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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NOTICE

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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 three 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. Appendix C presents the public comments that EPA received regarding the draft AP-42 sections which were submitted for public review during June 2004. Appendix C also discusses how each of these comments was addressed during the preparation of the August 2004 versions of these sections.

In addition to this document, there are electronic databases available on the web (http://www.epa.gov/ttn/chief/ap42/index.html) 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*)

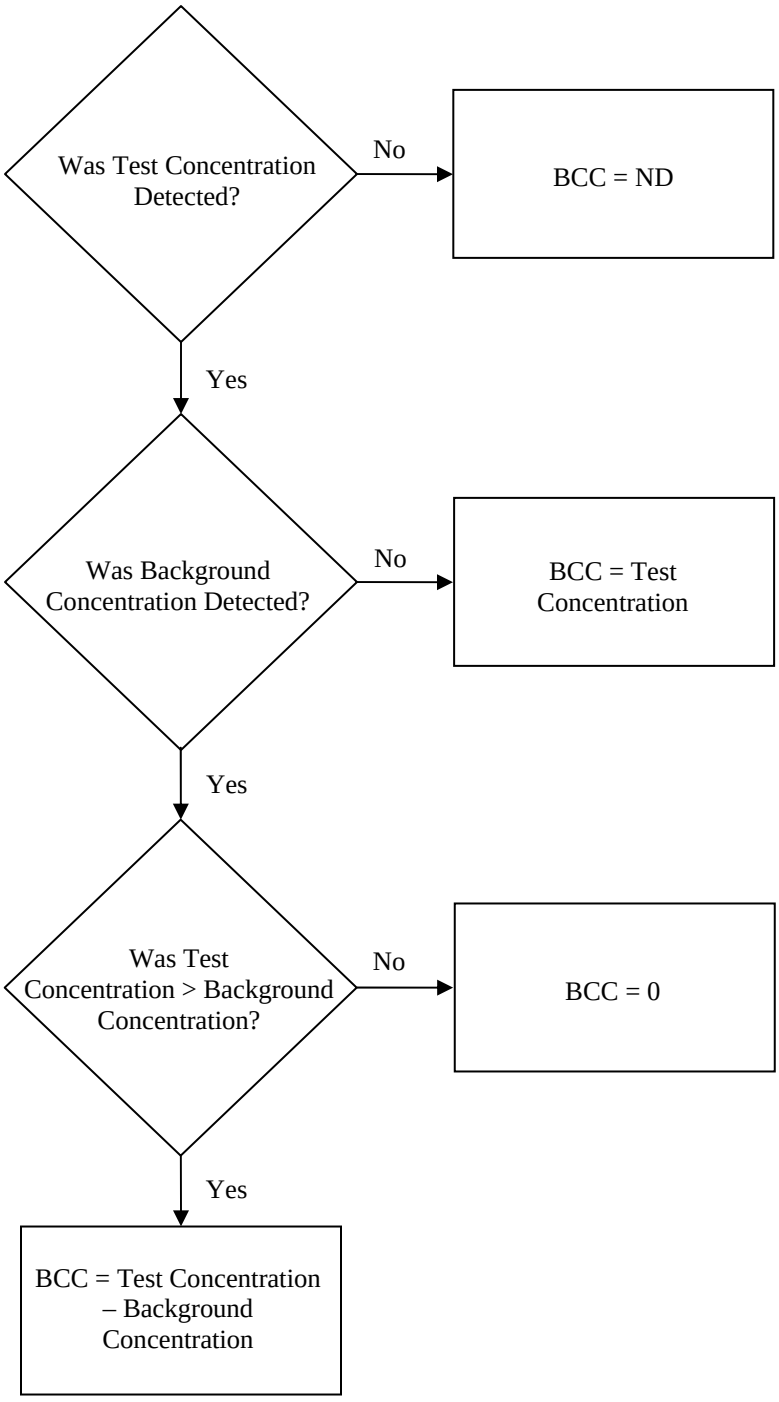

Figure 1 Calculation of background-corrected concentration (BCC).

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
Ethylbenzene	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 Reference 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.

Two analyses were conducted to assign ratings to the ordnance emission factors. First, an analysis was conducted on an ordnance-specific basis. Second, an analysis was conducted using all available ordnance emission factor data. The second analysis was conducted to determine whether a sufficient correlation existed between emission factors for different but similar ordnance to allow the number of test data points to be increased to the point that higher emission factor ratings could be assigned than were possible when using the ordnance-specific approach. Both analyses are described below.

5.1 Emission Factor Ratings Assigned – Based on Ordnance-Specific Test Data

As previously described, emission factor ratings are dependent upon the test data quality, the number of test data points, the amount of variability present within a source category population, and the randomness of the source category sample. The following test data facts pertain to these rating criteria:

1. As described in Section 3 of this Background Document, the ordnance test data was primarily rated A or B. The test data for a few compounds was rated C.
2. Only two tests were conducted per ordnance.
3. Ordnance are manufactured to very tight tolerance levels so there is little variability within a specific type of ordnance.
4. There was no evidence that suggested the tested items within each type of ordnance were specially selected.

Emission factor ratings were assigned based upon these facts. The rationale used to accept or reject specific emission factor ratings follow.

A: Rejected. The number of test data points was deemed to be insufficient to assign an A emission factor rating.

B: Rejected. The number of test data points was deemed to be insufficient to assign a B emission factor rating.

C: Accepted for most ordnance. The emission factors were developed using A- and B-rated test data, there is little variability among items, and there was no evidence that suggested the tested items were specially selected. Because of the limited number of data points, a C rating was deemed appropriate for this set of circumstances.

D: Accepted for some ordnance. The emission factors were developed using C-rated test data, there is little variability among items, and there was no evidence that suggested the tested items were specially selected. Because of the limited number of data points, a D rating was deemed appropriate for this set of circumstances.

E: Rejected. The ordnance described in this report were developed primarily using A- and B-rated test data rather than C- or D-rated data, there is little variability among items, and there was no evidence that suggested the tested items were specially selected. Therefore, an E emission factor rating was deemed inappropriate.

5.2 Emission Factor Ratings Assigned – Based on All Available Test Data

The proceeding sections of this Background Document concern the emission measurement methods, data analysis, and calculations used to develop emission factors for specific ordnance. However, USAEC's ordnance emission factor development program includes more than 200 ordnance that have been tested under more than 25 separate test series. Because many of these ordnance are similar in size and/or chemical composition, a statistical analysis was conducted to assess the similarity of the emission factors developed for similar ordnance. The results of this analysis were used to reevaluate the emission factor ratings assigned on an ordnance-specific basis.

USAEC characterized individual ordnance as falling into one of 17 separate categories, depending upon the size and/or chemical composition of the ordnance. The ordnance and their respective categories are identified in Table 8 along with a comment field describing the number of data points.

Within each of the 17 ordnance categories identified by USAEC, emission factors for each compound were compared. To allow the comparison of emission factors for ordnance with similar constituents but significant differences in net explosive weight, the comparison was made using the normalized emission factor units of mass of compound released per pound NEW. Based upon information provided by EPA,[7] the following procedures were used to assess the data correlation:

1. The relative standard deviation, defined as the standard deviation divided by the mean, was calculated for each compound within each ordnance category.
2. If the relative standard deviation was less than 1.0, the evaluated emission factors were considered to demonstrate good correlation. As such, the rating for these emission factors could be elevated to a maximum of an A, depending on the number of data points within the evaluated ordnance category.
3. If the relative standard deviation was between 1.0 and 2.0, the evaluated emission factors were considered to demonstrate fair correlation. As such, the rating for these emission factors could be elevated to a maximum of a B, depending on the number of data points within the evaluated ordnance category.
4. If the relative standard deviation was greater than 2.0, the evaluated emission factors were considered to demonstrate poor correlation. As such, the emission factor rating could not be elevated, regardless of the amount of data available.

TABLE 8 ORDNANCE CATEGORIZATION FOR EMISSION FACTOR CORRELATION ASSESSMENT

Category	DODIC	Ordnance Description	Test Series	Comment
CS	G963[a]	M73A CS Riot Control Agent Hand Grenade	DPG VI	Data not yet available
	K765[a]	CS Riot Control Agent Capsule	DPG VI	
Demolition	G900	TH3 AN-M14 Incendiary Grenade	EO5	20+ data points
	G911	MK3A2 Offensive Hand Grenade	EO2	
	G911	MK3A2 Offensive Hand Grenade	EO6	
	K010	M4 Field Incendiary Burster	EO5	
	K145	M18A1 Antipersonnel Mine	EO2	
	M023	M112 Demolition Block Charge	EO1	
	M030	1/4-Pound Demolition Block Charge	EO1	
	M030	1/4-Pound Demolition Block Charge	EO3	
	M031	1/2-Pound Demolition Block Charge	DPG IVA	
	M032	1-Pound Demolition Block Charge	EO2	
	M032	1-Pound Demolition Block Charge	EO3	
	M130[a]	M6 Electric Blasting Cap	DPG VII	
	M130[a]	M6 Electric Blasting Cap	EO7	
	M131[a]	M7 Blasting Cap	EO7	
	M241	M10 High Explosive Universal Destructor	DPG IVB	
	M456	PETN Type 1 Detonating Cord	DPG IVA	
	M500[a]	M21 REEF Line Cutter	FP10	
	M591	M1 Military Dynamite Demolition Block Charge	EO1	
	M913	M58A3 Linear Demolition Charge	EO3	
	ML05[a]	MK24 High Explosive Cutter	EO11	
	ML09	Linear Demolition Charge, Shaped 20 gr/ft	DPG IVA	
	ML15	Linear Demolition Charge, Shaped 225 gr/ft	DPG IVA	
	ML47[a]	M11 Blasting Cap	EO7	
	MM50[a]	M221 Shaped Charge	EO11	
	MN02[a]	M12 Blasting Cap	EO7	
	MN03[a]	M13 Blasting Cap	EO7	
	MN06[a]	M14 Blasting Cap	EO7	
	MN07[a]	M15 Delay Blasting Cap	EO11	

TABLE 8 (cont.)

Category	DODIC	Ordnance Description	Test Series	Comment
Demolition, continued	MN08[a]	M81 Igniter	EO9	20+ data points
	MN68[a]	M151 Booster Demolition Charge	DPG VIII	
	None	PAX-11, Granular Powder Burn	EO4	
	None	PAX-11, Molded Pellet Detonation	EO4	
Fuze	G878[a]	M228 Practice Hand Grenade Fuse	DPG VI	<10 data points
	K051	M604 Anti-Tank Practice Mine Fuze	EO6	
	N278[a]	M564 MTSQ Fuze	EO11	
	N285[a]	M577 Fuze	EO9	
	N286[a]	M582 Fuze	EO7	
	N335	M557 Point Detonating Fuze	EO5	
	N340	M739A1 Point Detonating Fuze	EO5	
	N464[a]	M732 Fuze	EO9	
Grenade	G881	M67 Fragmentation Grenade	EO1	<10 data points
	G978	M82 Smoke Simulant Screening Grenade Launcher	DPG V	
	G982	Terephthalic Acid Smoke Hand Grenade	DPG V	
	GG09[a]	M84 Non-Lethal Stun Hand Grenade	EO12	
Illumination	B535	M583A1 40-mm White Star Parachute Cartridge	DPG IVB	20+ data points
	B536	M585 40-mm White Star Cluster Cartridge	DPG IVB	
	B627	M83A3, M83A2, & M83A1 60-mm Illuminating Cartridge with Fuze	DPG V	
	D505	M485A2 155-mm Illumination Round (projectile)	DPG I	
	L305	M195 Green Star Parachute Signal Flare	DPG I	
	L306	M158 Red Star Cluster Signal Illumination	DPG II	
	L307	M159 White Star Cluster Signal Illumination	DPG II	
	L311	M126A1 Red Star Parachute Signal Flare	DPG II	
	L312	M127A1 White Star Parachute Signal Flare	DPG I	
	L314	M125A1 Green Star Cluster Signal Flare	DPG I	
	L367[a]	M22 Anti-Tank, Guided Missile, and Rocket Launching Simulator	DPG VI	
	L410[a]	M206 Aircraft Countermeasure Flare	DPG VI	

TABLE 8 (cont.)

Category	DODIC	Ordnance Description	Test Series	Comment
Inert	HA11[a]	Rocket, 2.75-inch Flechette with M255A1 Warhead	DPG VIII	Data not yet available
Large	C511	M490 105-mm Target Practice Tracer Cartridge (tracer)	EO6	Only 1 data point yet available
	C784[a]	M831 120-mm Target Practice Tracer Cartridge	EO12	
	C785[a]	M865 120-mm Target Practice Discarding Sabot Tracer Cartridge	EO12	
Medium	BA11[a]	M1001 40-mm HVCC Cartridge	EO12	Data not yet available
	BA15[a]	M769 60-mm FRP Cartridge	EO12	
Medium-FP	A652	M220 20-mm TP-T Cartridge	FP9	10+ data points
	A940	M910 25-mm Target Practice Discarding Sabot Tracer Cartridge	FP8	
	A976	M793 25-mm Target Practice Tracer Cartridge	FP8	
	B129[a]	M789 30 mm CTG	EO9	
	B519	M781 40-mm Practice Cartridge	FP2	
	B584	M918 40-mm Practice Cartridge	FP2	
	B505[a]	M662 40-mm Red Star Parachute Cartridge	DPG VIII	
Mine	K042[a]	M88 Volcano Practice Canister Mine	DPG VIII	Data not yet available
Mortar	CA03	XM929 120 mm Smoke Cartridge with M7334A1 Fuze	DPG V	Only 1 data point
Projectile	B542	M430 40-mm High Explosive Dual Purpose (HEDP) Cartridge (projectile)	EO3	10+ data points
	B571	M383 40-mm High Explosive Cartridge (projectile)	EO3	
	B632	M49A4 60-mm High Explosive Cartridge (projectile)	EO3	
	B642	M720 60-mm High Explosive Cartridge (projectile)	EO6	
	BZ-13[a]	M888 60-mm Cartridge with M935 PD Fuze	EO11	
	C995	M136 AT4 Recoilless Rifle, 84-mm Cartridge (projectile)	EO3	

TABLE 8 (cont.)

Category	DODIC	Ordnance Description	Test Series	Comment
Projectile, continued	H557	M72A3 66-mm High Explosive Antitank Rocket (warhead)	EO1	10+ data points
	H708[a]	M73 35-mm Subcaliber Practice Rocket	DPG VIII	
	None[a]	PAX-21, 60-mm Mortar	EO8	
	PJ02	FIM-92A Stinger-Basic Guided Missile (warhead)	EO6	
Propellant	B642	M720 60-mm High Explosive Cartridge (propelling charge)	FP4	20+ data points
	B653[a]	M766 60-mm Short Range Practice Mortar Cartridge	FP10	
	C226	M301A3 81-mm Illuminating Cartridge (propelling charge)	FP4	
	C379	M934 120-mm High Explosive Cartridge (Zone 1 - propelling charge)	FP8	
	C511	M490 105-mm Target Practice Tracer Cartridge (propelling charge)	FP5	
	C784	M831 120-mm Target Practice Tracer Cartridge (propelling charge)	FP5	
	C785	M865 120-mm Target Practice Discarding Sabot Tracer Cartridge (propelling charge)	FP5	
	C868	M821 81-mm High Explosive Cartridge (propelling charge)	FP4	
	C876	M880 81-mm Target Practice Short Range Cartridge (propelling charge)	FP4	
	CA09	M931 120-mm Full Range Practice Cartridge (Zone 1 - propelling charge)	FP8	
	CA09	M931 120-mm Full Range Practice Cartridge (Zone 4 - propelling charge)	FP8	
	D533	M119A2 155-mm Propelling Charge (Zone 7)	FP5	
	D540	M3 155-mm Propelling Charge (Zone 3, M199 Cannon)	FP1	
	D540	M3 155-mm Propelling Charge (Zone 3, M199 Cannon)	FP5	
	D540	M3 155-mm Propelling Charge (Zone 3, M284 Cannon)	FP1	
	D540	M3 155-mm Propelling Charge (Zone 5, M199 Cannon)	FP1	

TABLE 8 (cont.)

Category	DODIC	Ordnance Description	Test Series	Comment
Propellant, continued	D540	M3A1 155-mm Propelling Charge (Zone 3, M199 Cannon)	FP1	20+ data points
	D540	M3A1 155-mm Propelling Charge (Zone 3, M284 Cannon)	FP1	
	D541	M4A2 155-mm Propelling Charge (Zone 7)	FP5	
	H557	M72A3 66-mm High Explosive Antitank Rocket (propelling rocket)	FP7	
	M174[a]	MK209 Impulse Cartridge	FP10	
	M842[a]	M1 Squib	EO7	
	M842[a]	M79 Igniter	EO9	
	MD73[a]	M796 Impulse Cartridge	FP10	
	PJ02	FIM-92A Stinger-Basic Guided Missile (flight motor)	FP7	
	PJ02	FIM-92A Stinger-Basic Guided Missile (launch motor)	EO5	
Pyrotechnic	H975[a]	M274 2.75-inch Signature Smoke with H872 Warhead	DPG VIII	10+ data points
	L366	M74A1 Projectile Air Burst Simulator	DPG IVB	
	L495	M49A1 Surface Trip Flare	DPG II	
	L508[a]	M72 Red Railroad Warning Fuse	DPG VI	
	L592	TOW Blast Simulator	DPG V	
	L594	M115A2 Ground Burst Simulator	DPG I	
	L595[a]	M9 Liquid Projectile Air Burst Simulator	EO12	
	L596	M110 Flash Artillery Simulator	DPG I	
	L598	M117 Flash Booby Trap Simulator	DPG I	
	L599	M118 Illuminating Booby Trap Simulator	DPG II	
	L600	M119 Whistling Booby Trap Simulator	DPG II	
	L601	M116A1 Hand Grenade Simulator	DPG I	
	L602	M21 Artillery Flash Simulator	DPG IVB	
	L709	M25 Target Hit Simulator	EO2	
	L709	XM25 Target Hit Simulator	DPG V	
	L720	M26 Target Kill Simulator	EO6	
	M327[a]	Coupling Base Firing Device	FP10	
	M448[a]	M2 Percussion Detonator	EO11	

TABLE 8 (cont.)

Category	DODIC	Ordnance Description	Test Series	Comment
Pyrotechnic, continued	M626[a]	M1 Push Igniter	EO9	10+ data points
	M627[a]	M5 Pressure Release Igniter	FP10	
	M630	M1 Pull Igniter	DPG V	
	M630[a]	M1 Pull Igniter	EO9	
	M670[a]	M700 Blasting Fuse	EO11	
	M766[a]	M60 Igniter	EO9	
	ML03[a]	M142 Firing Device	EO11	
Rocket/Missile	H459	Rocket, 2.75-inch Flechette, MK40 Mod 3 Motor (propelling rocket)	FP7	<10 data points
	H557	M72A3 66-mm High Explosive Antitank Rocket (propelling rocket)	FP4	
	H708	M73 35-mm Subcaliber Practice Rocket Motor	FP9	
	H974	Rocket, 2.75-inch M267 Practice Warhead, MK66 Mod 3 Motor (propelling rocket)	FP7	
Small Arm-FP	A010	M220 10 Gage Blank/Subcaliber Salute Cartridge	FP9	20+ data points
	A011	12 Gage #00 Shot Cartridge	FP9	
	A017[a]	12 Gage #9 Shot Cartridge	FP10	
	A059	M855 5.56-mm Ball Cartridge (fired from the M16A1 Rifle)	FP3	
	A059	M855 5.56-mm Ball Cartridge (fired from the M16A2 Rifle)	FP3	
	A059	M855 5.56-mm Ball Cartridge (No-Lead)	FP4	
	A063	M856 5.56-mm Tracer Cartridge	FP3	
	A065	M862 5.56-mm Practice Ball Cartridge	FP3	
	A066	M193 5.56-mm Ball Cartridge	FP6	
	A068	M196 5.56-mm Tracer Cartridge	FP6	
	A080	M200 5.56-mm Blank Cartridge	FP3	
	A086	.22 Caliber Long Rifle Ball Cartridge	FP4	
	A106	.22 Caliber Standard Velocity Long Rifle Ball Cartridge	FP4	
	A111	M82 7.62-mm Blank Cartridge	FP3	
	A131	M62 7.62-mm Tracer Cartridge	FP6	
	A136	M118 7.62-mm Ball Match Cartridge	FP6	

TABLE 8 (cont.)

Category	DODIC	Ordnance Description	Test Series	Comment
Small Arm-FP, continued	A143	M80 7.62-mm Ball Cartridge	FP3	20+ data points
	A171	M852 7.62-mm Ball Match Cartridge	FP6	
	A182	M1 .30 Caliber Ball Cartridge	FP6	
	A212	M2 .30 Caliber Ball Cartridge	FP6	
	A218	M25 .30 Caliber Tracer Cartridge	FP9	
	A247	M72 .30 Caliber Ball Match Cartridge	FP6	
	A363	M882 9-mm Ball Cartridge	FP3	
	A365	M181 14.5-mm Trainer-Spotter Cartridge with 3-sec Delay (Artillery)	DPG V	
	A366[a]	M182 14.5-mm Cartridge	EO11	
	A400	M41 .38 Caliber Special Ball Cartridge	FP9	
	A403	.38 Caliber Special Blank Cartridge	FP9	
	A475	M1911 .45 Caliber Ball Cartridge	FP3	
	A518	M903 .50 Caliber SLAP Cartridge	FP9	
	A518[a]	M962 .50 Caliber SLAP/T	FP10	
	A525	M2 .50 Caliber Armor Piercing Cartridge	FP8	
	A557	M17 .50 Caliber Tracer Cartridge	FP3	
	A557	M33 .50 Caliber Ball Cartridge	FP3	
	A598	M1A1 .50 Caliber Blank Cartridge	FP3	
Smoke	C870[a]	M819 (IUK) 81-mm Red Phosphorous Smoke	DPG VII	10+ data points
	G815[a]	Red Phosphorous Smoke Screening Grenade Launcher (UK)	DPG VII	
	G930	Hexachloroethane Smoke Grenade	DPG V	
	G940	M18 Green Smoke Hand Grenade	DPG III	
	G945	M18 Yellow Smoke Hand Grenade	DPG III	
	G950	M18 Red Smoke Hand Grenade	DPG III	
	G950	M18 Red Smoke Hand Grenade (new formulation)	DPG V	
	G955	M18 Violet Smoke Hand Grenade	DPG III	
	G955	M18 Violet Smoke Hand Grenade (new formulation)	DPG V	
	K866[a]	ABC-M5 HC Ground Smoke Pot (MILES)	DPG VII	
	K867[a]	M4A2 Floating Smoke Pot	DPG VII	

TABLE 8 (cont.)

[a] Although testing may have been completed, emission factors for this ordnance have not yet been analyzed for inclusion in AP-42; therefore, these data were not included when the data correlation was assessed.

A poor correlation between emission factors was not necessarily construed as being indicative of poor test data. Rather, a poor correlation was more likely to indicate that the ordnance included in the category were not as similar in nature as anticipated by USAEC when the ordnance categories were defined.

In addition to assessing the data correlation, an assessment was made of the number of test data points available within each of the 17 ordnance categories. Because each ordnance test consisted of two test data points (i.e., two test runs per ordnance or two independent sampling trains were used during an ordnance test), the number of test data points available in each of the ordnance categories varied from 2 to 68. Based upon information provided by EPA,[7] the following assumptions were used to assess whether sufficient category-specific test data points were available to justify elevating the emission factor ratings based on ordnance-specific data only:

1. If 20 or more data points were available, the emission factor rating could be elevated to a maximum of an A, provided that the data also demonstrated a good correlation.
2. If at least 10 but less than 20 data points were available, the emission factor rating could be elevated to a maximum of a B, provided that the data also demonstrated a good correlation.
3. If less than 10 data points were available, the emission factor rating could not be elevated, regardless of the data correlation.
4. If the data demonstrated a fair correlation and 20 or more data points were available, the emission factor rating could be elevated to a maximum of a B.
5. If the data demonstrated a fair correlation and at least 10 but less than 20 data points were available, the emission factor rating could be elevated to a maximum of a C.

Using the criteria specified above, the emission factor ratings assigned to ordnance in each of the 17 ordnance categories were reevaluated. This evaluation indicated that some of the emission factor ratings associated with ordnance included in eight categories could be elevated from a C or D rating to an A or B rating. These eight categories are:

1. Demolition
2. Illumination
3. Medium – Firing Point
4. Projectiles
5. Propellants
6. Pyrotechnics
5. Small Arms – Firing Point
6. Smokes

A final assessment was made as to the emission factor rating assigned based on ordnance-specific test data only. If the original emission factor data rating assigned was a C, then the emission factor rating was elevated to an A or B, as appropriate, based upon the data for the whole ordnance category. If the original emission factor data rating assigned was a D, then the emission factor rating was elevated to a B or C, as appropriate, based upon the data for the whole ordnance category. The analysis is documented in an Excel spreadsheet that is located on the EPA website at: http://www.epa.gov/ttn/chief/ap42/index.html.

Within the current test series, DODICS D505, L305, L312, and L314 were included in the Illumination category, which included more than 20 test data points. DODICS L594, L596, L598, and L601 were included in the Pyrotechnics category, which included more than 10 data points. As a result, some emission factor ratings associated with each of these ordnance were elevated. The emission factor ratings assigned are presented in Appendix A.

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.

7. Information regarding the relationship between emission factor data correlation, the number of data points available, and the resulting emission factor rating assigned supplied upon request by Mr. Ron Myers, Measurement Policy Group, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC, June 2006.

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,c]		Minimum Detection Level mg/m^3[,e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[f]	1.8	3.0 E-01	--
630-08-0	Carbon monoxide[f]	2.6 E-02	4.3 E-03	--
10102-44-0	Nitrogen dioxide	3.9 E-03	6.4 E-04	--
10102-43-9	Nitrogen oxide[g]	5.9 E-02	9.6 E-03	--
--	Oxides of nitrogen[f]	9.4 E-02	1.5 E-02	--
--	PM-10[f]	3.0	4.9 E-01	--
7446-09-5	Sulfur dioxide[g]	2.7 E-03	4.5 E-04	--
--	Total nonmethane hydrocarbons[g]	1.5 E-03	2.5 E-04	--
12789-66-1	Total suspended particulate[f]	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[g]	2.9 E-05	4.7 E-06	--
107-13-1	Acrylonitrile[g]	2.1 E-05	3.4 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[f]	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	--
71-43-2	Benzene[f]	1.1 E-04	1.8 E-05	--
92-87-5	Benzidine	ND	ND	5.1 E-02
56-55-3	Benzo[a]anthracene	ND	ND	1.7 E-03
205-99-2	Benzo[b]fluoranthene	ND	ND	1.1 E-03
207-08-9	Benzo[k]fluoranthene	ND	ND	2.2 E-03
191-24-2	Benzo[g,h,i]perylene	ND	ND	8.9 E-04
50-32-8	Benzo[a]pyrene	ND	ND	1.2 E-03

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	7.4 E-05	1.2 E-05	--
86-74-8	Carbazole	ND	ND	9.3 E-04
75-15-0	Carbon disulfide[g]	6.4 E-05	1.0 E-05	--
56-23-5	Carbon tetrachloride[g]	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[g]	7.0 E-06	1.1 E-06	--
218-01-9	Chrysene	ND	ND	1.8 E-03
7440-48-4	Cobalt[g]	1.8 E-06	3.0 E-07	--
7440-50-8	Copper[f]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene[g]	7.3 E-06	1.2 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	1.3 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	Hexachlorocyclopentadiene	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	--

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
7647-01-0	Hydrochloric acid	ND	ND	5.8 E-02
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[g]	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[g]	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[g]	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[f]	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

TABLE A1 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
99-55-8	5-Nitro-o-toluidine	ND	ND	1.4 E-03
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
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[g]	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin TEQ[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	9.4 E-06	1.5 E-06	--
67-64-1	Acetone[g]	1.3 E-04	2.1 E-05	--
74-86-2	Acetylene[g]	2.6 E-04	4.2 E-05	--
100-52-7	Benzaldehyde[g]	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[g]	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[g]	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[g]	3.5 E-06	5.7 E-07	--
624-64-6	trans-2-Butene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	1.4 E-06	2.2 E-07	--
611-14-3	o-Ethyltoluene[g]	1.4 E-06	2.2 E-07	--
622-96-8	p-Ethyltoluene[g]	8.5 E-07	1.4 E-07	--
98-01-1	2-Furaldehyde[g]	3.1 E-05	5.0 E-06	--
110-00-9	Furan	4.7 E-06	7.7 E-07	--
111-71-7	Heptanal[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[f]	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[g]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	3.6 E-06	5.8 E-07	--
109-67-1	1-Pentene[g]	4.0 E-06	6.6 E-07	--
627-20-3	cis-2-Pentene[g]	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	--
7723-14-0	Phosphorus[g]	6.0 E-05	9.7 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[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[,e]
		lb per item	lb per lb NEW[d]	
99-35-4	sym-Trinitrobenzene	ND	ND	4.7 E-03

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 6.123 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[f]	8.8 E-02	2.8 E-01	--
630-08-0	Carbon monoxide[f]	9.4 E-03	3.0 E-02	--
10102-44-0	Nitrogen dioxide	1.1 E-04	3.4 E-04	--
10102-43-9	Nitrogen oxide[g]	1.5 E-03	4.7 E-03	--
--	Oxides of nitrogen[f]	2.4 E-03	7.6 E-03	--
--	PM-10[f]	1.2 E-01	3.7 E-01	--
7446-09-5	Sulfur dioxide[g]	7.8 E-05	2.5 E-04	--
--	Total nonmethane hydrocarbons[g]	1.7 E-04	5.5 E-04	--
12789-66-1	Total suspended particulate[f]	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[g]	1.1 E-06	3.4 E-06	--
107-13-1	Acrylonitrile[g]	1.3 E-06	4.0 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[f]	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	--
71-43-2	Benzene[f]	1.3 E-05	4.2 E-05	--
92-87-5	Benzidine	ND	ND	7.0 E-03
56-55-3	Benzo[a]anthracene	ND	ND	2.3 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
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.2 E-04

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	1.2 E-06	3.7 E-06	--
86-74-8	Carbazole	ND	ND	1.3 E-04
75-15-0	Carbon disulfide[g]	1.0 E-05	3.3 E-05	--
56-23-5	Carbon tetrachloride[g]	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[g]	7.3 E-06	2.3 E-05	--
218-01-9	Chrysene	ND	ND	2.5 E-04
7440-48-4	Cobalt[g]	3.7 E-06	1.2 E-05	--
7440-50-8	Copper[f]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene[g]	5.2 E-07	1.6 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	1.8 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	5.8 E-03

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	2.6 E-04
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[g]	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[g]	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[g]	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[f]	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

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	4.7 E-04
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
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[g]	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin TEQ[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	2.4 E-06	7.6 E-06	--
67-64-1	Acetone[g]	7.1 E-06	2.2 E-05	--
74-86-2	Acetylene[g]	2.5 E-05	8.0 E-05	--
100-52-7	Benzaldehyde[g]	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[g]	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[g]	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[g]	4.5 E-07	1.4 E-06	--
624-64-6	trans-2-Butene[g]	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[g]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	3.4 E-07	1.1 E-06	--
611-14-3	o-Ethyltoluene[g]	3.4 E-07	1.1 E-06	--
622-96-8	p-Ethyltoluene[g]	2.2 E-07	7.0 E-07	--
98-01-1	2-Furaldehyde[g]	7.6 E-07	2.4 E-06	--
110-00-9	Furan	7.3 E-07	2.3 E-06	--
111-71-7	Heptanal[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
592-41-6	1-Hexene[g]	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[f]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
99-09-2	3-Nitroaniline	ND	ND	4.6 E-04
75-52-5	Nitromethane[g]	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[g]	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[g]	1.4 E-06	4.4 E-06	--
109-67-1	1-Pentene[g]	5.1 E-07	1.6 E-06	--
627-20-3	cis-2-Pentene[g]	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
7723-14-0	Phosphorus[g]	1.2 E-05	3.7 E-05	--
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[g]	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[g]	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

TABLE A2 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	6.5 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 3.16 E-01 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[f]	3.8 E-03	1.3 E-02	--
630-08-0	Carbon monoxide[f]	4.4 E-03	1.6 E-02	--
10102-44-0	Nitrogen dioxide	9.9 E-05	3.5 E-04	--
10102-43-9	Nitrogen oxide[g]	3.6 E-03	1.3 E-02	--
--	Oxides of nitrogen[f]	5.7 E-03	2.0 E-02	--
--	PM-10[f]	1.7 E-01	6.1 E-01	--
7446-09-5	Sulfur dioxide[g]	1.3 E-04	4.7 E-04	--
--	Total nonmethane hydrocarbons[g]	8.5 E-05	3.0 E-04	--
12789-66-1	Total suspended particulate[f]	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[g]	1.2 E-06	4.1 E-06	--
107-13-1	Acrylonitrile[g]	2.0 E-06	7.0 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[f]	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	--
71-43-2	Benzene[f]	9.6 E-06	3.4 E-05	--
92-87-5	Benzidine	ND	ND	7.2 E-03
56-55-3	Benzo[a]anthracene	ND	ND	2.4 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
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.3 E-04

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	1.3 E-07	4.4 E-07	--
86-74-8	Carbazole	ND	ND	1.3 E-04
75-15-0	Carbon disulfide[g]	2.0 E-05	7.1 E-05	--
56-23-5	Carbon tetrachloride[g]	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[g]	7.5 E-06	2.6 E-05	--
218-01-9	Chrysene	ND	ND	2.6 E-04
7440-48-4	Cobalt[g]	2.6 E-07	9.1 E-07	--
7440-50-8	Copper[f]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene[g]	8.9 E-07	3.1 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	1.8 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	Hexachlorocyclopentadiene	ND	ND	5.9 E-03

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	2.6 E-04
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[g]	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[g]	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[g]	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[f]	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

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	4.8 E-04
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
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[g]	ND	ND	4.3 E-04
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin TEQ[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	5.6 E-07	2.0 E-06	--
67-64-1	Acetone[g]	5.3 E-06	1.9 E-05	--
74-86-2	Acetylene[g]	6.4 E-06	2.3 E-05	--
100-52-7	Benzaldehyde[g]	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[g]	0	0	--
431-03-8	2,3-Butanedione	ND	ND	3.6 E-04
106-98-9	1-Butene[g]	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[g]	2.3 E-07	8.1 E-07	--
624-64-6	trans-2-Butene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	3.4 E-07	1.2 E-06	--
611-14-3	o-Ethyltoluene[g]	4.6 E-07	1.6 E-06	--
622-96-8	p-Ethyltoluene[g]	4.2 E-09	1.5 E-08	--
98-01-1	2-Furaldehyde[g]	ND	ND	4.0 E-04
110-00-9	Furan	ND	ND	2.8 E-04
111-71-7	Heptanal[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
592-41-6	1-Hexene[g]	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[g]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
99-09-2	3-Nitroaniline	ND	ND	4.7 E-04
75-52-5	Nitromethane[g]	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[g]	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[g]	1.3 E-06	4.6 E-06	--
109-67-1	1-Pentene[g]	2.3 E-07	8.1 E-07	--
627-20-3	cis-2-Pentene[g]	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
7723-14-0	Phosphorus[g]	1.1 E-05	3.8 E-05	--
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[g]	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[g]	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

TABLE A3 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	6.7 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 2.827 E-01 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level $mg/m^{3,e}$
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[f]	1.4 E-01	8.5 E-02	--
630-08-0	Carbon monoxide[f]	1.0 E-02	6.2 E-03	--
10102-44-0	Nitrogen dioxide	1.6 E-05	9.4 E-06	--
10102-43-9	Nitrogen oxide[g]	1.1 E-03	6.4 E-04	--
--	Oxides of nitrogen[f]	1.7 E-03	9.9 E-04	--
--	PM-10[f]	6.6 E-02	3.9 E-02	--
7446-09-5	Sulfur dioxide[g]	2.9 E-07	1.8 E-07	--
--	Total nonmethane hydrocarbons[g]	2.5 E-04	1.5 E-04	--
12789-66-1	Total suspended particulate[f]	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[g]	1.3 E-06	7.9 E-07	--
107-13-1	Acrylonitrile[g]	4.3 E-06	2.6 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[f]	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	--
71-43-2	Benzene[f]	1.7 E-05	1.0 E-05	--
92-87-5	Benzidine	ND	ND	5.7 E-03
56-55-3	Benzo[a]anthracene	ND	ND	1.9 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
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.0 E-04

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	8.4 E-08	5.1 E-08	--
86-74-8	Carbazole	ND	ND	1.0 E-04
75-15-0	Carbon disulfide[g]	1.7 E-05	1.0 E-05	--
56-23-5	Carbon tetrachloride[g]	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[g]	6.5 E-06	3.9 E-06	--
218-01-9	Chrysene	ND	ND	2.1 E-04
7440-48-4	Cobalt[g]	7.8 E-07	4.6 E-07	--
7440-50-8	Copper[f]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene[g]	1.7 E-06	1.0 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	1.4 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	Hexachlorocyclopentadiene	ND	ND	4.7 E-03

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	2.1 E-04
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[g]	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[g]	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[g]	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[f]	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

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	3.8 E-04
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
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[g]	6.7 E-07	4.0 E-07	--
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin TEQ[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	4.3 E-06	2.6 E-06	--
67-64-1	Acetone[g]	7.7 E-06	4.6 E-06	--
74-86-2	Acetylene[g]	5.6 E-05	3.4 E-05	--
100-52-7	Benzaldehyde[g]	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[g]	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[g]	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[g]	9.0 E-07	5.4 E-07	--
624-64-6	trans-2-Butene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	9.0 E-07	5.4 E-07	--
611-14-3	o-Ethyltoluene[g]	6.8 E-07	4.0 E-07	--
622-96-8	p-Ethyltoluene[g]	8.8 E-07	5.3 E-07	--
98-01-1	2-Furaldehyde[g]	1.6 E-06	9.6 E-07	--
110-00-9	Furan	1.3 E-06	7.9 E-07	--
111-71-7	Heptanal[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
592-41-6	1-Hexene[g]	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[f]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
99-09-2	3-Nitroaniline	ND	ND	3.7 E-04
75-52-5	Nitromethane[g]	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[g]	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[g]	1.0 E-06	6.0 E-07	--
109-67-1	1-Pentene[g]	4.5 E-07	2.7 E-07	--
627-20-3	cis-2-Pentene[g]	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
7723-14-0	Phosphorus[g]	6.3 E-06	3.8 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[g]	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[g]	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

TABLE A4 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	5.3 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 1.669 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[g]	3.4 E-03	2.4 E-02	--
630-08-0	Carbon monoxide[g]	2.1 E-03	1.5 E-02	--
10102-44-0	Nitrogen dioxide	1.5 E-04	1.1 E-03	--
10102-43-9	Nitrogen oxide	3.5 E-03	2.5 E-02	--
--	Oxides of nitrogen[g]	5.5 E-03	3.9 E-02	--
--	PM-10[g]	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[g]	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[g]	2.6 E-07	1.8 E-06	--
98-86-2	Acetophenone[g]	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[g]	ND	ND	2.2 E-04
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[g]	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	--
71-43-2	Benzene	8.8 E-06	6.3 E-05	--
92-87-5	Benzidine	ND	ND	1.3 E-02
56-55-3	Benzo[a]anthracene	ND	ND	4.4 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
191-24-2	Benzo[g,h,i]perylene	ND	ND	2.3 E-04

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene	7.5 E-07	5.4 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	3.3 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	Hexachlorocyclopentadiene	ND	ND	1.1 E-02

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	4.8 E-04
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[g]	4.1 E-06	2.9 E-05	--
7439-96-5	Manganese[g]	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[g]	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

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	8.8 E-04
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
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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[f]	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[g]	6.4 E-06	4.6 E-05	--
74-86-2	Acetylene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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
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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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	--
7723-14-0	Phosphorus[g]	6.6 E-05	4.7 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	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[g]	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

TABLE A5 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	1.2 E-03

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 1.41 E-01 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[g]	2.5 E-01	1.3	--
630-08-0	Carbon monoxide[g]	6.8 E-03	3.6 E-02	--
10102-44-0	Nitrogen dioxide	3.1 E-04	1.7 E-03	--
10102-43-9	Nitrogen oxide	1.1 E-03	5.7 E-03	--
--	Oxides of nitrogen[g]	2.0 E-03	1.0 E-02	--
--	PM-10[g]	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[g]	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[g]	ND	ND	1.7 E-04
98-86-2	Acetophenone[g]	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[g]	ND	ND	2.2 E-04
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[g]	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	--
71-43-2	Benzene	2.1 E-03	1.1 E-02	--
92-87-5	Benzidine	ND	ND	4.5 E-03
56-55-3	Benzo[a]anthracene	ND	ND	1.5 E-04
205-99-2	Benzo[b]fluoranthene	ND	ND	9.3 E-05
207-08-9	Benzo[k]fluoranthene	ND	ND	1.9 E-04
191-24-2	Benzo[g,h,i]perylene	ND	ND	7.9 E-05

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene	2.0 E-03	1.1 E-02	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	2.1 E-07	1.1 E-06	--
118-74-1	Hexachlorobenzene	ND	ND	1.2 E-04
87-68-3	Hexachlorobutadiene	ND	ND	1.1 E-03
77-47-4	Hexachlorocyclopentadiene	ND	ND	3.7 E-03

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	1.6 E-04
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[g]	1.1 E-05	5.8 E-05	--
7439-96-5	Manganese[g]	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[g]	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

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	3.0 E-04
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
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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[f]	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[g]	1.7 E-05	9.2 E-05	--
74-86-2	Acetylene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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	--
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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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
7723-14-0	Phosphorus[g]	6.1 E-06	3.3 E-05	--
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[g]	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

TABLE A6 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	4.2 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 1.875 E-01 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[g]	0	0	--
630-08-0	Carbon monoxide[g]	5.3 E-05	6.8 E-03	--
10102-44-0	Nitrogen dioxide	2.6 E-06	3.4 E-04	--
10102-43-9	Nitrogen oxide	2.9 E-05	3.8 E-03	--
--	Oxides of nitrogen[g]	5.0 E-05	6.5 E-03	--
--	PM-10[g]	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[g]	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[g]	2.9 E-08	3.8 E-06	--
98-86-2	Acetophenone[g]	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[g]	2.5 E-08	3.3 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[g]	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	--
71-43-2	Benzene	3.5 E-07	4.6 E-05	--
92-87-5	Benzidine	ND	ND	6.1 E-03
56-55-3	Benzo[a]anthracene	ND	ND	2.0 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
191-24-2	Benzo[g,h,i]perylene	ND	ND	1.1 E-04

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene	ND	ND	6.7 E-04
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	1.5 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	Hexachlorocyclopentadiene	ND	ND	5.0 E-03

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	2.2 E-04
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[g]	2.3 E-06	3.0 E-04	--
7439-96-5	Manganese[g]	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[g]	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

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	4.1 E-04
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
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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[f]	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[g]	1.1 E-07	1.4 E-05	--
74-86-2	Acetylene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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
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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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
7723-14-0	Phosphorus[g]	2.4 E-05	3.1 E-03	--
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[g]	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

TABLE A7 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	5.7 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 7.7 E-03 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

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

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
Carbon Dioxide, Criteria Pollutants, Total Nonmethane Hydrocarbons, and Total Suspended Particulates				
124-38-9	Carbon dioxide[g]	4.1 E-03	5.1 E-02	--
630-08-0	Carbon monoxide[g]	3.7 E-04	4.5 E-03	--
10102-44-0	Nitrogen dioxide	1.7 E-04	2.1 E-03	--
10102-43-9	Nitrogen oxide	3.6 E-03	4.4 E-02	--
--	Oxides of nitrogen[g]	5.6 E-03	6.9 E-02	--
--	PM-10[g]	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[g]	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[g]	ND	ND	1.7 E-04
98-86-2	Acetophenone[g]	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[g]	3.4 E-07	4.2 E-06	--
107-05-1	Allyl chloride	ND	ND	3.2 E-04
7429-90-5	Aluminum[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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[g]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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	Ethylbenzene	1.8 E-07	2.3 E-06	--
75-00-3	Ethyl chloride	ND	ND	2.7 E-04
74-85-1	Ethylene[g]	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
86-73-7	Fluorene	ND	ND	2.4 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

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
67-72-1	Hexachloroethane	ND	ND	3.5 E-04
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[g]	1.4 E-06	1.7 E-05	--
7439-96-5	Manganese[g]	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[g]	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

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
59-89-2	n-Nitrosomorpholine	ND	ND	6.4 E-04
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
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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[f]	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[g]	1.7 E-06	2.1 E-05	--
74-86-2	Acetylene[g]	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[g]	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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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[g]	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
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,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
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[g]	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,c]		Minimum Detection Level mg/m^{3}[e]
		lb per item	lb per lb NEW[d]	
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
7723-14-0	Phosphorus[g]	1.5 E-05	1.9 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[g]	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

TABLE A8 (cont.)

CASRN[a]	Compound	Emission Factor[b,c]		Minimum Detection Level mg/m^3[e]
		lb per item	lb per lb NEW[d]	
107-40-4	2,4,4-Trimethyl-2-pentene	ND	ND	1.0 E-04
99-35-4	sym-Trinitrobenzene	ND	ND	8.9 E-04

[a] CASRN = Chemical Abstracts Service Registry Number.
[b] ND = nondetected.
[c] Emission factors rated C unless otherwise noted.
[d] NEW = net explosive weight. The NEW for this ordnance is 8.13 E-02 pounds per item.
[e] Data provided for compounds that were not detected.
[f] Emission factor rated A because of correlation with emission factors for similar ordnance and number of test data points.
[g] Emission factor rated B because of correlation with emission factors for similar ordnance and number of test data points.

APPENDIX B

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

Electronic versions of the new AP-42 sections for ordnance included in Phase I testing at Dugway Proving Ground, Utah, are located on the EPA TTN at: http://www.epa.gov/ttn/chief/ap42/index.html

APPENDIX C

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

1.0 INTRODUCTION

On June 22, 2004, the Environmental Protection Agency submitted for public review 10 draft AP-42 sections that will be included in a new AP-42 chapter, Chapter 15: Ordnance Detonation. The 10 AP-42 sections were developed using emission factor data collected for 8 ordnance included in the Phase I testing program conducted at Dugway Proving Ground, Utah, and 2 ordnance included in the Phase II testing program conducted at Dugway Proving Ground, Utah. EPA received one letter commenting on the proposed sections that was submitted by the U.S. Department of Defense. This appendix summarizes the AP-42 changes recommended by the commenter and discusses how the recommendations were addressed in the August 2004 versions of the AP-42 sections.

2.0 PUBLIC COMMENTERS

The commenters and their affiliations are listed in Table C.1.

TABLE C.1 LIST OF COMMENTERS AND THEIR AFFILIATIONS

Commenter ID Number	Commenter and Affiliation
AP-1	G. Schirf U.S. Department of Defense, Office of the Deputy Under Secretary (Environment, Safety and Occupational Health) Washington, DC

3.0 PUBLIC COMMENTS RECEIVED

Comment from Commenter AP-1: In each of the draft AP-42 sections, an emission factor for phosphorus is presented with a footnote that states that the compound is categorized as a reportable chemical under EPCRA Section 313. Only white and yellow phosphorus are categorized as a reportable chemical under EPCRA Section 313. An analysis of the phosphorus contained in the munitions that were tested indicates that neither yellow or white phosphorus are present. We believe that the phosphorus emissions are not really the yellow or white form of phosphorus, but rather another form of phosphorus, and therefore should not be categorized as a reportable chemical under EPCRA Section 313.

Response: EPA reviewed data included in the test reports and concurred that the phosphorous detected during the ordnance testing programs is not the yellow or white form, and therefore, is not categorized as a reportable chemical under EPCRA Section 313. Phosphorus emission factors were removed from the appropriate tables in each AP-42 section. In addition, within the tables contained in Appendix A of the Background Document, EPA moved the phosphorous emission factors from the "Hazardous Air Pollutants and Toxic Chemicals" sections to the "Other Pollutants" sections.