3.3 E-04
134-32-7	1-Naphthylamine	ND	ND	5.9 E-04
91-59-8	2-Naphthylamine	ND	ND	5.2 E-04
7440-02-0	Nickel	5.1 E-07	2.7 E-06	--
100-01-6	4-Nitroaniline	ND	ND	2.6 E-04
98-95-3	Nitrobenzene	ND	ND	3.0 E-04
88-75-5	2-Nitrophenol	ND	ND	1.8 E-04
100-02-7	4-Nitrophenol	ND	ND	1.0 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	7.5 E-03
924-16-3	N-Nitrosodibutylamine	ND	ND	1.2 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	2.8 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	1.2 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	9.4 E-05
59-89-2	N-Nitrosomorpholine	ND	ND	3.0 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	ND	ND	2.4 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	1.2 E-04
608-93-5	Pentachlorobenzene	ND	ND	2.2 E-04
76-01-7	Pentachloroethane	ND	ND	2.4 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	4.5 E-04
87-86-5	Pentachlorophenol	ND	ND	9.6 E-03
127-18-4	Perchloroethylene	5.7 E-05	3.1 E-04	--
85-01-8	Phenanthrene	6.7 E-07	3.6 E-06	--
108-95-2	Phenol	ND	ND	8.3 E-05
7723-14-0	Phosphorus	6.1 E-06	3.3 E-05	--
109-06-8	2-Picoline	ND	ND	3.5 E-04
23950-58-5	Pronamide	ND	ND	8.6 E-05
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	2.1 E-05	1.1 E-04	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	1.9 E-07	1.0 E-06	--
110-86-1	Pyridine	ND	ND	3.4 E-04
94-59-7	Safrole	ND	ND	2.4 E-04
7782-49-2	Selenium	ND	ND	5.5 E-05
7440-22-4	Silver	ND	ND	2.2 E-05
100-42-5	Styrene	1.5 E-05	8.0 E-05	--
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	1.4 E-12	7.5 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	8.6 E-05
108-88-3	Toluene	5.2 E-03	2.8 E-02	--
95-53-4	o-Toluidine	ND	ND	1.3 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	0	0	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	1.8 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	2.1 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	ND	7.8 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	1.5 E-03	8.2 E-03	--
540-84-1	2,2,4-Trimethylpentane	3.3 E-05	1.8 E-04	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	3.7 E-03	2.0 E-02	--
95-47-6	o-Xylene	2.3 E-03	1.2 E-02	--
7440-66-6	Zinc	1.7 E-05	9.1 E-05	--
Other Pollutants				
64-19-7	Acetic Acid	4.6 E-05	2.4 E-04	--
67-64-1	Acetone	1.7 E-05	9.2 E-05	--
74-86-2	Acetylene	1.6 E-05	8.7 E-05	--
100-52-7	Benzaldehyde	9.2 E-05	4.9 E-04	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	1.2 E-02
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	1.2 E-06	6.3 E-06	--
123-73-9	trans-2-Butenal	ND	ND	2.9 E-04
75-28-5	i-Butane	6.6 E-06	3.5 E-05	--
106-97-8	n-Butane	3.5 E-05	1.9 E-04	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	5.2 E-06	2.8 E-05	--
115-11-7	i-Butene	1.4 E-05	7.3 E-05	--
590-18-1	cis-2-Butene	1.2 E-06	6.2 E-06	--
624-64-6	trans-2-Butene	3.7 E-06	2.0 E-05	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	1.9 E-04
95-57-8	2-Chlorophenol	ND	ND	5.3 E-05
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	1.6 E-05	8.4 E-05	--
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	8.1 E-07	4.3 E-06	--
112-31-2	Decanal	4.0 E-05	2.2 E-04	--
124-18-5	n-Decane	3.8 E-06	2.0 E-05	--

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.1 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	0	0	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	1.0 E-04	5.6 E-04	--
824-22-6	2,3-Dihydro-4-methyl-1H-indene	1.3 E-04	7.1 E-04	--
75-83-2	2,2-Dimethylbutane	1.7 E-05	9.0 E-05	--
79-29-8	2,3-Dimethylbutane	3.8 E-05	2.0 E-04	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	1.0 E-05	5.3 E-05	--
589-43-5	2,4-Dimethylhexane	2.0 E-05	1.1 E-04	--
592-13-2	2,5-Dimethylhexane	1.7 E-05	9.3 E-05	--
565-59-3	2,3-Dimethylpentane	3.6 E-05	1.9 E-04	--
108-08-7	2,4-Dimethylpentane	2.2 E-05	1.2 E-04	--
--	Dimethylphenethylamine	ND	ND	6.8 E-03
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	0	0	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	1.3 E-04
620-14-4	m-Ethyltoluene	4.9 E-05	2.6 E-04	--
611-14-3	o-Ethyltoluene	3.1 E-05	1.7 E-04	--
622-96-8	p-Ethyltoluene	8.1 E-04	4.3 E-03	--
86-73-7	Fluorene	2.1 E-07	1.1 E-06	--
98-01-1	2-Furaldehyde	ND	ND	4.0 E-04
110-00-9	Furan	ND	ND	2.8 E-04
111-71-7	Heptanal	1.2 E-05	6.6 E-05	--
142-82-5	n-Heptane	1.7 E-04	9.1 E-04	--
1888-71-7	Hexachloropropene	ND	ND	1.9 E-04
66-25-1	Hexanal	ND	ND	4.2 E-04
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	5.2 E-07	2.8 E-06	--
7688-21-3	cis-2-Hexene	7.0 E-07	3.7 E-06	--
4050-45-7	trans-2-Hexene	1.3 E-06	6.8 E-06	--
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	3.4 E-04	1.8 E-03	--
78-79-5	Isoprene	2.3 E-07	1.2 E-06	--
143-50-0	Kepone	ND	ND	6.3 E-03
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	1.6 E-02	8.6 E-02	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	6.9 E-03
563-45-1	3-Methyl-1-butene	9.3 E-07	5.0 E-06	--
563-46-2	2-Methyl-1-butene	2.7 E-06	1.4 E-05	--
513-35-9	2-Methyl-2-butene	1.0 E-06	5.6 E-06	--
108-87-2	Methylcyclohexane	1.7 E-04	9.3 E-04	--
96-37-7	Methylcyclopentane	8.3 E-05	4.4 E-04	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	5.5 E-05	2.9 E-04	--
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	1.2 E-04	6.4 E-04	--
589-34-4	3-Methylhexane	1.3 E-04	7.0 E-04	--
66-27-3	Methyl methanesulfonate	ND	ND	1.3 E-04
624-91-9	Methylnitrite	8.3 E-05	4.4 E-04	--
107-83-5	2-Methylpentane	1.9 E-04	1.0 E-03	--
96-14-0	3-Methylpentane	1.4 E-04	7.2 E-04	--
763-29-1	2-Methyl-1-pentene	8.7 E-07	4.7 E-06	--
625-27-4	2-Methyl-2-pentene	1.0 E-06	5.6 E-06	--
691-37-2	4-Methyl-1-pentene	7.0 E-07	3.7 E-06	--
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.2 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	2.9 E-04
75-52-5	Nitromethane	1.2 E-05	6.3 E-05	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	2.7 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	4.0 E-04
124-19-6	Nonanal	4.5 E-05	2.4 E-04	--
111-84-2	n-Nonane	1.4 E-05	7.7 E-05	--
124-13-0	Octanal	3.3 E-05	1.8 E-04	--
111-65-9	n-Octane	1.8 E-05	9.5 E-05	--
117-84-0	bis(n-Octyl)phthalate	ND	ND	1.0 E-04
110-62-3	Pentanal	ND	ND	3.6 E-04
78-78-4	i-Pentane	1.9 E-04	1.0 E-03	--
109-66-0	n-Pentane	1.9 E-04	1.0 E-03	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	ND	ND	3.6 E-04
109-67-1	1-Pentene	1.9 E-06	9.9 E-06	--
627-20-3	cis-2-Pentene	9.3 E-07	5.0 E-06	--
646-04-8	trans-2-Pentene	1.7 E-06	9.3 E-06	--
62-44-2	Phenacetin	ND	ND	7.5 E-05
536-74-3	Phenylacetylene	ND	ND	4.2 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	0	0	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	2.7 E-05	1.4 E-04	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	1.8 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	2.4 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	ND	ND	3.5 E-04
108-67-8	1,3,5-Trimethylbenzene	7.9 E-04	4.2 E-03	--
16747-26-5	2,2,4-Trimethylhexane	3.6 E-06	1.9 E-05	--
565-75-3	2,3,4-Trimethylpentane	5.7 E-06	3.0 E-05	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	4.2 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.1875 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A7 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L598, M117 FLASH BOOBY TRAP SIMULATOR

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	0	0	--
630-08-0	Carbon monoxide	5.3 E-05	6.8 E-03	--
10102-43-9	Nitrogen oxide	2.9 E-05	3.8 E-03	--
10102-44-0	Nitrogen dioxide	2.6 E-06	3.4 E-04	--
--	Oxides of nitrogen	5.0 E-05	6.5 E-03	--
--	PM-10	2.5 E-03	3.3 E-01	--
7446-09-5	Sulfur dioxide	4.4 E-04	5.7 E-02	--
--	Total nonmethane hydrocarbons	3.8 E-06	4.9 E-04	--
12789-66-1	Total suspended particulate	3.2 E-03	4.2 E-01	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.6 E-04
208-96-8	Acenaphthylene	ND	ND	1.5 E-04
75-05-8	Acetonitrile	2.9 E-08	3.8 E-06	--
98-86-2	Acetophenone	3.9 E-09	5.1 E-07	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.4 E-04
107-02-8	Acrolein	1.6 E-07	2.1 E-05	--
107-13-1	Acrylonitrile	2.5 E-08	3.3 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	9.3 E-06	1.2 E-03	--
92-67-1	4-Aminobiphenyl	ND	ND	9.4 E-04
62-53-3	Aniline	ND	ND	1.8 E-04
120-12-7	Anthracene	ND	ND	1.7 E-04
7440-36-0	Antimony	8.9 E-04	1.2 E-01	--
7440-38-2	Arsenic	1.8 E-06	2.3 E-04	--
7440-39-3	Barium	1.5 E-07	1.9 E-05	--
56-55-3	Benzo[a]anthracene	ND	ND	2.0 E-04
71-43-2	Benzene	3.5 E-07	4.6 E-05	--
92-87-5	Benzidine	ND	ND	6.1 E-03
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.1 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.3 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	2.6 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.5 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	ND	ND	4.8 E-05
101-55-3	4-Bromophenylphenylether	ND	ND	3.1 E-04
106-99-0	1,3-Butadiene	7.8 E-08	1.0 E-05	--
123-72-8	Butanal	6.1 E-09	7.9 E-07	--
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	ND	ND	4.9 E-04
85-68-7	Butylbenzylphthalate	3.2 E-08	4.2 E-06	--
7440-43-9	Cadmium	6.9 E-09	9.0 E-07	--
86-74-8	Carbazole	ND	ND	1.1 E-04
75-15-0	Carbon disulfide	2.9 E-06	3.7 E-04	--
56-23-5	Carbon tetrachloride	6.6 E-08	8.5 E-06	--
463-58-1	Carbonyl sulfide	1.2 E-08	1.6 E-06	--
7782-50-5	Chlorine	4.3 E-04	5.6 E-02	--
106-47-8	p-Chloroaniline	ND	ND	1.5 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	2.3 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	1.8 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.4 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	1.7 E-04
91-58-7	2-Chloronaphthalene	ND	ND	2.6 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	1.3 E-04
7440-47-3	Chromium	1.5 E-07	2.0 E-05	--
218-01-9	Chrysene	ND	ND	2.2 E-04
7440-48-4	Cobalt	9.1 E-09	1.2 E-06	--
7440-50-8	Copper	1.5 E-06	2.0 E-04	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	2.1 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	0	0	--
2303-16-4	Diallate	ND	ND	2.2 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	1.1 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	1.1 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	6.2 E-08	8.1 E-06	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.5 E-04
75-71-8	Dichlorodifluoromethane	1.3 E-07	1.7 E-05	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	2.2 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.7 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	2.1 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	9.0 E-04
131-11-3	Dimethyl phthalate	ND	ND	1.3 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	1.5 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	3.8 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.2 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	1.4 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	2.0 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	3.2 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	ND	ND	6.7 E-04
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	4.8 E-07	6.3 E-05	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	ND	ND	5.5 E-04
206-44-0	Fluoranthene	ND	ND	1.6 E-04
118-74-1	Hexachlorobenzene	ND	ND	1.7 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexacholorocyclopentadiene	ND	ND	5.0 E-03
67-72-1	Hexachloroethane	ND	ND	2.2 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	8.5 E-08	1.1 E-05	--
7647-01-0	Hydrochloric acid	ND	ND	5.4 E-02
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	9.9 E-05
78-59-1	Isophorone	ND	ND	9.7 E-05
120-58-1	Isosafrole	ND	ND	4.9 E-04
7439-92-1	Lead	2.3 E-06	3.0 E-04	--
7439-96-5	Manganese	4.2 E-07	5.4 E-05	--
7439-97-6	Mercury	ND	ND	No Data
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	8.8 E-08	1.1 E-05	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	5.3 E-04
75-09-2	Methylene chloride	4.5 E-07	5.9 E-05	--
78-93-3	Methyl ethyl ketone	6.0 E-08	7.7 E-06	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	ND	ND	1.6 E-04
95-48-7	2-Methylphenol	ND	ND	2.5 E-04
91-20-3	Naphthalene	3.0 E-08	3.9 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	4.5 E-04
134-32-7	1-Naphthylamine	ND	ND	8.0 E-04
91-59-8	2-Naphthylamine	ND	ND	7.1 E-04
7440-02-0	Nickel	2.6 E-08	3.4 E-06	--
100-01-6	4-Nitroaniline	ND	ND	3.5 E-04
98-95-3	Nitrobenzene	ND	ND	4.0 E-04
88-75-5	2-Nitrophenol	ND	ND	2.4 E-04
100-02-7	4-Nitrophenol	ND	ND	1.4 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	1.0 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	1.7 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	3.8 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	1.6 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	1.3 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	4.1 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	0	0	0
99-55-8	5-Nitro-o-toluidine	ND	ND	1.6 E-04
608-93-5	Pentachlorobenzene	ND	ND	3.1 E-04
76-01-7	Pentachloroethane	ND	ND	3.3 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	6.1 E-04
87-86-5	Pentachlorophenol	ND	ND	1.3 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	2.8 E-04
108-95-2	Phenol	ND	ND	1.1 E-04
7723-14-0	Phosphorus	2.4 E-05	3.1 E-03	--
109-06-8	2-Picoline	ND	ND	4.8 E-04
23950-58-5	Pronamide	ND	ND	1.2 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	0	0	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	2.2 E-04
110-86-1	Pyridine	ND	ND	4.6 E-04
94-59-7	Safrole	ND	ND	3.2 E-04
7782-49-2	Selenium	1.9 E-08	2.5 E-06	--
7440-22-4	Silver	3.8 E-08	4.9 E-06	--
100-42-5	Styrene	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	6.5 E-14	8.4 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	1.5 E-04
108-88-3	Toluene	1.9 E-07	2.5 E-05	--
95-53-4	o-Toluidine	ND	ND	1.8 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	2.1 E-07	2.7 E-05	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	2.4 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	2.9 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	8.5 E-10	1.1 E-07	--

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	ND	ND	5.0 E-04
540-84-1	2,2,4-Trimethylpentane	3.4 E-07	4.4 E-05	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	7.0 E-08	9.1 E-06	--
95-47-6	o-Xylene	ND	ND	4.4 E-04
7440-66-6	Zinc	1.0 E-06	1.3 E-04	--
Other Pollutants				
64-19-7	Acetic Acid	1.7 E-07	2.2 E-05	--
67-64-1	Acetone	1.1 E-07	1.4 E-05	--
74-86-2	Acetylene	8.0 E-07	1.0 E-04	--
100-52-7	Benzaldehyde	9.6 E-08	1.2 E-05	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic Acid	ND	ND	1.7 E-02
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	ND	ND	3.2 E-04
123-73-9	trans-2-Butenal	3.4 E-08	4.4 E-06	--
75-28-5	i-Butane	0	0	--
106-97-8	n-Butane	0	0	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene	0	0	--
115-11-7	i-Butene	0	0	--
590-18-1	cis-2-Butene	0	0	--
624-64-6	trans-2-Butene	8.5 E-08	1.1 E-05	--
59-50-7	4-Chloro-3-methylphenol	ND	ND	2.6 E-04
95-57-8	2-Chlorophenol	ND	ND	7.2 E-05
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	ND	ND	1.0 E-04
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	1.2 E-07	1.6 E-05	--
124-18-5	n-Decane	ND	ND	1.0 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
13466-78-9	delta 3-Carene	ND	ND	1.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.6 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	0	0	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	0	0	--
79-29-8	2,3-Dimethylbutane	4.3 E-08	5.5 E-06	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	3.4 E-08	4.4 E-06	--
589-43-5	2,4-Dimethylhexane	3.8 E-08	5.0 E-06	--
592-13-2	2,5-Dimethylhexane	2.6 E-08	3.3 E-06	--
565-59-3	2,3-Dimethylpentane	1.8 E-07	2.3 E-05	--
108-08-7	2,4-Dimethylpentane	9.8 E-08	1.3 E-05	--
--	Dimethylphenethylamine	ND	ND	9.2 E-03
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	0	0	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	1.8 E-04
620-14-4	m-Ethyltoluene	ND	ND	1.0 E-04
611-14-3	o-Ethyltoluene	ND	ND	1.0 E-04
622-96-8	p-Ethyltoluene	ND	ND	5.0 E-04
86-73-7	Fluorene	ND	ND	1.5 E-04
98-01-1	2-Furaldehyde	7.6 E-08	9.9 E-06	--
110-00-9	Furan	ND	ND	2.8 E-04
111-71-7	Heptanal	3.7 E-08	4.7 E-06	--
142-82-5	n-Heptane	1.7 E-08	2.2 E-06	--
1888-71-7	Hexachloropropene	ND	ND	2.6 E-04
66-25-1	Hexanal	2.8 E-08	3.7 E-06	--
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	ND	ND	1.0 E-04
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
116-09-6	1-Hydroxy-2-propanone	ND	ND	3.1 E-04
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	8.5 E-03
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	1.9 E-04	2.5 E-02	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	9.4 E-03
563-45-1	3-Methyl-1-butene	ND	ND	1.0 E-04
563-46-2	2-Methyl-1-butene	ND	ND	1.0 E-04
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	8.5 E-09	1.1 E-06	--
96-37-7	Methylcyclopentane	2.6 E-08	3.3 E-06	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	2.1 E-08	2.8 E-06	--
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	2.6 E-08	3.3 E-06	--
589-34-4	3-Methylhexane	1.3 E-08	1.7 E-06	--
66-27-3	Methyl methanesulfonate	ND	ND	1.8 E-04
624-91-9	Methylnitrite	5.3 E-08	6.8 E-06	--
107-83-5	2-Methylpentane	7.2 E-08	9.4 E-06	--
96-14-0	3-Methylpentane	6.4 E-08	8.3 E-06	--
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.6 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	4.0 E-04
75-52-5	Nitromethane	5.9 E-08	7.6 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	3.6 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	5.4 E-04
124-19-6	Nonanal	1.7 E-07	2.3 E-05	--
111-84-2	n-Nonane	4.3 E-08	5.5 E-06	--
124-13-0	Octanal	7.7 E-08	1.0 E-05	--
111-65-9	n-Octane	4.3 E-09	5.5 E-07	--
117-84-0	bis(n-Octyl)phthalate	ND	ND	1.4 E-04
110-62-3	Pentanal	3.0 E-08	3.9 E-06	--
78-78-4	i-Pentane	3.4 E-08	4.4 E-06	--
109-66-0	n-Pentane	2.6 E-08	3.3 E-06	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	ND	ND	3.6 E-04
109-67-1	1-Pentene	ND	ND	1.0 E-04
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	ND	ND	1.0 E-04
62-44-2	Phenacetin	ND	ND	1.0 E-04
536-74-3	Phenylacetylene	ND	ND	4.2 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	0	0	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	ND	ND	1.0 E-04
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	2.5 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	3.2 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	3.5 E-08	4.6 E-06	--
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	2.6 E-08	3.3 E-06	--
565-75-3	2,3,4-Trimethylpentane	6.8 E-08	8.9 E-06	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	5.7 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.0077 pounds per item.
[d] Data provided for compounds that were not detected.

TABLE A8 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L601, M116A1 HAND GRENADE SIMULATOR

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	4.1 E-03	5.1 E-02	--
630-08-0	Carbon monoxide	3.7 E-04	4.5 E-03	--
10102-43-9	Nitrogen oxide	3.6 E-03	4.4 E-02	--
10102-44-0	Nitrogen dioxide	1.7 E-04	2.1 E-03	--
--	Oxides of nitrogen	5.6 E-03	6.9 E-02	--
--	PM-10	1.2 E-01	1.5	--
7446-09-5	Sulfur dioxide	4.7 E-04	5.8 E-03	--
--	Total nonmethane hydrocarbons	4.2 E-05	5.1 E-04	--
12789-66-1	Total suspended particulate	1.1 E-01	1.4	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	2.6 E-04
208-96-8	Acenaphthylene	ND	ND	2.3 E-04
75-05-8	Acetonitrile	ND	ND	1.7 E-04
98-86-2	Acetophenone	3.8 E-07	4.7 E-06	--
53-96-3	2-Acetylaminofluorene	ND	ND	2.2 E-04
107-02-8	Acrolein	1.7 E-06	2.1 E-05	--
107-13-1	Acrylonitrile	3.4 E-07	4.2 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	1.1 E-02	1.4 E-01	--
92-67-1	4-Aminobiphenyl	ND	ND	1.5 E-03
62-53-3	Aniline	ND	ND	2.8 E-04
120-12-7	Anthracene	ND	ND	2.6 E-04
7440-36-0	Antimony	2.0 E-05	2.4 E-04	--
7440-38-2	Arsenic	2.7 E-07	3.3 E-06	--
7440-39-3	Barium	3.9 E-05	4.8 E-04	--
71-43-2	Benzene	1.5 E-06	1.8 E-05	--
92-87-5	Benzidine	ND	ND	9.5 E-03
56-55-3	Benzo[a]anthracene	ND	ND	3.2 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	2.0 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	4.1 E-04
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.7 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	2.3 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	3.6 E-08	4.4 E-07	--
101-55-3	4-Bromophenylphenylether	ND	ND	4.9 E-04
106-99-0	1,3-Butadiene	1.3 E-07	1.6 E-06	--
123-72-8	Butanal	ND	ND	3.0 E-04
71-36-3	1-Butanol	ND	ND	3.1 E-04
111-76-2	2-Butoxyethanol	0	0	--
85-68-7	Butylbenzylphthalate	1.1 E-06	1.3 E-05	--
7440-43-9	Cadmium	2.3 E-07	2.8 E-06	--
86-74-8	Carbazole	ND	ND	1.7 E-04
75-15-0	Carbon disulfide	5.4 E-05	6.7 E-04	--
56-23-5	Carbon tetrachloride	3.1 E-08	3.8 E-07	--
463-58-1	Carbonyl sulfide	2.7 E-07	3.3 E-06	--
7782-50-5	Chlorine	3.9 E-06	4.8 E-05	--
106-47-8	p-Chloroaniline	ND	ND	2.3 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	3.6 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	2.8 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	2.2 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	2.7 E-04
91-58-7	2-Chloronaphthalene	ND	ND	4.0 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	2.0 E-04
7440-47-3	Chromium	6.2 E-07	7.6 E-06	--
218-01-9	Chrysene	ND	ND	3.5 E-04
7440-48-4	Cobalt	3.3 E-07	4.1 E-06	--
7440-50-8	Copper	1.8 E-05	2.3 E-04	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	3.4 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	ND	ND	1.0 E-04
2303-16-4	Diallate	ND	ND	3.4 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	1.8 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
132-64-9	Dibenzofuran	ND	ND	1.7 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutyl phthalate	3.0 E-06	3.7 E-05	--
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	2.4 E-04
75-71-8	Dichlorodifluoromethane	1.6 E-07	2.0 E-06	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	3.5 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	2.6 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	3.3 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	1.4 E-03
105-67-9	2,4-Dimethylphenol	ND	ND	2.4 E-04
131-11-3	Dimethyl phthalate	ND	ND	2.1 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	6.0 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.9 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	2.2 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	3.2 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	5.0 E-04
123-91-1	1,4-Dioxane	ND	ND	3.7 E-04
100-41-4	Ethyl benzene	1.8 E-07	2.3 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	7.7 E-06	9.4 E-05	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	3.4 E-07	4.2 E-06	--
206-44-0	Fluoranthene	ND	ND	2.6 E-04
118-74-1	Hexachlorobenzene	ND	ND	2.6 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexachlorocyclopentadiene	ND	ND	7.9 E-03
67-72-1	Hexachloroethane	ND	ND	3.5 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
110-54-3	n-Hexane	6.1 E-08	7.6 E-07	--
7647-01-0	Hydrochloric acid	ND	ND	4.9 E-02
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	1.6 E-04
78-59-1	Isophorone	ND	ND	1.5 E-04
120-58-1	Isosafrole	ND	ND	7.7 E-04
7439-92-1	Lead	1.4 E-06	1.7 E-05	--
7439-96-5	Manganese	1.2 E-05	1.5 E-04	--
7439-97-6	Mercury	1.6 E-09	2.0 E-08	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	ND	ND	3.7 E-04
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	8.3 E-04
75-09-2	Methylene chloride	3.8 E-06	4.7 E-05	--
78-93-3	Methyl ethyl ketone	5.3 E-07	6.6 E-06	--
80-62-6	Methyl methacrylate	ND	ND	4.2 E-04
90-12-0	1-Methylnaphthalene	ND	ND	5.9 E-04
91-57-6	2-Methylnaphthalene	1.4 E-07	1.7 E-06	--
95-48-7	2-Methylphenol	ND	ND	4.0 E-04
91-20-3	Naphthalene	4.5 E-07	5.6 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	7.1 E-04
134-32-7	1-Naphthylamine	ND	ND	1.3 E-03
91-59-8	2-Naphthylamine	ND	ND	1.1 E-03
7440-02-0	Nickel	1.2 E-06	1.5 E-05	--
100-01-6	4-Nitroaniline	ND	ND	5.5 E-04
98-95-3	Nitrobenzene	ND	ND	6.3 E-04
88-75-5	2-Nitrophenol	ND	ND	3.8 E-04
100-02-7	4-Nitrophenol	ND	ND	2.2 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	1.6 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	2.7 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	6.1 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	2.5 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	2.0 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	6.4 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
100-75-4	N-Nitrosopiperidine	ND	ND	5.2 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	2.6 E-04
608-93-5	Pentachlorobenzene	ND	ND	4.8 E-04
76-01-7	Pentachloroethane	ND	ND	5.1 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	9.5 E-04
87-86-5	Pentachlorophenol	ND	ND	2.1 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	4.3 E-04
108-95-2	Phenol	ND	ND	1.8 E-04
7723-14-0	Phosphorus	1.5 E-05	1.9 E-04	--
109-06-8	2-Picoline	ND	ND	7.5 E-04
23950-58-5	Pronamide	ND	ND	1.8 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	2.6 E-06	3.2 E-05	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	3.5 E-04
110-86-1	Pyridine	ND	ND	7.3 E-04
94-59-7	Safrole	ND	ND	5.1 E-04
7782-49-2	Selenium	1.3 E-07	1.6 E-06	--
7440-22-4	Silver	ND	ND	4.5 E-05
100-42-5	Styrene	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	4.7 E-13	5.8 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	5.7 E-04
108-88-3	Toluene	6.8 E-07	8.4 E-06	--
95-53-4	o-Toluidine	ND	ND	2.8 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	0	0	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	3.8 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	4.5 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0	0	--

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-63-6	1,2,4-Trimethylbenzene	2.6 E-07	3.2 E-06	--
540-84-1	2,2,4-Trimethylpentane	2.4 E-07	3.0 E-06	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04
106-42-3 / 108-38-3	m-Xylene / p-Xylene	3.2 E-07	4.0 E-06	--
95-47-6	o-Xylene	2.8 E-07	3.5 E-06	--
7440-66-6	Zinc	1.3 E-05	1.6 E-04	--
Other Pollutants				
64-19-7	Acetic acid	6.2 E-08	7.6 E-07	--
67-64-1	Acetone	1.7 E-06	2.1 E-05	--
74-86-2	Acetylene	7.3 E-06	9.0 E-05	--
100-52-7	Benzaldehyde	7.2 E-07	8.8 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic acid	ND	ND	2.6 E-02
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	ND	ND	5.0 E-04
75-28-5	i-Butane	6.0 E-08	7.4 E-07	--
106-97-8	n-Butane	0	0	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
123-73-9	trans-2-Butenal	1.7 E-07	2.2 E-06	--
106-98-9	1-Butene	3.1 E-07	3.8 E-06	--
115-11-7	i-Butene	4.5 E-07	5.6 E-06	--
590-18-1	cis-2-Butene	9.1 E-08	1.1 E-06	--
624-64-6	trans-2-Butene	4.6 E-07	5.6 E-06	--
13466-78-9	delta-3-Carene	ND	ND	1.0 E-04
59-50-7	4-Chloro-3-methylphenol	ND	ND	4.0 E-04
95-57-8	2-Chlorophenol	ND	ND	1.1 E-04
2074-87-5	Cyanogen	ND	ND	2.2 E-04
108-94-1	Cyclohexanone	ND	ND	4.1 E-04
287-92-3	Cyclopentane	ND	ND	1.0 E-04
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	0	0	--

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
124-18-5	n-Decane	4.6 E-08	5.7 E-07	--
87-65-0	2,6-Dichlorophenol	ND	ND	2.4 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	1.0 E-07	1.3 E-06	--
767-58-8	2,3-Dihydro-1-methyl-1H-indene	ND	ND	5.5 E-04
824-22-6	2,3-Dihydro-4-methyl-1H-indene	ND	ND	5.5 E-04
75-83-2	2,2-Dimethylbutane	ND	ND	1.0 E-04
79-29-8	2,3-Dimethylbutane	ND	ND	1.0 E-04
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	ND	ND	1.0 E-04
589-43-5	2,4-Dimethylhexane	ND	ND	1.0 E-04
592-13-2	2,5-Dimethylhexane	ND	ND	1.0 E-04
565-59-3	2,3-Dimethylpentane	ND	ND	1.0 E-04
108-08-7	2,4-Dimethylpentane	0	0	--
--	Dimethylphenethylamine	ND	ND	1.5 E-02
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
74-84-0	Ethane	1.7 E-06	2.1 E-05	--
637-92-3	Ethyl tert-butyl ether	ND	ND	1.0 E-04
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
104-76-7	2-Ethyl-1-hexanol	ND	ND	5.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	2.8 E-04
620-14-4	m-Ethyltoluene	1.5 E-07	1.9 E-06	--
611-14-3	o-Ethyltoluene	1.8 E-07	2.3 E-06	--
622-96-8	p-Ethyltoluene	ND	ND	5.0 E-04
86-73-7	Fluorene	ND	ND	2.4 E-04
98-01-1	2-Furaldehyde	1.3 E-06	1.6 E-05	--
110-00-9	Furan	3.2 E-07	4.0 E-06	--
111-71-7	Heptanal	1.6 E-07	2.0 E-06	--
142-82-5	n-Heptane	3.0 E-08	3.7 E-07	--
1888-71-7	Hexachloropropene	ND	ND	4.0 E-04
66-25-1	Hexanal	1.7 E-09	2.1 E-08	--
628-73-9	Hexanenitrile	ND	ND	4.0 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
592-41-6	1-Hexene	ND	ND	1.0 E-04
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
116-09-6	1-Hydroxy-2-propanone	1.2 E-06	1.5 E-05	--
496-11-7	Indane	ND	ND	4.9 E-04
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	1.3 E-02
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	1.3 E-02	1.6 E-01	--
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	1.5 E-02
563-46-2	2-Methyl-1-butene	4.6 E-08	5.6 E-07	--
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
563-45-1	3-Methyl-1-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	ND	ND	1.0 E-04
96-37-7	Methylcyclopentane	0	0	--
497-26-7	2-Methyl-1,3-dioxolane	ND	ND	3.7 E-04
534-22-5	2-Methylfuran	ND	ND	3.4 E-04
592-27-8	2-Methylheptane	ND	ND	1.0 E-04
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	ND	ND	1.0 E-04
589-34-4	3-Methylhexane	ND	ND	1.0 E-04
66-27-3	Methyl methanesulfonate	ND	ND	2.9 E-04
624-91-9	Methylnitrite	8.6 E-07	1.1 E-05	--
107-83-5	2-Methylpentane	3.0 E-08	3.7 E-07	--
96-14-0	3-Methylpentane	ND	ND	1.0 E-04
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-82-0	2-Methylpropanenitrile	ND	ND	2.9 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-94-4	Methyl vinyl ketone	1.9 E-07	2.4 E-06	--
88-74-4	2-Nitroaniline	ND	ND	2.5 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
99-09-2	3-Nitroaniline	ND	ND	6.3 E-04
75-52-5	Nitromethane	7.5 E-07	9.2 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	5.7 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	8.5 E-04
124-19-6	Nonanal	0	0	--
111-84-2	n-Nonane	1.8 E-07	2.2 E-06	--
124-13-0	Octanal	1.1 E-07	1.3 E-06	--
111-65-9	n-Octane	1.5 E-08	1.8 E-07	--
117-84-0	bis(n-Octyl)phthalate	ND	ND	2.2 E-04
110-62-3	Pentanal	0	0	--
78-78-4	i-Pentane	9.3 E-08	1.1 E-06	--
109-66-0	n-Pentane	3.0 E-08	3.7 E-07	--
110-59-8	Pentanenitrile	ND	ND	3.5 E-04
107-87-9	2-Pentanone	ND	ND	3.6 E-04
109-67-1	1-Pentene	ND	ND	1.0 E-04
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	ND	ND	1.0 E-04
62-44-2	Phenacetin	ND	ND	1.6 E-04
536-74-3	Phenylacetylene	ND	ND	4.2 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	3.0 E-07	3.7 E-06	--
107-12-0	Propanenitrile	ND	ND	2.3 E-04
71-23-8	Propanol	ND	ND	2.5 E-04
103-65-1	n-Propylbenzene	3.0 E-08	3.7 E-07	--
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	3.9 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	5.1 E-04
109-99-9	Tetrahydrofuran	ND	ND	3.0 E-04
110-02-1	Thiophene	2.1 E-07	2.6 E-06	--
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	ND	ND	1.0 E-04
565-75-3	2,3,4-Trimethylpentane	0	0	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
99-35-4	sym-Trinitrobenzene	ND	ND	8.9 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.0813 pounds per item.
[d] Data provided for compounds that were not detected.

APPENDIX B

NEW AP-42 SECTIONS FOR ORDNANCE INCLUDED IN PHASE I TESTING AT DUGWAY PROVING GROUND, UTAH

BACKGROUND DOCUMENT

REPORT ON REVISIONS TO 5TH EDITION AP-42 CHAPTER 15 - ORDNANCE DETONATION

EMISSION FACTORS DEVELOPED BASED ON PHASE II TESTING CONDUCTED AT DUGWAY PROVING GROUND, UTAH

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Due to the lack of credible data concerning emissions from training ordnance when used in their tactical configurations, the U.S. Army Environmental Center (USAEC) established a program to quantify emissions from the detonation of ordnance. This document presents background information concerning the development of air emission factors for six ordnance types used during training exercises at U.S. Army installations. The air emission factors were developed from test data collected by USAEC. Ordnance for which emission factors have been developed and their corresponding AP-42 sections are identified in Table 1. To help readers easily find those emission factors of interest, the ordnance are organized according to their Department of Defense Identification Code (DODIC).

TABLE 1 ORDNANCE FOR WHICH EMISSION FACTORS WERE DEVELOPED

DODIC	Ordnance Description	AP-42 Section
L306	M158 Red Star Cluster Signal Illumination	15.8.2
L307	M159 White Star Cluster Signal Illumination	15.8.3
L311	M126A1 Red Star Parachute Signal Flare	15.8.4
L495	M49A1 Surface Trip Flare	15.8.9
L599	M118 Illuminating Booby Trap Simulator	15.8.13
L600	M119 Whistling Booby Trap Simulator	15.8.14

The emission factors described in this document are based on data obtained during testing conducted at Dugway Proving Ground, Utah, as presented in the final test report titled *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*[1] and supplemented by additional information from the testing contractor.[2] For each ordnance, one or two test runs were conducted. The number of individual ordnance detonated per run varied with the ordnance. Generally, the number of individual ordnance detonated was greater for smaller ordnance in order to generate measurable quantities of emissions. Source test protocols were developed by USAEC before any testing was conducted and were reviewed by the U.S. Environmental Protection Agency's (EPA's) Emission Measurement Center. The tests were conducted between October 12 and 14, 1998.

The compounds that were measured included carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), total suspended particulate (TSP), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM-10), metals, hydrogen chloride and chlorine (HCl/Cl_2), volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and dioxins/furans (PCDD/PCDF). Appendix A identifies, by ordnance type, all of the compounds for which analyses were performed and the emission factors that were developed. Within each of the AP-42 sections, only emission factors for criteria pollutants, carbon dioxide, hazardous air pollutants (as defined by §112(b)(1) of the *Clean Air Act* [CAA]), and toxic chemicals (as defined by §313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are presented.

The emission factors were developed on a "per item" basis and on a "per net explosive weight (NEW)" basis. Users should choose the appropriate emission factor to estimate emissions based upon the data available; either factor is equally valid. The NEW of each ordnance tested is provided in the corresponding AP-42 section and in Table 2.

TABLE 2 ORDNANCE NET EXPLOSIVE WEIGHT

DODIC	Ordnance Description	NEW (lb/item)[a]
L306	M158 Red Star Cluster Signal Illumination	0.2809
L307	M159 White Star Cluster Signal Illumination	0.32
L311	M126A1 Red Star Parachute Signal Flare	0.29
L495	M49A1 Surface Trip Flare	1.0811
L599	M118 Illuminating Booby Trap Simulator	0.0134
L600	M119 Whistling Booby Trap Simulator	0.106

[a] NEW values were obtained from Reference 3.

This document includes five sections in addition to this Introduction. Section 2 of this document identifies the compounds measured during the test program and describes the emission measurement methods used. Section 3 includes a discussion of the emission factor final test report and ratings for the test data contained therein. Section 4 describes the calculations and methodologies used to develop emission factors for each type of compound measured. Section 5 describes the methodology used to rate the emission factors and provides emission factor ratings for each type of compound measured. Section 6 includes a complete list of the references cited in this document.

There are two appendices included with this document. Appendix A identifies, by ordnance type, all of the compounds for which analyses were performed and the emission factors that were developed. Appendix A also identifies the minimum detection levels associated with all compounds that were not detected. Appendix B includes the new AP-42 sections for two of the ordnance (L599 and L600) that were tested during the Phase II testing program; AP-42 sections for the remaining ordnance have not yet been developed. In addition to this document, there are electronic databases available on the web (www.epa.gopv/ttn/chief) that contain the data used in the development of the emission factors. The procedures that were followed to develop these emission factors can be found at the same web address under the title *Procedures for Preparing Emission Factor Documents*.[4]

2.0 COMPOUNDS MEASURED AND EMISSION MEASUREMENT METHODS

During the USAEC Phase II Training Ordnance Emission Characterization tests, ordnance were detonated in a thermal treatment characterization facility known as a BangBox™. The BangBox used during the test was a 50-foot diameter hemisphere made from plasticized fabric, which was kept rigid by a constant injection of fresh air and a semirigid airlock. Within the test chamber were samplers, a steel-lined detonation pit, an automatically-regulated inflation blower, environmental control equipment, and a sampling tube. Real-time analyzers were connected to a data recorder.

A number of different test methods were employed to collect and analyze the emission data that were used to develop emission factors for detonation of ordnance. Table 3 identifies each emission test method used. The emissions data were collected using EPA test methods published in Title 40 of the Code of Federal Regulations, Part 50 (40 CFR 50) and 40 CFR 60, and in *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*.[5] Some of the sample analytical procedures used were from EPA Office of Solid Waste (OSW) publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*.[6] Where necessary, the test methods were adapted to reflect application to the unique testing of ordnance detonation in the BangBox.

TABLE 3 EMISSION TEST METHODS USED

Compound	Test Method
CO	40 CFR 60, Appendix A, EPA Method 10 [sampling and analysis]
CO_2	40 CFR 60, Appendix A, EPA Method 3A [sampling and analysis]
NO_x	40 CFR 60, Appendix A, EPA Method 7E [sampling and analysis]
SO_2	40 CFR 60, Appendix A, EPA Method 6C [sampling and analysis]
TSP	40 CFR 50, Appendix B [sampling and analysis]
PM-10	40 CFR 50, Appendix J [sampling and analysis]
Metals	40 CFR 50, Appendix B [sampling] 40 CFR 60, Appendix A, EPA Method 29 (analysis of TSP) [analysis]
HCl/Cl_2	40 CFR 60, Appendix A, EPA Method 26 [sampling] EPA Method 9057 [analysis]
VOC	TO-12 - *Method for the Determination of Non-Methane Organic Compounds (NMOC) in Ambient Air Using Cryogenic Preconcentration and Direct Flame Ionization Detection (FID)* [sampling and analysis]
Speciated VOC	TO-14 - *Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography* [sampling and analysis]
SVOC	TO-13 - *Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)* [sampling] SW-846 Method 8270 plus tentatively identified compounds [analysis]
PCDD/PCDF	TO-9 - *Determination of Polychlorinated, Polybrominated, and Brominated/ Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in Ambient Air* [sampling] SW-846 Method 8290 [analysis]

[a] All TO methods are from *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*.[5]

The following sections identify and briefly describe the test methods used to measure each compound or group of compounds. Additional information regarding the operation of the BangBox and the test methods used is presented in Appendix II-K of Reference 1. EPA-approved methods were used by the laboratories that provided sampling and analysis data.

2.1 Carbon Monoxide, Carbon Dioxide, Oxides of Nitrogen, and Sulfur Dioxide

Real-time concentrations of CO, CO_2, NO_x, and SO_2 that resulted from the detonation of ordnance in the BangBox were measured using a continuous emissions measurement system (CEMS). CO sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 10, with an API 300 nondispersive infrared analyzer. CO_2 sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 3A, with a TECO Model 41C infrared analyzer. NO_x sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 7E, with an API 200A chemiluminescent NO-NO_2 gas analyzer. SO_2 sampling was conducted in accordance with 40 CFR Part 60, Appendix A, Method 6C, with an API 100A fluorescent analyzer.

2.2 Total Suspended Particulate

The TSP concentration that resulted from the detonation of ordnance in the BangBox was determined using a high-volume sampling and analysis procedure based on 40 CFR 50, Appendix B – *Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method)*. During each run, duplicate samples were obtained using two high-volume samplers operating simultaneously. For each run, the target minimum sampling time was 20 minutes. The sampling rate was recorded continuously using a data acquisition system (DAS). The TSP concentration was computed by dividing the mass of TSP collected by the volume of air sampled, corrected to standard conditions.

2.3 Particulate Matter with an Aerodynamic Diameter Less than or Equal to 10 Microns

The PM-10 concentration that resulted from the detonation of ordnance in the BangBox was determined using a high-volume sampling and analysis procedure based on 40 CFR 50, Appendix J – *Reference Method for the Determination of Particulate Matter as PM-10 in the Atmosphere*. A high-volume PM-10 sampler with a size-selective inlet was used to collect the PM-10. During each run, duplicate samples were obtained using two samplers operating simultaneously. Due to high PM-10 concentrations, the filters would become loaded with PM-10 and the samplers could not maintain the desired flow throughout a run. To maintain the sampling cut point near PM-10, each sampler was to be stopped when the sampling flow rate dropped to 80 percent of the initial sampling rate (i.e., a 20 percent drop in the sampling rate). The PM-10 concentration was computed by dividing the mass of PM-10 collected by the volume of air sampled, corrected to standard conditions.

2.4 Metals

Metal concentrations that resulted from the detonation of ordnance in the BangBox were determined using particulate matter from the TSP Hi-Vol samples. As described above, TSP was collected using a high-volume sampling and analysis procedure based on 40 CFR 50, Appendix B. After the TSP total weight gain was determined in the laboratory, a portion of the TSP filter was digested with concentrated hydrogen fluoride and nitric acid per 40 CFR 60, Appendix A, Method 29. Alternatively, if insufficient TSP material was present, the entire filter was digested. The digestate was then analyzed for metals (except mercury) using inductively coupled argon plasma (ICAP) emission spectroscopy in accordance with SW-846 Method 6010A. Mercury was determined by cold vapor atomic absorption spectroscopy (CVAAS) in accordance with SW-846 Method 7470. The concentration of each target metal was computed by dividing the mass of metal collected by the volume of air sampled, corrected to standard conditions.

2.5 Hydrogen Chloride and Chlorine

Hydrogen chloride and chlorine that resulted from the detonation of ordnance in the BangBox were measured in accordance with 40 CFR Part 60, Appendix A, Method 26 - *Determination of Hydrogen Chloride Emissions from Stationary Sources*. During each run, duplicate samples were obtained using two samplers operating simultaneously. The target sampling duration was 30 minutes. Collected samples were analyzed using SW-846 Method 9057 - *Determination of Chloride from HCl/Cl_2 Emission Sampling Train (Methods 0050 and 0051) by Anion Chromatography*. The concentrations of HCl and Cl_2 were computed by dividing the mass collected by the volume of air sampled, corrected to standard conditions. HCl was also measured by a continuous analyzer, but these results were not used for development of emission factors.

2.6 Volatile Organic Compounds

VOC concentrations that resulted from the detonation of ordnance in the BangBox were determined using two methods from the *Second Supplement to Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*: (1) Method TO-12 - *Method for the Determination of Non-methane Organic Compounds in Ambient Air using Cryogenic Preconcentration and Direct Flame Ionization Detection* and (2) Method TO-14 - *Determination of Volatile Organic Compounds in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analysis*. For both procedures, air samples were collected in stainless steel SUMMA® canisters. Two or three identical canisters were used for each test run. The minimum sampling time for each VOC canister was 10 minutes.

2.7 Semivolatile Organic Compounds

SVOC concentrations that resulted from the detonation of ordnance in the BangBox were determined based on procedures found in Method TO-13 - *Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)*. During each run, duplicate samples were collected using two PS-1 samplers that contained special sampling inlets (i.e., aluminum sampling modules) designed to hold 100-mm diameter quartz fiber filters to collect particulate matter, followed by XAD-2 adsorbent resin cartridges for collection of vapor phase SVOCs. A 20-minute sampling time was targeted. Following sampling, the filters and resin cartridges underwent solvent extraction and the mass of SVOC collected was quantitatively determined by GC/MS analysis following procedures in SW-846 Method 8270 - *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)*. Unknown compounds, if any, were tentatively identified using computerized mass spectral matching techniques of the 20 highest non-target "peaks."

2.8 Dioxin/Furan Compounds

Dioxin/furan compound concentrations that resulted from the detonation of ordnance in the BangBox were determined based on procedures found in Method TO-9 - *Determination of Polychlorinated, Polybrominated, and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in Ambient Air*. During each run, duplicate samples were obtained using two modified PS-1 samplers. The modified samplers used standard quartz filters, but the adsorbent cartridges contained XAD-2 resin sandwiched between polyurethane foam (PUF) plugs. A minimum sampling time of 20 minutes was targeted. After sampling, the filters and adsorbent cartridges underwent extraction with the appropriate solvent(s). The mass of PCDD/PCDF collected was quantitatively determined following SW-846 Method 8290 - *Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS)*.

3.0 TEST DATA ANALYSIS AND RATING

3.1 EPA Guidance Regarding Test Data Quality Ratings

Prior to inclusion of emission factors in AP-42, the reliability of the underlying emission test data must be appraised in accordance with the rating system specified in *Procedures for Preparing Emission Factor Documents*.[4] Under this rating system, test data are assigned a rating from A to D, where an "A" rating is assigned to the highest quality data. The criteria used to assign a specific data quality rating are summarized below.

A Tests are performed by using an EPA reference test method, or when not applicable, a sound methodology. Tests are reported in enough detail for adequate validation and raw data are provided that can be used to duplicate the emission results presented in the report.

B Tests are performed by a generally sound methodology, but lacking enough detail for adequate validation. Data are insufficient to completely duplicate the emission result presented in the report.

C Tests are based on an unproven or new methodology, or are lacking a significant amount of background information.

D Tests are based on a generally unacceptable method, but the method may provide an order-of-magnitude value for the source.

Four specific criteria are identified in *Procedures for Preparing Emission Factor Documents* for consideration to assist in the assignment of a test data quality rating. These four criteria are:

1. Source operation. If the manner in which the source was operated is well documented in the report and the source was operating within typical parameters during the test, an A rating should be assigned. If the report stated parameters that were typical, but lacked detailed information, a B rating should be assigned. If there is reason to believe the operation was not typical, a C or D rating should be assigned.

2. Test methods and sampling procedures. In developing the ratings, the estimated accuracy and precision of the test method as well as the adequacy of the documentation should be considered. In general, if a current EPA reference test method, appropriate for the source, was followed, the rating should be higher (A or B). If other methods were used, an assessment should be made of their validity. If it is judged that the method was likely to be inaccurate or biased, a lower rating (C or D) should be given. A complete report should indicate whether any procedures deviated from standard methods and explain any deviations. If deviations were reported, an evaluation should be made of whether these were likely to influence the test results.

3. Process information. During testing, many variations in the process can occur without warning and sometimes without being noticed. Such variations can induce wide deviations in sampling results. If a large variation between test run results cannot be explained by information contained in the site final test report or from final test reports of other sources, the data are suspect and should be given a lower rating or excluded. However, it should be recognized that a process may have highly variable emissions and a lower rating may not be appropriate solely on the basis of wide deviations in sampling results.

4. Analysis and calculations. Ideally, final test reports should contain original raw data sheets and other documentation such as gas parameters (dry cubic feet per minute, oxygen percentage), calculation sheets, or example calculations describing how the calculated emission results were obtained. If there are data sheets, the nomenclature and equations used should be compared to those specified by EPA to establish equivalency. The depth of review of the calculations should be dictated by the reviewers' confidence in the ability and conscientiousness of the tester, based on such factors as consistency of results and completeness of other areas of the final test report. Reports may indicate that raw data sheets were available, but were not included. If the final test report is of high quality based on the other criteria, the quality rating should not be lowered due to a lack of data sheets.

An overall test data quality rating should be assigned based upon the ratings assigned for each of the four criteria.

3.2 Analysis of Test Data

Data included in the final test report titled *Sampling Results for AEC Phase II Training Ordnance Emission Characterizations*[1] were rated in accordance with the rating system described above. Results for each of the four criteria described above are presented in the following sections.

3.2.1 Source Operations

The manner by which the ordnance were deployed (i.e., used) is documented in the final test report. Each of the ordnance that was tested was deployed in a manner similar to that which would occur in the field. Mounted ordnance were installed in a frame and deployed remotely using either electronic or mechanical actuators, while flares were deployed by launching into a sand-filled pit. Although the flares were launched into a sand-filled pit rather than into the air, they (and all other ordnance) were fully deployed during their respective test runs. Consequently, the tests appear to have replicated typical ordnance operating parameters and the test data should be assigned an "A" rating based on this criterion.

3.2.2 Test Methods and Sampling Procedures

The test methods and sampling procedures were evaluated as being appropriate and consistent with EPA test methods or sound methodology. No problems of any significance were identified; consequently, the test data should be assigned an "A" rating based on this criterion.

3.2.3 Process Information

Large discrepancies (i.e., order of magnitude) were not observed between test runs for any of the ordnance tested. Furthermore, ordnance are manufactured to tight tolerances and are expected to deploy (i.e., the process) in a very repeatable fashion. Consequently, the test data should be assigned an "A" rating based on this criterion.

3.2.4 Analysis and Calculations

The final test report was reviewed to determine whether it contained all of the original raw data, other documentation, and example calculations. Although the final test report contained almost all of the raw data, it did not contain data associated with the calculation of the BangBox volume. The lack of this information was judged insufficient to result in a downgrade of the test data quality rating. The final test report also lacked certain calibration data. Again, the missing information was judged insufficient to result in a downgrade of the test data quality rating.

The raw data and sample calculations presented in the final test report were reviewed to determine if the emission factors presented in the report could be duplicated. Excel spreadsheets were developed to assist in this effort. The sample calculations and raw data were presented in the final test report in sufficient detail to allow the emission factors to be calculated. Where differences were found between the emission factors calculated using the Excel spreadsheets and those presented in the final test report, an examination was made to determine the reason for the differences. Several minor errors were noted in the calculation of the emission factors within the final test report, particularly with respect to the incorporation of analytical detection limits into the emission factors (see Section 4.4 for a discussion of the methodology). However, the emission factors presented in AP-42 are based upon the corrected spreadsheets. Based upon the raw data, other documentation, and the Excel spreadsheet calculations, the test data should be assigned an "A" rating.

3.3 Test Data Quality Ratings

Upon completing the analysis described in the preceding section of this document, the test data quality ratings assigned as a result of the four criteria were reviewed. This review led to a "A" rating for all of the test data.

4.0 EMISSION FACTOR CALCULATIONS

The methodologies and procedures that were used to develop emission factors from the test data are described in this section. A similar approach was used to calculate emission factors for TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds. The calculation steps that were performed for each sampling train and each run are summarized below.

1. The sample duration was calculated for the background and test runs.
2. Volumetric flow meter biases were calculated for the background and test runs.
3. The sample volumes associated with the background and test runs were calculated.
4. For compounds for which more than one test sample was obtained, analytical detection limits were incorporated into the test data.
5. The background compound concentration was calculated by dividing the mass of compound detected during the background run by the background run sample volume.
6. The test compound concentration was calculated by dividing the mass of compound detected during the test run by the test run sample volume.
7. A background-corrected concentration was calculated by subtracting the background concentration from the test concentration.
8. A dilution correction factor was calculated for the test run.
9. A dilution-corrected concentration was calculated by dividing the background-corrected concentration by the dilution correction factor.
10. The mass of compound released during the test run was calculated by multiplying the dilution-corrected concentration by the volume of the BangBox.
11. Emission factors for each sample or sampling train and test run were calculated by dividing the mass of compound released by the number of ordnance detonated during the test run or by the NEW detonated during the test run, as appropriate.
12. Average emission factors were calculated for each compound.

For CEMS-measured compounds (i.e., CO, CO_2, NO_x, and SO_2), the sample times were calculated in accordance with step 1 above. Because concentration data (i.e., mg/m^3, ppmv, or ppbv) were recorded during the background and test runs for VOC and CEMS-measured compounds, it was not necessary to calculate either a volumetric flow meter bias or a sample volume as described in steps 2 and 3, respectively. Where present, ppmv and ppbv values were converted to mg/m^3. Emission factors for VOC and CEMS-measured compounds were then estimated in accordance with the remaining steps described above.

The following sections describe the emission factor calculation steps in more detail. Sections 4.1 through 4.12 discuss the calculations involved with the completion of the 12 basis steps listed above. Section 4.13 discusses how data from combined sampling runs were handled. Section 4.14 discusses how specific compounds that were measured using more than one test method or that were analyzed using

more than one analytical method were addressed. Finally, Section 4.15 discusses the calculation of a toxicity equivalency factor for dioxin/furan compounds.

4.1 Determination of Sample Duration

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the background run sample duration was calculated as the difference between the time the sampler was turned on and the time the sampler was turned off. The time the sampler was turned on was identified as the first apparent deviation (an increase) from the volumetric flow meter bias point (see Section 4.2), while the time the sampler was turned off was identified as the time that the volumetric sampling rate data appeared to reach a steady state value following a substantial decrease (i.e., returned to the volumetric flow meter bias point) or the end of the test data, whichever came first. The exact times to select were somewhat subjective, but the final results were not affected in any substantial way. For Phase II testing at Dugway Proving Ground, the typical background sampling time was 30 minutes.

For test runs during which the sampler was turned on prior to detonation, the sample duration was calculated as the difference between the time of detonation and the time the sampler was turned off. For test runs during which the sampler was turned on after detonation, the sample duration was calculated as the difference between the time the sampler was turned on and the time the sample was turned off. The time the sampler was turned on and turned off was determined in the same manner as discussed above for the background runs. The detonation time was identified by the first nonzero value in the "Fire" data field.

For the CEMS-measured compounds, the sample duration was calculated as the difference between the time the compounds emitted from the detonation appeared to be fully mixed with the air within the BangBox and the time the sampler was turned off. The time the compounds were fully mixed within the BangBox was identified as the time at which the peak concentration data were recorded on the CEMS. This peak value typically occurred between 3 and 5 minutes after detonation. The exact time to select was somewhat subjective, but the final results were not affected in any substantial way. The time the sampler was turned off was identified as the time that the CEMS sampling data appeared to reach a steady state value following a substantial decrease or the end of the test data, whichever came first.

4.2 Determination of Volumetric Flow Meter Bias

The volumetric flow meters used during the collection of the TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds typically recorded a nonzero value while the associated pumps were turned off. This bias was quantified as the arithmetic mean of all volumetric flow rate measurements recorded while the pumps were off.

4.3 Determination of Sample Volume

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the sample volume was calculated by multiplying the average volumetric sampling rate by the sample duration. The average volumetric sampling rate was calculated by subtracting the volumetric flow meter bias from the arithmetic mean of all volumetric flow rate measurements recorded during the sample duration. This calculation is illustrated by the following equation:

$$\textit{sample volume} = (\textit{average volumetric flow rate}) - (\textit{volumetric flow meter bias})\,(\textit{sample duration})$$

Sample volumes were not calculated for VOC and CEMS-measured compounds because the test data for these compounds were recorded in terms of concentrations rather than in terms of mass.

4.4 Incorporation of Analytical Detection-Limits to the Test Data

In many cases, more than one test sample was obtained for a specific compound (i.e., more than one sample was obtained for a given test run or more than one test run was conducted). When multiple samples were obtained for the same compound, a comparison was made of all the sample data collected. Based upon the results of the comparison, the following adjustments were made to the test data:

1. If all of the samples indicated that a compound was "not detected," the sample data were not adjusted.
2. If all of the samples indicated that a compound was detected, the sample data were not adjusted.
3. If one or more of the samples indicated that a compound was detected and one or more of the samples indicated that a compound was not detected, the "not detected" values were replaced with a value equal to one half of the compound's analytical detection limit. The assumption inherent to this adjustment was that the measured presence of a compound in one or more samples was indicative of the compound's presence in all samples. The analytical detection limits for each sample were obtained from the test data report.

4.5 Determination of Background Concentration

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the background compound concentration was calculated by dividing the mass of compound detected during the background run by the background run sample volume. This calculation is illustrated by the following equation:

$$background\ compound\ concentration = \frac{(mass\ of\ compound\ measured\ during\ background\ run)}{(background\ run\ sample\ volume)}$$

For VOC compounds, the background run data were used directly. For CEMS-measured compounds, the background compound concentration was calculated as the arithmetic mean of all CEMS measurements recorded during the test run prior to detonation. This methodology was used to provide a reading of the background compound concentrations within the BangBox that was as accurate as possible for the given test run.

4.6 Determination of Test Compound Concentration

For TSP, PM-10, metals, SVOC, HCl, Cl_2, and dioxin/furan compounds, the test compound concentration was calculated by dividing the mass of compound measured during the test run by the test run sample volume. This calculation is illustrated by the following equation:

$$test\ compound\ concentration = \frac{(mass\ of\ compound\ measured\ during\ test\ run)}{(test\ run\ sample\ volume)}$$

For VOC compounds, the test run data were used directly. For CEMS-measured compounds, the test compound concentration was calculated as the arithmetic mean of all CEMS measurements recorded during the sample duration.

4.7 Determination of Background-Corrected Concentration

For all compounds, the calculation of the background-corrected concentration was dependent on whether the background and test concentrations were detected and whether they were less than, equal to, or greater than one another. The procedures used to calculate the background-corrected concentration for an individual sampling train are described below and are displayed graphically in Figure 1.

1. If the test concentration was not detected (ND), the background-corrected concentration equaled ND.
2. If the test concentration was detected and the background concentration was not detected, the background-corrected concentration equaled the test concentration.
3. If the test and background concentrations were detected and the test concentration was less than or equal to the background concentration, the background-corrected concentration equaled 0.
4. If the test and background concentrations were detected and the background concentration was less than the test concentration, the background concentration was subtracted from the test concentration. This calculation is illustrated by the following equation:

$$background\ corrected\ concentration = (test\ concentration) - (background\ concentration)$$

4.8 Determination of Dilution Correction Factor

Because the BangBox is not a rigid structure, the box was continually pressurized to maintain its shape and volume using a supply of fresh air. A tracer gas, sulfur hexafluoride (SF_6), was released into the BangBox at the same time as detonation to allow the dilution of the sample volume to be quantified. Using measurements of the tracer gas concentration, a dilution correction factor was calculated using the following equation:

$$dilution\ correction\ factor = \frac{1}{(100)\,(aD)}\,(e^{Aa} - e^{Ba})$$

where:

a = slope of the regression line fitted to the tracer gas concentration vs. time data
A = sample start time, as measured from the detonation time (min)
B = sample stop time, as measured from the detonation time (min)
D = sample duration (min)

4.9 Determination of Dilution-Corrected Concentration

The dilution-corrected concentration was calculated by dividing the background-corrected concentration by the applicable dilution correction factor. This calculation is illustrated by the following equation:

$$dilution\ corrected\ concentration = \frac{(background\ corrected\ concentration)}{(dilution\ correction\ factor)}$$

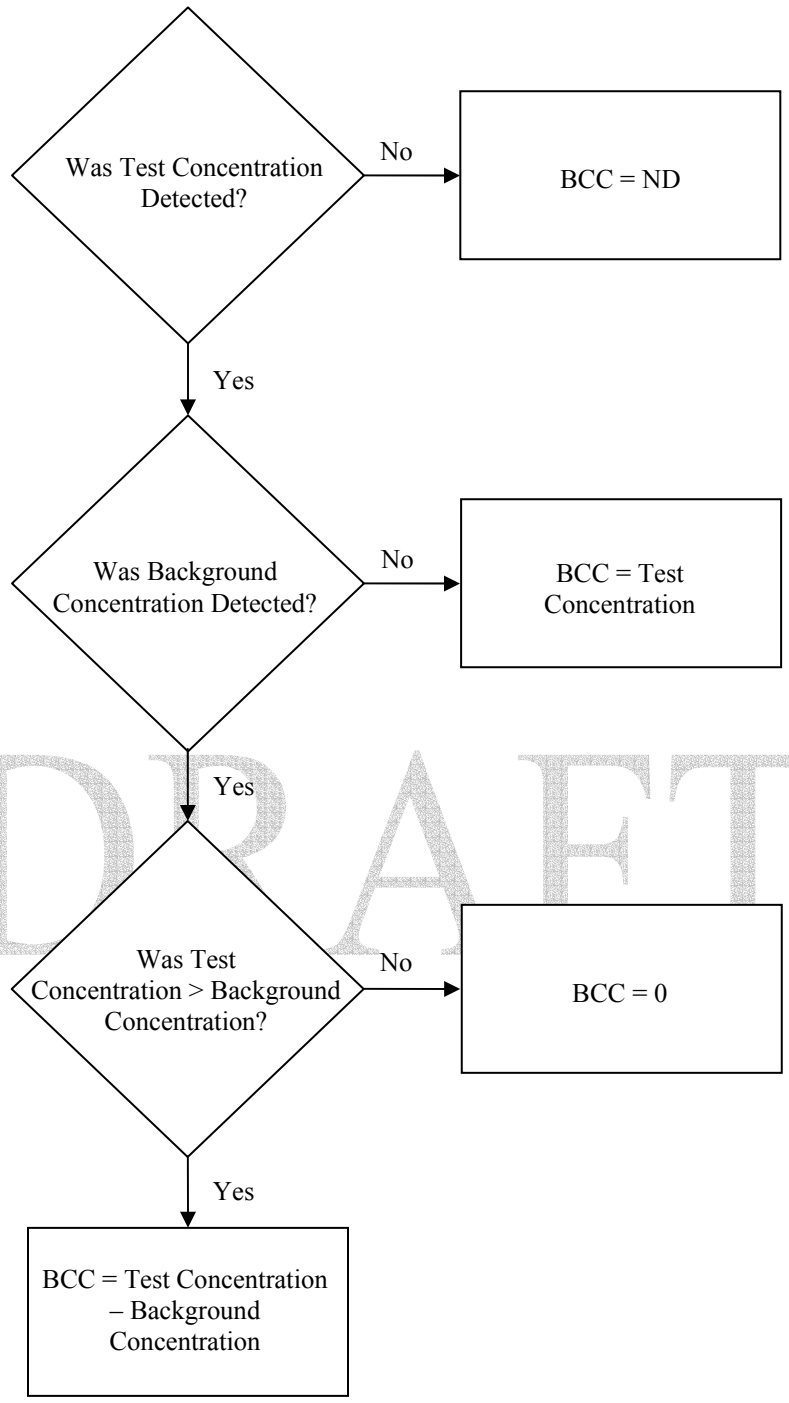

Figure 1 Calculation of background-corrected concentration (BCC).

4.10 Determination of Mass of Compound Released

The mass of compound released was calculated by multiplying the dilution-corrected concentration by the volume of the BangBox. This calculation is illustrated by the following equation:

$$mass\ compound\ released = (dilution\ corrected\ concentration)\ (BangBox\ volume)$$

4.11 Determination of Emission Factors

Once the mass of compound released was calculated, two emission factors were developed for each sample or sampling train and for each test run: the mass of compound released per item (i.e., per single ordnance) and the mass of compound released per pound NEW. The NEW for all ordnance were determined from Reference 3.

4.12 Determination of Average Emission Factors

Steps 1 through 11, as described in Sections 4.1 through 4.11, are applicable to individual samples or sampling trains within individual test runs. The final step in the emission factor calculation process was to calculate average emission factors for each compound in terms of mass released per item and mass released per pound NEW. The average emission factors for each compound were calculated as the arithmetic mean of the individual samples or sampling trains associated with the compound. Not detected (ND) values were ignored in the calculation process unless all samples or sampling trains indicated the compound was not detected. In this instance, the average emission factor was assigned a value of ND. [Note: The minimum detection levels associated with the compounds that were not detected are presented in Appendix A.]

4.13 Handling Compounds Sampled or Analyzed Using More than One Test or Analytical Method

Nineteen compounds were either sampled or analyzed using two methods; these compounds are identified in Table 4. For each of these compounds, emission factors were calculated based upon the data measured using the more appropriate test or analytical method; data measured using the less appropriate method were ignored. The more appropriate method was identified by reviewing the methods and the target compound lists associated with each method. If a specific compound appeared on the target compound list for one method but not the other, the method targeting the compound was selected. If a specific compound appeared on the target compound lists for both methods, the method judged to provide the most accurate data was selected. For all volatile organic compounds measured using both the TO-12 and TO-14 methods and for which the compounds appeared on both target compound lists, the TO-14 method was judged to be more accurate and was therefore selected. For compounds measured using both the TO-13 and TO-14 methods and for which the compounds appeared on both target compound lists, the TO-14 method was judged to be more accurate and was therefore selected. For HCl, which was measured using 40 CFR 60 Method 26 and by CEMS, Method 26 was judged to be more accurate and was therefore selected.

4.14 Dioxin and Furan Emission Factor Calculations

The laboratory responsible for analyzing the dioxin and furan test data analyzed each sample for the presence of 17 individual dioxin and furan compounds. However, the masses of individual compounds detected were annotated within the final test report as being below the analytical detection limits. Consequently, the individual compounds were not reported in the AP-42 sections. Instead, all of the dioxin and furan compounds detected were converted to equivalent masses of 2,3,7,8-TCDD. This conversion was accomplished by multiplying the emission factors calculated (in accordance with steps 1 through 12 described above) for each individual compound by the compound's toxicity equivalency factor, a ratio of the toxicity of the compound as compared to the toxicity of 2,3,7,8-TCDD. The individual emission factors calculated in this method were summed to produce 2,3,7,8-TCDD toxic equivalent (TEQ) emission factors. These factors were presented in the AP-42 sections.

TABLE 4 COMPOUNDS MEASURED USING MORE THAN ONE TEST OR ANALYTICAL METHOD

Compounds	Selected Method	Other Method Employed
Acetophenone	SVOC, TO-13	VOC, TO-14
Benzene	VOC, TO-14	VOC, TO-12
1,3-Butadiene	VOC, TO-14	VOC, TO-12
1,2-Dichlorobenzene	VOC, TO-14	SVOC, TO-13
1,3-Dichlorobenzene	VOC, TO-14	SVOC, TO-13
1,4-Dichlorobenzene	VOC, TO-14	SVOC, TO-13
Ethyl benzene	VOC, TO-14	VOC, TO-12
p-Ethyltoluene	VOC, TO-14	VOC, TO-12
Hexachlorobutadiene	VOC, TO-14	SVOC, TO-13
Hydrochloric acid	40 CFR 60 Method 26	CEMS
Methyl tert-butyl ether	VOC, TO-14	VOC, TO-12
Naphthalene	SVOC, TO-13	VOC, TO-14
Styrene	VOC, TO-14	VOC, TO-12
Toluene	VOC, TO-14	VOC, TO-12
1,2,4-Trichlorobenzene	VOC, TO-14	SVOC, TO-13
1,2,4-Trimethylbenzene	VOC, TO-14	VOC, TO-12
1,3,5-Trimethylbenzene	VOC, TO-14	VOC, TO-12
m-Xylene/p-Xylene	VOC, TO-14	VOC, TO-12
o-Xylene	VOC, TO-14	VOC, TO-12

4.15 Handling Tentatively Identified Compounds

During the analysis of the SVOC data, the 20 highest nontarget "peaks" were tentatively identified using computerized mass spectral matching techniques. Emission factors were developed for these tentatively identified compounds (TICs) if both of the following criteria were met.

1. The TIC corresponded to a unique compound (e.g., ethylbenzene). Emission factors were not developed if the TIC corresponded to a class of compounds (e.g., unknown alcohol).
2. The TIC was not identified using another sampling or analysis method that provided higher confidence data. Emission factors were developed based upon the higher confidence sampling or analysis method if such data were available.

The number of SVOC that were tentatively identified as unique compounds varied from a minimum of two compounds for DODIC L600 to a maximum of eight compounds for DODIC L307. The majority of these compounds were also identified using higher confidence methods. Therefore, using the second criteria identified above, the number of emission factors developed for TICs varied from a minimum of zero to a maximum of two for a given ordnance.

5.0 EMISSION FACTOR RATINGS

The emission factors were appraised in accordance with the rating system specified in *Procedures for Preparing Emission Factor Documents*.[4] Under this rating system, emission factors are assigned a rating from A to E, where an "A" rating is assigned to the highest quality factors. The criteria used to assign a specific emission factor rating are summarized below.

A Excellent. The emission factor was developed primarily from A- and B-rated source test data taken from many randomly chosen facilities in the industry population. The source category population was sufficiently specific to minimize variability.

B Above average. The emission factor was developed primarily from A- or B-rated test data from a moderate number of facilities. Although no specific bias was evident, it was not clear if the facilities tested represented a random sample of the industry. As with the A rating, the source category population was sufficiently specific to minimize variability.

C Average. The emission factor was developed primarily from A-, B- and/or C-rated test data from a reasonable number of facilities. Although no specific bias was evident, it was not clear if the facilities tested represented a random sample of the industry. As with the A rating, the source category population was sufficiently specific to minimize variability.

D Below average. The emission factor was developed primarily from A-, B-, and C-rated test data from a small number of facilities, and there may have been reason to suspect that these facilities did not represent a random sample of the industry. There also may have been evidence of variability within the source category population.

E Poor. The emission factor was developed from C- and D-rated test data from a very limited number of facilities, and there may have been reason to suspect that the facilities tested did not represent a random sample of the industry. There also may have been evidence of variability within the source category population.

Although the emission factors for the six ordnance described in this report were developed using A-rated test data, only one or two tests were conducted and only a few ordnance were included in each test. Consequently, emission factor ratings of A and B were considered inappropriate. Conversely, ordnance are manufactured to very tight tolerance levels so there is little variability among items, and there was no evidence that suggested the tested items within each type of ordnance were not randomly selected from available stocks. These considerations ruled out assigning the emission factors an E rating. Although the number of items tested within each ordnance was very limited, the other considerations (randomness and potential variability) lead to the judgment that a C rating was a better fit than a D rating for all of the emission factors except those for tentatively identified compounds. Therefore, all emission factor except those for TICs were assigned a C rating. The emission factors for tentatively identified compounds were assigned a D rating.

6.0 REFERENCES

1. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

2. John R. Carson, *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.

3. *Hazard Classification of United States Military Explosives and Munitions*, Revision 11, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, February 2001.

4. *Procedures for Preparing Emission Factor Documents*, EPA-454/R-95-015, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1997.

5. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Supplement, EPA/600/4-89/017, U.S. Environmental Protection Agency, Research Triangle Park, NC, June 1988.

6. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), U.S. Environmental Protection Agency, http://www.epa.gov/epaoswer/hazwaste/test/main.htm.

APPENDIX A

COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR ORDNANCE INCLUDED IN PHASE II TESTING AT DUGWAY PROVING GROUND, UTAH

TABLE A1 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L599, M118 ILLUMINATING BOOBY TRAP SIMULATOR

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	1.7 E-02	1.3	--
630-08-0	Carbon monoxide	2.7 E-04	2.0 E-02	--
10102-43-9	Nitrogen oxide	2.0 E-06	1.5 E-04	--
10102-44-0	Nitrogen dioxide	5.0 E-05	3.9 E-03	--
--	Oxides of nitrogen	1.9 E-06	1.5 E-04	--
--	PM-10	3.9 E-03	3.0 E-01	--
7446-09-5	Sulfur dioxide	2.1 E-06	1.6 E-04	--
--	Total nonmethane hydrocarbons	2.0 E-05	1.5 E-03	--
12789-66-1	Total suspended particulate	3.8 E-03	2.9 E-01	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.8 E-04
208-96-8	Acenaphthylene	ND	ND	1.6 E-04
75-07-0	Acetaldehyde	1.8 E-07	1.4 E-05	--
75-05-8	Acetonitrile	3.0 E-08	2.3 E-06	--
98-86-2	Acetophenone	1.9 E-08	1.4 E-06	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.6 E-04
107-02-8	Acrolein	1.5 E-07	1.2 E-05	--
107-13-1	Acrylonitrile	1.1 E-08	8.6 E-07	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	4.5 E-07	3.5 E-05	--
92-67-1	4-Aminobiphenyl	ND	ND	1.0 E-03
62-53-3	Aniline	ND	ND	2.0 E-04
120-12-7	Anthracene	ND	ND	1.8 E-04
7440-36-0	Antimony	8.4 E-06	6.5 E-04	--
7440-38-2	Arsenic	1.2 E-08	9.0 E-07	--
7440-39-3	Barium	3.0 E-08	2.3 E-06	--
71-43-2	Benzene	1.1 E-06	8.8 E-05	--
92-87-5	Benzidine	ND	ND	6.7 E-03
56-55-3	Benzo[a]anthracene	ND	ND	2.2 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.4 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	2.9 E-04
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.2 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.6 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	ND	ND	1.1 E-05
101-55-3	4-Bromophenylphenylether	ND	ND	3.4 E-04
106-99-0	1,3-Butadiene	2.4 E-07	1.8 E-05	--
123-72-8	Butanal	1.1 E-07	8.6 E-06	--
85-68-7	Butylbenzylphthalate	ND	ND	1.0 E-04
7440-43-9	Cadmium	1.5 E-08	1.1 E-06	--
86-74-8	Carbazole	ND	ND	1.2 E-04
75-15-0	Carbon disulfide	7.6 E-07	5.9 E-05	--
56-23-5	Carbon tetrachloride	9.8 E-09	7.5 E-07	--
463-58-1	Carbonyl sulfide	1.4 E-08	1.1 E-06	--
7782-50-5	Chlorine	1.1 E-07	8.1 E-06	--
106-47-8	p-Chloroaniline	ND	ND	1.6 E-04
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	2.5 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	1.9 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.6 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	1.9 E-04
91-58-7	2-Chloronaphthalene	ND	ND	2.8 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	1.4 E-04
7440-47-3	Chromium	9.3 E-09	7.2 E-07	--
218-01-9	Chrysene	ND	ND	2.4 E-04
7440-48-4	Cobalt	6.7 E-09	5.2 E-07	--
7440-50-8	Copper	7.3 E-08	5.6 E-06	--
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	2.4 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	ND	ND	1.0 E-04
2303-16-4	Diallate	ND	ND	2.4 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	1.2 E-04
132-64-9	Dibenzofuran	ND	ND	1.2 E-04
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	6.0 E-08	4.6 E-06	--

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	1.7 E-04
75-71-8	Dichlorodifluoromethane	4.9 E-08	3.8 E-06	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	2.4 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.8 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	2.3 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	9.8 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	1.7 E-04
131-11-3	Dimethyl phthalate	ND	ND	1.4 E-04
99-65-0	1,3-Dinitrobenzene	ND	ND	4.2 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	1.4 E-02
51-28-5	2,4-Dinitrophenol	ND	ND	1.6 E-02
121-14-2	2,4-Dinitrotoluene	ND	ND	2.2 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	3.5 E-04
100-41-4	Ethyl benzene	2.6 E-07	2.0 E-05	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	3.9 E-06	3.0 E-04	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	8.9 E-08	6.8 E-06	--
206-44-0	Fluoranthene	ND	ND	1.8 E-04
118-74-1	Hexachlorobenzene	ND	ND	1.8 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexachlorocyclopentadiene	ND	ND	5.5 E-03
67-72-1	Hexachloroethane	ND	ND	2.5 E-04
110-54-3	n-Hexane	2.5 E-08	2.0 E-06	--
7647-01-0	Hydrochloric acid	2.5 E-07	1.9 E-05	--
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	1.1 E-04
78-59-1	Isophorone	ND	ND	1.1 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
120-58-1	Isosafrole	ND	ND	5.4 E-04
556-61-6	Isothiocyanatomethane	ND	ND	3.0 E-04
7439-92-1	Lead	5.5 E-08	4.2 E-06	--
7439-96-5	Manganese	1.4 E-08	1.1 E-06	--
7439-97-6	Mercury	3.8 E-10	3.0 E-08	--
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	ND	ND	3.7 E-04
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	5.8 E-04
75-09-2	Methylene chloride	6.7 E-07	5.1 E-05	--
78-93-3	Methyl ethyl ketone	2.4 E-07	1.8 E-05	--
91-57-6	2-Methylnaphthalene	ND	ND	1.8 E-04
108-10-1	4-Methyl-2-pentanone	ND	ND	4.2 E-04
95-48-7	2-Methylphenol	ND	ND	2.8 E-04
91-20-3	Naphthalene	8.2 E-08	6.3 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	5.0 E-04
134-32-7	1-Naphthylamine	ND	ND	8.7 E-04
91-59-8	2-Naphthylamine	ND	ND	7.8 E-04
7440-02-0	Nickel	2.5 E-08	1.9 E-06	--
100-01-6	4-Nitroaniline	ND	ND	3.9 E-04
98-95-3	Nitrobenzene	ND	ND	4.4 E-04
98-95-3	Nitrobenzene	ND	ND	5.1 E-04
88-75-5	2-Nitrophenol	ND	ND	2.7 E-04
100-02-7	4-Nitrophenol	ND	ND	1.5 E-02
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	1.1 E-02
924-16-3	N-Nitrosodibutylamine	ND	ND	1.9 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	4.2 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	1.7 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	1.4 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	4.5 E-04
100-75-4	N-Nitrosopiperidine	ND	ND	3.6 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	1.8 E-04
608-93-5	Pentachlorobenzene	ND	ND	3.3 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
76-01-7	Pentachloroethane	ND	ND	3.6 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	6.7 E-04
87-86-5	Pentachlorophenol	ND	ND	1.4 E-02
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	3.0 E-04
108-95-2	Phenol	5.6 E-08	4.3 E-06	--
7723-14-0	Phosphorus	2.3 E-05	1.8 E-03	--
109-06-8	2-Picoline	ND	ND	5.3 E-04
23950-58-5	Pronamide	ND	ND	1.3 E-04
67-63-0	2-Propanol	ND	ND	2.5 E-04
115-07-1	Propene	8.0 E-07	6.1 E-05	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	1.1 E-08	8.7 E-07	--
110-86-1	Pyridine	ND	ND	5.1 E-04
94-59-7	Safrole	ND	ND	3.5 E-04
7782-49-2	Selenium	ND	ND	1.5 E-04
7440-22-4	Silver	ND	ND	2.7 E-05
100-42-5	Styrene	1.0 E-07	7.7 E-06	--
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	3.2 E-14	2.5 E-12	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	3.5 E-04
108-88-3	Toluene	3.6 E-07	2.7 E-05	--
95-53-4	o-Toluidine	ND	ND	2.0 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	6.2 E-10	4.8 E-08	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	2.7 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	3.1 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	2.3 E-09	1.8 E-07	--
95-63-6	1,2,4-Trimethylbenzene	0	0	--
540-84-1	2,2,4-Trimethylpentane	4.5 E-08	3.4 E-06	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
106-42-3 / 108-38-3	m-Xylene / p-Xylene	7.3 E-07	5.6 E-05	--
95-47-6	o-Xylene	2.5 E-07	1.9 E-05	--
7440-66-6	Zinc	3.4 E-06	2.6 E-04	--
Other Pollutants				
64-19-7	Acetic acid	0	0	--
67-64-1	Acetone	1.3 E-06	9.6 E-05	--
74-86-2	Acetylene	5.9 E-06	4.5 E-04	--
100-52-7	Benzaldehyde	1.8 E-07	1.4 E-05	--
271-89-6	Benzofuran	8.3 E-08	6.4 E-06	--
65-85-0	Benzoic acid	4.0 E-07	3.0 E-05	--
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	ND	ND	3.5 E-04
75-28-5	i-Butane	6.4 E-09	4.9 E-07	--
106-97-8	n-Butane	3.2 E-08	2.5 E-06	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
123-73-9	trans-2-Butenal	1.3 E-07	1.0 E-05	--
106-98-9	1-Butene	1.4 E-07	1.1 E-05	--
115-11-7	i-Butene	7.6 E-08	5.9 E-06	--
590-18-1	cis-2-Butene	3.2 E-08	2.5 E-06	--
624-64-6	trans-2-Butene	2.4 E-07	1.9 E-05	--
123-86-4	Butyl acetate	ND	ND	4.8 E-04
13466-78-9	delta-3-Carene	ND	ND	1.0 E-04
59-50-7	4-Chloro-3-methylphenol	ND	ND	2.8 E-04
95-57-8	2-Chlorophenol	ND	ND	7.9 E-05
96-43-5	2-Chlorothiophene	ND	ND	5.0 E-04
17249-80-8	3-Chlorothiophene	ND	ND	5.0 E-04
95-49-8	o-Chlorotoluene	ND	ND	5.3 E-04
106-43-4	p-Chlorotoluene	ND	ND	5.3 E-04
287-92-3	Cyclopentane	ND	ND	1.0 E-04
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	ND	ND	6.5 E-04
124-18-5	n-Decane	ND	ND	1.0 E-04
693-54-9	2-Decanone	ND	ND	6.5 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
156-60-5	trans-1,2-Dichloroethene	ND	ND	4.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	1.7 E-04
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	1.5 E-08	1.2 E-06	--
75-83-2	2,2-Dimethylbutane	ND	ND	1.0 E-04
79-29-8	2,3-Dimethylbutane	ND	ND	1.0 E-04
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	ND	ND	1.0 E-04
589-43-5	2,4-Dimethylhexane	ND	ND	1.0 E-04
592-13-2	2,5-Dimethylhexane	ND	ND	1.0 E-04
565-59-3	2,3-Dimethylpentane	ND	ND	1.0 E-04
108-08-7	2,4-Dimethylpentane	ND	ND	1.0 E-04
--	Dimethylphenethylamine	ND	ND	1.0 E-02
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
3658-80-8	Dimethyltrisulfide	ND	ND	5.2 E-04
74-84-0	Ethane	4.0 E-07	3.0 E-05	--
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	ND	ND	1.0 E-04
62-50-0	Ethyl methanesulfonate	ND	ND	1.9 E-04
620-14-4	m-Ethyltoluene	1.9 E-08	1.5 E-06	--
611-14-3	o-Ethyltoluene	ND	ND	1.0 E-04
622-96-8	p-Ethyltoluene	3.9 E-08	3.0 E-06	--
86-73-7	Fluorene	ND	ND	1.7 E-04
98-01-1	2-Furaldehyde	2.0 E-06	1.6 E-04	--
498-60-2	3-Furaldehyde	5.2 E-08	4.0 E-06	--
110-00-9	Furan	2.2 E-07	1.7 E-05	--
111-71-7	Heptanal	2.3 E-07	1.7 E-05	--
142-82-5	n-Heptane	5.7 E-08	4.4 E-06	--
111-70-6	1-Heptanol	ND	ND	4.8 E-04
110-43-0	2-Heptanone	ND	ND	4.7 E-04
106-35-4	3-Heptanone	2.3 E-08	1.8 E-06	--
18829-55-5	trans-2-Heptenal	ND	ND	4.7 E-04
1888-71-7	Hexachloropropene	ND	ND	2.8 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
66-25-1	Hexanal	1.4 E-07	1.1 E-05	--
111-27-3	1-Hexanol	ND	ND	4.2 E-04
591-78-6	2-Hexanone	2.0 E-08	1.6 E-06	--
6728-26-3	trans-2-Hexenal	ND	ND	4.1 E-04
592-41-6	1-Hexene	ND	ND	1.0 E-04
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
67-47-0[e]	5-Hydroxymethylfurfural	4.2 E-07	3.3 E-05	--
78-79-5	Isoprene	ND	ND	1.0 E-04
143-50-0	Kepone	ND	ND	9.3 E-03
138-86-3[e]	Limonene	3.3 E-07	2.5 E-05	--
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	1.3 E-06	9.6 E-05	--
78-85-3	Methacrolein	7.4 E-08	5.7 E-06	--
91-80-5	Methapyrilene	ND	ND	1.0 E-02
563-46-2	2-Methyl-1-butene	1.3 E-08	9.8 E-07	--
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
563-45-1	3-Methyl-1-butene	1.3 E-08	9.8 E-07	--
108-87-2	Methylcyclohexane	ND	ND	1.0 E-04
96-37-7	Methylcyclopentane	ND	ND	1.0 E-04
620-02-0	5-Methyl-2-furaldehyde	2.9 E-07	2.2 E-05	--
592-27-8	2-Methylheptane	ND	ND	1.0 E-04
928-68-7	6-Methyl-2-heptanone	4.6 E-08	3.6 E-06	--
110-93-0	6-Methyl-5-hepten-2-one	2.7 E-08	2.1 E-06	--
591-76-4	2-Methylhexane	ND	ND	1.0 E-04
589-34-4	3-Methylhexane	3.8 E-08	2.9 E-06	--
66-27-3	Methyl methanesulfonate	ND	ND	2.0 E-04
624-91-9	Methylnitrite	1.3 E-07	9.8 E-06	--
107-83-5	2-Methylpentane	3.2 E-08	2.5 E-06	--
96-14-0	3-Methylpentane	ND	ND	1.0 E-04
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-83-1	2-Methyl-1-propanol	ND	ND	3.1 E-04
554-14-3	2-Methylthiophene	ND	ND	4.1 E-04
616-44-4	3-Methylthiophene	ND	ND	4.1 E-04
78-94-4	Methyl vinyl ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.8 E-04
99-09-2	3-Nitroaniline	ND	ND	4.4 E-04
75-52-5	Nitromethane	2.5 E-07	2.0 E-05	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	4.0 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	5.9 E-04
124-19-6	Nonanal	3.6 E-07	2.8 E-05	--
111-84-2	n-Nonane	3.8 E-08	2.9 E-06	--
821-55-6	2-Nonanone	ND	ND	5.9 E-04
18829-56-6	trans-2-Nonenal	ND	ND	5.8 E-04
124-13-0	Octanal	4.3 E-07	3.3 E-05	--
111-65-9	n-Octane	6.4 E-09	4.9 E-07	--
111-13-7	2-Octanone	ND	ND	5.3 E-04
2363-89-5	trans-2-Octenal	ND	ND	5.2 E-04
117-84-0	bis(n-Octyl)phthalate	ND	ND	1.6 E-04
110-62-3	Pentanal	2.7 E-07	2.1 E-05	--
78-78-4	i-Pentane	3.2 E-08	2.5 E-06	--
109-66-0	n-Pentane	3.8 E-08	2.9 E-06	--
107-87-9	2-Pentanone	1.4 E-07	1.1 E-05	--
1576-87-0	trans-2-Pentenal	ND	ND	3.5 E-04
109-67-1	1-Pentene	ND	ND	1.0 E-04
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	ND	ND	1.0 E-04
62-44-2	Phenacetin	ND	ND	1.1 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	8.3 E-08	6.4 E-06	--
71-23-8	Propanol	8.8 E-08	6.8 E-06	--
103-65-1	n-Propylbenzene	ND	ND	1.0 E-04
7446-09-5	Sulfur dioxide	ND	ND	2.7 E-04

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^3[,d]
		lb per item	lb per lb NEW[c]	
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	2.7 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	3.5 E-04
109-99-9	Tetrahydrofuran	1.5 E-07	1.2 E-05	--
110-02-1	Thiophene	6.5 E-08	5.0 E-06	--
98-03-3	2-Thiophenecarboxaldehyde	ND	ND	4.7 E-04
87-61-6	1,2,3-Trichlorobenzene	ND	ND	7.5 E-04
108-70-3	1,3,5-Trichlorobenzene	ND	ND	7.5 E-04
108-67-8	1,3,5-Trimethylbenzene	ND	ND	5.0 E-04
16747-26-5	2,2,4-Trimethylhexane	ND	ND	1.0 E-04
565-75-3	2,3,4-Trimethylpentane	ND	ND	1.0 E-04
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	6.2 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.0134 pound per item.
[d] Data provided for compounds that were not detected.
[e] Tentatively identified compound.

TABLE A2 COMPOUNDS ANALYZED AND EMISSION FACTORS DEVELOPED FOR DODIC L600, M119 WHISTLING BOOBY TRAP SIMULATOR

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide	4.1 E-03	3.9 E-02	--
630-08-0	Carbon monoxide	1.4 E-03	1.3 E-02	--
10102-43-9	Nitrogen oxide	3.7 E-05	3.5 E-04	--
10102-44-0	Nitrogen dioxide	1.4 E-05	1.4 E-04	--
--	Oxides of nitrogen	6.6 E-05	6.3 E-04	--
--	PM-10	2.4 E-03	2.2 E-02	--
7446-09-5	Sulfur dioxide	8.1 E-06	7.6 E-05	--
--	Total nonmethane hydrocarbons	6.2 E-05	5.8 E-04	--
12789-66-1	Total suspended particulate	2.4 E-03	2.2 E-02	--
Hazardous Air Pollutants and Toxic Chemicals				
83-32-9	Acenaphthene	ND	ND	1.4 E-04
208-96-8	Acenaphthylene	ND	ND	1.0 E-04
75-07-0	Acetaldehyde	2.7 E-07	2.5 E-06	--
75-05-8	Acetonitrile	ND	ND	1.7 E-04
98-86-2	Acetophenone	3.4 E-08	3.2 E-07	--
53-96-3	2-Acetylaminofluorene	ND	ND	1.2 E-04
107-02-8	Acrolein	2.7 E-07	2.5 E-06	--
107-13-1	Acrylonitrile	ND	ND	2.2 E-04
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum	ND	ND	No Data
92-67-1	4-Aminobiphenyl	ND	ND	2.5 E-04
62-53-3	Aniline	ND	ND	1.6 E-04
120-12-7	Anthracene	ND	ND	1.1 E-04
7440-36-0	Antimony	ND	ND	No Data
7440-38-2	Arsenic	ND	ND	No Data
7440-39-3	Barium	ND	ND	No Data
71-43-2	Benzene	7.1 E-06	6.7 E-05	--
92-87-5	Benzidine	ND	ND	6.9 E-03
56-55-3	Benzo[a]anthracene	ND	ND	1.2 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	1.6 E-04
207-08-9	Benzo[k]fluoranthene	ND	ND	8.2 E-05
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.5 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
50-32-8	Benzo[a]pyrene	ND	ND	1.9 E-04
100-44-7	Benzyl chloride	ND	ND	5.3 E-04
7440-41-7	Beryllium	ND	ND	No Data
101-55-3	4-Bromophenylphenylether	ND	ND	2.3 E-04
106-99-0	1,3-Butadiene	1.1 E-06	1.1 E-05	--
123-72-8	Butanal	4.0 E-07	3.7 E-06	--
85-68-7	Butylbenzylphthalate	ND	ND	6.7 E-05
7440-43-9	Cadmium	ND	ND	No Data
86-74-8	Carbazole	ND	ND	4.0 E-05
75-15-0	Carbon disulfide	1.7 E-06	1.6 E-05	--
56-23-5	Carbon tetrachloride	3.6 E-08	3.4 E-07	--
463-58-1	Carbonyl sulfide	ND	ND	2.5 E-04
7782-50-5	Chlorine	8.8 E-06	8.3 E-05	--
106-47-8	p-Chloroaniline	ND	ND	5.9 E-05
108-90-7	Chlorobenzene	ND	ND	4.7 E-04
510-15-6	Chlorobenzilate	ND	ND	1.4 E-04
111-91-1	bis(2-Chloroethoxy)methane	ND	ND	1.3 E-04
111-44-4	bis(2-Chloroethyl)ether	ND	ND	1.5 E-04
67-66-3	Chloroform	ND	ND	5.0 E-04
108-60-1	bis(2-Chloroisopropyl)ether	ND	ND	8.6 E-05
91-58-7	2-Chloronaphthalene	ND	ND	1.3 E-04
7005-72-3	4-Chlorophenylphenyl ether	ND	ND	8.4 E-05
7440-47-3	Chromium	ND	ND	No Data
218-01-9	Chrysene	ND	ND	1.4 E-04
7440-48-4	Cobalt	ND	ND	No Data
7440-50-8	Copper	ND	ND	No Data
106-44-5 / 108-39-4	p-Cresol / m-Cresol	ND	ND	1.4 E-04
98-82-8	Cumene	ND	ND	1.0 E-04
110-82-7	Cyclohexane	ND	ND	1.0 E-04
2303-16-4	Diallate	ND	ND	1.9 E-04
53-70-3	Dibenz[a,h]anthracene	ND	ND	9.3 E-05
132-64-9	Dibenzofuran	ND	ND	7.3 E-05
106-93-4	1,2-Dibromoethane	ND	ND	7.8 E-04
84-74-2	Dibutylphthalate	3.8 E-07	3.5 E-06	--

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
95-50-1	1,2-Dichlorobenzene	ND	ND	6.1 E-04
541-73-1	1,3-Dichlorobenzene	ND	ND	6.1 E-04
106-46-7	1,4-Dichlorobenzene	ND	ND	6.1 E-04
91-94-1	3,3'-Dichlorobenzidine	ND	ND	7.6 E-05
75-71-8	Dichlorodifluoromethane	9.1 E-09	8.6 E-08	--
75-34-3	1,1-Dichloroethane	ND	ND	4.1 E-04
540-59-0	1,2-Dichloroethene	ND	ND	4.0 E-04
120-83-2	2,4-Dichlorophenol	ND	ND	1.0 E-04
10061-02-6	trans-1,3-Dichloro-1-propene	ND	ND	4.6 E-04
76-14-2	Dichlorotetrafluoroethane	ND	ND	7.1 E-04
60-11-7	p-Dimethylaminoazobenzene	ND	ND	1.4 E-04
57-97-6	7,12-Dimethylbenz[a]anthracene	ND	ND	3.7 E-04
119-93-7	3,3'-Dimethylbenzidine	ND	ND	8.7 E-04
105-67-9	2,4-Dimethylphenol	ND	ND	1.7 E-04
131-11-3	Dimethyl phthalate	ND	ND	4.6 E-05
99-65-0	1,3-Dinitrobenzene	ND	ND	2.6 E-04
534-52-1	4,6-Dinitro-2-methylphenol	ND	ND	2.0 E-04
51-28-5	2,4-Dinitrophenol	ND	ND	6.5 E-03
121-14-2	2,4-Dinitrotoluene	ND	ND	1.5 E-04
606-20-2	2,6-Dinitrotoluene	ND	ND	2.0 E-04
100-41-4	Ethyl benzene	2.9 E-06	2.8 E-05	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene	1.2 E-05	1.1 E-04	--
107-06-2	Ethylene dichloride	ND	ND	4.1 E-04
117-81-7	bis(2-Ethylhexyl)phthalate	ND	ND	2.4 E-04
206-44-0	Fluoranthene	ND	ND	1.4 E-04
118-74-1	Hexachlorobenzene	ND	ND	1.9 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexachlorocyclopentadiene	ND	ND	3.2 E-04
67-72-1	Hexachloroethane	ND	ND	2.9 E-04
110-54-3	n-Hexane	0	0	--
7647-01-0	Hydrochloric acid	2.3 E-06	2.2 E-05	--
193-39-5	Indeno[1,2,3-cd]pyrene	ND	ND	1.8 E-04
78-59-1	Isophorone	ND	ND	1.1 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
120-58-1	Isosafrole	ND	ND	2.2 E-04
556-61-6	Isothiocyanatomethane	ND	ND	3.0 E-04
7439-92-1	Lead	ND	ND	No Data
7439-96-5	Manganese	ND	ND	No Data
7439-97-6	Mercury	ND	ND	No Data
74-83-9	Methyl bromide	ND	ND	4.0 E-04
1634-04-4	Methyl tert-butyl ether	8.7 E-09	8.2 E-08	--
74-87-3	Methyl chloride	ND	ND	2.1 E-04
71-55-6	Methyl chloroform	ND	ND	5.5 E-04
56-49-5	3-Methylcholanthrene	ND	ND	1.2 E-04
75-09-2	Methylene chloride	1.7 E-06	1.6 E-05	--
78-93-3	Methyl ethyl ketone	5.5 E-07	5.2 E-06	--
91-57-6	2-Methylnaphthalene	ND	ND	1.1 E-04
108-10-1	4-Methyl-2-pentanone	ND	ND	4.2 E-04
95-48-7	2-Methylphenol	ND	ND	1.2 E-04
91-20-3	Naphthalene	3.4 E-07	3.2 E-06	--
130-15-4	1,4-Naphthoquinone	ND	ND	2.4 E-04
134-32-7	1-Naphthylamine	ND	ND	2.5 E-04
91-59-8	2-Naphthylamine	ND	ND	6.0 E-03
7440-02-0	Nickel	ND	ND	No Data
100-01-6	4-Nitroaniline	ND	ND	2.1 E-04
98-95-3	Nitrobenzene	ND	ND	1.2 E-04
98-95-3	Nitrobenzene	ND	ND	5.1 E-04
88-75-5	2-Nitrophenol	ND	ND	9.5 E-05
100-02-7	4-Nitrophenol	ND	ND	4.8 E-03
56-57-5	4-Nitroquinoline-1-oxide	ND	ND	4.6 E-03
924-16-3	N-Nitrosodibutylamine	ND	ND	1.8 E-04
55-18-5	N-Nitrosodiethylamine	ND	ND	2.4 E-04
62-75-9	N-Nitrosodimethylamine	ND	ND	2.0 E-04
621-64-7	N-Nitrosodipropylamine	ND	ND	2.2 E-04
59-89-2	N-Nitrosomorpholine	ND	ND	1.4 E-04
100-75-4	N-Nitrosopiperidine	ND	ND	1.9 E-04
99-55-8	5-Nitro-o-toluidine	ND	ND	2.2 E-04
608-93-5	Pentachlorobenzene	ND	ND	2.2 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
76-01-7	Pentachloroethane	ND	ND	3.5 E-04
82-68-8	Pentachloronitrobenzene	ND	ND	4.0 E-04
87-86-5	Pentachlorophenol	ND	ND	5.4 E-03
127-18-4	Perchloroethylene	ND	ND	6.9 E-04
85-01-8	Phenanthrene	ND	ND	1.4 E-04
108-95-2	Phenol	ND	ND	8.3 E-05
7723-14-0	Phosphorus	ND	ND	No Data
109-06-8	2-Picoline	ND	ND	2.0 E-04
23950-58-5	Pronamide	ND	ND	7.1 E-05
67-63-0	2-Propanol	1.9 E-07	1.8 E-06	--
115-07-1	Propene	1.9 E-06	1.7 E-05	--
78-87-5	Propylene dichloride	ND	ND	4.7 E-04
129-00-0	Pyrene	ND	ND	8.5 E-05
110-86-1	Pyridine	ND	ND	1.8 E-04
94-59-7	Safrole	ND	ND	1.6 E-04
7782-49-2	Selenium	ND	ND	No Data
7440-22-4	Silver	ND	ND	No Data
100-42-5	Styrene	5.8 E-07	5.5 E-06	--
--	2,3,7,8-Tetrachlorodibenzo-p-Dioxin TEQ	1.0 E-13	9.5 E-13	--
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	7.0 E-04
7440-28-0	Thallium	ND	ND	No Data
108-88-3	Toluene	1.6 E-06	1.5 E-05	--
95-53-4	o-Toluidine	ND	ND	1.3 E-04
120-82-1	1,2,4-Trichlorobenzene	ND	ND	7.5 E-04
79-00-5	1,1,2-Trichloroethane	ND	ND	5.5 E-04
79-01-6	Trichloroethylene	ND	ND	5.5 E-04
75-69-4	Trichloromonofluoromethane	8.4 E-08	7.9 E-07	--
95-95-4	2,4,5-Trichlorophenol	ND	ND	1.5 E-04
88-06-2	2,4,6-Trichlorophenol	ND	ND	1.4 E-04
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	2.6 E-08	2.5 E-07	--
95-63-6	1,2,4-Trimethylbenzene	1.7 E-07	1.6 E-06	--
540-84-1	2,2,4-Trimethylpentane	5.7 E-08	5.4 E-07	--
75-01-4	Vinyl chloride	ND	ND	2.6 E-04
75-35-4	Vinylidene chloride	ND	ND	4.0 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
106-42-3 / 108-38-3	m-Xylene / p-Xylene	7.3 E-06	6.9 E-05	--
95-47-6	o-Xylene	2.4 E-06	2.2 E-05	--
7440-66-6	Zinc	ND	ND	No Data
Other Pollutants				
64-19-7	Acetic acid	1.5 E-08	1.4 E-07	--
67-64-1	Acetone	1.6 E-06	1.5 E-05	--
74-86-2	Acetylene	1.4 E-05	1.3 E-04	--
100-52-7	Benzaldehyde	3.2 E-07	3.0 E-06	--
271-89-6	Benzofuran	ND	ND	4.9 E-04
65-85-0	Benzoic acid	0	0	--
100-47-0	Benzonitrile	ND	ND	4.3 E-04
100-51-6	Benzyl alcohol	ND	ND	2.4 E-04
75-28-5	i-Butane	0	0	--
106-97-8	n-Butane	0	0	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
123-73-9	trans-2-Butenal	ND	ND	2.9 E-04
106-98-9	1-Butene	3.7 E-07	3.5 E-06	--
115-11-7	i-Butene	2.0 E-07	1.9 E-06	--
590-18-1	cis-2-Butene	5.7 E-08	5.4 E-07	--
624-64-6	trans-2-Butene	8.0 E-07	7.5 E-06	--
123-86-4	Butyl acetate	ND	ND	4.8 E-04
13466-78-9	delta-3-Carene	ND	ND	1.0 E-04
59-50-7	4-Chloro-3-methylphenol	ND	ND	1.9 E-04
95-57-8	2-Chlorophenol	ND	ND	1.7 E-04
96-43-5	2-Chlorothiophene	ND	ND	5.0 E-04
17249-80-8	3-Chlorothiophene	ND	ND	5.0 E-04
95-49-8	o-Chlorotoluene	ND	ND	5.3 E-04
106-43-4	p-Chlorotoluene	ND	ND	5.3 E-04
287-92-3	Cyclopentane	0	0	--
120-92-3	Cyclopentanone	ND	ND	3.5 E-04
142-29-0	Cyclopentene	ND	ND	1.0 E-04
112-31-2	Decanal	3.1 E-07	2.9 E-06	--
124-18-5	n-Decane	0	0	--
693-54-9	2-Decanone	ND	ND	6.5 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
156-60-5	trans-1,2-Dichloroethene	ND	ND	4.0 E-04
87-65-0	2,6-Dichlorophenol	ND	ND	9.0 E-05
10061-01-5	cis 1,3-Dichloro-1-propene	ND	ND	4.6 E-04
84-66-2	Diethylphthalate	ND	ND	7.7 E-05
75-83-2	2,2-Dimethylbutane	5.7 E-08	5.4 E-07	--
79-29-8	2,3-Dimethylbutane	0	0	--
624-92-0	Dimethyldisulfide	ND	ND	3.9 E-04
1071-26-7	2,2-Dimethylheptane	ND	ND	1.0 E-04
584-94-1	2,3-Dimethylhexane	2.9 E-08	2.7 E-07	--
589-43-5	2,4-Dimethylhexane	2.9 E-08	2.7 E-07	--
592-13-2	2,5-Dimethylhexane	0	0	--
565-59-3	2,3-Dimethylpentane	2.9 E-08	2.7 E-07	--
108-08-7	2,4-Dimethylpentane	5.7 E-08	5.4 E-07	--
--	Dimethylphenethylamine	ND	ND	4.8 E-03
463-82-1	2,2-Dimethylpropane	ND	ND	1.0 E-04
3658-80-8	Dimethyltrisulfide	ND	ND	5.2 E-04
74-84-0	Ethane	1.5 E-06	1.5 E-05	--
1678-91-7	Ethylcyclohexane	ND	ND	1.0 E-04
619-99-8	3-Ethylhexane	2.9 E-08	2.7 E-07	--
62-50-0	Ethyl methanesulfonate	ND	ND	3.1 E-04
620-14-4	m-Ethyltoluene	8.6 E-08	8.1 E-07	--
611-14-3	o-Ethyltoluene	ND	ND	1.0 E-04
622-96-8	p-Ethyltoluene	3.8 E-07	3.6 E-06	--
86-73-7	Fluorene	ND	ND	1.8 E-04
98-01-1	2-Furaldehyde	3.4 E-07	3.2 E-06	--
498-60-2	3-Furaldehyde	ND	ND	4.0 E-04
110-00-9	Furan	ND	ND	2.8 E-04
111-71-7	Heptanal	0	0	--
142-82-5	n-Heptane	2.9 E-08	2.7 E-07	--
111-70-6	1-Heptanol	ND	ND	4.8 E-04
110-43-0	2-Heptanone	ND	ND	4.7 E-04
106-35-4	3-Heptanone	ND	ND	4.7 E-04
18829-55-5	trans-2-Heptenal	ND	ND	4.7 E-04
1888-71-7	Hexachloropropene	ND	ND	2.0 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
66-25-1	Hexanal	0	0	--
111-27-3	1-Hexanol	ND	ND	4.2 E-04
591-78-6	2-Hexanone	ND	ND	4.2 E-04
6728-26-3	trans-2-Hexenal	ND	ND	4.1 E-04
592-41-6	1-Hexene	ND	ND	1.0 E-04
7688-21-3	cis-2-Hexene	ND	ND	1.0 E-04
4050-45-7	trans-2-Hexene	ND	ND	1.0 E-04
78-79-5	Isoprene	4.6 E-07	4.3 E-06	--
143-50-0	Kepone	ND	ND	3.7 E-03
5989-27-5	d-Limonene	ND	ND	1.0 E-04
7439-95-4	Magnesium	ND	ND	No Data
78-85-3	Methacrolein	ND	ND	2.9 E-04
91-80-5	Methapyrilene	ND	ND	5.1 E-03
563-46-2	2-Methyl-1-butene	ND	ND	1.0 E-04
513-35-9	2-Methyl-2-butene	ND	ND	1.0 E-04
563-45-1	3-Methyl-1-butene	ND	ND	1.0 E-04
108-87-2	Methylcyclohexane	5.7 E-08	5.4 E-07	--
96-37-7	Methylcyclopentane	0	0	--
620-02-0	5-Methyl-2-furaldehyde	ND	ND	4.6 E-04
592-27-8	2-Methylheptane	2.9 E-08	2.7 E-07	--
928-68-7	6-Methyl-2-heptanone	ND	ND	5.3 E-04
110-93-0	6-Methyl-5-hepten-2-one	ND	ND	5.2 E-04
591-76-4	2-Methylhexane	0	0	--
589-34-4	3-Methylhexane	1.4 E-07	1.3 E-06	--
66-27-3	Methyl methanesulfonate	ND	ND	1.1 E-04
624-91-9	Methylnitrite	2.7 E-07	2.6 E-06	--
107-83-5	2-Methylpentane	5.7 E-08	5.4 E-07	--
96-14-0	3-Methylpentane	0	0	--
763-29-1	2-Methyl-1-pentene	ND	ND	1.0 E-04
625-27-4	2-Methyl-2-pentene	ND	ND	1.0 E-04
691-37-2	4-Methyl-1-pentene	ND	ND	1.0 E-04
691-38-3	cis-4-Methyl-2-pentene	ND	ND	1.0 E-04
78-83-1	2-Methylpropanol	ND	ND	3.1 E-04
78-83-1	2-Methyl-1-propanol	ND	ND	3.1 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
554-14-3	2-Methylthiophene	ND	ND	4.1 E-04
616-44-4	3-Methylthiophene	ND	ND	4.1 E-04
78-94-4	Methyl vinyl ketone	ND	ND	2.9 E-04
88-74-4	2-Nitroaniline	ND	ND	1.9 E-04
99-09-2	3-Nitroaniline	ND	ND	2.2 E-04
75-52-5	Nitromethane	2.9 E-07	2.7 E-06	--
10595-95-6	N-Nitrosomethylethylamine	ND	ND	3.4 E-04
930-55-2	N-Nitrosopyrrolidine	ND	ND	2.6 E-04
124-19-6	Nonanal	6.5 E-07	6.1 E-06	--
111-84-2	n-Nonane	1.1 E-07	1.1 E-06	--
821-55-6	2-Nonanone	ND	ND	5.9 E-04
18829-56-6	trans-2-Nonenal	ND	ND	5.8 E-04
124-13-0	Octanal	2.0 E-07	1.9 E-06	--
111-65-9	n-Octane	0	0	--
111-13-7	2-Octanone	ND	ND	5.3 E-04
2363-89-5	trans-2-Octenal	ND	ND	5.2 E-04
117-84-0	bis(n-Octyl)phthalate	ND	ND	2.8 E-05
110-62-3	Pentanal	1.3 E-08	1.3 E-07	--
78-78-4	i-Pentane	0	0	--
109-66-0	n-Pentane	0	0	--
107-87-9	2-Pentanone	6.8 E-07	6.4 E-06	--
1576-87-0	trans-2-Pentenal	ND	ND	3.5 E-04
109-67-1	1-Pentene	ND	ND	1.0 E-04
627-20-3	cis-2-Pentene	ND	ND	1.0 E-04
646-04-8	trans-2-Pentene	ND	ND	1.0 E-04
62-44-2	Phenacetin	ND	ND	2.1 E-04
80-56-8	alpha-Pinene	ND	ND	1.0 E-04
127-91-3	beta-Pinene	ND	ND	1.0 E-04
74-98-6	Propane	1.7 E-07	1.6 E-06	--
71-23-8	Propanol	2.4 E-07	2.3 E-06	--
103-65-1	n-Propylbenzene	0	0	--
7446-09-5	Sulfur dioxide	ND	ND	2.7 E-04
95-94-3	1,2,4,5-Tetrachlorbenzene	ND	ND	1.2 E-04
58-90-2	2,3,4,6-Tetrachlorophenol	ND	ND	2.3 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b]		Minimum Detection Level mg/m^{3,d}
		lb per item	lb per lb NEW[c]	
109-99-9	Tetrahydrofuran	2.0 E-07	1.9 E-06	--
110-02-1	Thiophene	ND	ND	3.5 E-04
98-03-3	2-Thiophenecarboxaldehyde	ND	ND	4.7 E-04
87-61-6	1,2,3-Trichlorobenzene	ND	ND	7.5 E-04
108-70-3	1,3,5-Trichlorobenzene	ND	ND	7.5 E-04
108-67-8	1,3,5-Trimethylbenzene	2.2 E-07	2.0 E-06	--
16747-26-5	2,2,4-Trimethylhexane	ND	ND	1.0 E-04
565-75-3	2,3,4-Trimethylpentane	0	0	--
107-39-1	2,4,4-Trimethyl-1-pentene	ND	ND	1.0 E-04
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	1.5 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] NEW = net explosive weight. The NEW for this ordnance is 0.106 pound per item.
[d] Data provided for compounds that were not detected.

APPENDIX B

NEW AP-42 SECTIONS FOR ORDNANCE INCLUDED IN PHASE II TESTING AT DUGWAY PROVING GROUND, UTAH