OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

MEMORANDUM **June 6, 2018**

TO: Phillip Fielder, P.E., Permits and Engineering Group Manager

THROUGH: Phil Martin, P.E., Manager, Existing Source Permits Section

THROUGH: Amalia Talty, P.E., Existing Source Permits Section

FROM: Ryan Buntyn, P.E., Existing Source Permits Section

SUBJECT: Evaluation of Permit Application No. **2012-672-C (M-7) PSD**
McAlester Army Ammunition Plant (MCAAP) (Facility ID 923)
Ammunition Manufacturing Facility
The facility covers large parts of T4N and T5N, R12E through R14E, Pittsburg County. The main entrance is near 34.8381°N, 95.8413°W.
Directions: From the intersection of US 69 and the Indian Nations Turnpike, travel two miles southwest on US 69 to facility on right (northwest).

SECTION I. INTRODUCTION

McAlester Army Ammunition Plant (MCAAP) has applied for a Part 70 PSD construction permit for their Ammunition Manufacturing Facility (SIC Code 9711). The facility is currently operating under Permit No. 2012-672-TVR (M-11) issued February 12, 2018.

The applicant requests authorization to allow the static firing of an additional type of rocket motor. The new rocket motors are from missiles that use a lead-based propellant. On October 13, 2016, MCAAP submitted an applicability determination [Permit No. 2012-672-AD (M-6)] requesting the Department of Environmental Quality (DEQ) make a determination as to whether the proposed modification meets the definition of Prevention of Significant Deterioration (PSD) major modification as defined in OAC 252:100-8 or if the modification can be completed as a modification to the current operating permit. A previous applicability determination [Permit No. 99-112-AD (M-6)] was issued to MCAAP on May 20, 2013, concluding that static firing of a different rocket motor (Maverick rockets) with substantially different propellant composition constitutes a change in method of operation as defined in OAC 252:100-8-31. Based on this decision, Permit No. 2012-672-AD (M-6) determined that this project would also constitute a change in method of operation and a Part 70 PSD construction permit would be required. MCAAP is an existing major stationary source under Oklahoma's PSD preconstruction permitting program. The static firing of the additional proposed rocket motors constitutes a major modification under the PSD permitting program for emissions of lead. Emission increases of PM_{10}, $PM_{2.5}$, carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2), and greenhouse gasses (GHG as CO_2e) will not exceed the PSD significance emission rate thresholds.

Since the facility emits more than 100 TPY of a regulated pollutant, it is subject to Title V permitting requirements. Emission units (EUs) have been arranged into Emission Unit Groups (EUGs) in section VIII.

SECTION II. PERMIT HISTORY

The 44,965-acre facility was established in 1942 as the McAlester Naval Ammunition Depot. It became an Army Installation in 1977 and is currently a US Army Materiel Command (AMC) facility. Because MCAAP began operations in 1943, it continues to operate largely as a "grandfathered" facility, except for permit limits that are a result of facility modifications. Emission units constructed or significantly modified since 1972 are not considered grandfathered and are subject to the limitations established. An extensive listing of permits and Applicability Determinations (ADs) issued to the facility is available in Permit 99-112-TV (M-1) and is not repeated here, because the terms of all previous permits and ADs are included in this Part 70 operating permit.

SECTION III. PSD APPLICABILITY REVIEW

MCAAP is considered a PSD Major Source since total facility emissions are permitted to exceed 250 TPY (each) of three pollutants including NO_X, PM, and VOC. Therefore, any modification (physical or operational change that could increase any regulated pollutant) must be evaluated under PSD rules.

The emissions increases associated with the proposed project are reviewed for PSD permitting applicability per OAC 252:100-8-30. In accordance with OAC 252:100-8-30(b)(1)(A), a project is a major modification for a regulated New Source Review (NSR) pollutant if it causes two types of emissions increases: a significant emissions increase and a significant net emissions increase. Thus, following is the first step in determining if a project would be considered a major modification and subject to PSD review.

Determine Emissions Increases

1. Emission Increase - Calculate the emissions increases and compare to PSD significant emission rate thresholds.

OAC 252:100-8-30(b)(3) through (6) describes the test methods for determining if significant emission increases have occurred.

> (3) ***Actual-to-projected-actual applicability test for projects that only involve existing emissions units.*** A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the projected actual emissions and the baseline actual emissions for each existing emissions unit, equals or exceeds the amount that is significant for that pollutant.
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> (4) ***Actual-to-potential test for projects that only involve construction of a new emissions unit(s).*** A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the potential to emit from each new emissions unit following completion of the project and the baseline actual emissions of these units before the project equals or exceeds the amount that is significant for that pollutant.
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> (5) ***Hybrid test for projects that involve multiple types of emissions units.*** A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the emissions increases for each emissions unit, using the method specified in OAC 252:100-

8- 30(b)(3) or (4) as applicable with respect to each emissions unit, for each type of emissions unit equals or exceeds the amount that is significant for that pollutant.

(6) ***Actual-to-potential test for projects that only involve existing emissions units.*** In lieu of using the actual-to-projected-actual test, owners or operators may choose to use the actual-to-potential test to determine if a significant emissions increase of a regulated NSR pollutant will result from a proposed project. A significant emissions increase of a regulated NSR pollutant will occur if the sum of the difference between the potential emissions and the baseline actual emissions for each existing emissions unit, equals or exceeds the amount that is significant for that pollutant. Owners or operators who use the actual to potential test will not be subject to the recordkeeping requirements in OAC 252:100-8-36.2(c).

For the purposes of this project, which involves modifications to the existing static firing source at the facility, MCAAP is utilizing the actual-to-potential test for projects that only involve existing emissions units.

Determine Net Emissions Increases
Emissions netting is a term that refers to the process of considering certain previous and prospective emissions changes at an existing major source to determine the total net emissions increase of a pollutant that will result from a proposed physical change or change in the method of operation. A PSD netting analysis is performed based on suggested emissions netting procedures in the EPA's Draft New Source Review Workshop Manual and the NSR Revisions published in the OAC. The following five additional steps are used for determining if the net emissions change is significant.

2. Contemporaneous Period - Determine the beginning and ending dates of the contemporaneous period as it relates to the project.

3. Emissions Increases and Decreases During the Contemporaneous Period - Determine which emissions units at the facility experienced or will experience a credible increase or decrease in emissions during the contemporaneous period. This step also includes any emissions decreases from the project.

4. Creditable Emissions Changes - Determine which contemporaneous emissions changes are creditable.

5. Amount of Emissions Increases and Decreases - Determine, on a pollutant-by-pollutant basis, the amount of each contemporaneous and creditable emissions increase and decrease.

6. PSD Applicability Review - Sum all contemporaneous and creditable increases and decreases with the emissions changes from the project to determine if a significant net emissions increase will occur.

Actual emissions are defined in OAC252:100-8-31 as:
the actual rate of emissions of a regulated NSR pollutant from an emissions unit, as determined in accordance with paragraphs (A) through (C) of this definition, 75 except that this definition shall not apply for calculating whether a significant emissions increase has occurred, or for establishing a PAL under OAC 252:100-8-38. Instead, the definitions of "projected actual emissions" and "baseline actual emissions" shall apply for those purposes.

(A) In general, actual emissions as of a particular date shall equal the average rate in TPY at which the unit actually emitted the pollutant during a consecutive 24-month period which precedes the particular date and which is representative of normal source operation. The Director shall allow the use of a different time period upon a determination that it is more representative of normal source operation. Actual emissions shall be calculated using the unit's actual operating hours, production rates, and types of materials processed, stored, or combusted during the selected time period.

(B) The Director may presume that source-specific allowable emissions for the unit are equivalent to the actual emissions of the unit.

(C) For any emissions unit that has not begun normal operations on the particular date, actual emissions shall equal the potential to emit of the unit on that date.

Baseline actual emissions are defined as OAC252:100-8-31 as:
The rate of emissions, in TPY, of a regulated NSR pollutant, as determined in accordance with paragraphs (A) through (E) of this definition.

(A) The baseline actual emissions shall be based on current emissions data and the unit's utilization during the period chosen. Current emission data means the most current and accurate emission factors available and could include emissions used in the source's latest permit or permit application, the most recent CEM data, stack test data, manufacturer's data, mass balance, engineering calculations, and other emission factors.

(C) For an existing emissions unit (other than an EUSGU), baseline actual emissions means the average rate in TPY, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10- year period immediately preceding either the date the owner or operator begins actual construction of the project, or the date a complete permit application is received by the Director for a permit required either under this Part or under a plan approved by the Administrator, whichever is earlier, except that the 10 year period shall not include any period earlier than November 15, 1990.

(i) The average rate shall include fugitive emissions to the extent quantifiable, and emissions associated with startups, shutdowns, and malfunctions.

(ii) The average rate shall be adjusted downward to exclude any noncompliant emissions that occurred while the source was operating above an emission limitation that was legally enforceable during the consecutive 24-month period.

(iii) The average rate shall be adjusted downward to exclude any emissions that would have exceeded an emission limitation with which the major stationary source must currently comply, had such major stationary source been required to comply with such limitations during the consecutive 24-month period. However, if an emission limitation is part of a MACT standard that the Administrator proposed or promulgated under 40 CFR 63, the baseline actual emissions need only be adjusted if DEQ has taken credit for such emissions reduction in an attainment demonstration or maintenance plan consistent with requirements of 40 CFR 51.165(a)(3)(ii)(G).

(iv) For a regulated NSR pollutant, when a project involves multiple emissions units, only one consecutive 24-month period must be used to determine the baseline actual emissions for the emissions units being changed. A different consecutive 24-month period can be used for each regulated NSR pollutant.

(v) The average rate shall not be based on any consecutive 24-month period for which there is inadequate information for determining annual emissions, in TPY, and for adjusting this amount if required by (C)(ii) and (iii) of this definition.

(D) For a new emissions unit, the baseline actual emissions for purposes of determining the emissions increase that will result from the initial construction and operation of such unit shall equal zero; and thereafter, for all other purposes, shall equal the unit's potential to emit.

Historical emissions from sources affected by the projects included in this permit have been calculated from representative historical data. The baseline actual emissions for the projects included in this permit are based on the most representative operating data for a consecutive 24-month period during the previous ten years. As allowed in OAC 252:100-31, MCAAP has chosen to use different consecutive 24-month periods to establish baseline emissions. For CO emissions, the operating data for the period of January 2008 through December 2009 was used. For PM_{10} emissions, the operating data from January 2009 through December 2010 was used to calculate baseline emissions. No historical emissions data is available for NO_X, SO_2, lead and CO_2e. For these NSR regulated pollutants, baseline actual emissions are assumed to be zero.

Potential to emit is defined in OAC252:100-31 as:
The maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source.

Emissions Increases from the Project
The emissions increases from this project are calculated on a pollutant-by-pollutant basis. These increases include both project emissions and emissions from any source associated with the project. Emission decreases are not considered in this step.

Static Firing Emissions - Estimated potential emissions for the new rocket motors are based on emissions factors provided by the manufacturer and the known composition of the propellant contained in each type of rocket motor. These emissions are considered alongside the existing static firing emissions to determine the new potential-to-emit for EUG5P. The emissions in the following table are based on maximum operational capacity of the static firing stands.

Associated Emission Units - No associated emissions increases are expected from this project. No emissions units are being added or removed as part of this permit. Static firing of the alternative rocket motors will not result in an increased utilization of any other emissions units at the facility; therefore, no associated emissions increases will occur as a result of this modification.

The following table summarizes the project emissions increases for the modified source. Potential emissions are based off manufacturer's data, reflect the known composition of the MK12 rocket motors and the maximum number of rockets that can be fired in a year, three rockets per day and 366 days per year. The MK12 rocket motors represent the worst case rocket motors for lead, NOx, PM, and CO_2e; other rocket motors containing lead may be fired at the facility. HAWK rocket motors represent the worst case rocket motors for CO. Maverick rocket motors represent the worst case rocket motors for SO_2.

MK12 Potential Emissions

Rocket Motor	Units	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	Lead	CO_2e
MK12	lb/rocket	0.3788	8.7012	55.49896	55.49896	0.0000105	18.70355	170.0103
	lb/day	1.14	26.10	166.50	166.50	0.01	56.11	510.03
	lb/year	416.01	9,553.92	60,937.86	60,937.86	0.11	20,536.50	186,671.31
	TPY	0.21	4.78	30.47	30.47	0.01	10.27	93.34

The previous table shows that the total project potential emissions are greater than PSD SERs for PM_{10}, $PM_{2.5}$, and lead.

Emission Increases

	CO (TPY)	NOx (TPY)	PM_{10} (TPY)	$PM_{2.5}$ (TPY)	SO_2 (TPY)	Lead (TPY)	CO_2e (TPY)
Baseline Emissions	6.43	0.00	9.41	9.41	0.00	0.00	0.00
Maximum Potential Emissions	41.50[a]	4.78[b]	24.40[c]	19.40[d]	32.00[e]	6.54[f]	93.34[b]
Project Emission Increases	35.07	4.78	14.99	9.99	32.00	6.54	93.34
PSD SER (TPY)	100	40	15	10	40	0.6	75,000
PSD Analysis?	**No**	**No**	**No**	**No**	**No**	**Yes**	**No**

a - Maximum CO emissions are based off potential emissions from the HAWK missiles;
b - Maximum emissions are based off potential emissions from the MK12 missiles;
c - MCAAP proposes to take a limit of 24.40 TPY of PM_{10} to avoid PSD review;
d - MCAAP proposes to take a limit of 19.40 TPY of $PM_{2.5}$ to avoid PSD review.
e - Maximum SO_2 emissions are based off potential emissions from the Maverick missiles;
f - Based on $PM_{2.5}$ limitations, Pb emissions are reduced for the number of MK12's that may be fired.

The previous table shows the total project emissions increases, taking into account baseline actual emissions and a PM_{10} emission limit of 24.40 TPY and a $PM_{2.5}$ emission limit of 19.40 TPY, are greater than PSD SER for only lead. CO baseline emissions are based off operational data from January 2008 to December 2009 and PM baseline emissions are based off operational data from January 2009 to December 2010. Baseline emissions are based off DEQ Air Emission Inventories. There was no historical data available for NOx, SO_2, lead, or CO_2e. MCAAP will show compliance with PM_{10} and $PM_{2.5}$ limits by calculation emissions monthly and as a 12-month rolling total.

PSD Review

The proposed project is subject to PSD review for lead because the sum of all contemporaneous creditable emissions increases and decreases results in a significant net emissions increase.

SECTION IV. BACT ANALYSIS OUTLINE

As required by OAC252:100-7-15(c)(1), OAC252:100-8-5(d)(1)(A) and 40 CFR 52.21, MCAAP conducted a BACT analysis for the emissions associated with the proposed static firing modification that exceeded the PSD SER. As shown in the previous table, emissions of lead exceed the PSD SER for this project.

BACT is defined in OAC252:100-1-3 as:
an emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Director, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of such pollutant. In no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.

The following methodology for performing a top-down BACT analysis has been developed from the US EPA's Draft NSR Workshop manual. The analysis utilizes five key steps to identify the most suited BACT option for the project. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically, environmentally, or economically infeasible for the unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

Step 1 - Identify Available Control Technologies
Available control technologies are identified for each unit in question. The following methods are used to identify potential technologies: 1) querying the Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database, 2) surveying regulatory agencies, 3) drawing from previous engineering experience, 4) surveying air pollution control equipment vendors, and 5) reviewing available literature.

Step 2 - Eliminate Technically Infeasible Options
After the identification of control options, an analysis is conducted to eliminate technically infeasible options. A control option is eliminated from consideration if there are process-specific conditions that prohibit the implementation of the control technology or if the highest control efficiency of the option would result in an emission level that is higher than any applicable regulatory limits, such as an NSPS.

Step 3 - Rank Remaining Control Options by Control Effectiveness
Once technically infeasible options are removed from consideration, the remaining options are ranked based on their control effectiveness. If there is only one remaining option, or all of the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required.

Step 4 - Evaluate and Eliminate Control Technologies Based on Energy, Environmental, and Economic Impacts

Beginning with the most efficient control option in the ranking, detailed economic, energy, and environmental impact evaluations are performed. If a control option is determined to be economically feasible without adverse energy or environmental impacts, it is not necessary to evaluate the remaining options with lower control efficiencies.

The economic evaluation centers on the cost effectiveness of the control option. Costs of installing and operating control technologies are estimated following the methodologies outlined in the EPA's *OAQPS Control Cost Manual* (CCM) and other industry resources. Cost effectiveness is expressed as dollars per ton of pollutant controlled. Objective analysis of energy and environmental impacts associated with each option are also conducted. Both beneficial and adverse impacts are discussed and quantified.

Step 5 - Select BACT and Document the Selection as BACT

In the final step, one pollutant-specific control option is proposed as BACT for each emission unit under review. This control option is proposed based on technical, environmental, and economic evaluations from the previous step. Per OAC 252:100-1-3, BACT is imposed as an emission limitation (i.e., not a particular control technology) or other standard (e.g., work practice or design) if it is determined that an emission limitation is infeasible.

SECTION V. BACT ANALYSIS

Step 1 - Identify Available Control Technologies

The first step in the BACT analysis is to identify the possible control technologies for each applicable pollutant for comparable emissions sources. For most source types, the EPA's RBLC is the preferred reference. The following table lists commercially available controls for rocket demilitarization and rocket engine test firing. While there were no RBLC entries for the pollutant of concern, lead, it is reasonable to apply the listed control technologies.

All RBLC Listed Control Technologies

Control Technologies
Rocket Engine Test Fire • Good operating practices, liquid hydrogen/oxygen fuel whenever possible

It is important to note that while rocket engine test firing is not the same process as static firing, there are some similarities, namely the inability to safely control emissions associated with both processes. As stated in the pollutant compliance notes contained in one rocket engine test firing entry. The following comment is included in the pollutant compliance notes for the RBLC search results for Rocket Engine Test Firing (99.010) for the National Aeronautics Space Administration's (NASA) Permit No. 1000-00005 issued March 26, 2000:

> *"the emissions from rocket testing have been considered incontrollable due to the fact that most rocket engines emit larger quantities of combustion products for a relatively short period of time."*

Good Operating Practices
Good operating practices for static firing operations include, but are not limited to, routine inspections and timely repairs of static firing equipment and only conducting operations during daylight hours when climatic conditions are acceptable.

Step 2 - Eliminate Technically Infeasible Options
The only control technology being considered is good operating practices, which is further considered in the following steps of the top-down BACT analysis.

Step 3 - Rank Control Technologies by Effectiveness
The following table lists the control technologies considered in order of decreasing emission reduction potential.

Ranking Control Technology Options

Rank	Option
1	Good Operating Practices

Step 4 - Evaluate Most Effective Control Option
No energy, environmental, or economic analysis was completed in the step as the impacts associated with good operation practices are expected to be minimal.

Step 5 - Select Lead BACT for Static Firing
Good operational practices have been selected as BACT for lead emissions associated with static firing of rocket motors. The resulting BACT standard is an emission limit unless technological or economic limitations of the measurement methodology would make the imposition of an emission standard infeasible, in which case a work practice or operating standard can be imposed. For the proposed modification, good operating practices and a lead BACT emission limit of 6.98 TPY for static firing operations, based on a 12-month rolling total, have been selected.

SECTION VI. AIR QUALITY DISPERSION MODELING ANALYSIS

Both the Federal PSD (40 CFR Part 52.21) and New Source Review (NSR) construction permit programs are incorporated in OAC 252:100-8. These programs require air dispersion modeling analysis be conducted to demonstrate compliance with and to protect the National Ambient Air Quality Standards (NAAQS) and PSD Increments in support of PSD construction permit applications. MCAAP has conducted an air dispersion modeling analysis for lead emissions associated with the requested modification to the static firing operations conducted at the facility.

Model Selection
EPA's American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) (version 16216r) was used. The AERMOD model, a steady-state plume dispersion model used for assessment of pollutant concentrations from a variety of sources, has become the primary model used for conducting refined modeling analyses. AERMOD incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

Terrain

Modeling with elevated terrain was used for this analysis. AERMAP (version 11103), a terrain preprocessor that incorporates complex terrain using U.S. Geological Survey (USGS) Digital Elevation Data was used to determine stack, building, and receptor elevations/hill heights. Elevations entered into the model were interpolated from USGS 7.5-minute digital elevation model (DEM) data of the area surrounding the facility.

Stack GEP Analysis & Building Downwash

Building wake effects on each emission point source were incorporated through the use of the BPIP-PRIME (version 04274) algorithm. BPIP-PRIME calculates all direction specific building data required by the air dispersion model to enable it to include the appropriate building downwash algorithm into the calculations. The structure dimensions are then imported into AERMOD on an emission point-specific basis. Building data used in the model is presented in the following tables.

RECTANGULAR BUILDING PARAMETERS

Description	X Coord (meters)	Y Coord (meters)	Elevation (meters)	Height (meters)	X Length (meters)	Y Length (meters)	Angle (degree)
Special Weapons	233,199.57	3,856,933.28	231.65	7.31	32.92	248.70	0
Demo Range Shelter	234,081.74	3,856,127.27	250.12	5.64	7.62	18.29	0
AT Magazine 1	234,325.02	3,855,191.30	231.88	5.79	7.62	24.38	40
AT Magazine 2	234,411.08	3,855,311.62	232.05	5.79	7.62	24.38	40
AT Magazine 3	234,497.70	3,855,432.07	231.20	5.79	7.62	24.38	40
AT Magazine 4	234,583.33	3,855,553.27	229.81	5.79	7.62	24.38	40
AT Magazine 5	234,669.08	3,855,672.94	228.60	5.79	7.62	24.38	40
AT Magazine 6	234,754.77	3,855,793.84	228.10	5.79	7.62	24.38	40

Polygon Building Parameters

Description	Elevation (meters)	Height (meters)	X Coord (meters)	Y Coord (meters)
NW Berm	240.79	3.25	233,738.90	3,856,190.90
			233,740.30	3,856,212.80
			233,776.40	3,856,207.30
			233,777.00	3,856,181.10
			233,771.50	3,856,181.10
			233,770.20	3,856,200.90
			233,746.50	3,856,204.00
			233,745.50	3,856,190.90
Center Berm	242.09	3.25	233,805.30	3,856,163.70
			233,828.50	3,856,170.20
			233,844.10	3,856,136.20
			233,823.00	3,856,127.90
			233,820.50	3,856,134.30
			233,834.20	3,856,139.20
			233,825.50	3,856,159.10
			233,810.30	3,856,155.00

SE Berm	243.45	3.25	233,836.90	3,856,088.70
			233,858.60	3,856,086.40
			233,857.30	3,856,050.60
			233,835.70	3,856,050.40
			233,835.30	3,856,056.50
			233,850.20	3,856,056.70
			233,851.40	3,856,080.20
			233,836.50	3,856,081.70

Meteorological Data

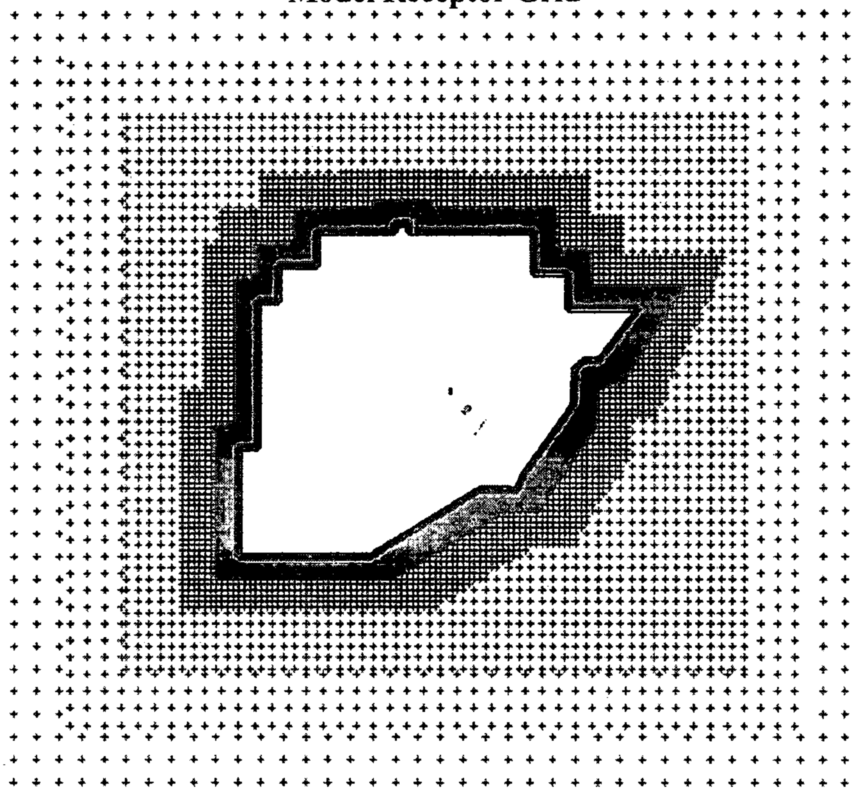
Pre-processed meteorological data (AERMET version 16216) was used for the modeling analysis. Integrated Surface Hourly (ISH) meteorological data from the McAlester Regional Airport (KMLC - Station # 93950) was provided for years 2011 through 2015. For all meteorological years (2011 to 2015), upper air data from the OU Max Westheimer Airport, (KOUN - Station # 3948) was used.

Receptor Grid

Ground-level concentrations are calculated for receptors located on five Cartesian grids covering a region that extends at least 10 km from all facility emission sources. The grid used for the modeling analysis is shown in the following table. The grids are defined as follows:

- A fence line grid containing 50 meter-spaced receptors located along the facility fence line.
- A 100-meter grid containing 100 meter-spaced receptors, extending approximately 1.0 km from the fence line, exclusive of the fence line grid.
- A 250-meter grid containing 250 meter-spaced receptors, extending approximately 2.5 km from the fence line, exclusive of the 100 meter grid.
- A 500-meter grid containing 500 meter-spaced receptors, extending approximately 5.0 km from the fence line, exclusive of the 250 meter grid.
- A 750-meter grid containing 750 meter-spaced receptors, extending approximately 7.5 km from the fence line, exclusive of the 500 meter grid.
- A 1,000-meter grid containing 1,000 meter-spaced receptors, extending approximately 10 km from the fence line, exclusive of the 750 meter grid.

Model Receptor Grid



Significance Analysis

A significant impact analysis is the first level of modeling performed in a PSD evaluation. For each applicable pollutant, the analysis must include all increases in stack emissions and quantifiable fugitive emissions resulting only from the project. There is no SIL for lead, so no significance analysis was performed. No further discussion of the significance analysis is included in this report.

Full Impact Analysis

A full impact analysis, typically consisting of a NAAQS analysis and a PSD Increment analysis, needs to be conducted for each pollutant with an ambient impact that exceeds a SIL. As discussed above, there is no PSD Class I or II Increment for lead; therefore, PSD Increment analyses were not performed and are not discussed further in this report.

NAAQS Analysis

Since there is no SIL for lead, the first step of the NAAQS Analysis of determining the Radius of Impact (ROI) cannot be performed. In order to develop an inventory of sources to include in the NAAQS analysis, MCAAP requested DEQ assist in developing an appropriate inventory. As determined by DEQ, the only sources of lead in the surrounding area are the open burning/open detonation (OB/OD) activities conducted by the facility.

To complete the NAAQS analysis, the emissions from the proposed static firing of the new rocket motors are modeled simultaneously with the emissions from the sources identified in the inventory. Because MCAAP is the only source of lead in the surrounding area and historical monitored lead concentrations were low enough to justify removal of the previously active lead monitor, no background concentrations have been included for comparison with the NAAQS.

The pollutant evaluated in the modeling analysis is lead. As discussed in the construction application submitted under separate cover, static firing operations are physically limited due to the number and configuration of the firing pads and time constraints associated with safely firing rocket motors. Modeling conducted for the proposed rocket motors is conservatively based on the assumption that up to six rocket motors may be fired in an eight-hour period during each day. For the purpose of this model, total daily emissions were evenly distributed across the modeled eight-hour period. Each static firing pad is represented in the modeling analysis as three volume sources evenly spaced starting at the actual firing pad and extending in the direction of the exhaust of the rocket motor.

In order to obtain additional operational flexibility, three different eight-hour periods were modeled: one starting at 0800, one starting at 0900, and one starting a 1000. The maximum monthly modeled impacts at each receptor for the three eight-hour periods were combined to create an overall maximum output file. The generated maximum output was processed in EPA's post-processing tool, LEADPOST, to determine the maximum rolling three-month average modeled impact. A summary of the modeled emissions for each scenario as well as modeled parameters are provided in the tables below. A sample calculation demonstrating how the modeled rocket motor emissions were determined is presented following.

$$Source\ Emission\ Rate = \frac{12.72\ lb}{rocket\ motor}\ x\ \frac{6\ rocket\ motors}{day}\ x\ \frac{day}{8\ hours}\ x\ \frac{1}{3\ pads}\ x\ \frac{pad}{3\ sources}$$

$$Source\ Emission\ Rate = 1.06\ lb/hr\ \ per\ source$$

STATIC FIRING MODELED SOURCE EMISSIONS

Time	NW Pad (lb/hr)	Center Pad (lb/hr)	SE Pad (lb/hr)
08:00-16:00	3.18	3.18	3.18
09:00-17:00	3.18	3.18	3.18
10:00-18:00	3.18	3.18	3.18

[1] – Emissions shown are total emissions modeled for each pad. Modeled emissions for each volume source are one third of the total of each pad.

STATIC FIRING MODELED SOURCE PARAMETERS

Description	X Coord (meters)	Y Coord (meters)	Elevation (meters)	Emission Rate (lb/hr)	Release Height (meters)	Initial Lateral Dimension (meters)	Initial Vertical Dimension (meters)
NW Pad 1	233,757.30	3,856,181.00	241.11	1.06	5.00	2.33	2.33
NW Pad 2	233,757.30	3,856,175.34	241.11	1.06	5.00	2.33	2.33
NW Pad 3	233,757.30	3,856,169.68	241.11	1.06	5.00	2.33	2.33
Center Pad 1	233,806.10	3,856,141.30	242.14	1.06	5.00	2.33	2.33
Center Pad 2	233,802.10	3,856,137.30	242.14	1.06	5.00	2.33	2.33
Center Pad 3	233,798.10	3,856,133.30	242.14	1.06	5.00	2.33	2.33
SE Pad 1	233,829.00	3,856,063.40	243.62	1.06	5.00	2.33	2.33
SE Pad 2	233,823.34	3,856,063.40	243.62	1.06	5.00	2.33	2.33
SE Pad 3	233,817.68	3,856,063.40	243.62	1.06	5.00	2.33	2.33

Inventory source emissions calculations are based on, for open detonation (OD), 2014 and 2015 net explosive weight (NEW) and lead emissions, and, for open burning (OB), 2015 and 2016 NEW and lead emissions. Detailed modeled emissions calculations are provided in the following tables. OB activities are limited in the plant's Resource Conservation and Recovery (RCRA) permit to 20,000 pounds of NEW per burn event and two burn events per day. The calculated pounds of lead per burn event is based on 20,000 pounds of NEW. OD activities are also limited in the plant's RCRA permit and are divided between two areas, the newer area (NEWOD) and the older area (OLDOD). A total of 26,000 pounds of NEW is allowed to be detonated per day. The calculated pounds of lead per detonation is divided evenly between the two open detonation areas. OB and OD source parameters are provided in the following tables.

OB MODELED SOURCE EMISSIONS

Year	lb NEW/yr	lb Lead/yr	Annual Average lb Lead/lb NEW	lb Lead per Burn
2015	2,048,247	1,152.0	0.000562	--
2016	3,734,964	1,852.0	0.000496	--
2-Yr Avg.	--	--	**0.000529**	**10.58**

OD MODELED SOURCE EMISSIONS

Year	lb NEW/yr	lb Lead/yr	Annual Average lb Lead/lb NEW	Total lb Lead per Day	lb Lead per Detonation Pad
2014	2,095,349	320.0	0.000153	--	--
2015	1,731,870	212.0	0.000122	--	--
2-Yr Avg.	--	--	**0.000138**	**3.58**	**1.79**

OB MODELED SOURCE PARAMETERS

Description	X Coord (meters)	Y Coord (meters)	Elevation (meters)	Stack Height (meters)	Stack Temp (K)	Stack Velocity (m/sec)	Stack Diameter (meters)
OB	234,005.00	3,856,293.00	244.49	2.65	0.20	810.93	3.00

OD MODELED SOURCE PARAMETERS

Description	X Coord (meters)	Y Coord (meters)	Elevation (meters)	Emission Rate (lb/hr)	Release Height (meters)	Initial Lateral Dimension (meters)	Initial Vertical Dimension (meters)
OLDOD	235,269.00	3,854,470.00	231.61	0.224	0.00	1.64	5.77
NEWOD	233,718.00	3,855,576.00	246.01	0.224	0.00	1.64	5.77

The results for the static firing modification demonstrate that, when modeled using EPA's and DEQ's preferred methods and in accordance with the most recently published guidance, the facility does not cause or contribute to a violation of lead rolling three-month NAAQS.

<u>NAAQS Analysis</u>

As is shown in the table below, lead emissions from the static firing of the proposed rocket motors as presented in this modeling analysis do not result in a modeled violation of the lead rolling three-month NAAQS. Therefore, this analysis satisfies EPA's and DEQ's requirements for demonstrating compliance with the lead NAAQS.

NAAQS Analysis Results

Time	Maximum Modeled Concentration[1] (μg/m³)	Maximum Background (2013-2015) (μg/m³)	Total Concentration (μg/m³)	NAAQS[2] (μg/m³)	Exceeds NAAQS? (Yes/No)
0800-1600	0.084	0.000	0.084	--	--
0900-1700	0.047	0.000	0.047	--	--
1000-1800	0.041	0.000	0.041	--	--
Generated Maximum	0.084	0.000	0.084	0.15	**No**

[1] Maximum three-month rolling arithmetic mean over 5 years.

[2] 73 FR 66964

Growth Impacts

A growth analysis is intended to quantify the amount of new residential, commercial, or industrial growth that is likely to occur in support of the project and to estimate emissions resulting from that associated growth. Residential growth depends on the number of new employees and the availability of housing in the area, while associated commercial and industrial growth consists of new sources providing services to the new employees and the facility. MCAAP does not anticipate additional personnel will be employed to assist in the static firing of the additional types of rocket motors. Therefore, additional growth from this project is expected to be negligible.

Soils and Vegetation

The effects of gaseous air pollutants on vegetation may be classified into three rather broad categories: acute, chronic, and long-term. Acute effects are those that result from relatively short (less than 1 month) exposures to high concentrations of pollutants. Chronic effects occur when organisms are exposed for months or even years to certain threshold levels of pollutants. Long-term effects include abnormal changes in ecosystems and subtle physiological alterations in organisms. Acute and chronic effects are caused by the gaseous pollutant acting directly on the organism, whereas long-term effects may be indirectly caused by secondary agents such as changes in soil pH.

Since the modeled lead impacts when added to the maximum background concentration are predicted to be below the NAAQS, the project is not expected to cause or contribute to a violation of any primary or secondary NAAQS, which are designed to protect both public health and welfare and the environment from any unknown or adverse effects of air pollution, including damage to vegetation and harmful contamination of soils. Because modeled impacts are below the NAAQS, it is reasonable to assume that secondary and tertiary ingestion of the lead through the consumption of fish (secondary) and deer that eat grass (tertiary) will not cause adverse effects. Therefore, it is expected this project will have no adverse impacts on vegetation or soil.

Visibility Impairment

This project is not expected to produce any perceptible visibility impacts in the immediate vicinity of the plant. Given the limitation of 20% opacity for operations at the plant and the fact that OB/OD/Static Firing operations take less than the six-minute averaging period contained in OAC 252:100-25, no immediate visibility impairment is anticipated.